Impact of Progressive Muscle Relaxation Implementation on Mothers' Sleep Quality and Anxiety Level Having Children undergoing Cardiac Catheterization

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Abstract

Background: For mothers of children undergoing cardiac catheterization, the procedure is a stressful and anxiety-inducing event. So, as part of getting moms ready for the surgery, a catheterization nurse's duties start with assessing their level of anxiety. Data suggests that mothers' worry and sleep issues are lessened by the pre-procedure information provided by CC pediatric nurses. Many techniques are available for providing information. Print materials, such as an illustrated educational guide, were used in this study. You can reduce anxiety and improve the quality of your sleep by using progressive muscle relaxation. Aim: To determine the impact of progressive muscle relaxation implementation on mothers' sleep quality and anxiety level having children undergoing cardiac catheterization. Subjects and method: Design: A quasi-experimental research design was utilized to fulfill the aim of this study. Setting: The study was conducted at the catheterization unit at Sohag University Hospital. Subjects: A convenient sample of 100 children undergoing cardiac catheterization and their mothers were randomly divided into two groups within six months. Tools: Three tools were used: Tool (I): A structured interview schedule Tool; (II) Pittsburgh Sleep Quality Index Scale, and Tool (III) Spielberger State Anxiety Scale. Results: There were significant differences and improvements in sleep quality mean scores and anxiety levels between the two groups' post-progressive muscle relaxation implementation. Conclusion: Progressive muscle relaxation implementation has a significant effect on improving mothers' sleep quality and reducing their anxiety levels. Recommendations: Provide a Training program for mothers of children undergoing cardiac catheterization about progressive muscle relaxation to enhance the quality of sleep and reduce anxiety levels. Cardiac catheterization nurses should develop an illustrated educational guide about cardiac catheterization to be used as a reference for orientation pre-cardiac catheterization procedure and disseminated to parents before discharge.

Keywords: Anxiety, Children undergoing cardiac catheterization, Progressive muscle relaxation, Sleep quality.

Introduction:

The most common birth defect among infants is congenital heart disease or CHD. In the first year of life, it is also a primary cause of death. The presence of an atypical heart or great blood vessel structure during fetal development is the definition given to it. Though its precise cause is unknown, rapid and recent research has led experts to believe that it is caused by a complex interaction between genetic and environmental factors. Childhood patients, ages 0 to 15, are frequently affected by congenital heart diseases. A-cyanotic and cyanotic congenital heart abnormalities can be distinguished based on whether the patient exhibits cyanosis in a clinical sense (**Bhatt et al., 2020).**

Any child, regardless of nationality or socioeconomic status, can be affected by congenital heart disease. Approximately 30 to 40% of all congenital malformations and 8–12 out of every 1000 live births worldwide are attributed to it. One in every 100 newborns is born with congenital heart disease in Lebanon alone each year. Each year, more than 700 newborns receive a heart problem diagnosis. While in Alexandria, Egypt, it was discovered that 1.01/1000 school-age children had congenital heart disease (CHD) **(BassiliA et al., 2021).** The incidence of CHD in the United States is 4–10/1000 live births. More than 3/4 of children with congenital abnormalities survive into adulthood thanks to significant breakthroughs in prenatal diagnosis and correction procedures. Currently, the number of infantile mortality has decreased (**Gilboa et al., 2019).**

When diagnosing congenital cardiac disorders in children, a range of invasive and non-invasive procedures can be used. Before any therapeutic intervention, the most invasive diagnostic procedure that is typically needed is pediatric cardiac catheterization. Over the past twenty years, significant advancements in medicine have made it possible to treat congenital cardiac problems non-surgically in a catheterization lab. A radiopaque catheter is introduced via a peripheral blood artery into the heart during a sterile technique known as pediatric cardiac catheterization. A radiopaque contrast material is injected through the catheter and into the circulation during angiocardiography, which is typically combined with it. Pediatric cardiac catheterization yields data on cardiac output or stroke volume, as well as blood oxygen saturation in the heart chambers and major arteries, cardiac output or stroke volume as well as anatomic abnormalities such as septal defects or obstruction (**Feltes et al., 2021).**

Pediatric cardiac catheterization can be done for electrophysiological, interventional, or diagnostic purposes. There are two methods for diagnostic cardiac

catheterization: left-sided or arterial catheterization and right-sided or venous catheterization. On the other hand, interventional cardiac catheterization involves using a catheter to treat heart problems, such as by dilating a constricted valve or artery with a balloon catheter. Conversely, a catheter equipped with small electrodes is used in diagnostic electrophysiological catheterization to capture cardiac electrical impulses straight from the conduction system (**Hockenberry & Perry, 2014).**

Pre-procedural cardiac catheterization causes mothers of small infants to feel anxious and stressed. Mothers of children undergoing cardiac catheterization reported higher anxiety levels following cardiac catheterization with angiography, according to research by **Uzgeret et al. (2019).** Researchers discovered that between 25% and 50% of moms whose infants had serious congenital heart abnormalities reported having high symptoms of anxiety, depression, or both, and between 30% and 80% said they were feeling significant psychological distress (**American Psychiatric Association, 2023).**

Anxiety is the body's natural reaction to an emergency—fight or flight. It is a typical, logical, emotional, and expected reaction to actual or possible danger. An occasional feeling of anxiousness is common in life. It is a physical and autonomic manifestation coupled with a subjective experience of tension, discomfort, apprehension, or scared concern (**Buzatto & Zanei, 2020**). Anxiety among mothers due to their children undergoing cardiac catheterization stems from a variety of factors, including inadequate knowledge about the procedure, follow-up plan of care, pre-and post-procedure preparation, and potential complications during or after the procedure (**LeRoy et al., 2023).**

