

Research Article

An Evaluation of the Impact of a Nurse-Led Educational Intervention on Anxiety and Fatigue in Patients Undergoing Cardiac Catheterization: A Quasi Experimental Study

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INTRODUCTION

Background of Study

Anxiety is a frequent psychological issue among patients undergoing cardiac catheterization and fatigue is also reported by the patients. Globally, studies have shown a high prevalence of pre-procedural anxiety and fatigue. A randomized controlled study revealed that a significant proportion of patients experienced moderate to severe anxiety before cardiac catheterization, which adversely affected their procedural experience (Malliarou et al., 2022). Another international trial reported that more than 60% of patients undergoing cardiac procedures exhibited high anxiety levels before the intervention (Monfared et al., 2021). In Pakistan, a recent study reported that approximately 58% of patients scheduled for cardiac catheterization suffered from considerable anxiety, pointing to the critical need for preoperative education and psychological support (Hassan et al., 2025). Cardiac catheterization is a widely utilized medical procedure for diagnosing and treating cardiovascular diseases such as coronary artery disease, valvular disorders, and congenital heart anomalies. It involves inserting a catheter into the heart through blood vessels to examine cardiac function and blood flow. Despite its clinical benefits, the procedure is often associated with considerable psychological stress, particularly pre-procedural anxiety, which can adversely affect patient outcomes (Bejar et al., 2021).

Given the clinical significance of anxiety in this context, nurse-led educational interventions have emerged as a practical and evidence-based solution to mitigate this issue. These interventions typically include pre-procedural counseling, audiovisual aids, printed

educational materials, and interactive question-answer sessions, all tailored to the individual needs of patients. By addressing informational gaps and enhancing patient understanding, nurses are able to build trust and emotional resilience in patients who may otherwise feel overwhelmed or fearful (Bagheri et al., 2025). While global and regional evidence highlights the value of nurse-led educational interventions in reducing procedural anxiety, the Pakistani healthcare setting presents unique challenges where this essential aspect of nursing care remains significantly underexplored. Despite the rising burden of cardiovascular diseases and the routine performance of cardiac catheterization, anxiety management is often deprioritized especially in under-resourced public sector hospitals. Structural barriers such as inadequate nurse staffing, high patient-to-nurse ratios, and the absence of formal patient education protocols significantly limit nurses' ability to deliver consistent psychosocial support (Hassan et al., 2025).

Moreover, the impact of unmanaged anxiety is not confined to the perioperative period. Elevated anxiety levels among cardiac patients have been linked to delayed recovery, poor adherence to post-discharge instructions, medication non-compliance, and overall dissatisfaction with the healthcare experience. These downstream consequences reinforce the view that managing procedural anxiety is not merely an emotional concern, but a clinical priority. Nurse-led educational strategies offer an accessible, cost-effective, and scalable approach to mitigating this problem particularly when adapted to the constraints and cultural realities of the Pakistani healthcare system (Hamdan & Mehany, 2025).

Future research in Pakistan should thus extend beyond immediate anxiety and fatigue reduction and evaluate long-term outcomes such as hospital readmissions, compliance with cardiac rehabilitation, and improvements in patients' quality of life. By generating evidence in the local context, such studies can reinforce the role of nurses as critical agents in delivering holistic cardiovascular care. Therefore, this study aims to evaluate the impact of a nurse-led educational intervention on reducing anxiety and fatigue levels in patients undergoing cardiac catheterization. By addressing an under-researched yet crucial component of pre-procedural care, this research seeks to contribute practical insights into the effectiveness of nursing strategies that prioritize both physical treatment and emotional preparedness. Ultimately, the findings could help shape institutional policies, enhance nursing practice, and advocate for the integration of structured education into standard care protocols across Pakistan's cardiac units.

Problem Statement

Cardiac catheterization is a common and important procedure used to diagnose and treat heart problems. However, many patients feel high levels of anxiety before the procedure because they do not fully understand what will happen or what to expect. Anxiety before medical procedures can negatively affect a patient's physical and emotional well-being and may also interfere with treatment outcomes (Hassan et al., 2025)

In hospitals, nurses play a key role in preparing patients for procedures. Educational support provided by nurses can reduce fear and increase patient confidence. Although many international studies have shown the benefits of nurse-led education in reducing anxiety and fatigue, limited research is available in the Pakistani context. Most patients in Pakistan receive only basic information before the procedure, which may not be enough to ease their fears.

