P-ISSN: 2617-9806
E-ISSN: 2617-9814

Impact Factor: RJIF 5.2
www.nursingjournal.net

International Journal of Advance Research in Nursing

Volume 8; Issue 1; Jan-Jun 2025; Page No. 207-212

Received: 15-11-2024
Accepted: 17-12-2024

Indexed Journal
Peer Reviewed Journal

Effectiveness of pranayama in stress reduction among the parents of children undergoing cardiac surgery in a selected cardiac care hospital, Bangalore

[1]Maitra BM

[1]Department of Psychiatric Nursing, Narayana Hrudayalaya College of Nursing, Rajiv Gandhi University of Health Sciences, Bangalore, Karnataka, India

Corresponding Author: Maitra BM

DOI: https://doi.org/10.33545/nursing.2025.v8.i1.C.465

Abstract

Background: The hospitalization of a child for cardiac surgery is a highly stressful experience for parents. Pranayama, a yogic breathing technique, is known to reduce stress, enhance well-being, and promote physical and psychological healing.

Statement of the Problem: An experimental study was conducted to assess the effectiveness of pranayama in reducing stress among parents of children undergoing cardiac surgery in a selected cardiac care hospital in Bangalore.

Methods: A true experimental pre-test-post-test control group design was adopted. The study included parents of children undergoing cardiac surgery in a selected cardiac care hospital in Bangalore, chosen using simple random sampling. A structured questionnaire was used to collect baseline data and assess stress levels. Pranayama was provided for 30 minutes daily. Data were analyzed using descriptive and inferential statistics.

Results: Post-intervention stress levels showed a significant reduction in the experimental group, with 7% reporting mild stress, 78% moderate stress, and 12% severe stress. In the control group, 3% reported mild stress, 43% moderate stress, and 54% severe stress. The paired t-test in the experimental group was 13.542 (first day) and 3.131 (last day). The independent t-test for the last day post-test was 4.050 (p<0.05).

Keywords: Pranayama, stress reduction, cardiac surgery, parents

Introduction

The hospitalization of a child for cardiac surgery is a profoundly stressful experience for parents, often leading to heightened levels of anxiety and psychological distress [1]. This stress can adversely affect parents' well-being and their ability to support their child's recovery [2]. Various interventions have been explored to mitigate this stress, with mind-body practices such as pranayama-controlled breathing exercises rooted in yoga-gaining attention for their potential benefits [3].

Pranayama involves deliberate regulation of breath and has been shown to activate the parasympathetic nervous system, inducing relaxation and reducing stress [4]. Studies have indicated that pranayama can decrease anxiety levels and improve overall mental health [5]. For instance, research has demonstrated that specific pranayama techniques can significantly reduce anxiety among patients undergoing cardiac procedures [2].

Need for the study

Despite the recognized stress experienced by parents during their child's cardiac surgery, there is a paucity of research focusing on interventions to alleviate this burden [1]. Given the promising outcomes of pranayama in reducing anxiety in clinical populations, it is imperative to investigate its effectiveness specifically among parents of children undergoing cardiac surgery [3]. Assessing the impact of pranayama on parental stress can inform supportive care strategies, potentially enhancing parental well-being and, by extension, benefiting the child's recovery process [4].

Objectives of the study

1. To assess the pre-interventional stress levels in the experimental and control groups.
2. To evaluate the effectiveness of pranayama in stress reduction.
3. To determine the association between pre-intervention stress levels and selected baseline variables.

Research Methodology

Research Approach: An evaluative approach was adopted to examine the relationship between pranayama and stress reduction among parents of children undergoing cardiac surgery.

Research Design: A true experimental pre-test-post-test design with a control group was used to assess the effectiveness of pranayama in stress reduction.

Research Setting: The study was conducted in the pediatric

ward of a selected cardiac care hospital in Bangalore, where the intervention was administered in the morning while the subjects were in the hospital.

Population and Sample Size: The target population included parents of children undergoing cardiac surgery. A total of 120 participants were selected, with 60 assigned to the experimental group and 60 to the control group.

Sampling Technique: Simple random sampling using the lottery method was employed. Odd-numbered picks were assigned to the experimental group, and even-numbered picks were assigned to the control group.

Sampling Criteria

Inclusion Criteria

- Parents willing to participate in the study.
- Parents experiencing mild, moderate, or severe stress levels.