Mothers who experience excessive anxiety may experience bad behaviors, physical and psychological health issues, an inability to manage their illness, and a delay in their ability to recover (**Li et al., 2024 Rice et al., 2018).** Since insufficient sleep can have an impact on all body systems, getting enough sleep is essential to human health and physiological function (**Acosta, 2019**). Various sleep disorders and other psychiatric conditions are caused by anxiety and poor sleep quality (**Boergers et al., 2017).** Children with this disease may experience sleep difficulties as a result of being apart from their parents, friends, and family **(Acosta, 2019).**

According to **Frederiksen et al., (2017**), one non-pharmacological remedy for these issues is the progressive muscle relaxation method (PMRT), which lowers stress through its impact on both physical and mental circumstances. Progressive muscle relaxation is said to be the most simple to teach and apply to kids; it is also the least priced, always accessible, patient-initiated, and side-effect-free. Through the release of endorphins, it can improve the body's health and immunity **(Krupinska & Kulmatycki, 2024).**

Based on the idea that tense muscles cause irritable thoughts, it relieve tension in the body and mind (**Cougle et al., 2020**). Children who have had a pneumonectomy may benefit from progressive muscle relaxation when it comes to their sleep. It is simple to learn, doesn't need a set time or location, and doesn't require any special tools. By calming the body, lowering blood pressure, enhancing blood circulation, and preserving muscular relaxation, it aids in the sympathetic nervous system's equilibrium (**Aksu, Erdogan, & Ozgur, 2018).**

As educators and counselors, pediatric nurses play a crucial role in setting up progressive muscle relaxation program training and educating caregivers and service users. Educating others about health issues and supporting the growth of other members of the multidisciplinary team. Psychiatric health nurses also have a significant responsibility to assist patients emotionally. A crucial part of the cardiac care of children is provided by cardiac catheterization nurses (**Heikkinen, 2020)**. It's common knowledge that a mother's emotional health affects her child's conduct. Pediatric cardiac catheterization is undoubtedly known to cause worry in parents. As part of preparing moms and kids for cardiac catheterization, a catheterization lab nurse's duties therefore commence with evaluating the anxiety of the mother. Mothers' anxiety is decreased when cardiac catheterization pediatric nurses provide pre-procedure information. Information should be provided individually depending on the recipient's intellectual and cultural background, prior hospital experience, and knowledge (**Gilmer, 2019).**

Mothers' knowledge and awareness of the cardiac catheterization process can be raised through the use of a variety of teaching materials. One type of this is written or printed content, such as informational booklets, pamphlets, booklets, and leaflets. For numerous reasons, cardiac catheterization lab pediatric nurses most frequently utilize printed materials as their educational resource. More knowledge can be retained and recalled whenever needed thanks to them. They provide flexibility in information distribution and timing while providing message consistency. Parents can use them to study at their speed and refer to them when needed. In addition, they require no additional equipment and are lightweight, convenient to carry, and can be used as needed. Not only does it work well to alter (**Nakamura et al., 2021)**.

Significance of the study

Mothers confront difficulties while trying to strike a balance between their children's needs and their concerns about their health, which can cause worry and disrupt sleep. The researchers in this study created an illustrated teaching guide that includes precise and crucial information regarding the cardiac catheterization technique, including preparation for the procedure before and after it, as well as the discharge plan. The content was written in an easy-to-read, straightforward, and succinct style. Simple, labeled images were used to

help with the understanding of the written material **(Beck et al., 2018).** To raise mothers' understanding and reduce their worry, this guide was created to provide them with essential information concerning pediatric cardiac catheterization procedures. There are two ways to treat anxiety and sleep disturbances: either use pharmaceuticals to treat the condition or use non-pharmacological techniques such as progressive muscle relaxation technique, reflexology, and relaxation as a low-risk, safe alternative (**Stefanac & Nesbit, 2020).**

Aim of the study:

To determine the impact of progressive muscle relaxation implementation on mothers' sleep quality and anxiety levels having children undergoing cardiac catheterization

Research hypotheses:

1: Mothers of children undergoing cardiac catheterization who receive progressive muscle relaxation, their anxiety level is expected to reduce than mothers who do not.

2: Mothers of children undergoing cardiac catheterization who receive progressive muscle relaxation, their sleep quality will be improved than mothers who do not.

Subjects andmethod:

Research design:

A quasi-experimental research design was used to fulfill the aim of this study.

Setting:

The study was conducted at the catheterization unit at Sohag University Hospital

Subjects:

A convenient sample of one hundred children and their mothers scheduled for cardiac catheterization between July 1, 2023, and December 31, 2023, will be followed up on every six months. Through simple random sampling, they were split into two equal groups, one with progressive muscle relaxation and the other without. 50 mothers who have gotten regular care along with muscular relaxation techniques make up the study group. 50 moms in the control group received nothing except standard medical treatment.

Tools of Data Collection:

For this study, data were gathered using the following three tools:

Tool I: A structured interview:

It was developed by researchers after reviewing the related literature (**Hearps et al., 2024; Elgazzar, & Keshk, 2020; Kobayashi et al., 2019**) and research studies to assess demographic data of mothers and their children which included three parts:

Part (1): Demographic data of the studied mothers such as age, educational level,occupation, and residence.

Part (2): Demographic data of the studied children such as sex, age, and birth order.

Part (3): Mothers' knowledge regarding cardiac catheterization: It includes a definition of cardiac catheterization, indications, types of cardiac catheterization, pre-procedure preparation of the child, and intervention during cardiac catheterization procedure, post procedure management of the child undergoing cardiac catheterization, discharge plan for the child and finally the probable complications of cardiac catheterization for the child.

