

GÖĞÜS AĞRISI OLAN ÇOCUKLARDA AĞRI SKALASI KULLANIMI: KARDİYAK KÖKEN AÇISINDAN BİR GÖZLEM

USE OF PAIN SCALE IN CHILDREN WITH CHEST PAIN: AN OBSERVATION IN TERMS OF CARDIAC ORIGIN

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ÖZET

AMAÇ: Çocuk ve ergenlerde göğüs ağrısı genellikle kalp dışı nedenlere bağlıdır. Etiyolojinin ayırıtılmasında temel varsayım kardiyolojik değerlendirmedir. Ağrının şiddeti ile kardiyolojik etiyojisi arasındaki ilişki daha önce araştırılmamıştır. Bu çalışmada, çocuk kardiyolojisi polikliniğine göğüs ağrısı şikayeti ile başvuran çocuklarda ağrıyı daha iyi tanımlayabilmek için ağrı skalası, demografik-laboratuvar verileri, elektrokardiyografi ve ekokardiyografi bulguları, kardiyak orijinli göğüs ağrısı ile ağrı şiddeti arasındaki ilişki olduğu hipotezinden hareketle değerlendirilmiştir.

GEREÇ VE YÖNTEM: Bu çalışma üçüncü basamak çocuk hastanesi çocuk kardiyoloji polikliniğine başvuran 131 hasta ile gerçekleştirildi. Göğüs ağrısını sorgulamak için Wong-Baker Yüz Ağrısı Ölçeği kullanıldı.

BULGULAR: Çalışmaya 80 kız ve 51 erkek dahil edildi. Olguların yaş ortalaması $13,4 \pm 2,9$ idi. Ekokardiyografik bulgular: %87,8'i normal, %12,2'si patolojik bulguya sahipti. En sık görülen kardiyak patoloji mitral kapak yetersizliği idi (%4,6). Wong-Baker Faces ağrı skalasına göre hastalar en çok 4 puan (%29) ve 6 puan (%47,3) mimik gösterdi.

SONUÇ: Göğüs ağrısı olan çocuklarda ekokardiyografi sınırlı tanısal güce sahiptir. Bu çalışma ağrı ölçeği ile kardiyak patoloji arasında anlamlı bir ilişki tespit edemedi. Wong-Baker Yüz Ağrısı Ölçeği ile yapılan değerlendirme yetersiz olarak değerlendirildi.

ANAHTAR KELİMELER: Göğüs ağrısı, Kalp, Ekokardiyografi.

ABSTRACT

OBJECTIVE: Chest pain in children and adolescents is usually due to non-cardiac causes. The basic assumption in distinguishing the etiology is the cardiologic evaluation. The relationship between the severity of pain and its cardiologic etiology has not been investigated before. This study aimed to evaluate the pain scale, demographic-laboratory data, electrocardiographic and echocardiographic findings in order to better define pain in children who were admitted to the pediatric cardiology outpatient clinic with chest pain, based on the hypothesis that there is a correlation between chest pain with cardiac origin and pain severity.

MATERIAL AND METHODS: This study was carried out with 131 patients in the pediatric cardiology outpatient clinic of the tertiary pediatric hospital. The Wong-Baker Faces Pain Scale was used to inquire about chest pain.

RESULTS: 80 girls and 51 boys were included in the study. The mean age of the cases was 13.4 ± 2.9 years. Echocardiographic findings: 87.8% were normal, 12.2% had pathological findings. The most common cardiac pathology was mitral valve regurgitation (4.6%). According to the Wong-Baker Faces pain scale, patients mostly showed 4 points (29%) and 6 points (47.3%) mimics.

CONCLUSIONS: Echocardiography has limited diagnostic power in children with chest pain. This study failed to detect any significant relationship between pain scale and cardiac pathology. The evaluation with the Wong-Baker Faces Pain Scale was assessed to be insufficient.

KEYWORDS: Chest pain, Heart, Echocardiography.