Therefore, there is a need to explore how a nurse-led educational intervention can help manage anxiety and fatigue in patients undergoing cardiac catheterization in local hospitals. This study aims to fill that gap by evaluating the effectiveness of a structured educational session given by nurses.

Significance of the Study

Cardiac catheterization is a very important procedure for diagnosing and treating heart problems. Many patients feel very anxious before the procedure because they don't fully understand what will happen. This anxiety can harm their physical and emotional health and may affect how well the treatment works (Bejar et al., 2021).

Nurses have a vital role in helping patients prepare for medical procedures by providing education and support. When nurses give proper information, patients feel less scared and more confident. Although studies from other countries show that nurse-led education reduces anxiety and fatigue, there is little research about this in Pakistan. Most patients here get only basic information, which is often not enough to reduce their fears.

If this important research is not done, patients in Pakistan may continue to experience high anxiety and fatigue before cardiac catheterization, which can lead to worse health outcomes and more stress. This study is needed to find out how nurse-led education can help local patients and improve their experience and treatment success.

Research Questions

1. Is there any significant impact of nurse-led educational intervention on anxiety and fatigue in patients undergoing cardiac catheterization?

Research Objective:

1. To assess the effectiveness of a nurse-led educational intervention in reducing anxiety and fatigue among patients undergoing cardiac catheterization.

LITERATURE REVIEW

Cardiac catheterization is a vital procedure widely used in diagnosing and treating various cardiovascular conditions. However, patients undergoing this procedure often experience heightened levels of anxiety, which can negatively affect physiological parameters such as heart rate and blood pressure, potentially complicating both the procedure and the recovery process. An experimental study in Jordan aimed to assess the effectiveness of an animated educational program (AEP) on reducing anxiety, vascular complications, and flat time in children aged 6 to 12 undergoing cardiac catheterization for the first time. The study measured anxiety levels before the procedure and vascular outcomes after sheath removal. The findings demonstrated that AEP effectively reduced anxiety and improved post-

procedure outcomes, highlighting the importance of child-focused, age-appropriate educational tools in pediatric cardiac care (Bagheri et al., 2025)

A study was conducted to evaluate the effectiveness of an instructional module on the knowledge and anxiety levels of caregivers of children undergoing cardiac catheterization. The caregivers were divided into experimental and control groups (30 each), with the experimental group receiving a booklet-based instructional module, while the control group received routine instructions. Pre- and post-intervention assessments were carried out using a structured knowledge questionnaire and the State-Trait Anxiety Inventory. The findings revealed a significant improvement in knowledge and a reduction in anxiety levels among caregivers in the experimental group ($P < 0.001$), highlighting the positive impact of structured educational interventions in enhancing caregiver preparedness and emotional well-being during their child's cardiac procedure (Kumari et al., 2023)

A study conducted at Assiut General Hospital assessed the perception and satisfaction levels of patients undergoing cardiac catheterization, revealing that although the majority received complete information about the procedure, 80% of patients held unacceptable perceptions of care. Despite this, overall satisfaction remained high, with no significant association between satisfaction and sociodemographic characteristics. However, patient perceptions were significantly influenced by education and employment status. The study concluded that a positive correlation exists between patient perception and satisfaction, recommending comprehensive educational programs to bridge knowledge gaps and strengthen communication between patients and healthcare providers (Hamdan & Mehany, 2025).

Nurse-led interventions play a critical role in improving psychological outcomes in patients undergoing invasive cardiac procedures. A quasi-experimental study conducted at Mansoura University Hospital evaluated the effectiveness of a nurse-led intervention on anxiety and fatigue among 100 patients undergoing cardiac catheterization. The study utilized structured interviews, the Spielberger's State Anxiety Inventory (SSAI), and a fatigue assessment scale. Findings demonstrated that the intervention group experienced a significant reduction in anxiety and fatigue compared to the control group ($P < .001$), highlighting the

positive impact of nurse-led education and emotional support before the procedure. These results support the inclusion of structured nurse-led interventions in pre-procedural care to enhance patient outcomes. (Mohammed Ali Hassan et al., 2021).

A study assessing the impact of an informational brochure on patients undergoing cardiac catheterization for the first time revealed that pre-procedural education significantly reduced patients' short-term and overall fear and anxiety. Participants who received the brochure reported better emotional preparedness, although fear regarding long-term consequences remained unchanged. Furthermore, satisfaction with the information provided was associated with reduced transient anxiety, particularly among patients without comorbidities. These findings emphasize the importance of structured pre-procedural education to ease patient stress and improve their overall experience (Malliarou et al., 2022).