Scoring system:

Calculated for both known and unknown responses were the overall moms' knowledge percentages. An incomplete accurate response received one mark, a wrong or unknown response received zero, and each complete correct answer received two marks. Following a 100% reflection of the total score of sixty, the following categories were indicated: The three levels of performance were deemed satisfactory for the good and fair levels, and unsatisfactory for the poor level. A score ranging from 75% to 100% was indicated at the good level, while a score from 50% to 75%, and a poor level reflected a score below 50%.

Tool II: The Pittsburgh sleeps quality index scale (PSQI) (Buysse, Reynolds, & Monk, 1989).

Before and following the intervention, sleep quality was assessed using the PSQI (Carpenter & Rykowski, 1998). The Buysse and Collaborators scale was devised to assess the quality of sleep and facilitate the differentiation between those with inadequate sleep and those with adequate sleep. Subjective quality of sleep, sleep latency, duration, habitual efficiency of sleep, sleep disruptions, usage of sleep medication, and dysfunction during the day are among the numerous domains of the scale. The scale consists of five questions that are scored by a bed partner and 19 self-reported questions that are used to rate the scale. A physician or research assistant may also administer the scale. The majority of the questions are multiple-choice, concise, and simple to grasp and respond to.

The PSQI questions are scored on a scale from 0 (no difficulty) to 3 (extreme difficulty), producing scores that match the scale's domains. The authors recommend that a score of more than five be regarded as a major sleep disturbance. The scores range from 0 to 21. Five to ten minutes to finish the PSQI scale. Cronbach's alpha for the scale's total score of 0.83 indicates that it has good reliability. Reliability between tests is also regarded as good. The authors have characterized the validity of PSQI as good, with 89.6% sensitivity and

86.5% specificity of patients compared to control people.

Tool (II): State-Trait Anxiety Inventory

Spielberger (1970) created it to gauge anxiety state. It has twenty sentences that discuss how Mothers are feeling at a specific moment. Five subscales (sadness, concern, fear, uncertainty, and anxiety) are used to group scale statements. Mothers were told to react in a way that reflected their feelings toward their children's procedures. Mothers choose one of the three options (rarely, occasionally, and frequently) in response to the scale. Three, two, and one were the values allocated to the response categories.

Scoring system:

There were 60 total scores, which represent the sum of the item scores. Scores between 20 and 30 were regarded as moderate anxiety for statistical purposes, scores between 30 and 40 as average, scores between 40 and 50 as above average, and scores between 50 and 60 as very high anxiety.

The procedure of data collection:

- Data were collected within six months from the beginning of July 2023 tillthe end of December 2023.
- For collected data, Researchers attended the previously mentioned setting two days per week (Saturday, and Monday), from 9 am to 11 am.

Assessment:

• After about 30 minutes of one-on-one interviews, the researchers obtained written consent from each mother and child and went over the purpose of the study. Next, they collected demographic data, the State-Trait Anxiety Inventory, and the sleep quality index scale from each child and mother for each of the two groups. Mothers (of both groups) were interviewed in the hospital after admission, in the child's room, at least two hours before cardiac catheterization.

Validity of the tool:

A board of five professionals with expertise in the fields of pediatric and psychiatric nursing conducted the face validity test and examined the instruments for content validity, coverage, wording, clarity, length, format, applicability, and overall appearance. No changes were made. There was a 0.96 Content Validity Index (CVI).

Reliability of the tool:

The Reliability of the first tool was assessed through Cronbach's alpha test α=88% and the reliability coefficients α between items of STAIC was 0.86.

Pilot study

It was conducted for 10% of the studied mothers (10 mothers). The clarity and testing of the feasibility of the research process needed for modifications were carried out to develop the final form of the tools. Mothers involved in the pilot study were included in the study.

Administrative and Ethical Considerations:

The Research Ethics Committee gave their approval to the formal letter. Through a letter sent to the head of the catheterization, critical care, and cardiac care units by the Dean of the Faculty of Nursing at Sohag University, administrative approval was established. In this letter requesting permission to collect research data, the purpose of the project was outlined, along with the anticipated results from its implementation. The moms received an explanation of the research's goal. The participants were told by the researcher that they might choose not to participate in the study; it was entirely optional. At any moment and for any reason, mothers were free to leave the research. Moms received guarantees that the information they provided would be kept private and used for research purposes only.

The accompanying booklet, an illustrated guide regarding pediatric cardiac catheterization, was developed throughout three phases, including:

Preparation phase: After examining relevant and recent literature on pediatric cardiac catheterization, the researchers succeeded in their goal. Additionally, it was consistent with the traditional verbal instructions that the researcher had provided in the previously described context. The study's goals are presented, along with the definition, types, indications, pre-procedure planning for the child, intervention during the cardiac catheterization procedure, post-procedure management for the child undergoing cardiac catheterization, discharge plan for the child, and, lastly, likely complications for the child following cardiac catheterization.

1- Pre-procedural preparation for the child entails the following: putting on an apron, taking vital signs and growth measurements, inquiring about any allergies to food, medication, or iodine, inserting an intravenous line, getting the parent's informed consent, and taking the prescribed medication.

2- • Interventions performed within the cardiac catheterization setting include the child being placed on a supine position throughout the procedure, being connected to a monitor, being given general anesthesia, inserting a catheter, demonstrating the path from the artery of the extremity to the coronary arteries, and injecting dye into the heart.

3- • Post-procedural interventions include pressing on the site of insertion for 20 to 30 minutes, applying a tense plaster around the site, going back to the patient's room, and instructing the patient to keep the affected extremity straight for a while. The nurse will also continuously assess the patient's peripheral circulation, extremity color, and pulse. If the patient's condition permits, the nurse will also provide information about the procedure's outcome.

