

# Chest Pain in Children

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### Abstract

Chest pain in children is rarely due to cardiac disease and etiology is usually obscure. Three hundred patients [128 (42.7%) girls and 172 (57.3%) boys] with chest pain were evaluated. The ages of the girls and boys ranged from 3 to 17 years (mean 9.6 years) and 3 to 15 years (mean 10.4 years). The course time during chest pain was over one month in 207 (68.8%) of the patients. Localization was on the left precordium in 226 (75.3%) of the patients. The reason for chest pain was idiopathic in 189 (63.4%) of the patients. Psychiatric, cardiac, gastrointestinal, pulmonary, and musculoskeletal causes were present in 56 (18.7%), 24 (8%), 14 (4.7%), 9 (3%), and 5 (1.6%) of the patients. One patient presented with BCG lymphadenitis (axillary); one patient with thelarche; and one patient with gynecomastia had chest pain. *Int Pediatr.* 2004;19(3):175-179.

*Key words:* Chest pain, children

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### Introduction

Chest pain is not a usual manifestation of cardiac disease in the pediatric population; however, it is a frequent cause for referral to the pediatric cardiologist or emergency room because chest pain is especially associated with atherosclerotic heart diseases and myocardial infarction in adults. Unlike adults, chest pain in children is rarely associated with life-threatening diseases.<sup>1-3</sup> This study prospectively evaluated the etiology of chest pain in children admitted to Dr. Sami Ulus Children's Hospital during a one-year period.

### Methods and Materials

The study involved 300 patients evaluated by the Pediatric Cardiology Unit of Dr. Sami Ulus Children's

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Hospital during a one-year period. All patients were examined by a pediatrician before referral to a pediatric cardiologist. A chest pain protocol was performed on every patient, including a history, physical examination, complete blood count (CBC), electrocardiogram (ECG), telecardiography, and two dimensional and color Doppler echocardiography (HP Sonos 1000). When patients had epigastric tenderness following consultation with a pediatric gastroenterologist, endoscopy or esophagastroduodenogram was performed. Patients with a history of positive psychological findings were evaluated by a child psychiatrist using the Diagnostic and Statistical Manual of Mental disorder-IV-Text Revision (DSM-IV-R) diagnostic criteria as a part of the evaluation.<sup>4</sup>

The patients with psychiatric chest pain associated with depression were provided with an antidepressant treatment (Imipramine), and then reevaluated once a month for six months or one year. The patients with positive gastrointestinal findings in endoscopy or esophagastroduodenogram were treated with antacid and H<sub>2</sub>-blockers. Response to antacids and H<sub>2</sub>-blockers was defined as the relief of epigastric tenderness one month later. Two patients with *Helicobacter pylori* positive were given clarithromycin for 15 days. Diagnoses were grouped as idiopathic, psychiatric, cardiac, gastrointestinal, pulmonary, musculoskeletal, and other causes.

### Results

During the study, 300 patients suffering from chest pain were admitted to our hospital. There were 128 (42.7%) girls and 172 (57.3%) boys. The mean age for the girls was 9.6 years (ranging in ages 3-17), and the mean age for the boys was 10.4 years (ranging in ages 3-15). Among the patients, 200 (66.7%) were younger than 12 years of age, while 100 (33.3%) of them were older than 12. Idiopathic and psychiatric chest pains

were more common in boys (59%, 58.9%, respectively) than in girls.

Fifty-seven (20.4%) patients had a history of drug use, and 46 had a history of aspirin use. Two patients were cigarette smokers. Forty (13.3%) patients had an additional disorder; four goitre; four rheumatic heart disease; eight epilepsy; two chronic renal failure; one acute lymphoblastic leukemia; two Duchenne muscular dystrophy; one hypercholesterolemia; one Friedrich ataxia and Type 1 diabetes mellitus; five chronic hepatitis B; four allergic rhinitis; and seven growth retardation. Nine (3%) patients had a history of death of the father or mother. Twenty-three (7.6%) patients had school related problems, and 13 (4.3%) patients had problems in the family. Six patients (2%) reported sudden death in the family, while eight (2.6%) patients experienced jealousy, and two (0.6%) patients were attending a boarding school. Two (0.6%) patients had experienced a traumatic situation such as an earthquake.

The family history of the patients revealed heart disease in 36 (12%); chest pain in 27 (9%); sudden death in 16 (5.2%); psychogenic problems in 13 (4.3%); and peptic ulcer in 38 (12.6%) of the patients (Table 1).

Chest pain localizations and characteristics are shown in Table 2. The time course of the pain was over one month in 207 (69%) of the patients, and the duration of the pain was under one minute in 100 (33.3%) patients. In 226 (75.3%) of the patients, the pain was localized on the left precordium. In 172 (57.3%) of the patients, chest pain was sharp. In 134 (44.7%) of the patients, chest pain was increased with exercise; however, in 89 (28.7 %) of the patients, chest pain was subsided with rest. In 173 (57.7%) of the patients, chest pain was not resolved.

