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Review of Chest Pain in Children after COVID-19 Pandemic in Albaha, Saudi Arabia

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Abstract

Introduction: Although chest pain in children induces anxiety among their parents and caregivers, various studies have reported that the majority of cases in children are benign and not related to cardiac disorders. **Methodology and objectives:** This is retrospective cohort file review study between January 2022 and December 2023, included all admitted pediatric patients due to chest pain. The study aimed to review the clinical profile and etiology of chest pain after the coronavirus disease 2019 (COVID-19) pandemic in Albaha, Saudi Arabia. **Results:** We noted some pre- versus post-pandemic differences in the etiology and prevalence of chest pain. Idiopathic causes were the most common, but the incidence decreased from 56% pre- to 40.5% post-pandemic ($p=0.20$). Respiratory causes increased from 13% pre- to 21.4% post-pandemic ($p=0.14$) and became more common than musculoskeletal causes (18.6%; $p=0.23$). Gastrointestinal causes were slightly increased from 4% pre- to 8.4% post-pandemic ($p=0.17$). A slight uptick in psychogenic causes was observed from 4% pre- to 7.4% post-pandemic ($p=0.16$), and reported more in female patients. In contrast, cardiac causes decreased from 7% pre- to 3.7% post-pandemic ($p=0.09$). **Conclusion:** This study confirmed that pediatric chest pain has a benign origin in most cases. After the COVID-19 pandemic, mild differences in etiology and prevalence were noted, while psychogenic causes were slightly elevated.

Keywords: Children, Chest Pain

1. Introduction

Although chest pain in children induces anxiety among their parents and caregivers, various studies have reported that the majority of cases in children are benign and not related to cardiac disorders. The etiology of chest pain in pediatrics is broad, and the majority of cases are not due to underlying pathology (Alp, Esmâ Keleş, and Hayrullah

Alp 2021). A critical literature review revealed that most pediatric cases of chest pain are idiopathic, chest pain is slightly more common in males, and no detected pathologies echoed earlier research conclusions that accounted for up to half of pediatric chest pain cases (Powell, Adam W., et al. 2020). The etiology of chest pain in pediatric cohorts differs significantly from that in adult populations, and chest pain is reportedly more common in late childhood with no notable sex-based differences. Musculoskeletal causes such as costochondritis and muscle strain are common in children presenting with chest pain and movement changes. Gastroesophageal reflux disease and dyspepsia, the most common gastrointestinal etiologies of chest pain, affect 5-10% of cases (Aygun, Emre, et al. 2020). Cardiac causes of chest pain in children are relatively rare and constitute less than 5% of cases; conversely, the most common causes are non-cardiac. Arrhythmias, myocarditis, congenital heart diseases, and pericarditis are the most common cardiac causes (Chen, Li, et al. 2022). The worldwide prevalence of cardiac chest pain in children - reportedly 0.3-6% of pediatric emergency department visits - remains relatively low (Alsabri, Mohammed, et al 2024). Bronchial asthma and pneumonia are common respiratory pathologies and can be identified by history, physical examination, and chest x-ray findings (Yeh, Tisha K., and Jay Yeh 2015, Harahsheh, Ashraf S., et al. 2017). Pediatric patients admitted to the pediatric emergency department with chest pain have a good prognosis (Dönmez, Yasemin Nuran, et al 2024). The prevalence of a psychological pathology of chest pain in children has increased since the coronavirus disease 2019 (COVID-19) pandemic. Stress, anxiety, and panic disorders are reportedly associated with chest pain in children (Chen, Li, et al 2021, First, Michael B., and Harold Alan Pincus 2002). Symptoms reporting are potentially due to infection-induced inflammation or increased psychological stress, during this period (Lubrano, Riccardo, et al. 2023, Tang, Yaqi, et al. 2022). A full detailed history and physical examination are important in the diagnostic process, and care must be taken to differentiate between chest pain pathology and respiratory, gastrointestinal, or cardiac symptoms (Almawazini, A. M., et al. 2013, Fisher, Jay D., and Beth Warren 2022). However, the routine use of electrocardiography (ECG), chest x-rays, and echocardiography is unnecessary (Mohan, Shaun, et al. 2018). The cardiac profile should be measured only in children with chest pain who have a positive family history of cardiovascular disease, cardiac symptoms, or ECG changes (Januzzi, James L., and Cian P. McCarthy 2018, Brancato, Federica, et al. 2021). A comprehensive clinical evaluation should be applied to improve clinical assessments, alleviate family anxiety, and reduce unnecessary medical testing in children with chest pain.