4- -

The orientation phase/implementation phase: involves the following steps:

Intervention for the study group:

The children and their mothers were interviewed one-on-one by the researchers for approximately two hours, depending on the mothers' comfort level and the children's understanding of the study's purpose. The researchers also obtained oral consent from the mothers and children. Next, they collected demographic data, the State-Trait Anxiety Inventory, and the sleep quality index scale from the mothers and children using the progressive muscle relaxation technique.

- The mothers and their children were divided into two equal groups at random: the study group, which consisted of 50 subjects who got routine care and progressive muscle relaxation, and the control group, which consisted of 50 patients who received regular care only.
- - Two mothers every day participated in the training session. Permission from the appropriate supervising nurse at the chosen hospital was obtained to conduct the courses in the training unit.
- "-Teaching strategies included group discussions, gradual muscle relaxation technique models, and repeated demonstrations.
- - The questionnaire for this study was given out twice: before and after the intervention. Participants have done as instructed by the researcher.
- "-Following the completion of the sleep quality index scale pre-test, each mother in the study group began to receive progressive muscle relaxation instruction. -
- "-The subjects in the study group were personally informed by the researchers about the progressive muscle relaxation approach.
- Subjects in the study group were instructed to be in a comfortable position (either sitting or lying) and to empty their bladders. The Jacobson method of progressive muscular relaxation involved contracting and relaxing certain muscle groups until complete relaxation was attained. For thirty minutes in a room, the participants in the intervention group were required to lie on their sides with their legs slightly bent (so as not to put pressure on any muscles), closed eyelids, and in a relaxed position. The technique involved dividing the body's muscles into eight sections. It involved actively contracting those muscles for five seconds, followed by a 30-second rest or tension period during which the muscles were released.
- - The following muscles were contracted and released: the back and stomach, the chest and shoulders, the face, the head, and the scalp; the right and left feet; and the hands and feet. Using a CD that had already been recorded and prepared for each participant in the intervention group, this procedure was carried out in the researcher's presence. Researchers gave participants instructions to practice the procedure twice a day, in the morning and at night, while under their supervision.
- The mothers were asked to re-demonstrate the progressive muscle relaxation technique after the researchers had shown them each step of the way. Once the mothers had mastered the strategy, the researchers urged them to repeat all the processes three or four times.

"-To provide instructions on how to use the relaxation technique, each participant received a handbook prepared by the researchers.

The control group:

Only standard care was provided to the participants, such as physical examinations, preventative medicine, and safe, restful sleep for the children without the use of progressive muscle relaxation techniques.

Designed manual booklet about progressive muscle relaxation:

Every training session's key topics were included in this booklet together with colorful illustrations.

General objective: To determine the impact of progressive muscle relaxation implementation on mothers' sleep quality and anxiety level having children undergoing cardiac catheterization.

Specific objectives:

To assess anxiety level and sleep quality among mothers having children undergoing cardiac catheterization pre-intervention.

To implement progressive muscle relaxation through mothers' education(intervention)

To assess anxiety level and sleep quality among mothers having children undergoing cardiac catheterization post-intervention.

Outlines of the booklet:

1- Knowledge about progressive muscle relaxation technique (Meaning, technique, causes, and importance).

2- Steps of progressive muscle relaxation technique.

Evaluation phase:

Using the same instruments as the pre-test, the researchers reevaluate anxiety and sleep quality in both the study and control groups following a two-hour intervention involving progressive muscular relaxation technique.

Statistical analysis:

SPSS for Windows, version 20, was used for data entry. For both qualitative and quantitative variables, descriptive statistics were shown as means and standard deviations (SDs) and frequencies and percentages. The t-test—a comparison of the two means—was employed.

The Chi-square (x2) test was used to compare the qualitative values. The degree of relationship between two sets of variables was evaluated using Pearson's correlation coefficient (γ) test. P-value <0.05 was used to determine statistical significance.

Results:

According to **Table 1,** the majority of mothers in both the study and control groups (48% and 46%, respectively) were between the ages of 30 and under 40. In both the research and control groups, the proportion of mothers under 25 years old was the lowest (4% and 10%, respectively). Regarding educational attainment, the mothers in the study group with the highest proportion (42%) had preparatory education, while the mothers in the same group with the lowest percentage (10%) had elementary education. Conversely, (38%) of mothers in the control group only had a secondary education, while only 8% of mothers in the same group held a university degree. In terms of occupation, 68% of mothers in the study group were urban dwellers, compared to 70% in the control group. In terms of residence, moms in the study group (66%) were housewives, while 68% of mothers in the control group were the same. Regarding age and education level, no statistically significant differences were found between the two groups.

Table (2) shows that the study group and the control group had the largest percentage of children (50%) and 46%, respectively, who were between the ages of two and four. In both groups, boys make up about two-thirds of the total number of children (66% in the research group and 64% in the control one). In both the research and the control group, the first child accounts for the largest percentage (78% and 82%, respectively). A-cyanotic congenital cardiac illnesses affect most children (96% in the study group and 92% in the control one).

Table (3) shows that mothers' percentages related to their knowledge of cardiac catheterization significantly increased and improved after implementation in the study group compared control group, with high statistically significant differences observed between the post- and pre-implementation related to all items between study and control in the table (P-value <0.001).

A highly statistically significant difference (p<0.001) in the mothers' overall knowledge levels concerning cardiac catheterization before and after implementation was identified, as shown in **Figure 1.** In the pretest, 58% of mothers scored poorly on the knowledge test; however, 76% of them demonstrated good knowledge following the implementation.