In summary, the reviewed literature underscores the significance of nurse-led educational interventions in reducing anxiety among patients undergoing cardiac catheterization. While many studies report positive outcomes, significant gaps remain regarding local applicability in Pakistan, the integration of culturally sensitive practices, and evaluation of long-term benefits. This study aims to address these gaps by evaluating the impact of a culturally tailored nurse-led educational intervention on anxiety in cardiac catheterization patients, thus contributing valuable evidence for improving patient-centered care in this context.

Gap Analysis

While several international studies have demonstrated that educational brochures and structured information sessions can significantly reduce anxiety and improve satisfaction among patients undergoing cardiac catheterization (Bordbar & Najafi Kalyani, 2023), there is a noticeable lack of such research in the Pakistani context. Most available literature originates from Western or other Asian countries, where healthcare systems and patient education practices differ significantly from those in Pakistan. Furthermore, limited attention has been paid to evaluating the knowledge and emotional preparedness of caregivers, who play a vital role in patient recovery and decision-making. This gap highlights the need for localized, nurse-led

educational interventions targeting both patients and caregivers in Pakistan to assess their effectiveness in managing anxiety, fatigue and enhancing procedural understanding.

Conceptual Definitions

Anxiety

Pre-procedural anxiety is a psychological and physiological response characterized by apprehension, nervousness, or fear experienced by patients before undergoing medical procedures, often linked to uncertainty, perceived threat, or lack of information (Harkness et al., 2003).

Nurse-Led Educational Intervention

A nurse-led educational intervention is a structured program delivered by nursing professionals aimed at increasing patient understanding of medical procedures, improving emotional readiness, and reducing psychological distress through the use of evidence-based teaching methods (Haddad et al., 2018)

Operational Definitions

Anxiety

In this study, pre-procedural anxiety is measured using a standardized anxiety assessment tool (e.g., the State-Trait Anxiety Inventory – STAI or a locally validated hospital anxiety scale) and its scoring ranges from 1 (Not at all) to 4 (Very much so), administered 1 hour before the cardiac catheterization procedure (Bejar et al., 2021).

Fatigue

In this study, fatigue is defined as a subjective feeling of tiredness and reduced energy, assessed before and after the educational intervention in cardiac catheterization patients using a 0–100 scale, where higher scores indicate greater fatigue severity.

Nurse-Led Educational Intervention

In this study, the nurse-led educational intervention comprises a 15–20-minute session delivered by a trained nurse, including verbal explanation, printed handouts, and an audiovisual video detailing the cardiac catheterization process. It is administered

within 24 hours prior to the scheduled procedure (Ayasrah & Ahmad, 2016).

HYPOTHESIS

Null Hypothesis (H_0):

There will be no significant difference in anxiety and fatigue levels between patients who receive nurse-led educational intervention and those who receive routine care before undergoing cardiac catheterization.

Alternative Hypothesis (H_1):

There will be a difference in anxiety and fatigue levels among patients who receive nurse-led educational intervention compared to those who receive routine care before undergoing cardiac catheterization.

METHODOLOGY

This study used a quasi-experimental design to assess the effect of a nurse-led educational intervention on anxiety in patients undergoing cardiac catheterization.

Study Setting

The research took place in a Jinnah Hospital where cardiac catheterization procedures are performed.

Study Population

The population includes patients scheduled for elective cardiac catheterization at Jinnah Hospital Lahore.

Sampling

A non-probability (purposive) sampling method was used to select patients who meet the criteria.

Sample Size

Sample size was calculated using OpenEpi (Compare Two Means). Means and standard deviations were taken from a previously published study (Education group: mean = 44.23, SD = 3.97; Control group: mean = 48.57, SD = 8.08). With a two-sided 95% confidence level, 80% power, and a 1:1 allocation ratio, the calculated minimum sample size was 33 participants per group (total n = 66). The means and SDs from the reference study were used only for sample size estimation and will not be reported as study outcomes (Gökçe & Arslan, 2019).

Sample size of Group 1	33
Sample size of Group 2	33
Total sample size	66

Results from OpenEpi, Version 3, open source calculator--SSMean

Inclusion Criteria

Participants must meet all of the following conditions:

1. Adults aged 18 years and above.
2. Scheduled for elective cardiac catheterization.
3. Able to read or understand Urdu
4. Willing to give informed written consent.
5. Medically stable and able to participate in an educational session.

