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Chest Pain in Children

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Abstract

Objectives: Chest pain (CP) is a common cause of referral the children to Hospital. The objective of this study is to describe current magnitude, causes, rate of cardiac chest pain, associated risk factors, and what is the ideal approach for this group of patients in pediatric emergency department and cardiology unit in.

Patients and methods: This is prospective hospital based cross sectional study done in Pediatric Department, King Fahad Hospital Albaha Kingdom of Saudi Arabia from Jan 2010 till Jan 2013. The patients are aged from 5 to 12 year. A chest pain protocol was performed by Pediatrician on every patient, including a detailed history, full physical examination, complete blood count, ESR, blood sugar, electrolytes, (ECG) electrocardiogram, and Echocardiography. EEG had done only for patients with positive family history of seizure disorder. Holter ECG done for pts with significant cardiac signs, and stress ECG done only for 2 pts. Patients with sickle cell anemia, CNS diseases, trauma associated chest pain, and syndromic pts, with chest pain are excluded. Statistical analysis was performed using the Odds, Odd-ratio and 95% CI.

Results: 225 patients were seen in this study. 126 pts are male (56%) and 99 female (44%). Electrocardiography (ECG) and Echocardiography were done to all pts. Holter ECG monitoring done in 10 pts (4%). Idiopathic Chest Pain is the most common cause diagnosed in 125 patients (56%), it is more common in elder pts >10 yr and it is a diagnosis of exclusion. Musculoskeletal causes account for (16%. Pulmonary causes account for 13%. Cardiac causes, account for 15 pts. (7%), Gastrointestinal causes account for 4%. Psychological causes account for 10 pts (4%), school and family related problems are the most common psychological problems.

Conclusion: Idiopathic chest pain is the most common in children and slightly more common in males. Cardiac causes are rare. Detailed history, full clinical examination, CXR, and ECG can diagnose the majority causes. Echocardiography, Holter ECG, and EEG reserved for some cases when associated with significant cardiac or neurological symptoms and signs.

Keywords: Chest pain; Pediatrics

Abbreviations: CP: Chest pain; Pts: Patients; ECG: Electrocardiogram; CNS: Central Nervous System; CHD: Congenital Heart Disease; CBC: Complete Blood Count; CXR: Chest X Ray; ESR: Erythrocyte Sedimentation Rate; EEG: Electroencephalogram; ORl: Odd Ratio; Echo: Echocardiogram; CI: Confidence Interval

Introduction

Chest pain is a common complaint among children, account for 0.3–0.6% [1]. Annually in the United States, about 600,000 individuals have chest pain [2]. Chest pain in children is rarely associated with life-threatening disease [2,3]. Idiopathic chest pain and other non cardiac causes in the pediatric population is most common etiology [6]. Most chest pain in children is associated with benign or self-limited illness [6]. Chest pain is not a usual manifestation of cardiac disease in the pediatric population [10,17]; however, it is a frequent cause for referral to the pediatric cardiologist or emergency room [11]. Although cardiac causes of chest pain in children are uncommon, but are potentially dangerous [13]. This study prospectively evaluated the etiology of chest pain in children examined in Pediatric Department, King Fahad Hospital Albaha, Southwest Saudi Arabia during a three years period

Methods and Materials

This is prospective hospital based cross sectional study done in Pediatric Department, King Fahad Hospital Albaha Kingdom of Saudi Arabia from Jan 2010 till Jan 2013. The study approved by ethical and research committee in our Hospital. No consent obtained from patients because no intervention procedure done for pts but already informed about this survey. The authors have indicated they have no financial support releated to this article to disclose. Patients were identified on the basis of International Classification of diseases, Ninth Revision (ICD, R9). The patients included in our study aged between 5 to 12 yr. Patient less than 5 yr has difficulty to describe ideally his chest pain, and the policy in our hospital is to follow up pts older than 12 yr in adult units. Patients with sickle cell anemia, CNS diseases, trauma associated chest pain, and syndromic pts, were excluded. Statistical analysis was performed using the Odds, Odd-ratio and 95% CI. All patients had examined in Pediatric Cardiology Unit in King Fahad Hospital during study period by a Pediatrician before referral to a pediatric cardiologist. A chest pain protocol [5] was performed by Pediatrician for every patient by detailed history, full physical examination, complete blood count, ESR, blood sugar, electrolytes, (ECG) electrocardiogram, and Echocardiography. Two dimensional and color Doppler Echocardiography done for all patients