Table (4): Statistically significant differences were identified after the intervention (P<0.001), while no differences were found before the intervention (P=0.849) between the study and control groups' sleep quality (PSQI) ratings. Following the progressive muscle relaxation approach, the study group's sleep quality scores (7.22±2.55 & 9.67±5.8) were lower than those of the control group.

Table (5) demonstrates that, after progressive muscle relaxation technique intervention, the mean overall anxiety score among the mothers under study was 43.2±3.1 before it dropped to 22.3±1.1 in the intervention group and 39.88±6.07 in the control group. The overall mean anxiety score in both groups before and after the progressive muscle relaxation technique intervention showed significant changes (P=0.001).

As seen in **Figure (2),** 23% of the mothers in the pretest study group reported having high levels of anxiety. However, following the progressive muscle relaxation technique intervention, 73% of these mothers reported having low levels of anxiety, while no one in the control group reported having low levels of anxiety.

Table (6) demonstrates the significant correlation (P<0.001) found between knowledge and the demographic information of the mothers under research in both the control and study groups.

Table (7) shows during the pre-intervention phase in the study group, about one-third of mothers (34%) who have children with a cyanotic congenital heart disease exhibit average anxiety and high anxiety levels. Whereas, after using Progressive muscle relaxation, the majority of mothers (90%) who have children with the same diagnosis experience low anxiety. There was a statistically significant difference.

It is noticed in **Table (8**) that in the control group during the pre-intervention phase, nearly two-thirds of mothers (66%) who have children with a-cyanotic congenital heart disease exhibit high anxiety levels. While, after intervention, the percenta g e of mothers who have children with the same diagnosis and at the average level of anxiety was reduced to (58%).

Table (1): The demographic data among the studied mothers having children undergoing cardiac catheterization (n=100)

Mothers' Characteristics	Study group (n=50)		Control group (n=50)		X2	P
Age/ years						
Less than 25	2	4%	5	10%		
25 and < 30	19	38%	15	30%		
30 and < 40	24	48%	23	46%	9.72	0.62
40 and above	5	10%	7	14%		
Level of education:						
Elementary	5	10%	11	22%		
Preparatory	21	42%	16	32%		
Secondary	18	36%	19	38%	3.35	0.34
University	6	12%	4	8%		
Residence						
Urban	33	66%	34	68%	3.21	0.32
Rural	17	34%	16	32%		
Occupation						
Housewives	34	68%	35	70%	9.33	0.68
Working	16	32%	15	30%		

Significant at P<0.05

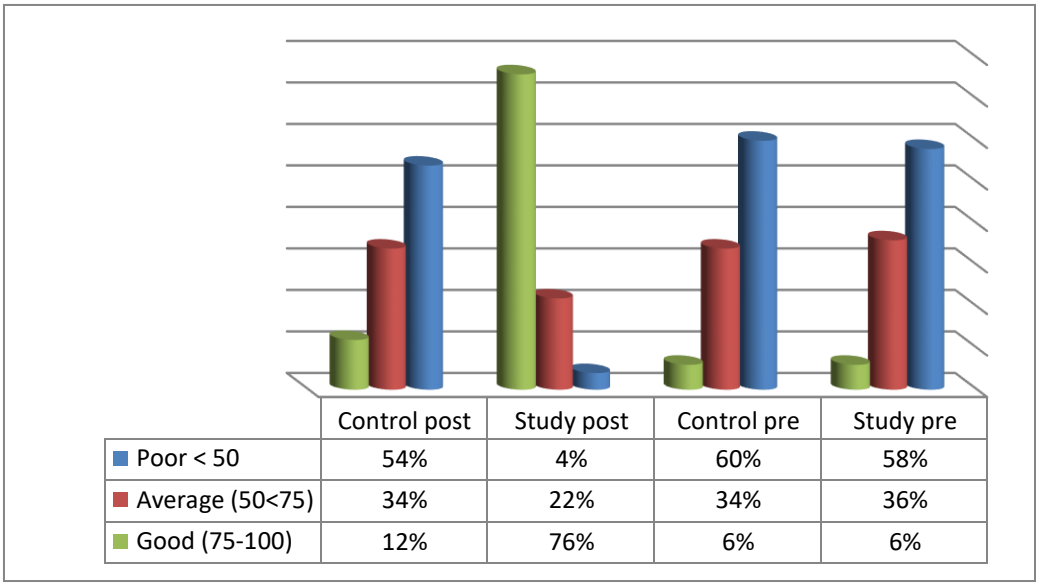
Table (2): Undergoing cardiac catheterization children distribution regarding their demographic data (n=100)

Child characteristics	Study group		Control group	
	No(50)	%	No(50)	%
Age:				
<2 years	13	26%	12	24%
2- 4 years	25	50%	23	46%
More than 4 years	12	24%	15	30%
Gender:				
Boys	33	66%	32	64%
Girls	17	34%	18	36%
Birth order:				
First	39	78%	41	82%
Second	11	22%	9	18%
Diagnosis:				
A-cyanotic congenital heart disease	47	96%	46	92%
Cyanotic congenital heart disease	3	4%	4	8%

Table (3): Comparison between the studied mother's knowledge about cardiac catheterization pre and post-implementation

Items of knowledge	Study group		Control group		P -value
	Pre	Post	Pre	Post	
Definition of cardiac catheterization	11 (22)	47 (94)	10 (20)	12 (24)	<0.001*
Indications for cardiac catheterization	15 (30)	50 (100)	13 (26)	14 (28)	<0.001*
Types for cardiac catheterization	10 (20)	48 (96)	11 (22)	11 (22)	
Pre-procedure preparation of the child	16 (32)	46 (92)	14 (28)	15 (30)	<0.001*
Intervention during a cardiac catheterization procedure	16 (32)	47 (94)	15 (30)	16 (32)	<0.001*
Complications of cardiac catheterization	8 (16)	48 (96)	7 (14)	9 (18)	
Post-procedure management	9 (18)	45 (90)	8 (16)	10 (20)	<0.001*
Discharge plan	10 (20)	46 (92)	12 (24)	14 (28)	<0.001*