Exclusion Criteria

- Parents unavailable during data collection.
- Parents using other stress coping techniques.

Description of Tool: The study utilized three sections of tools:

1. **Baseline Data:** Included demographic details and parental background.
2. **Parental Stress Scale:** A 45-item Likert scale measuring various stress domains.
3. **Modified Perceived Stress Scale:** A 10-item standardized scale assessing stress perception.

Content Validity of the Tool: Content validity was established through expert evaluation, resulting in a validity score of 0.81 for the Parental Stress Scale.

Pre-Testing of the Tool: Pre-testing was conducted on 12 participants. Adjustments were made based on feedback, reducing the frequency of administering the Parental Stress Scale.

Reliability of the Tool: Reliability was established using Pearson's correlation, yielding an R-value of 0.91 for the Parental Stress Scale and 0.84 for the Perceived Stress Scale.

Pilot Study: A pilot study was conducted over 10 days in a selected hospital to assess feasibility. Adjustments were made, limiting intervention to the period before the child's surgery.

Method of Data Collection: The researcher completed a 3-month yoga training program before the study. Data collection included baseline assessment, daily pre- and post-intervention stress measurement, and administration of pranayama.

Intervention Protocol

1. Permission obtained from the research and ethics committee.
2. Participants randomly assigned to experimental and control groups.
3. Pre-intervention stress assessment.
4. Experimental group practiced pranayama for 30 minutes daily until the child's surgery.
5. Post-intervention stress reassessment.
6. Pranayama steps included breath awareness, OM chanting, full yogic breathing, alternate nostril breathing, and relaxation techniques.

- **Data Analysis:** Descriptive and inferential statistics were used:
- **Descriptive Statistics:** Frequency, percentage, mean, and standard deviation.
- **Inferential Statistics:** 't' test and chi-square test.

Result

Part 1: Analysis of baseline variables of parents.

Part 2: Analysis of level of stress of parents.

A. Level of stress among parents belonging to both control and experimental group.
B. Area wise analysis of stress of the parents belonging to both control and experimental group.

Part 3: Analysis of effectiveness of pranayama on stress.

A. Comparison of pre intervention stress scores with post intervention scores of the experimental group assessed by Parental Stress Scale using the paired 't' test.
B. Comparison of pre-test and post-test stress of parents belonging to experimental group assessed by Perceived Stress Scale using the paired 't' test.
C. Comparison of stress scores between the control and experimental group using the independent 't' test.

Part 4: Analysis of association between pre interventional stress level and selected baseline variables.

Part 1: Analysis of baseline variables of parents.

Table 1: Baseline variables of parents.

Si no:	Baseline variables	Number (%)		χ^2 Value	DF	P-Value	Inference
		Experimental group (N=60)	Control group(N=60)				
1	**Age of the parents in years**						
	20-30	28 (47)	30 (50)	0.179	2	0.914	P> 0.05 NS
	31-40	26 (43)	25 (42)				
	41-50	6 (10)	5 (8)				
2	**Sex of parents**						
	Father	14 (23)	13 (22)	0.478	1	0.827	P> 0.05 NS
	Mother	46 (77)	47 (78)				
3	**Education of the parents**						