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by two pediatric cardiologist by echocardiography machine Philips IE33. Holter 24 hr ECG done for patient with arrhythmias on ECG or have chest pain associated with cardiac symptoms and signs. Chest X-rays were done for all pts reviewed by the consultant radiologist with official report. When patients had significant epigastric tenderness, the consultation for pediatric gastroenterologist was requested, and Gastrografin was performed. The patients with positive gastrointestinal findings were treated with antacid and H2-blockers [4]. Response to antacids and H2-blockers was defined as the relief of chest pain and epigastric pain. Patients suspected to have psychological findings were evaluated by using the Diagnostic and Statistical Manual of Mental disorder-IV-Text Revision (DSM-IV-R) diagnostic criteria as a part of the evaluation [7], and consultation to pediatric psychiatrist was requested. EEG and neurology consultation were done only for pts with symptoms of CNS disease. Diagnoses were grouped as idiopathic, musculoskeletal.

Results

The diagnoses established in the study are summarized in Table 1, and positive findings in Table 2. During the study, 225 patients suffering from chest pain were seen. There were 126 (56%) males and 99 (44%) females the odds (1.3). The mean age for the pts was 8.5 years (ranging in ages 5-12). Among the patients, 175 (78%) were older than 9 years of age, while 50 (22%) of them were younger. Chest pain is more common in elder pts, 100 (57%) pts males and 75 (43%) pts female, OR (1.3), CI95% (0.3-1.6). ECG, Echocardiography and CXR were done for all patients while Holter ECG done for 10 (4%) pts with positive cardiac signs and it was abnormal in two pts. Positive family history of chest pain was found in 15 pts (7%). Echocardiography examination

Diagnosis	Pts number	male	female
Total pts in the study	225	126 (56 %)	99 (44%)
>9 years	175 (78%)	100 (57%)	75 (43%)
<9 years	50 (22%)	26 (52%)	24 (48%)
Idiopathic CP	**125 (56%)**	**70 (56%)**	**55 (44%)**
Musculoskeletal CP	**35 (16%)**	**18 (51%)**	**17 (49%)**
Growing pain	17	10	7
Post competitive sport	8	3	5
Post traumatic	5	2	3
costochondritis	3	2	1
leukaemia	2	1	1
Pulmonary CP	**30 (13%)**	**20 (67%)**	**10 (33%)**
asthma	16	10	6
bronchopneumonia	10	8	2
Lobar Pneumonia	4	2	2
Cardiac CP	**15 (7%)**	**8 (53%)**	**7 (47%)**
Mitral valve Prolapse	5	3	2
Kawasaki disease	1	1	-
Aortic stenosis	2	1	1
Pulmonary stenosis	3	2	1
Rheumatic heart disease.	2	1	1
PVCs	1	-	1
LQTS	1	-	1
Gastrointestinal CP	**10 (4%)**	**4 (40%)**	**6 (60%)**
gastritis	5	2	3
Gastroesophageal reflux	3	1	2
Gastric motility	2	1	1
Psychogenic C	**10 (4%)**	**6 (60%)**	**4 (40%)**
school related problems	6	5	1
Family related problems	4	1	3

Table 1: Diagnosis in children with chest pain.