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INTRODUCTION

Chest pain in childhood is among the most common reasons for referral to pediatric emergency and pediatric cardiology outpatient clinics. Unlike adults, the probability of chest pain being cardiac in children is very low (1). When the causes of chest pain are examined, idiopathic (12-85%), followed by the musculoskeletal system (15-31%) and respiratory system (12-21%), while cardiologic causes are seen among (4-6%) (2). Although cardiologic causes are rare, the differential diagnosis should be made carefully, as the risk of morbidity and death is high, which worries the family a lot (3).

Pain has been defined as an unpleasant sensory and emotional experience or tissue damage that occurs in relation to actual or potential tissue damage (4). The general definition of pain also includes the evaluation of various parameters such as the severity, duration, and repetitive nature of the pain. While making the differential diagnosis of chest pain, the severity of the pain is usually not questioned. The relationship between pain severity and demographic findings and true heart-related pain has not been studied in the literature. There are many behavioral observational pain scales. The Wong-Baker Faces Pain Scale (WBFPRS) includes six hand-drawn facial expressions in the horizontal plane that can be used for children aged 3-18.

Patients try to indicate the pain they feel by looking at these statements. It symbolizes the phrase "no pain" with a smiley face on the far left. Pain intensity increases from left to right. On the far right, there is a face expression that represents the expression "unbearable pain", crying with tears (5). This study we aimed to evaluate the pain scale, demographic-laboratory data, electrocardiography (ECG) and echocardiography (ECHO) findings in order to better define pain in children who were admitted to the pediatric cardiology outpatient clinic with chest pain, based on the hypothesis that there is a correlation between chest pain with cardiac origin and pain severity.

MATERIALS AND METHODS

Study Protocol

This study was carried out in the pediatric cardiology outpatient clinic of the tertiary pediatric hospital between June 2020 and April 2021. All patients participating in our study detailed information was given and informed consent was requested. WBFPRS was used as an observational pain scale in this study. Demographic parameters such as age, gender, height, weight, and ECG, ECHO findings, and WBFPRS responses were obtained by filling in the "chest pain inquiry and evaluation form" together with the archive file records of 131 patients were admitted with chest of chest pain. Age, gender, height, weight, body mass index (BMI), percentile distribution of body mass index, seasonal distribution by time of hospital admission, character and duration of chest pain, recurrent pain, history of upper respiratory tract infection (URTI), relationship of pain with exercise, cessation of pain, presence of fainting, presence of palpitations, family history of heart disease at an early age were recorded as demographic data. Creatine kinase (CK-MB) and troponin I parameters, which indicate cardiac injury, were collected within the laboratory examinations.

Pain Scale

WBFPRS was used to question the chest pain (Figure 1). The pain scale from left to right was shown to the patients in ascending order. Patients over 7 years of age were questioned to participate in the study regardless of gender. At the time of chest pain, they were asked to express the severity of the pain felt between 0-10 points on the scale.



Figure 1: The Wong-Baker Faces Pain Scale

Age Group

Patients were grouped according to their ability to express their age group was limited. Two groups were constituted with the expectation that chest pain would become more evident and their ability to express themselves would improve at the age of 12 and beyond. The first group was formed between the ages of 7-11, and the second group was between the ages of 12-18.

Cardiologic Evaluation

Electrocardiography recordings were performed using Nihon Kohden Cardiofax S device at 25 mm/sec and 10 mm/mV with 12 leads. All echocardiography measurements were made by a single physician with the Vivid 5S (General Electric Medical Systems) device.

Ethical Committee

The study protocol was approved by the local ethics committee (Adiyaman University Non-Interventional Clinical Research Ethics Committee. No. 2022/04-10, dated 20.04.2022).

Statistical Analysis

Statistical analysis were made with the Statistical Package for Social Sciences (SPSS Statistics for Windows, Version 24.0; IBM Corp., Armonk, NY, USA). Parametric numerical values were expressed as mean \pm standard deviation. Student's t-test was used to compare variables. Chi-square test was used for categorical variables. P value <0.05 was considered statistically significant. Pearson bivariate correlation analysis was performed for correlation between WBFPRS and other parameters. Kruskal-Wallis nonparametric analysis of variance was performed for ordinal variables.