**Table 1 - Patients' History**

History	Number of Patients (%)
Emotional problem	54 (18)
Aspirin	46 (15.3)
Additional disorder	40(13.3 )
Smoking	2 (0.7)
Trauma	2 (0.7)
<b>Family history</b>	<b>Number of Patients (%)</b>
Cardiac disease	36 (12)
Peptic ulcer	35 (11.7)
Chest pain	27 (9)
Sudden death	16 (5.3)
Psychogenic problems	13 ( 4.3)

While the results of the physical examinations were normal in 180 (60%) of the remaining 120 (40%) cases, 63 had cardiac murmur. Of these, 44 had innocent murmur; there were findings of epigastric tenderness in 35; splenomegaly in four; hepatomegaly in four; painful xiphoid in two; chest wall deformity in three; breast pain in two; rales in six; and axillary lymphadenitis in one. The findings of the telecardiography were within normal limits in 289 (96.3%) of the patients. The telecardiography showed prominent pulmonary conus in six patients; cardiomegaly in three patients; right paracardiac pulmonary infiltrates in one patient; and bilateral high position diaphragm in one patient. The ECG was normal in 293 (97.7%) of the patients. The ECG findings were left atrial dilatation in one patient; ST depression in one patient; preexcitation syndrome in one patient; negative T waves on the left precordial derivations in one patient; right ventricle hypertrophy in one patient; and left ventricle hypertrophy in two patients. Echocardiographic examination was performed on 288, of whom 249 had normal results (Table 3). Echocardiographic studies revealed mitral valve prolapse (MVP) in 13 cases; hypertrophic cardiomyopathy in four cases; aortic stenosis and coarctation of aorta in one patient; aortic stenosis in one patient; pulmonary hypertension in one patient; and dilated cardiomyopathy in one patient. Psychiatric evaluation was performed on 125 patients. Endoscopy or esophagastroduodenogram was performed on 35 patients.

The diagnoses established in the study are summarized in Table 4. Idiopathic chest pain (63%) was the most prevalent diagnosis. Psychiatric pain accounted for 18.7%; cardiac causes for 8%; gastrointestinal causes for 4.7%; pulmonary diseases for 3%; and musculoskeletal causes for 1.6% of the children with chest pain. BCG lymphadenitis in one patient, thelarche in another, and gynecomastia in one was associated with chest pain. The most common etiologies of psychiatric, cardiac, and gastrointestinal chest pain were depression, MVP, and bulbitis and gastritis.

## Discussion

Chest pain, a common complaint of pediatric patients, accounts for 6 in 1000 visits to pediatric emergency services. In addition, chest pain is the second most prevalent reason for referral to pediatric cardiologists.<sup>5</sup>

Chest Pain

**Table 2 - Characteristics of Chest Pain**

Characteristics	Number of Patients	(%)
<b>Time course</b>		
Acute (<2day)	24	(8)
Persistent		
2-15 day	43	(14.3)
16-30 day	26	(8.7)
31 day-6 month	82	(27.3)
Chronic (6 month<)	125	(41.6)
<b>Duration(minutes)</b>		
<1	100	(33.3)
1-5	77	(25.7)
6-60	90	(30)
60 <	33	(11)
<b>Location</b>		
Left precordium	226	(75.3)
Epigastrium	21	(7)
Undefined	20	(6.7)
Sternum	14	(4.7)
Right precordium	12	(4)
Breast	7	(2.3)
<b>Description</b>		
Sharp	172	(57.3)
Dull	86	(28.7)
Undefined	42	(14)
<b>Increasing reasons</b>		
Exercise	134	(44.7)
Psychogenic Stress	20	(6.7)
After meals	13	(4.3)
Before meals	10	(3.3)
No increasing reason	121	(40.4)
<b>Resolution</b>		
Rest	89	(28.7)
Massage	25	(8.3)
Eating	10	(3.4)
Sleeping	3	(1)
No resolution	173	(57.7)

**Table 3 - Results of the Laboratory Tests**

Tests	Total	Results	
		Normal	Abnormal
Complete blood count	300	295	5
Telecardiography	300	289	11
Electrocardiogram	300	293	7
Echocardiography	288	249	39
Endoscopy/ Esophagastrodeudonogram	35	20	15

Chest pain in the pediatric population is most commonly idiopathic in etiology, representing 12-85% of all cases. Musculoskeletal, pulmonary, gastrointestinal, psychogenic, and cardiac diseases are unusual causes of chest pain in children.<sup>1,3,6</sup> In the study of Tunaoglu et al,<sup>6</sup> 92% of the patients had idiopathic chest pain. However, in their study, idiopathic chest

pain also included psychiatric chest pain. Fyfe and Moodie<sup>2</sup> considered 55% of their patients with normal physical examinations, chest roentgenograms, and electrocardiograms as having idiopathic chest pain; however, did not report any psychiatric chest pain in their patients. In the study of Selbst et al,<sup>3</sup> idiopathic chest pain ranked as the most common diagnosis