Findings	Pts number	Normal		Abnormal	
		M	F	M	F
Dysmorphic Pts	225	126	99	-	-
Cardiac murmur	225	101	79	Innocent murmur	
				18	15
				pathologic murmur	
				7	5
CXR	225	116	95	10	4
ECG	225	126	97	-	2
Echocardiogram	225	119	94	7	5
Holter ECG	10	5	3	-	2
Stress ECG	2	-	2	-	-
Gastrografin	7	2	2	1	2
Endoscopy	3	-		1	2
DSM-IV-R	10	6	4	-	-

Table 2: Positive findings.

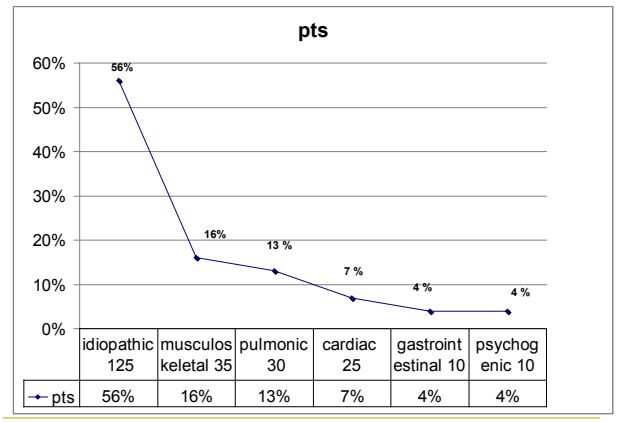

Figure 1: Percentage of chest pain causes in children.

was performed for all 225 pts. Valvular diseases diagnosed only in 12 pts (5%) with equal occurrence rate between male and female OR (1.1), CI95 %(-1.1-2.4). Commonly idiopathic chest pain in our study diagnosed as the main etiology, representing in 125 pts 56% of all cases (Figure 1). It is higher in male 70 pts (56%) than female 55 pts (44%), the odds (1.2). This is a diagnosis of exclusion, being made only when all other diseases were excluded. Musculoskeletal chest pain account for 35 pts (16%), and there is no significant different in the occurrence between male 18 pts (51%) and female 17 pts (49%). Growing pain is the most common cause of chest pain, and male pts slightly more affected OR (1.8), CI 95% (0.59–3.51). Costochondritis as a group exclusive of musculoskeletal origin it was accounted for 3pts. Musculoskeletal chest pain is a common complaint in all ages regardless of gender. Thus in all causes of chest pain, the gender does not seem to be a determinant in chest pain [14]. Pulmonary Chest Pain: account for 30 pts (13%). Asthma, bronchopneumonia and lobar pneumonia are the three most common causes. Pectus excavatum had seen in one patient, OR (1.5), CI 95% (0.41–2.5). Cardiac Chest Pain; account for 15 pts. (7%). 8 (53%) pts were males and 7 (47%) pts females. The majority of pts were normal 180 (80%) pts while remaining 45 pts (20%) had cardiac murmur OR (4.9), CI 95% (1.19–2.61), 33 pts of them had innocent murmur while 12 pts had pathological cardiac murmur. Pain was localized on the left precordium, was increased with exercise. From 15 pts have cardiac chest pain, 10 pts (67 %) had chest pain subsided with rest while in 5 pts (33%) was not resolved. 12 pts (80%) has significant murmur while 3 pts (20%) had no murmur. Abnormal echocardiography had seen

in 12 pts (80%) with valvular problems, (MVP) Mitral valve Prolapse in 5 pts with sharp chest pain, pulmonic stenosis 3 pts, aortic stenosis 2 pts, and rheumatic mitral valve 2 pts. Arrhythmias diagnosed in 2 pts by ECG and Holter ECG, one pt had PVCs unifocal, and one pt had LQTS with a positive family history of sudden death. One pt 10 years old diagnosed Kawasaki disease with significant coronary arteries dilatation.