RESULTS

A total of 131 cases, including 80 girls (61%) and 51 boys (39%), participated in this study. Fifty eight girls (44%) were 12 years and older. The mean age of the cases was 13.4 ± 2.9 years. The patients were admitted to hospital most frequently in the autumn (42%) and summer (40.5%) months (**Table 1**).

No statistically significant difference was detected in the comparison of WHPRS scores between age groups ($p=0.95$). Seven patients (5.3%) had weight below 3rd percentile and 9 patients (6.9%)

had weight above 97th percentile. Two patients (1.5%) had height below 3rd percentile and 3 patients (2.3%) above 97th percentile (**Table 2**).

Table 1: Characteristics of children with chest pain according to history and physical examination and distribution of pain scale scores

Parameter	WBFPRS score		2	4	6	8	10	Total frequency N	P value
	Variants (%)								
Gender	Male (39)		2	15	24	10	0	51	0.39
	Female (61)		2	16	39	19	4	80	
Season	Winter (14.5)		0	10	4	5	0	19	0.66
	Spring (3.1)		0	0	4	0	0	4	
	Summer (40.5)		1	14	25	10	3	53	
	Autumn (42)		3	13	24	14	1	55	
Pain Type	Squeezing (45)		2	15	30	10	2	59	0.93
	Sinking (41.2)		2	12	24	14	2	54	
	Combustion (13.8)		0	4	9	5	0	18	
URTI Presence	Yes (5.3)		0	3	4	0	0	7	0.49
	No (94.7)		4	28	59	29	4	124	
Pain Recurrence	Yes (89.5)		4	29	56	23	4	116	0.37
	No (11.5)		0	2	7	6	0	15	
Exercise Relation	Yes (25)		0	12	15	4	1	32	0.16
	No (75)		4	19	48	25	3	99	
Faint	Yes (2.3)		0	1	1	0	1	3	0.036
	No (97.7)		4	30	62	29	3	128	
Palpitation	Yes (49)		1	14	30	16	3	64	0.61
	No (51)		3	17	33	13	1	67	
Cardiological Pathology	Yes (12.2)		1	6	6	2	1	16	0.42
	No (87.8)		3	25	57	27	3	115	
ECHO Finding	Normal (87.8)		3	25	57	27	3	115	0.15
	AI (2.3)		0	1	2	0	0	3	
	MR (4.6)		1	1	2	1	1	6	
	MVP (3.8)		0	4	1	0	0	5	
	MVP-MR (1.5)		0	0	2	0	0	2	
	Yes (13.1)		1	2	6	1	0	10	
	No (86.9)		3	29	57	28	4	121	
ECG Finding	Normal (55.7)		1	22	32	15	2	73	0.44
	1st degree AV block (3.1)		0	0	2	2	0	4	
	RBBB (6.9)		1	1	5	2	0	9	
	Sinus bradycardia (2.3)		0	2	1	0	0	3	
	Sinus arrhythmia (13)		2	2	6	7	0	17	
	Long QT (1.5)		0	0	2	0	0	2	

Abbreviations in the Table 1: Mitral valve prolapse (MVP), aortic insufficiency (AI), mitral regurgitation (MR), mitral valve prolapse and mitral regurgitation (MVP+MR), Upper respiratory tract infection (URTI), echocardiography (ECHO), Right bundle branch block (RBBB).

Table 2: Distribution of age group, height and weight by age, BMI, chest pain duration by pain scale scores.

Parameter	WBFPRS score		2	4	6	8	10	Total frequency N	P value
	Variants (%)								
Age Group	7-11 ages (23)		3	6	16	4	1	30	0.95
	12-18 ages (77)		1	25	47	25	3	101	
Height by Age	<3p (1.5)		0	0	1	1	0	2	0.36
	3-10p (9.2)		1	3	5	2	1	12	
	10-25p (7.6)		0	0	5	4	1	10	
	25-97p (74.8)		3	27	47	19	2	98	
	>97p (2.3)		0	1	1	1	0	3	
Weight by Age	<3p (5.3)		0	1	2	2	2	7	0.22
	3-10p (11.5)		0	6	4	5	0	15	
	10-25p (14.5)		2	1	11	4	1	19	
	25-97p (57.3)		2	21	38	13	1	75	
	>97p (6.9)		0	2	4	3	0	9	
BMI	Underweight (4.6)		0	2	2	2	0	6	0.98
	Normal weight (80.2)		4	24	51	22	4	105	
	Overweight (5.3)		0	5	2	0	0	7	
	Obese (5.3)		0	0	4	3	0	7	
Duration of Pain	<1 min (1.6)		1	6	9	4	1	21	0.2
	1-5 min (54.2)		3	20	34	13	1	71	
	5-10 min (14.5)		0	3	9	7	0	19	
	10-60 min (10.7)		0	2	11	0	1	13	
	>60 min (4.6)		0	0	0	5	1	6	