**Statistically Significant Differences*



	Control post	Study post	Control pre	Study pre
Poor < 50	54%	4%	60%	58%
Average (50<75)	34%	22%	34%	36%
Good (75-100)	12%	76%	6%	6%

**Statistically significant level at P < .001*

Figure (1): Total knowledge Levels among the studied mothers about cardiac catheterization pre and post-implementation

Table (4): Differences between sleep quality mean scores pre and post-progressive muscle relaxation intervention in both control and study groups

Sleep Quality	Study group (50)	Control group(50)	P-value
Before the intervention	10.44 ±3.77	10.34±5.67	0.849
After the intervention	7.22±2.55	9.67±5.8	P<0.001**

*Significance at 0.001 levels

Table (5): Comparison between the anxiety mean score in both studied groups preand post-progressive muscle relaxation intervention (n=100)

Items	Study group (50)	Control group (50)	P-value
Total anxiety mean score (pretest)	43.2±3.1	40.5±6.02	0.845
Total anxiety mean score (posttest)	22.3±1.1	39.88±6.07	P<0.001**

*Statistically significant level at P < .0001

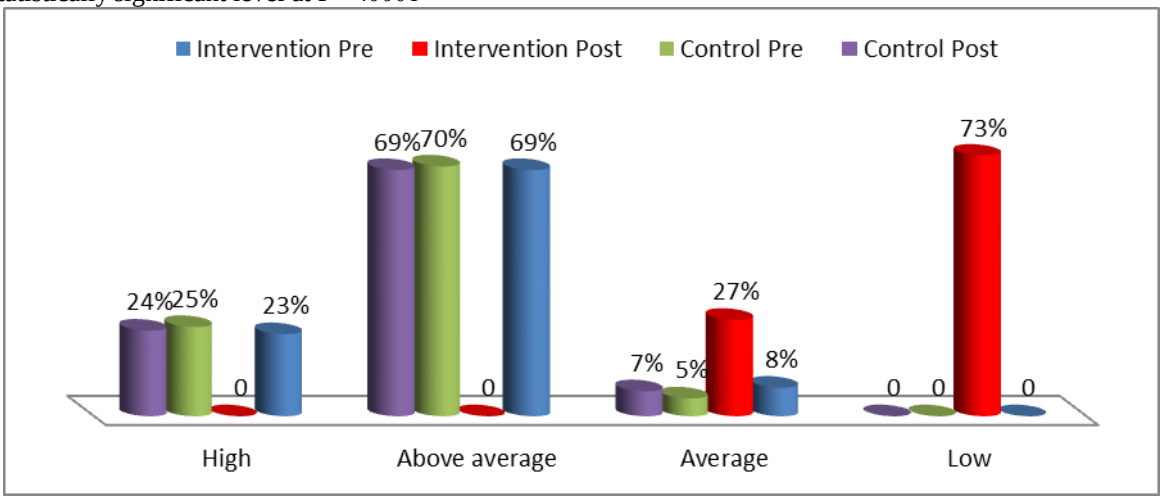


Figure (2): Total anxiety level among the studied mothers in both groups before and after progressive muscle relaxation intervention (n=100)

Table (6): Association between knowledgeand the studied mothers' demographic data in the control and study groups (n=100)

Item	Progressive muscle relaxation				X2	P-value
	The Study group (50)		The control group (50)			
	No.	%	No	%		
Mother's age in years						P<0.001**
≤25 years	36	72.0	37	74	49.2	
>25 years	14	28.0	13	26		
Women ' education						
Illiterate	8	16.0	2	4	87.8	P<0.001**
Elementary	22	44.0	30	60		
Higher	20	40.0	18	36		
Occupation						P<0.001**
Employee	16	32.0	18	36	67.3	
Housewife	34	68.0	32	64		
Residence						
-Rural	16	32.0	15	30	56.6	P<0.001**
-Urban	34	68.0	35	70		

*Significance at 0.000 levels

Table (7): Relationship between child' s diagnosis and level of anxiety among mothers in the study group

Level of anxiety	**Study group Pre-implementation No (50)**				**Study group post-implementation No (50)**			
	Cyanotic congenital heart disease		A-cyanotic congenital heart disease		Cyanotic congenital heart disease		A-cyanotic congenital heart disease	
	No (3)	**%**	**No (47)**	**%**	**N0 (3)**	**%**	**No (47)**	**%**
Low anxiety	0	0	0	0	0	0	45	90%
Average anxiety	0	0	13	6%	0	0	2	4%
Above average anxiety	3	6%	17	34%	3	6%	0	0
High Anxiety	0	0	17	34%	0	0	0	0
	.569				0.001*			

Fisher exact test Significance at P < 0.05

Table (8): Relationship between child' s diagnosis and level of anxiety among mothers in the control group

Level of anxiety	**Control group Pre** Progressive muscle relaxation **No (50)**				**Control group post** Progressive muscle relaxation **No (50)**			
	Cyanotic congenital heart disease		A-cyanotic congenital heart disease		Cyanotic congenital heart disease		A-cyanotic congenital heart disease	
	No (5)	**%**	**No (45)**	**%**	**N0 (5)**	**%**	**No (45)**	**%**
Low anxiety	0	0	0	0	4	8%	16	32%
Average anxiety	0	0	0	0	1	2%	29	58%
Above average anxiety	4	8%	12	24%	0	0	0	0
High Anxiety	1	2%	33	66%	0	0	0	0
	.032				.145			