Exclusion Criteria

Participants were excluded if they met any of the following:

1. Diagnosed with a psychiatric illness or cognitive impairment.
2. Have a history of previous cardiac catheterization.
3. Requiring emergency or urgent catheterization.
4. Suffering from hearing or visual impairments that interfere with educational delivery.
6. Currently on anti-anxiety medications or sedatives.

Study Duration

- The research was carried out over a period of four months, starting immediately after obtaining ethical approval from institute's ethics committee. (Bordbar & Najafi Kalyani, 2023) This duration includes recruitment of participants, data collection, data entry, and analysis. The timeline for the study is as follows:

- Month 1: Recruitment of study participants
- Month 2: Data collection
- Month 3: Data analysis using the SPSS program
- Month 4: Writing and editing the final report.

Intervention

The intervention consisted of an educational session by the researchers. This session provided information about the cardiac catheterization procedure, what to expect, possible risks, and post-procedure care. The education was delivered through simple explanations, printed leaflets, and a short video lasting about 10 minutes. The session took place one day before the procedure in a quiet room.

The control group received the usual care, which generally includes brief verbal instructions without extra materials.

Data Collection Procedure

Eligible patients were identified from the procedure schedule and approached a day before their cardiac catheterization. After obtaining informed consent, baseline data was collected, including demographic information and pre-intervention anxiety levels using the State-Trait Anxiety Inventory (STAI), and fatigue levels using the Fatigue Assessment Tool (0–100 scale).

Participants received the nurse-led educational session in a private room. This session included a video, printed material, and verbal explanations about the procedure.

Just before the procedure, all participants again completed the STAI to assess post-intervention anxiety and the Fatigue Assessment Tool to reassess fatigue levels.

The control group received standard routine care without any additional educational session.

Study Tools

Two tools will be used in this study to assess patient outcomes:

State-Trait Anxiety Inventory (STAI)

The STAI is a standardized questionnaire used to measure anxiety in clinical and research settings (Spielberger et al., 1971). This study uses the State Anxiety (S-Anxiety) subscale, consisting of 10 items rated on a 4-point Likert scale (1 = Not at all to 4 = Very much so). Scores range from 10–40, with higher scores indicating greater anxiety. The scale will be translated into Urdu and explained to participants. It will be administered before the intervention and again just before the procedure (Spielberger et al., 1971).

Fatigue Assessment Tool

Fatigue was measured using a 0–100 numeric rating scale categorized as follows:

Fatigue Level Score Range (Hassan et al., 2021)

- No fatigue (0)
- Very little fatigue (1–9)
- Mild fatigue (10–30)
- Moderate fatigue (31–60)
- Severe fatigue (61–80)
- Worst possible fatigue (81–100)

Patients marked their fatigue level before the intervention and again just before the procedure. Higher scores indicate greater fatigue severity.

Data Analysis

Data was analyzed using SPSS version 25. Descriptive statistics were used to summarize patients' demographic and clinical

characteristics. Paired t-tests compared pre- and post-intervention anxiety and fatigue scores within each group, while independent t-tests compared mean differences between the intervention and control groups. A p-value of less than 0.05 was considered statistically significant.

Ethical Considerations

1. Written informed consent (attached) was taken from all the participants.
2. All information and data collection was kept confidential.
3. Participants remained anonymous throughout the study.
4. The subjects were informed that there are no disadvantages or risks on the procedure of the study.
5. They were also informed that they will be free to withdraw at any time during the process of the study.

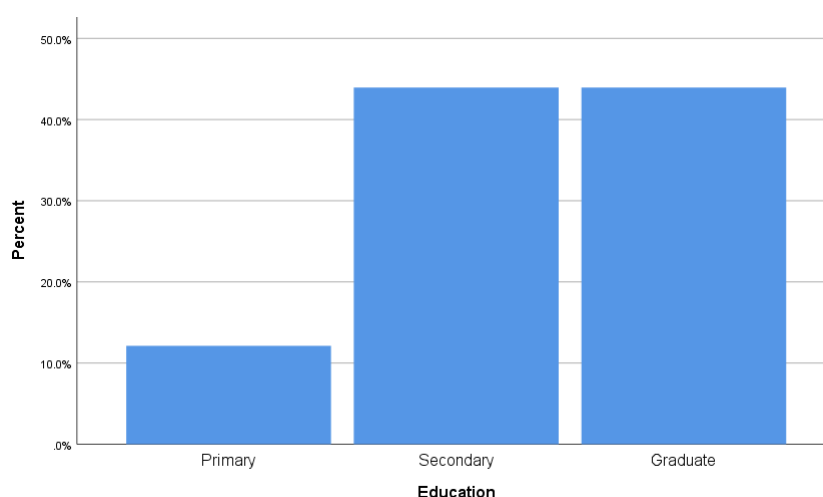
6. Data was kept under key and lock. In laptop it will be kept under password.