Based on BMI, 6 patients (4.6%) were underweight, 105 patients (80.2%) had normal weight, 7 patients (5.3%) were overweight, and 7 patients (5.3%) were obese. There was no statistical relationship between BMI and WBFPRS values ($p=0.98$). Fifty-nine patients (45%) described stinging pain and 54 (41.2%) patients described burning pain. About 16% of patients had chest pain for less than 1 minute and 54.2% of the

patients highlighted the duration of chest pain as 1-5 minutes. While 14.5% of patients had chest pain for 5-10 minutes, 4.6% of patients expressed chest pain for 60 minutes at least.

Only 5.3% of the cases had Upper respiratory tract infection (URTI). Although 116 patients (88.5%) stated that the pain recurred, 15 patients (11.5%) noted that they had pain for the first time. About 25% of the patients associated chest pain with exercise. While 49% of the patients felt palpitations during chest pain and 2% of the patients experienced fainting.

ECHO findings were abnormal in 12.2% of the patients. About 35% of the patients had a previous ECHO examination. Seven percent of the participants had a family history of heart disease before the age of 35. The ECG samples were normal in 55% of the patients whereas 2 patients had QT intervals longer than normal. According to the WBFPRS, 29% of the patients showed facial expression 4 and 47.3% of the patients demonstrated facial expression 6 (Table 1).

There was a statistically significant difference between the presence of fainting and the pain scale ($p=0.03$). No correlation was indicated between pain duration and scale ($p=0.2$), (Tables 1 and 2).

DISCUSSION

Although chest pain is a common disorder in children and adolescents, it is less associated with heart diseases in children, unlike adults (2). In a comprehensive study that lasted for about 10 years and was conducted with 3700 patients, the causes of chest pain were idiopathic in 52%, musculoskeletal system in 36%, while cardiovascular system disease was found in only 1% of patients (6). Similar studies have found similar rates (1-7%) (2, 3). In our study, 87.8% of the patients with chest pain and ECHO were evaluated as normal and 12.2% as pathological. The most common cardiac pathology was mitral regurgitation (MR) (4.6%) and mitral valve prolapse (MVP) (3.8%). Other cardiac pathologies were aortic regurgitation (AR) (2.6%) and MVP+ MR (1.6%).

This study reported that cardiac causes in the etiology of chest pain were proportionally high-

her than in recent studies (2, 3, 6). This finding might be attributed to the initial application of the patients to the pediatric emergency services, and the patients are referred to the pediatric cardiology outpatient clinic for further examination after the general evaluation and cardiac examinations are performed. That is, the patients who had their cardiac enzymes measured at the emergency department and found within normal range might not have admitted to outpatient clinics of pediatric cardiology.

The use of ECHO in the evaluation of cardiac causes of chest pain in children has little diagnostic value. It causes unnecessary cost to the parent and the healthcare system. A poorly selected caseload can cause physical and psychological wear and tear for all healthcare professionals. Gibbons et al. showed that there is was no need for ECHO examination in patients with chest pain due to its low detection rate (7).

Güvenç et al. reported that the population presenting with chest pain consisted mostly of adolescents aged 12-14 years (8). In this study, the mean age of the population was similar. Moreover, In this study, it was observed that chest pain was more common in girls (61%) than boys (39%). However, this finding was not statistically significant. There were similar male-female ratios in other Turkish studies (9, 10). However, literature indicates significantly higher frequency of chest pain in boys than girls (11). Similar to literature, 77% of the patients in this study were adolescents. It has been reported that especially psychogenic chest pain is more common in adolescent girls (12).