2. Materials & Methods

This retrospective hospital-based cohort study aimed to review the clinical profiles and causes of chest pain in children after the COVID-19 pandemic. The study was approved by ethical and research Committee of King Fahad Hospital Albaha, Saudi Arabia, (number; KFH/24122023/11), and its principles followed the tenets of the Declaration of Helsinki. Patients had chest pain as main complaint, aged 14 years or younger who were admitted to the emergency department between January 2022 and December 2023 were included. Those older than 14 years, patients who presented with chest pain after trauma, or had hematology disorders such as sickle cell disease and developed vaso-occlusive crises were excluded from the study. The participants' medical records were retrospectively reviewed; the collected findings included age, sex, and positive family history of chest pain. The hospital's protocol for chest pain management was applied. A full physical examination, laboratory workup, chest x-ray, ECG, and echocardiogram were performed for all patients. A few patients were referred to pediatric subspecialties as necessary, mainly if psychogenic causes were suspected. The American Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition, was used for the evaluations (Kocsis, Richard N 2013). Comparisons were made between the results of this and previous studies before the COVID-19 pandemic that mainly focused on prevalence and etiology. SPSS software (version 23.0 ;) was used to statistically evaluate the obtained data. Values of $p < 0.05$ were considered statistically significant, and the data were normally distributed.

3. Results

Results: Patients with chest pain represented $< 2\%$ of all patients who were seen in the emergency department during the study period. This study included 215 patients, of whom ($n=106$, 49.3%) patients were male and ($n=109$, 50.7%) patients were female. The mean patient age was 9.6 ± 4.3 years. The majority of the patients were 9 years or older ($n=164$, 76.3%), while the remainder ($n=51$, 23.7%) were younger than 9 years old. Most patients experienced chest pain in the precordial area and described the sensation as similar to being pricked by a needle.

A family history of heart disease was reported for (n=35, 16.3%). Approximately (n=49, 22.8%) of the patients had radiating chest pain, such through as the left arm, back, and right chest. A positive history of COVID-19 was reported for 30 patients (14%). We conducted a detailed history and full clinical examination for all patients. Abnormal chest x-rays reported in 24 cases with signs of chest infection. ECG changes documented with 8 patients, while Holter monitoring done for 5 patients and became normal. Echocardiography was found abnormal in 3 patients, two had mitral valve rheumatic changes and one patient had impaired left ventricular function. Troponin level was normal in all included patients. Most patients in the study showed no direct evidence to explain the chest pain or any organic causes. As mentioned in Table 1, among the different types of chest pain, idiopathic was the most common (n=87, 40.5%) with slightly higher in males (n=47, 54%) and females (n=40, 46%), and no clear causes were diagnosed. Pulmonary diseases were identified as the most common pathology (n=46, 21.4%) with an incidence that was slightly higher in males (n=26, 56.6%). This category included asthma (n=22), bronchopneumonia (n=20), and lobar pneumonia (n=4). Musculoskeletal etiologies were the next most common causes of chest pain (n=40, 18.6%), being slightly more prevalent in females (n=23, 57.5%). Growing pains were diagnosed in 20 patients, and noted more in female patients. Post-competitive sport conditions were seen in 12 patients and costochondritis in eight. Gastrointestinal causes of chest pain were identified in (n=18, 8.4%) of patients, slightly more often in females (n=12, 66.7%) than in males (n=6, 33.3%). This included cases of gastritis and gastroesophageal reflux. The incidence of psychogenic chest pain was increased slightly after the COVID-19 pandemic (n=16, 7.4%) among patients, and was more common in females (n=10, 62.5%), who had a significantly longer duration of chest pain, and believed they had heart disease and were evaluated by a pediatric psychiatrist after cardiac causes were excluded. School- and family-related issues were more common in this group of patients. Cardiovascular chest pain was diagnosed in (n=8, 3.7%) of all patients and fairly evenly split between males and females. This category comprised conditions such as premature ventricular contractions (n=2), rheumatic heart disease (n=2), supraventricular tachycardia (n=3) requiring pediatric intensive care unit admission, and dilated cardiomyopathy (n=1).

Table 1: Distribution of patients and common causes of chest pain in present study

Categories	N & percent	Male	Female
All pts.	215 pts.	106 (49.3%)	109 (50.7%)
<9 year	164 pts. (76.3%)	80 (48.8%)	84 (51.2%)
>9 years	51 pts. (23.7%)	26 (51%)	25 (49%)
Idiopathic	87 pts. (40.5%)	54%	46%
Respiratory	46 pts. (21.4%)	26 (56.6%)	20 (43.4%)
Asthma	22 pts.		
BPN	20 pts.		
Pneumonia	4 pts.		
Musculoskeletal	40 pts. (18.6%)	17 (42.5%)	23 (57.5%)
Growing pain	20 pts.		
Post exercise	12 pts.		
costochondritis	8 pts.		
Gastrointestinal	18 (8.4%)	6 (33.3%)	12 (66.6%)
Gastroenteritis	10 pts.		
Gastritis	6 pts.		
GERD	2 pts.		
Psychogenic	16 (7.4%)	6 (37.5%)	10 (62.5%)
Cardiac	8 (3.7%)	4 (50%)	4 (50%)
SVT	3 pts.		
PVCs	2 pts.		
RHD	2 pts.		
DCM	1 pts.		

Pts.; patients. N; number. BPN; bronchopneumonia. GERD; gastroesophageal reflex disease. SVT; supraventricular tachycardia. PVCs; premature ventricular contractions. RHD; rheumatic heart disease. DCM; dilated cardiomyopathy.