RESULTS

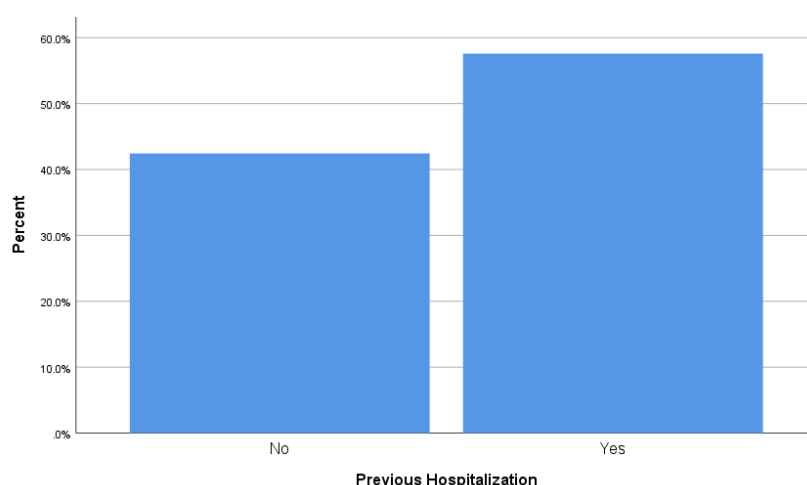
Demographic Characteristics of Participants

A total of 66 participants were included in the study. Among them, 33 (50.0%) were assigned to the control group and 33 (50.0%) to the intervention group.

Regarding gender distribution, 37 (56.1%) participants were female and 29 (43.9%) were male. In terms of marital status, 38 (57.6%) participants were married while 28 (42.4%) were single. Concerning educational status, 29 (43.9%) participants had secondary education, 29 (43.9%) were graduates, and 8 (12.1%) had primary education.



With respect to hospitalization history, 38 (57.6%) participants reported previous hospitalization, whereas 28 (42.4%) had no history of hospitalization.



Previous cardiac catheterization was reported by only 8 (12.1%) participants, while the majority, 58 (87.9%), had never undergone cardiac catheterization.

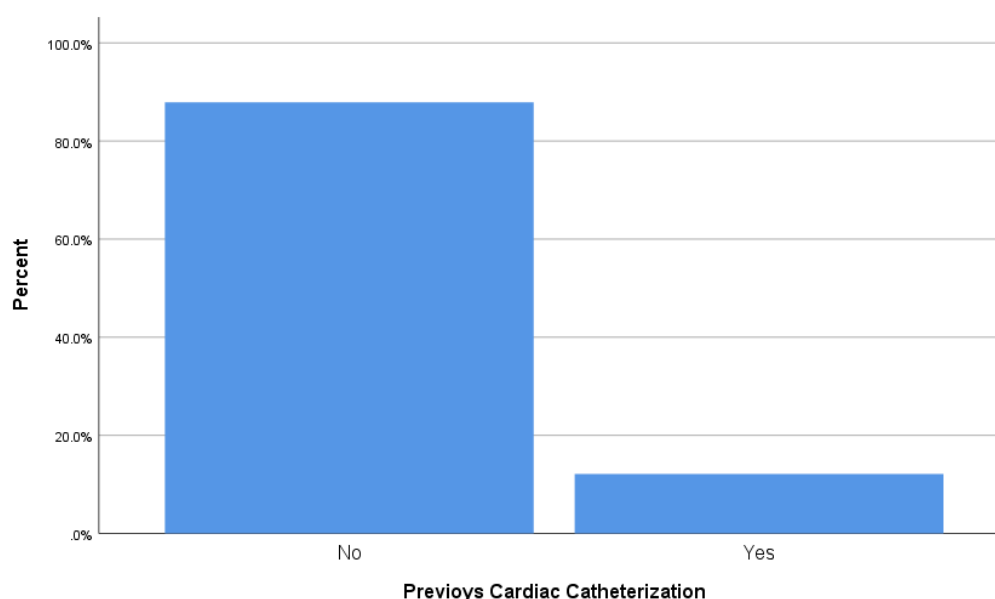


Table 4.1: Distribution of Participants According to Demographic Characteristics (N = 66)