Recent studies have indicated that the frequency of chest pain is increased in obese children (13). In this study, 5.3% of the patients were overweight and 5.3% of them were obese. In addition, there was no significant relationship between obesity and either duration or severity of chest pain. This finding can be due to the insufficient presentation of obese patients within the cohort.

The most common form of chest pain in children is squeezing pain. In this study, 45% of the patients described squeezing pain, 41.2% of them had stinging pain, and 13.8% of the patients revealed burning pain. On the contrary,

Tiryaki et al. reported that nearly 71% of the pediatric patients had stabbing-stinging pain (14).

In this study, admission to the outpatient clinic of pediatric cardiology was the most frequent in autumn and summer seasons and the least common in winter season. COVID-19 pandemic is the probable underlying reason for this finding. Measures such as curfew and home isolation due to the pandemic in the last spring and winter months may have prevented the emergence of the patients with non-cardiac chest pain, especially infectious ones. According to previous studies, the admission rate of the patients with chest pain changes by seasons and non-specific infectious chest pain is more frequent than expected. In pediatric studies, the duration of chest pain is generally addressed as 0-5 minutes. As for the present study, 54.2% of the patients felt pain for 1-5 minutes. Aygun et al. found that 26.7% of the patients had chest pain up to 1 minute and 47.3% of the patients had chest pain for 1-10 minutes (15). Çağdaş et al. designated that 85.8% of the patients experienced chest pain for 0-5 minutes (16).

In case of chest pain with cardiac etiology, short-term pain was observed to be at the forefront, as in the noncardiac pain group (mostly 1-5 minutes). The length of time also did not appear to be useful in distinguishing cardiac origin.

URTI is involved in the etiology of chest pain in children. In other words, URTI was accompanied by chest pain in 5.3% of the patients. It can be expected that patients admitting to outpatient clinics of pediatric cardiology complain about the recurrence of pain. While 88.5% of the patients stated that the pain recurred, Exercise-related chest pain, which is considered more significant for chest pain of cardiac origin, constitutes approximately one-fourth of the applications in childhood and adolescence. Similarly, 25% of the patient in our study had chest pain associated with exercise. While 49% of the patients had palpitations during chest pain, 2% of them experienced fainting. Çağdaş et al. found the frequency of URTI as 16.7%, palpitations as 28.3%, and syncope/presyncope as 13.3% (16).

Nevertheless, Aygun et al. specified exercise-related chest pain in 5.5% of the pediatric patients (15). The most accurate explanation of pain is possible with the person's self-expression. Unlike adults, children do not have sufficient communication and expression skills for describing the characteristics of the pain they feel. That's why, methods that do not require communication skills are recommended to allow the expression of pain by children. WBFPRS is one of the pain scales that have been adopted to determine the severity of both acute and chronic pain between the ages of 3 and 18 (5).

Young children tend to exaggerate the scale because of the crying visual. Therefore, the majority of the cohort in this study has been made up by adolescents and statistical analysis has been performed on the basis of age groups. The findings with respect to age complied with a previously published study (17).

As a result, the number of patients referred to the outpatient clinic of pediatric cardiology due to chest pain, both by emergency and pediatricians, continues to make up the majority of the applications. However, Ertürk et al. concluded that the incidence of chest pain was 2.4% among the patients admitted to the outpatient clinic of pediatric cardiology (18). Although cardiac pathologies constitute the minority for the causes of chest pain, this is a mostly disturbing and distressing symptom for both the patients and their parents. Pediatric patients who have acute onset chest pain which is unrelated with exercise, fainting, family history of heart disease should not be referred to a pediatric cardiologist if there are no pathological findings in physical examination and ECG samples. Otherwise, there would be financial burden and unnecessary anxiety in the patients and their families. WBFPRS was assessed to be insufficient for the evaluation of chest pain in children and adolescents.

Limitations of the study, the power of the present study is limited by relatively small cohort size, absence of other pain scales as well as heterogeneity in demographic and clinical characteristics. Another limitation is the conductance of this study during seasons which coincide with COVID-19 pandemic.

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