	Illiterate	17 (28)	19 (32)	0.171	2	0.918	P> 0.05 NS
	Primary and secondary	31 (52)	30 (50)				
	Graduate	12 (20)	11 (18)				
4	**Place of residence**						
	Urban	25 (42)	26 (43)	0.341	1	0.853	P> 0.05 NS
	Rural	35 (58)	34 (57)				
5	**Type of heart disease**						
	Cyanotic heart disease	45 (75)	45 (75)	0.00	1	1.000	P> 0.05 NS
	Acyanotic heart disease	15 (25)	15 (25)				
6	**Parents occupation**						
	Professional	6 (10)	7 (12)	0.554	3	0.907	P> 0.05 NS
	Farmer	9 (15)	10 (17)				
	Business	10 (17)	12 (20)				
	Unemployment	35 (58)	31 (51)				
7	**Family income in Rs per month**						
	Less than 20000 per month	46 (77)	45 (75)	0.455	1	0.831	P> 0.05 NS
	Above 20000 per month	14 (23)	15 (25)				
8	**Number of children**						
	One	20 (33)	18 (30)	0.163	2	0.922	P> 0.05 NS
	Two	28 (47)	29 (48)				
	Three and above	12 (20)	13 (22)				
9	**Religion**						
	Hindu	43 (72)	44 (73)	0.288	2	0.866	P> 0.05 NS
	Muslim	11 (18)	9 (15)				
	Christian	6 (10)	7 (12)				
10	Order of the birth of the child						
	First child	41 (68)	43 (72)	0.179	2	0.915	P> 0.05 NS
	Second child	13 (22)	12 (20)				
	Third child	6 (10)	5 (8)				
11	Comorbid illness of the child						
	Present	6 (10)	5 (8)	0.100	1	0.752	P> 0.05 NS
	Absent	54 (90)	55 (92)				
12	Problem of the parents						
	Marital	5 (7)	5 (7)	0.768	1	0.857	P> 0.05 NS
	Financial	35 (60)	34 (58)				
	Family	6 (10)	9 (15)				
	Other	14 (23)	12 (20)				
13	Physical health of the parents						
	Healthy	53 (88)	53 (88)	0.00	1	1.000	P> 0.05 NS
	Diseased	7 (12)	7 (12)				
15	Social support						
	Available	54 (90)	55 (92)	0.100	1	0.752	P> 0.05 NS
	Not available	6 (10)	5 (8)				
16	Parents satisfaction related to hospital care						
	Satisfied	54 (90)	55 (92)	0.100	1	0.752	P> 0.05 NS
	Not satisfied	6 (10)	5 (8)				
17	Financial support						
	Health insurance	45 (75)	46 (76)	0.777	2	0.962	P> 0.05 NS
	Friends	8 (13)	7 (12)				
	Own	7 (12)	7 (12)				

Part 2: Analysis of level of stress of parents.

A. Analysis of pre and post intervention stress level among parents belongs to both the experimental and control group.

Table 2: Analysis of pre intervention stress level

Stress	Pre intervention stress score		χ^2 value	DF	P-Value	Inference
	Experimental group (N= 60)	Control group (N= 60)				
Moderate (76-150)	17 (28)	16 (27)	0.418	1	0.838	P> 0.05 NS
Severe (151-225)	43 (72)	44 (73)				

NS=Not significant S=Significant

Pre-intervention stress levels showed that most parents in both groups experienced severe stress (72% in the experimental group and 73% in the control group), with no significant difference between them.

Table 3: Analysis of post intervention stress level

Stress	Post-test stress score		χ^2 value	DF	P-Value	Inference
	Experimental group (N=60)	Control group (N=60)				
Mild (0-75)	4 (7)	2 (3)	22.7	2	0.001*	P>0.05 S
Moderate (76-150)	47 (78)	26 (43)				
Severe (151-225)	9(15)	32 (54)				

Post-intervention stress levels indicated a significant reduction in stress in the experimental group compared to the control group (p=0.001). Mild stress was seen in 7% of the experimental group compared to only 3% in the control group, and severe stress dropped from 72% to 15% in the experimental group but remained high (54%) in the control group.

Table 4: Area wise analysis of stress of the parents belongs to experimental group.

Area of stress	Experimental group (N = 60)				Difference between pre and post intervention mean %
	Pre intervention stress		Post intervention stress		
	Mean ± SD	Mean %	Mean ± SD	Mean %	
Financial	7.23±2.34	48.2	6.81± 1.32	45.4	2.8
Physical	15.31±6.34	76.55	8.37±3.47	41.8	34.75
Psychological	18.22±7.82	72.88	9.31±5.43	37.24	35.64
Occupational	3.42± 1.32	34.2	3.21±1.02	32.1	2.1
Family	21.01±8.34	70.03	15.42± 6.25	51.4	18.63
Hospital	34.55±12.17	62.81	17.08±5.86	31.05	31.76

Table 5: Area wise analysis of stress of the parents belongs to control group.