4. Discussion

Chest pain is among the most prevalent indications for emergency department admissions and pediatric cardiology referrals. The present study confirmed that pediatric chest pain has a benign origin in most cases with no notable

difference between males and females, findings that are consistent with those of other published studies (Powell, Adam W., et al. 2020, Aygun, Emre, et al. 2020). We reported an increase in cases of chest pain After COVID-19 pandemic, consistent with Riccardo Lubrano et al. 2023. Clear differences were found in the etiology and prevalence of chest pain in our center before versus after the COVID-19 pandemic (Almawazini, A. M., et al. 2013). Consistent with other published studies, we reported that idiopathic chest pain that cannot be traced to any identifiable cause despite comprehensive investigations is prevalent in children but decreased from 56% pre- to 40.5% post-pandemic ($p=0.20$). Affected individuals typically report chronic pain that does not resolve with changes in respiration or body position and tends to disappear spontaneously (Chen, Li, et al. 2022). Contrary to previous studies, we found that respiratory causes increased from 13% pre- to 21.4% post-pandemic ($p=0.14$) and became the second most common cause of chest pain after idiopathic causes. This is particularly true when linking pain with breathing variations, physical activity, or detectable changes upon physical examination. Musculoskeletal-related chest pain increased from 16% pre- to 18.6% post-pandemic ($p=0.23$), aligning with findings of previous studies (Dönmez, Yasemin Nuran, et al. 2024, Januzzi, James L., and Cian P. McCarthy 2018, Brancato, Federica, et al. 2021). The present study revealed that chest pain of gastrointestinal origin increased slightly from 4% pre- to 8.4% post-pandemic ($p=0.17$); it was often described by our subjects as epigastric discomfort or a burning sensation in the sternum that improved while lying down or after eating, consistent with previous research, (First, Michael B., and Harold Alan Pincus 2002, Lubrano, Riccardo, et al 2023, Tang, Yaqi, et al 2022). A slight increase in psychogenic causes was observed from 4% pre- to 7.4% post COVID-19 pandemic; moreover, it was more common in female patients (62.5%; $p=0.16$). Consistent with published studies, this increase may be explained by parents attributing chest pain to heart-related issues or critical causes leading to behavior changes in their children such as school absences and heightened anxiety (Dönmez, Yasemin Nuran, et al. 2024). It is essential to have these patients assessed by child psychiatrists (First, Michael B., and Harold Alan Pincus 2002, Tang, Yaqi, et al. 2022, Almawazini, A. M., et al. 2013). Cardiac causes decreased from 7% pre- to 3.7% post-pandemic ($p=0.09$), consistent with other international studies (Alp, Esmâ Keleş, and Hayrullah Alp 2021,2,3). Assuring patients and their families about the non-cardiac nature of such pain is crucial to allaying their fears. Despite persistent concerns about potential heart disease leading to sudden death, the likelihood of identifying a cardiac pathology in pediatric chest pain cases remains exceedingly low as reported previously (Alsabri, Mohammed, et al. 2024, Harahsheh, Ashraf S., et al. 2017, Januzzi, James L., and Cian P. McCarthy 2018). However, more detailed cardiac evaluations are needed when certain risk factors are present, such as a family history of sudden cardiac death (Chen, Li, et al. 2021, First, Michael B., and Harold Alan Pincus 2002, Brancato, Federica, et al. 2021). In the context of the COVID-19 pandemic, while children typically experience mild symptoms, chest pain can be a serious concern because of possible severe complications. Providing a thorough assessment and evidence-based recommendations after using a standardized approach to evaluate and manage children with chest pain is highly needed (Fisher, Jay D., and Beth Warren 2022, Mohan, Shaun, et al 2018). None of the patients screened in this study in our emergency department with a positive COVID-19 test result showed serious symptoms. The pandemic's psychological impact emerged as a cause of chest pain. The referral rates of children with chest pain also increased post-pandemic (Januzzi, James L., and Cian P. McCarthy 2018, Kocsis, Richard N 2013). Osman Akdeniz et al. reported that musculoskeletal and psychogenic causes are more common than idiopathic causes of chest pain in children (Akdeniz, Osman, and Kerem Ertaş 2021).

Limitations: The limitations of the current study include its retrospective nature, short follow-up duration, and small sample size. Future larger prospective studies are recommended to verify our findings.

5. Conclusions

Our study confirmed that pediatric chest pain has a benign origin in most cases. However, it also confirmed an increase in cases of chest pain with no significant differences in etiology. The proportion of psychogenic causes was elevated after the COVID-19 pandemic. Chest pain of cardiac etiology was rare. A detailed history, full physical examination, laboratory tests, chest x-rays, ECG, and echocardiography are essential to determining the etiology of chest pain. This study demonstrated the prevalence, etiology, and common forms of chest pain in children in Albaha area, Saudi Arabia.

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Informed Consent Statement/Ethics Approval: Approved by ethical research committee.

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