Variable	Category	Frequency	Percentage (%)
Gender	Male	29	43.9
	Female	37	56.1
Marital Status	Single	28	42.4
	Married	38	57.6
Education	Primary	8	12.1
	Secondary	29	43.9
	Graduate	29	43.9
Previous Hospitalization	No	28	42.4
	Yes	38	57.6
Previous Cardiac Catheterization	No	58	87.9
	Yes	8	12.1
Group	Control	33	50.0
	Intervention	33	50.0

Effect of Educational Intervention on Anxiety Levels

The mean pre-intervention anxiety score in the control group was 54.00 ± 4.50 , whereas the post-intervention mean score was 54.15 ± 4.32 . The paired t-test showed no statistically significant difference between pre- and post-

intervention anxiety scores in the control group ($t = -0.571$, $p = 0.572$).

In the intervention group, the mean anxiety score decreased from 52.24 ± 3.29 before intervention to 49.67 ± 4.11 after intervention. The paired t-test revealed a statistically significant reduction in anxiety following the intervention ($t = 3.224$, $p = 0.003$).

Table 4.2: Comparison of Pre- and Post-Intervention Anxiety Scores within Groups

Group	Pre-test Mean $\pm$ SD	Post-test Mean $\pm$ SD	t-value	p-value
Control	54.00 ± 4.50	54.15 ± 4.32	-0.571	0.572
Intervention	52.24 ± 3.29	49.67 ± 4.11	3.224	0.003*

*Significant at $p < 0.05$

Comparison of Post-Intervention Anxiety Scores between Groups

An independent samples t-test was conducted to compare post-intervention anxiety scores between the control and intervention groups.

The results showed that the intervention group had significantly lower anxiety scores (49.67 ± 4.11) compared with the control group (54.15 ± 4.32). This difference was statistically significant ($t = 4.325$, $p < 0.001$).

Table 4.3 Comparison of Post-Intervention Anxiety Scores between Groups

Group	Mean $\pm$ SD	t-value	p-value
Control	54.15 $\pm$ 4.32	4.325	<0.001*
Intervention	49.67 $\pm$ 4.11		

*Significant at $p < 0.05$

Comparison of Anxiety Change Scores between Groups

The mean anxiety change score was 0.15 $\pm$ 1.52 in the control group and -2.58 $\pm$ 4.59 in the intervention group. Independent samples t-

test indicated a statistically significant difference between groups ($t = 3.240$, $p = 0.002$), suggesting that the intervention effectively reduced anxiety levels.

Table 4.4: Comparison of Anxiety Change Scores between Groups

Group	Mean $\pm$ SD	t-value	p-value
Control	0.15 $\pm$ 1.52	3.240	0.002*
Intervention	-2.58 $\pm$ 4.59		

*Significant at $p < 0.05$

Effect of Educational Intervention on Fatigue Levels

The mean fatigue score in the control group increased slightly from 3.36 $\pm$ 0.82 before intervention to 3.48 $\pm$ 0.87 after intervention. However, the difference was not statistically significant ($t = -1.071$, $p = 0.292$).

In the intervention group, fatigue scores decreased from 4.15 $\pm$ 0.80 before intervention to 2.88 $\pm$ 5.62 after intervention. Nevertheless, the paired t-test showed that this reduction was not statistically significant ($t = 1.283$, $p = 0.209$).

Table 4.5 Comparison of Pre- and Post-Intervention Fatigue Scores Within Groups

Group	Pre-test Mean $\pm$ SD	Post-test Mean $\pm$ SD	t-value	p-value
Control	3.36 $\pm$ 0.82	3.48 $\pm$ 0.87	-1.071	0.292
Intervention	4.15 $\pm$ 0.80	2.88 $\pm$ 5.62	1.283	0.209

Comparison of Post-Intervention Fatigue Scores between Groups

The post-intervention fatigue score was 3.48 $\pm$ 0.87 in the control group and 2.88 $\pm$ 5.62 in the

intervention group. Independent samples t-test showed no statistically significant difference between the groups ($t = 0.612$, $p = 0.543$).

Table 4.6: Comparison of Post-Intervention Fatigue Scores between Groups

Group	Mean $\pm$ SD	t-value	p-value
Control	3.48 $\pm$ 0.87	0.612	0.543
Intervention	2.88 $\pm$ 5.62		

Comparison of Fatigue Change Scores between Groups

The mean fatigue change score was 0.12 $\pm$ 0.65 in the control group and -1.27 $\pm$ 5.70 in

the intervention group. Independent samples t-test demonstrated no statistically significant difference between groups ($t = 1.397$, $p = 0.167$).