Table 4 - Diagnoses in Children with Chest Pain

Diagnoses	Number of Patients	Girl	Boy
<b>Idiopathic</b>	<b>189</b>	<b>77</b>	<b>112</b>
<b>Psychogenic</b>	<b>56</b>	<b>23</b>	<b>33</b>
Depression	29	13	16
Somatoform Disorder	14	6	8
Behavioral Abnormality	7	3	4
Cognitive disorder	2		2
Anxiety	1		1
Conversion disorder	1	1	
Tic	1		1
Conflict	1		1
<b>Cardiac</b>	<b>24</b>	<b>14</b>	<b>10</b>
Mitral valve prolapse	13	8	5
Hypertrophic cardiomyopathy	4	3	1
Pulmonary hipertansiyon	1	1	
Aortic stenosis	1		1
Dilated cardiomyopathy	1	1	
Preexcitation syndrome	1		1
Aortic stenosis + coarctation of aorta	1		1
Supraventricular tachyarrhythmia	1	1	
Ventricular tachyarrhythmia	1		1
<b>Gastrointestinal</b>	<b>14</b>	<b>5</b>	<b>9</b>
Bulbitis	5	3	2
Gastritis	4	1	3
Gastroesophageal reflux	3	1	2
Gastric motility disorder	2		2
<b>Pulmonary</b>	<b>9</b>	<b>5</b>	<b>4</b>
Pneumonia	4	2	2
Asthma bronchiale	2	1	1
Tuberculosis pneumonia	1	1	
Congenital subpleural bullae	1		1
Hydatid cyst	1	1	
<b>Musculoskeletal</b>	<b>5</b>	<b>2</b>	<b>3</b>
Duchenne muscular dystrophy	2		2
Costochondritis	1		
Posttraumatic	1		1
Leukemia	1		1
<b>Other</b>	<b>3</b>	<b>2</b>	<b>1</b>

among their 267 patients; psychiatric chest pain was the second most common diagnosis. Similarly, in this study, idiopathic chest pain was the most common diagnosis, while psychiatric chest pain was the second most common. Furthermore, the most common cause of psychiatric chest pain in our study was depression. The onset of the pubertal changes, family disruption, and move to a new school are particularly known to lead to anxiety and somatization.<sup>7</sup> Likewise, in our study, psychiatric chest pain was associated with emotional problems, family problems, and psychogenic stress.

Cardiac diseases are rarely associated with chest pain in the pediatric population. Thus, cardiac diseases related to chest pain are unusual in many of the studies of this population.<sup>8</sup> However, 8% of our patients had

cardiac chest pain. Myocardial infarction is a rare possibility in children and adolescents, but three major cardiac diseases should be considered.

The categories are: anatomic lesions, acquired lesions, and arrhythmias. MVP is an anatomic lesion that causes chest pain in up to 18% of children.<sup>9,10</sup> Chest pain presumably results from papillary muscle or left ventricular endocardial ischemia, but MVP is no more common in the children with chest pain than in the general population.

Hypertrophic obstructive cardiomyopathy is another anatomic lesion, which may cause ischemic symptoms in children.<sup>11,12</sup> In this study, while 13 patients had MVP, four patients had hypertrophic cardiomyopathy, one of whom had Friedrich ataxia.

Chest pain was the common complaint among these conditions. However, three patients had a family history of syncope and sudden death.

Sabri et al<sup>13</sup> evaluated and highlighted the significance of epigastric tenderness in children and adolescents with chest pain and performed endoscopy in which the findings showed 75% gastritis, 13.6% duodenitis, 11.4% gastroduodenitis, and 11.4% esophagitis and gastritis. The results of our study are in conformity with the results of Sabri et al.<sup>13</sup> The examinations of our patients with epigastric tenderness revealed nine (64.2%) patients with bulbitis and gastritis, while in seven patients, gastrointestinal problems due to aspirin intake were detected.

Selbst et al<sup>14</sup> reported costochondritis as a group exclusive of musculoskeletal origin, and they accounted for 15% musculoskeletal origin and 9% costochondritis. In their study, girls were more likely to have chest pain caused by costochondritis. In our study, one female patient had costochondritis.

Chest pain is a common complaint in all ages regardless of gender. Thus, gender does not seem to be a determinant in chest pain. However, for Selbst et al,<sup>3,14,15</sup> psychogenic pain was significantly more common in teenagers and girls. In this study, psychiatric chest pain was more common among patients younger than 12 and among male patients. Furthermore, idiopathic (37.3%) chest pain was also more common in males.

### Conclusion

Table 3 presents laboratory test results, most of which were normal. In conformity with other studies,<sup>3,14</sup> we believe that laboratory tests are not generally helpful in establishing a specific diagnosis for chest pain; however, these may help identify organic causes. Therefore, since the families of the patients who apply with a complaint of chest pain are often concerned about a possible cardiac disorder, after the physical examinations and obtaining the history, the

families of the patients should be informed about the necessity for laboratory tests to determine the cause, with a minimal suspicion of cardiac disorder, but a probable organic cause in mind.

As a result, chest pain during the childhood period is more prevalent, but not a risky situation. Taking a detailed history and good physical examination will be a good guide in discovering life-threatening disorders.

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