Gastrointestinal chest pain: found in 10 patients (4%), 6 pts (60%) females and 4 pts (4%) are males. 4 patients diagnosed as gastroesophageal reflux and 6 pts diagnosed as gastritis. Endoscopy done for 3 pts and it revealed just gastritis. Gastrografin done for the others 7 pts, 3 pts has reflux while the other 4 pts are normal. Treatment by antacid, and H2-blockers (omeprazole) and motilium given to them and follow up continued for six months. The results of our study are in conformity with the results of other international study [4,15].

Psychological Chest Pain: account for 10 pts (4%), psychiatric evaluation was performed for all by using the Diagnostic and Statistical Manual of Mental disorder [7] and consultation to psychiatrist. Six patients (60%) had school related problems mainly in male 5 pts, CI95 %(2.7–5.8, while 4 (40%) patients had family related problem mainly in female 3 pts, one pts the fathers was died and in the other two cases, the mother was divorced.

Discussion

Chest pain, a common complaint of pediatric patients, account for 0.3-0.6% in all visits to the pediatric emergent departments (ED) [1], in addition chest pain is one of the most prevalent reasons for referral to pediatric cardiologists [2,3,17]. Idiopathic chest pain can be established thorough history, physical examination and proper laboratory investigations after all other possible etiologies are ruled out [6,8]. It is accounts for 56% in all patients. As in other international studies, it is the most common cause in children [17]. Musculoskeletal: the pain over chest wall and often have history of chest wall muscle strain or unrecognized minor blunt trauma. The characteristic of musculoskeletal pain can be sharp or dull and the tenderness is related with palpation of the affected site [1]. It is the second most common diagnosis accounted for 35 pts (16%) in our study similarly to other international studies [15,16]. The onset of the pubertal changes, the growing of the bones and muscles, competitive sport, and costochondritis are the most common musculoskeletal causes of chest pain more in male patients. Pulmonary chest pain is the third common cause of chest pain in our study. It was diagnosed in 30 pts (13%). Similarly to other international studies asthma, bronchopneumonia, and lobar pneumonia are the most common pulmonary causes of chest pain [1,15] in children. Males more affected (odds 2). Cardiac chest pain: Cardiac related causes for chest pain in pediatric patients is rare but potentially serious and life-threatening6. Thus, cardiac diseases related to chest pain are unusual as in many of the studies of this population [12,13] . However, 15 pts (7%) of our patients had cardiac chest pain. Valvular and acquired heart disease is the most common 80% cause of cardiac chest pain in children [13,14]. Cardiac arrhythmias less common. Significant gastrointestinal causes are uncommon. Epigastric tenderness was found only in 10 pts (4%) of children with chest pain. The findings showed gastritis, and gastroesophageal reflux. Our result revealed that gastrointestinal chest pain is a complaint in all children ages regardless of gender, [9]. Thus, gender does not seem to be a determinant in chest pain (OR: 1.1). Furthermore, psychogenic chest pain diagnosed in 10 pts (4%). The most common cause of psychiatric chest pain in our study is the school and family related problems [9,10]. The odds is slightly more in males, (OR 1.5). This group of patient have to be evaluated by both Pediatrician and psychiatrist [7].

Conclusion

As a result of our study, chest pain during the childhood period is more prevalent, but not a risky situation. In conformity with other studies, [1,2], we believe that chest pain is a common complaint and mostly benign symptom in children. Taking a detailed history and full physical examination will be a good guide in diagnosing the etiologies and discovering life-threatening disorders or suspicion of cardiac disorder [17]. The laboratory tests are not generally helpful in establishing a specific diagnosis for chest pain [8]; however, these may help identify organic causes. The families of the patients should be informed about the necessity for Electrocardiogram and Echocardiogram to determine the cardiac situation. Consultations to other pediatric subspecialties should be done for children with chest pain if significant symptoms and signs discovered. Patients with cardiac structures abnormality need transfer for interventional cardiac catheterization or cardiac surgery.

Patients with suspicion of psychological problems should to be evaluated by both Pediatrician and psychiatrist [7].

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