Fisher exact test Significance at P < 0.05

Discussion:

Pediatric patients between the ages of 0 and 15 are frequently diagnosed with congenital cardiac abnormalities. Children and their parents are said to find pediatric cardiac catheterization to be a stressful and anxious event. Numerous elements, including parents' concerns mostly stemming from their ignorance of the cardiac catheterization process and the care of their kid's illness, will impact how the youngster reacts to the stress of the treatment (**Woolf-King et al., 2019**). Therefore, since parental concern adds to the stress experienced by children, it is imperative to analyze it. Parents' prior experiences, cultural background, and intelligence should all be taken into consideration when providing accurate information concerning cardiac catheterization (**Stanford Children's Health, 2022**).

Progressive muscle relaxation, a relaxation technique, can be used after short and easy training to help with anxiety management and enhance the quality of sleep. One of the greatest complementary therapies that is affordable, simple to learn, and doesn't require any specialized equipment is the Jacobson progressive muscle relaxation technique (**Alwan et al., 2018**). Before starting therapy or other interventions, cardiac catheterization is the accepted norm of care and plays a critical role in improving diagnostic accuracy. This study was therefore conducted to ascertain the effects of progressive muscle relaxation on the anxiety and quality of sleep experienced by mothers whose children are receiving cardiac catheterization.

The age range of the children receiving cardiac catheterization in both the study and control groups was found to be between birth and four years old. The findings align with the empirical and scientific evidence demonstrating that children with congenital heart problems can have cardiac catheterization at any age, including as soon as they are born (**Atwa & Safar, 2024).**

In the current study, boys make up almost two-thirds of the sample in both the study and control group in terms of gender. Consistent with studies conducted in Egypt, the results of Atwa & Safar (2024) contained a sample of 171 men and 141 females with congenital heart defects (CHDs) age less than 12 years. **Abouheiba (2019**) also discovered that congenital cardiac disease was somewhat more common in male children than in female children in Alexandria, Egypt (**Majdalani et al., 2023).**

According to the current results, children with a-cyanotic congenital heart disease make up the majority of the study and control groups, which is relevant to the child's diagnosis. In line with the findings of **Uzger et al. (2019**), 61 patients (83.6%) exhibited cyanotic congenital cardiac disease. In Alexandria, Egypt, **Abou Heiba (2019**) also discovered that the majority of the sample had a-cyanotic congenital heart disease (Majdalani et al., 2023) as their diagnosis.

According to the study's findings, there was a substantial statistical difference between the mothers' knowledge before and after implementation. This illustrates how well the implementation affected mothers' understanding. The results of this study showed that there was a very substantial change between the moms under study's pre- and post-implementation levels of overall knowledge. According to Elgazzar & Keshk (2020), there was an increase in overall knowledge on the management of patients undergoing coronary angioplasty following the implementation of the procedure, corroborating these findings.

According to the study's findings, when the cardiac catheterization protocol was put into place, over three-quarters of the mothers who took part had good knowledge of the procedure, compared to over half of them who had poor knowledge during the pretest. This demonstrates that moms' understanding of cardiac catheterization needs to be improved and that the implementation has had a good impact on their understanding. The application of guidelines about cardiac catheterization enhanced parents' knowledge, which is consistent with the findings of **Kobayashi et al. (2019**).

After using the progressive muscle relaxation technique, the study group's mean score for sleep quality was lower than the control group's, according to the study's findings. This outcome shows how beneficial and significant the progressive muscle relaxation method is for raising moms' sleep quality. This outcome was consistent with a study by **Seyedi et al. (2018**) that examined "the effect of relaxation technique on the relieving fatigue and promoting quality of sleep in patients diagnosed with chronic obstructive pulmonary disease" and found that progressive muscle relaxation can aid in improving sleep. After the intervention, the anxiety level may have decreased because the anterior and hypothalamic nuclei are balanced, which results in a decrease in the sympathetic nervous system activity thatleads to the prevention of adverse impacts of stress and anxiety levels, and cause an increase in body relaxation (**Ferendiuk et al., 2018**).

The outcome suggests that relaxing techniques have a beneficial impact on lowering children's anxiety levels. This finding is consistent with research by **De et al. (2019**), who examined "The effectiveness of relaxation technique and interactive guided imagery as a pain-decreasing intervention in patients with cancer" and found that applying progressive relaxation techniques can reduce anxiety. In their research on progressive muscular relaxation, which lowers the frequency of migraine attacks and normalizes contingent negative variation amplitudes, **Meyer et al. (2020**) discovered that the observation group's mean scores were lower than those of the control group. Parallel to this, **Xiao et al. (2020)** found that progressive muscular relaxation enhanced the quality of sleep for patients.

Similarly, in their investigation of the effects of progressive muscle relaxation intervention on negative emotions and sleep quality in patients, **Xiao et al. (2020**) found that progressive muscle relaxation and according to the findings of a study by **Annal et al. (2024**), relaxing techniques can help patients achieve better sleep quality. The study focused on sleep disorders that affect children, adolescents, and adults with psychomotor impairment. This has to do with gradual muscular relaxation, which relaxes the body and successfully reduces and relieves anxiety while improving the quality of sleep (**Liu et al., 2020**). During isolation, patients had better-quality sleep when their muscles relaxed.