Table 4.7: Comparison of Fatigue Change Scores between Groups

Group	Mean $\pm$ SD	t-value	p-value
Control	0.12 $\pm$ 0.65	1.397	0.167
Intervention	-1.27 $\pm$ 5.70		

DISCUSSION

Introduction

This chapter discusses the findings of the present study and interprets them in relation to existing literature. The main focus of this discussion is to examine the effectiveness of a

nurse-led educational intervention in reducing anxiety and fatigue among patients undergoing cardiac catheterization. The chapter also highlights the clinical and nursing implications of the findings, outlines the strengths and limitations of the study, and provides

recommendations for future research and practice.

Summary of Key Findings

The findings of the present study demonstrated that the nurse-led educational intervention was effective in reducing anxiety among patients undergoing cardiac catheterization. Within the intervention group, anxiety scores decreased significantly from pre-intervention (52.24 ± 3.29) to post-intervention (49.67 ± 4.11), and this reduction was statistically significant ($p = 0.003$). In contrast, the control group showed no significant change in anxiety scores following routine care ($p = 0.572$).

Furthermore, comparison of post-intervention anxiety scores between the control and intervention groups revealed a statistically significant difference ($p < 0.001$), with the intervention group reporting lower anxiety levels. Similarly, anxiety change scores differed significantly between groups ($p = 0.002$), indicating that the educational intervention produced a greater reduction in anxiety compared with routine care.

Regarding fatigue, no statistically significant differences were observed. Within-group comparisons showed no significant reduction in fatigue in either the control group ($p = 0.292$) or the intervention group ($p = 0.209$). Likewise, comparisons of post-intervention fatigue scores ($p = 0.543$) and fatigue change scores ($p = 0.167$) between groups were not statistically significant. These findings suggest that while the nurse-led educational intervention was successful in reducing anxiety, it had limited impact on fatigue levels among patients undergoing cardiac catheterization.

Effect of Nurse-Led Education on Anxiety

The present study found that nurse-led educational intervention significantly reduced anxiety among patients undergoing cardiac catheterization. Patients in the intervention group experienced a significant decrease in anxiety scores following the educational session, whereas no significant improvement was observed in the control group. In addition, post-intervention anxiety scores and anxiety change scores differed significantly between groups, indicating the effectiveness of the intervention.

These findings are consistent with previous studies that have demonstrated the beneficial role of structured nursing education in reducing anxiety before invasive cardiac procedures. Educational interventions provide patients with

information regarding procedural steps, expected sensations, potential risks, and post-procedural care, thereby reducing uncertainty and fear. Increased knowledge and understanding help patients feel more prepared and in control, resulting in lower anxiety levels. The findings also support the theoretical concept that anxiety is often associated with uncertainty and lack of information. By addressing patients' concerns and providing clear explanations before the procedure, nurses can improve psychological preparedness and reduce emotional distress. Therefore, nurse-led education can be considered an effective non-pharmacological strategy for anxiety management in cardiac catheterization settings.

Effect of Nurse-Led Education on Fatigue

Unlike anxiety, fatigue did not improve significantly following the educational intervention. Although the intervention group demonstrated a reduction in mean fatigue scores, the change was not statistically significant. Furthermore, no significant differences were observed between the intervention and control groups regarding post-intervention fatigue scores or fatigue change scores.

This finding suggests that fatigue may be influenced by factors beyond procedural knowledge and psychological preparedness. Fatigue in cardiac patients is a multidimensional symptom affected by disease severity, physical condition, sleep quality, emotional stress, medication effects, and previous health experiences. Therefore, providing information alone may not be sufficient to produce measurable improvements in fatigue levels.

Previous studies have suggested that fatigue management often requires comprehensive interventions involving physical activity programs, lifestyle modification, symptom management strategies, and ongoing psychosocial support. Consequently, while educational interventions can successfully reduce anxiety, additional approaches may be required to effectively address fatigue among patients undergoing cardiac catheterization.

Implications of the Study

Clinical Implications

The significant reduction in anxiety observed in the intervention group highlights the importance of incorporating nurse-led educational sessions into routine pre-cardiac catheterization care. Reduced anxiety may lead

to improved patient cooperation during procedures, stabilization of physiological parameters, and enhanced overall patient satisfaction. Integrating structured educational interventions into standard clinical practice can contribute to better patient experiences and outcomes in cardiac care units.