Area of stress	Control group (N=60)				Difference between pre and post-test mean %
	Pre-test stress		Post-test stress		
	Mean ± SD	Mean %	Mean ± SD	Mean %	
Financial	7.27±2.93	48.44	7.11±1.42	47.4	1.04
Physical	14.81±6.82	74.05	11.37±5.43	56.85	17.2
Psychological	18.51±7.84	74.04	14.61±7.34	58.44	15.6
Occupational	3.57± 1.62	35.7	3.31±1.03	33.1	2.6
Family	20.05±8.47	66.83	17.72± 6.26	59.06	7.77
Hospital	33.15±11.86	60.27	25.08±8.84	45.6	14.67

Table 4 & Table 5, Area-wise stress analysis showed a greater reduction in financial, physical, psychological, family, and hospital-related stress in the experimental group compared to the control group. Psychological and hospital-related stress showed the highest reductions in the experimental group (35.64% and 31.76%, respectively).

Part 3: Analysis of effectiveness of pranayama on stress

Table 6: Comparison of pre with post intervention stress scores assessed by parental stress scale of parents belonging to experimental group

Group	Day	Pre test	Post test	T-Value, DF=59	P-Value	Inference
		Mean + SD				
Experimental (N=60)	First	159.07+36.579	151.58±36.911	13.542	0.001*	S
	last	124.33±27.943	119.83±30.40	3.131	0.003*	S

NS=Not Significant, S=Significant

The paired t-test for Parental Stress Scale scores showed a statistically significant reduction in stress levels post-intervention (P=0.001).

Table 7: Comparison of pre and post interventional stress assessed by Perceived Stress Scale of parents belonging to experimental group

Day	N	Pre intervention stress	Post intervention stress	T-Value	DF	P-Value	Inference
Day 1	60	29.05+7.127	27.72+6.869	13.346	59	0.001*	S
Day 2	60	27.83+6.680	26.28+6.747	13.195	59	0.001*	S
Day 3	56	26.75+6.661	24.39+6.684	8.802	55	0.001*	S
Day 4	51	25.31+6.373	23.31+6.294	12.071	50	0.001*	S
Day 5	45	24.51+5.968	22.67+5.465	11.857	44	0.001*	S
Day 6	34	23.74+5.599	22.32+5.261	10.512	33	0.001*	S
Day 7	24	22.63+5.182	20.83+4.659	7.020	23	0.001*	S
Day 8	17	21.53+3.970	19.41+3.726	9.414	16	0.001*	S
Day 9	11	20.91+3.330	19.45+3.142	7.016	10	0.001*	S
Day 10	7	20.00+3.142	18.43+2.573	4.260	6	0.005*	S

NS=Not significant S=Significant

The perceived stress scale analysis indicated a consistent decline in stress scores from Day 1 to Day 10 in the experimental group, with all reductions being statistically significant (P=0.001).

Table 8: Comparison of stress scores between the control and experimental group

Days	Pre and post intervention stress	Experimental group	Control group	T-Value, DF=59	P-Value	Inference
		Mean + SD				
First	Pre intervention stress	159.07±36.579	160.08±26.167	-0.165	0.869	NS
	Post intervention stress	151.58±36.911	160.08±26.167	-1.362	0.178	NS
Last	Pre intervention stress	124.33±27.943	142.02±27.396	-3.324	0.002*	S
	Post intervention stress	119.83±30.40	142.02±27.396	-4.050	0.001*	S

Initial stress scores were similar in both groups. Significant difference in last-day post-test scores (119.83±30.40 in the experimental group vs. 142.02 ± 27.39 in the control group, P=0.001), proving the effectiveness of pranayama.

Table 9: The association between selected demographic variables with pre interventional stress score

