

The Effect of Deep Breathing Relaxation Exercises on Pain Management During Chest Tube Removal in Children with Post-Cardiac Surgery

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Deep Breathing
Relaxation
Exercises with
Post-Cardiac
Surgery

ABSTRACT

Objective: 1) To assess effect of non-pharmacological pain management techniques (cold application, deep breathing, relaxation exercises) in reduce pain during the removal of chest tube in children. Then, compare the outcomes with children who received standard care after heart surgery. (2) To explore the relationship between non-pharmacological pain management strategies and children's sociodemographic information.

Study Design: Descriptive study

Place and Duration of Study: This study was conducted at the Department of Pediatric Nursing, College of Nursing, University of Baghdad, Iraq from 1st December 2024 to 28th to 31st March 2025.

Methods: Forty children equally divided into a control and exercise group. Data were collected using a questionnaire and the Wang-Baker pain scale.

Results: Most of the children were 3–5 years old, female, living in urban areas, and did not receive analgesics. Pain was mild in the exercise group, while it ranged from moderate to severe in the control group.

Conclusion: Exercise is effective as a non-pharmacological method for pain relief and recommended its inclusion in care protocols and training for nursing staff.

Key Words: Deep breathing relaxation exercise, Chest tube removal, Pain, Congenital heart disease, Cardiac surgery

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INTRODUCTION

Congenital heart disease (CHD) is one of the most common conditions in the United States, affecting approximately 1% of births annually and a leading cause of infant mortality.¹ Its causes are associated with factors such as rubella, consanguineous marriage, and chromosomal abnormalities.² The incidence has risen to 8.22 per 1,000 live births, with an estimated 10% increase every five years.³ Its diagnosis is made using clinical examination, imaging, and catheterization, and treatment is performed with medication or surgery, depending on the condition.⁴

After surgery, a chest tube is used to drain fluids, and its removal causes moderate to severe pain.⁵

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Therefore, pharmacological and non-pharmacological interventions are recommended for pain relief⁶, including deep breathing exercises, which have been shown to be effective and safe, especially when the chest tube is removed.^{7,8}

METHODS

This descriptive study was conducted at Department of Pediatric Nursing, College of Nursing, University of Baghdad, Iraq from 1st December 2024 to 28th to 31st March 2025. Forty children following cardiac surgery in the intensive care unit (ICU) post-cardiac surgery with chest tube were enrolled. The non probability "convenient" sample technique was used. They were randomly divided into two groups. One group (20 children) underwent deep breathing exercises before chest tube removal without sedation, while the control group underwent the usual procedure without exercises or sedation. Pain was assessed using the Wong-Baker scale, and data were analyzed with SPSS (version 26).

RESULTS

Majority of children after cardiac surgery were 3–5 years old (55%), with a mean age of 6.04 years, and most of them were female (58.3%). Seventy-five percent of the children were urban residents, 60% were

illiterate, 35% had undergone VSD surgery, and none of them received analgesia (Table 1). The evaluation of the pain intensity on CTR in pediatric after thoracic surgery according to their groups were high level in control group and low level in deep breathing relaxation technique group (Table 2).

Table No.1: Distribution of the children according to their socio demographic and clinical data characteristics (n=40)

Variable	No.	%
Gender		
Male	15	
Female	25	
Age of school		
Preschool	23	
School age	17	
Residence		
Rural	12	
City	28	
Educational level		
Read	14	
Not read	26	
Surgical type		
ASD	8	
VSD	22	
TOF	7	
Atrioventricular septal defect	3	
Analgesic		
Not take analgesic	40	100.0
Take analgesic	-	-
Duration of stay chest tube		
One day	4	
Two days	28	
Three days	6	
Four days	2	

Table No.2: Evaluation of the pain intensity on chest tube removal in children after cardiac surgery according to their groups (control and deep breathing relaxation technique)

Group	Min.	Max.	Mean	Standard deviation	Evaluation
Control	8	10	8.90	1.021	Moderate
Deep breathing relaxation technique	2	8	5.00	2.000	Mild

Table No. 3: Distributions of the pain intensity levels on the removal of chest tube in children after thoracic surgery according to their groups (control and deep breathing relaxation technique)

Pain intensity	Control		Deep breathing relaxation technique	
	No.	%	No.	%
0: No pain	-	-	-	-
2 - 4: Mild	-	-	9	45.0
6 - 8: Moderate	11	45.0	11	55.0
10: Severe	9	45.0	-	-