The current study's findings showed that the mothers' mean overall anxiety score was 43.2±3.1 following the use of progressive muscle relaxation technique; this score then decreased to 22.3±1.1 in the intervention group and 39.88±6.07 in the control group afterward. Before and after the progressive muscle relaxation technique intervention, there were notable differences in the mean total anxiety score for both classes. This might be because all of the moms are experiencing cardiac catheterization for the first time, and it's their first time dealing with this kind of issue. It could also be because of a lack of understanding and appropriate information on pediatric cardiac catheterization. Raising parents' expectations due to ignorance of the cardiac catheterization process, recuperation techniques, discharge plans, and future life can lead to the elevation of parents' anxiety (**Carey et al., 2022**). These results parallel with **Rahimianfar et al. (2020**) findings revealed that the stress mean was higher than average among mothers of children undergoing cardiac catheterization.

Furthermore, according to **Uzger et al. (2019**) findings, parents of children undergoing angiography had BAI ratings of 21.9% for mild anxiety, 11% for moderate anxiety, and 17.8% for severe anxiety. Regretfully, **Zahrlk (2024**) assumed that pre-operative information on pre-and post-operative care in Lebanon is primarily focused on procedural information, with the psychological needs of children and their parents receiving little to no consideration (**Mattie-Luksic et al., 2020**).

The results of the present study showed that, following the application of the progressive muscle relaxation technique, over two-thirds of the women in the pretest study group had an anxiety reduction, compared with less than one-quarter of them before the intervention. This may point to the significance of using a relaxation technique that can reduce anxiety. According to a study by **Park et al. (2019**), relaxation technique intervention can successfully reduce dental patients' tension and anxiety. The study focused on progressive muscle relaxation intervention as a means of reducing dental anxiety.

. Further studies on the advantages of progressive muscle relaxation for anxiety in women (**Wilczyńska et al., 2019**), anxiety during pregnancy (**Rajeswari & Sanjeeva Reddy, 2019),** and sleep quality in fracture patients **(Xie et al., 2019)** corroborate the findings of this investigation. Furthermore, **Hasanpour-Dehkordi et al. (2019**) discovered that no strategy was beneficial in reducing anxiety or pain in surgical patients when they evaluated the effects of relaxing techniques in addition to analgesic. Possible causes of the disagreement include variations within the study group.

After implementing progressive muscle relaxation for cardiac catheterization, moms' overall anxiety scores showed extremely statistically significant decreases ($P<0.001$), according to the study's findings. This would suggest how critical it is to put Progressive Muscle Relaxation into practice to reduce anxiety. According to a study by **Hearps et al. (2024)** on psychosocial risk in families of infants undergoing surgery for serious congenital heart disease, mothers of children undergoing cardiac catheterization had high levels of stress and anxiety, but these improved after receiving education. This result is consistent with their findings.

These findings clarified how a growing emotional disturbance is caused by a knowledge gap. The results of this study are consistent with those of **Lakatos et al. (2019**), who investigated the "Prevalence and correlations of posttraumatic stress and postpartum depression among parents of infants in the Neonatal Intensive Care Unit (NICU)" and discovered that the majority of parents expressed psychological distress about their critical care baby. Comparably, **Kobayashi et al.'s (2018**) study on "Parental anxiety among children undergoing cardiac catheterization" found that mothers' levels of anxiety were extremely high about their children's cardiac catheterization procedures.

The study's conclusions showed a strong relationship between the study participants' demographic data and their understanding of progressive muscle relaxation in both the control and study groups. This might be explained by the fact that mothers who were less educated or younger than the average mother found it difficult to grasp the progressive muscle relaxation technique and lacked the necessary knowledge, whereas mothers who were more educated than the average mother found it easier to understand the progressive muscle relaxation technique. Before the guidelines were implemented, the women who were investigated had high mean ratings for emotional disturbance, particularly in rural areas.

According to the researcher, mothers in rural areas experience higher levels of stress due to a lack of medical supplies, a lack of knowledge, and the difficulty of traveling to an urban health center or hospital if their child appears to be having complications. Rural areas also differ from urban areas in terms of culture, values, and beliefs. Working mothers also contributed to a high degree of stress among mothers. This outcome might be the result of working women leaving their kids unattended for extended periods while they are at work,

which could raise their anxiety levels about their kids getting cardiac catheterization.

In the pre-intervention phase, approximately one-third of moms whose infants have cyanotic congenital heart disease in the study group show above-average and high levels of anxiety, according to the current study. On the other hand, most mothers of children with the same condition report significantly reduced anxiety following the use of Progressive muscle relaxation. It might be because there aren't many children with cyanotic congenital cardiac defects. According to **Uzgaret et al. (2019**), mothers of patients with cyanotic congenital heart disease experienced noticeably greater levels of worry, which is not consistent with this outcome.

Conclusion:

Depending upon the results of the current study and the study hypothesis was concluded that progressive muscle relaxation implementation has a significant effect on improving mothers' sleep quality and reducing their anxiety level.

Recommendations:

The following suggestions are made based on the earlier research:

- Developing a training program on progressive muscle relaxation techniques for moms whose children are receiving cardiac catheterization to enhance my writing and lower my anxiety levels.
- A visual instructional document about cardiac catheterization should be created by cardiac catheterization nurses and distributed to parents prior to discharge. This guide should serve as a reference for orientation prior to the procedure.
- Spreading knowledge about cardiac catheterization recommendations, including home care, issues related to late post-catheterization, and child follow-up, among women attending training sessions.
- To help moms feel less nervous and apprehensive, psychological support should be provided.
- Printed and stored at clinics and hospitals, basic Arabic booklets and pamphlets with adequate information about cardiac catheterization should be distributed to all mothers in the CC unit.
- For generalization, more studies including a bigger sample size of mothers are necessary.
- It is recommended that future studies compare the effectiveness of the progressive muscle relaxation technique with other management techniques.

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