SI No	Baseline Variables	Number	Moderate stress	Severe Stress	χ^2 Value	DF	P-Value	Inference
1	**Age of the parents in years**							
	20-30	58	**18**	**40**	1.563	2	0.458	P> 0.05 NS
	31-40	51	12	39				
	41-50	11	6	5				
2	**Sex of parents**							
	Father	27	11	16	0.29	1	0.885	P> 0.05 NS
	Mother	93	24	69				
3	**Education of the parents**							
	Illiterate	36	12	24	2.763	2	0.251	P> 0.05 NS
	Primary and secondary	61	16	45				
	Graduate	23	7	16				
4	**Place of residence**							
	Urban	51	12	33	1.999	1	0.157	P> 0.05 NS
	Rural	69	23	52				
5	**Type of heart disease**							
	Cyanotic heart disease	90	25	65	0.055	1	0.815	P> 0.05 NS
	Acyanotic heart disease	30	10	20				
6	**Parents occupation**							
	Professional	13	6	7	0.294	3	0.961	P> 0.05 NS
	Farmer	19	7	12				
	Business	32	12	20				
	Unemployment	56	10	46				
7	Family income in Rs per month							
	Less than 20,000 per month	91	23	68	0.492	1	0.483	P> 0.05 NS
	Above 20000 per month	29	12	17				
8	Number of children							
	One	38	9	29	2.258	3	0.521	P> 0.05 NS
	Two	57	18	39				
	Three and above	25	8	17				
9	**Religion**							
	Hindu	87	29	58	1.227	2	0.542	P> 0.05 NS
	Muslim	20	11	9				
	Christian	13	5	8				
10	**Order of the birth of the child**							
	First child	84	24	60	5.910	2	0.052	P> 0.05 NS
	Second child	25	7	18				
	Third child	11	5	6				
11	**Comorbid illness of the child**							
	Present	11	5	6	0.179	1	0.672	P> 0.05 NS
	Absent	109	32	77				
12	**Problem of the parents**							
	Marital	10	5	5	1.952	3	0.582	P> 0.05 NS
	Financial	69	22	47				
	Family	15	5	10				
	Other	26	7	19				
13	**Physical health of the parents**							
	Healthy	106	29	77	0.372	1	0.542	P> 0.05 NS
	Diseased	14	6	8				
15	**Social support**							
	Available	109	31	78	2.627	1	0.105	P> 0.05 NS
	Not available	11	4	7				
16	**Parents satisfaction related to hospital care**							
	Satisfied	109	33	76	0.178	1	0.673	P> 0.05 NS
	Not satisfied	11	5	6				
17	**Financial support**							
	Health insurance	91	24	67	1.367	2	0.505	P> 0.05 NS
	Friends	15	7	8				
	Own	14	4	10				

NS= Not significant S= Significant

The association between baseline characteristics and pre-intervention stress levels showed no significant relationship between stress levels and demographic factors such as age, gender, education, occupation, income, number of children, religion, and financial support.

Discussion

The findings of this study indicate that pranayama significantly reduced stress among parents of children with congenital heart disease, with severe stress decreasing from 72% to 15% in the experimental group, while the control group showed minimal improvement. This aligns with previous research demonstrating the effectiveness of pranayama and yoga-based interventions in reducing stress among caregivers.

A study by Bisht *et al.* (2019) [6] investigated the impact of a 12-week yoga-based lifestyle intervention, including pranayama, on parents of children with retinoblastoma. Their results showed a significant reduction in stress levels and improved quality of life across physical, psychological, and social domains. Additionally, biomarkers indicated increased brain-derived neurotrophic factor (BDNF) and decreased cortisol levels, suggesting lower stress levels (6). This supports the present study's findings, where psychological and physical stress domains showed the most improvement, with stress reductions of 35.64% and 34.75%, respectively. Similarly, Ramakrishnan and Gopal (2019) conducted a pilot study on the effect of pranayama on parents of children with autism. Their study found a significant drop in stress levels, with the mean pre-test score of 20.15 reducing to 13.4 post-intervention [7]. In comparison, the current study observed a reduction in perceived stress scale scores from 29.05±7.12 to 20.00±3.14 over 10 days, reinforcing the effectiveness of pranayama in stress relief.

Acknowledgment

I sincerely express my deepest gratitude to my guide, Prof. Dorothy Deena Theodore, for her invaluable guidance and unwavering support throughout this research. I am also profoundly thankful to all the participants for their time and cooperation, without whom this study would not have been possible.

Conclusion

The study demonstrates that pranayama is an effective technique for reducing stress among parents of children undergoing cardiac surgery. Parents who practiced pranayama showed significant improvement in stress levels, highlighting its potential as a simple, non-pharmacological intervention. Integrating pranayama into hospital care programs can provide emotional support and enhance parental well-being during their child's treatment. Further research is needed to explore its long-term benefits in different healthcare settings.

Conflict of Interest: Not available

Financial Support: Not available

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How to Cite This Article
Maitra BM. Effectiveness of pranayama in stress reduction among the parents of children undergoing cardiac surgery in a selected cardiac care hospital, Bangalore. International Journal of Advance Research in Nursing. 2025;8(1):207-212.