Table No.4: Compare between pain Intensity groups on chest tube removal in children after cardiac surgery

Group	No.	Mean Rank	Mean difference	Z	Significant
Control	20	29.68	3.900	-5.132	0.000
Deep breathing relaxation technique	20	11.13			

Table No.5: The relationship between children's sociodemographic data and nonpharmacological pain management techniques

Demographic and clinical data		Control			Deep breathing relaxation technique		
		Mean	Analysis	Sig.	Mean	Analysis	Sig.
Gender	Male	8.86	Z = -.138-	.890**	4.44	Z = -1.234-	.217**
	Female	8.92			5.45		
Age of school	Preschool	9.08	Cc = -.399-	.081*	6.18	Cc = -.686- **	.000*
	School age	8.57			3.56		
Residence	Rural	8.40	Z = -1.265-	.206**	3.50	Z = -1.831-	.067**
	Urban	9.07			5.38		
Education level	Read	8.57	Z = -1.056-	.291**	3.50	Z = -2.667-	.008**
	Not Read	9.08			6.00		
Surgical type	ASD	9.00	H = .107	.991***	4.25	H = 3.516	.319***
	VSD	8.80			5.25		
	TOF	8.89			5.33		
	AV canal	9.00			8.00		
Duration of stay chest tube	One day	8.00	H = .841	.657***	4.00	H = 2.726	.436***
	Two days	8.92			4.77		
	Three days	9.00			5.33		
	Four days				7.00		

*P. value was calculated by Spearman's correlation coefficient **P. value was calculated by Mann-Whitney U

***P. value was calculated by Kruskal-Wallis H

The pain intensity levels on CTR in Children After thoracic Surgery according to their group of intervention most were moderate and at most moderate in the control group and depend on Wong-Baker Faces Pain Rating Scale (WBPDS) [Table 3]. When using Kruskal-Wallis and Mann-Whitney U tests, that there were highly significant differences in the level of pain between children who used relaxation exercises and deep breathing during chest tube removal after cardiac surgery ($P < 0.001$) [Table 4].

Table 5 using the Mann-Whitney U, Spearman and Kruskal-Wallis tests showed a highly significant negative correlation between the deep breathing exercises group and age ($P < 0.001$), as well as significant differences at the 0.05 level between the same group and the educational level.

DISCUSSION

The study included 40 children in the intensive care unit after cardiac surgery. It was found that 55% of them were between 3 and 5 years old, with a mean age of 6.04 years. This is consistent with the study by Talib and Abdulwahd⁹ contradicts the findings of Muzail and Mohammed.¹⁰ The majority of the sample was female (58.3%), consistent with Sabry and Hassan¹¹ contradicting the study by Al-Mousawi et al.¹² In terms of residence, 75% of the children were from cities, consistent with the analysis of Zhang et al.¹³ In terms of educational level, 60% were unable to read, a finding supported by the study. Furthermore, 35% underwent surgery for a ventricular septal defect (VSD), according to the findings of Zhao et al.¹⁴ No child received analgesics, unlike Ring and Watson.¹⁵ 63.3% of children retained their chest tube for two days, consistent with Simoni et al.¹⁶

Tables 2 and 3 showed that pain intensity upon chest tube removal was higher in the control group and lower in the deep breathing exercise group. Pain severity was moderate to severe in the control group and mostly moderate in the experimental group. These results support Khalil and Shawq's¹⁷ study on the effect of music therapy. Shawq's¹⁸ study also confirmed the effectiveness of breathing exercises in reducing pain. The results of table 5 showed a statistically significant inverse relationship between breathing exercises and children's age ($P \leq 0.001$), consistent with Eskici Elgin and Yella.¹⁹ There were also significant differences between breathing exercises and educational level (at the 0.05 level), which contradicts the study by Jarrah et al.²¹, which did not find significant differences.

The study recommended developing complementary care protocols that include these interventions and training nurses on their use to reduce pain and improve children's recovery experiences.

CONCLUSION

Implementing non-pharmacological interventions, such as deep breathing exercises, reduced pain levels from moderate to mild in children during chest tube removal.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Azal Aqeel Naeem, Zaid W. Ajil
Drafting or Revising Critically:	Azal Aqeel Naeem, Zaid W. Ajil
Final Approval of version:	All the above authors
Agreement to accountable for all aspects of work:	All the above authors

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