Implications for Nursing Practice

The findings emphasize the critical role of nurses in patient education and psychological support. Nurses should be encouraged and trained to provide structured, patient-centered education tailored to individual learning needs. The use of visual aids, printed materials, and audiovisual tools may further enhance patient understanding and retention of information. Incorporating such educational strategies into nursing practice can strengthen the quality of holistic patient care.

Policy Implications

From a policy perspective, healthcare institutions should consider developing standardized protocols for nurse-led education for patients undergoing invasive cardiac procedures. Formalizing educational interventions within institutional policies may ensure consistent delivery of information, improve psychological outcomes, and promote patient-centered care across healthcare settings.

Strengths of the Study

This study has several strengths:

- First, the quasi-experimental design with a control group allowed for meaningful comparison and evaluation of the intervention's effectiveness.
- Second, the study was conducted in a real clinical setting, enhancing the practical applicability and external validity of the findings.
- Third, the use of validated and standardized tools for anxiety assessment strengthened the reliability and accuracy of the results.

Limitations of the Study

Despite its strengths, the study has some limitations.

- The follow-up period was short, as anxiety and fatigue were assessed only around the time of the procedure, limiting the ability to assess long-term effects.
- The intervention consisted of a single educational session, which may not have been sufficient to influence complex symptoms such as fatigue.

- Additionally, the sample size, although adequate for detecting changes in anxiety, may have limited the detection of smaller effects related to fatigue or subgroup analyses.

Recommendations for Future Research

Based on the findings and limitations of this study, several recommendations are proposed:

- Future studies should explore multi-session or blended educational interventions that include stress management and coping strategies.
- Longitudinal studies should be conducted to assess the long-term effects of nurse-led education on anxiety and fatigue.
- Additional outcome measures such as patient satisfaction, physiological parameters, and procedural cooperation should be included.
- Tailored educational interventions based on patient demographics, psychological status, and learning preferences should be investigated to maximize effectiveness.

Conclusion

The present study demonstrated that a nurse-led educational intervention was effective in significantly reducing anxiety among patients undergoing cardiac catheterization. These findings support existing evidence that structured nursing education enhances psychological preparedness and improves patient experiences during invasive procedures. Although the intervention did not significantly reduce fatigue, the results highlight the need for broader and more comprehensive approaches to address fatigue. Overall, this study supports the integration of structured nurse-led educational interventions into cardiac care protocols to improve patient outcomes and quality of care.

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ANNEXURE I CONSENT FORM

Title of the Study

An Evaluation of the Impact of a Nurse-Led Educational Intervention on Anxiety and in Patients Undergoing Cardiac Catheterization: A Quasi Experimental Study

Description of the Research and Your Participation

You are invited to take part in a research study that aims to assess the effect of a nurse-led educational session on reducing anxiety and fatigue in patients undergoing cardiac catheterization. If you agree to participate, you will be asked to fill out two short questionnaires—once before and once after an educational session. The session will include simple information about your procedure, delivered by a trained nurse.

Risks and Discomforts

There are no physical risks involved in this study. Some people may feel slightly uncomfortable while answering questions related to anxiety. You are free to skip any question you do not wish to answer.

Potential Benefits

You may benefit by feeling more informed and less anxious about your upcoming procedure. Your participation will also help improve nursing

practices for future patients undergoing cardiac catheterization.

Protection of Confidentiality

All information you provide will be kept strictly confidential. Your name and identity will not be used in any report, publication, or shared with anyone outside the research team.

Voluntary Participation

Your participation is completely voluntary. You may choose not to participate, or withdraw at any time without giving a reason. Your medical care will not be affected by your decision.

Consent Statement

I have read and understood the purpose and process of this study. I have had the opportunity to ask questions. I voluntarily agree to participate in this research.

Participant's

Signature:

Date: _____

A copy of this consent form will be provided to you for your record.

فارم رضامندی

تحقیق کا عنوان

ایمری لعت ہدیرک مہارف ےس بناج کی سرن
رہ نمائی کا دل کی کہ یتھ یٹرائڈ زیشن کے
مریہ ضوں کی ہے چینی اور تھ کن پر اثر

تحقیق اور شرکت کی وضاحت

آپ کو اس تحقیق میں حصہ لینے کی
دعوت دی جا رہی ہے۔ اس تحقیق کا مقصد
یہ دیکھنا ہے کہ اگر دل کی
ڈیزیشن کے مریہ ضوں کو نرس کی یتھ یٹرائڈ
کی جانب سے مکمل اور آسان معلومات دی
جائیں تو کیا اس سے ان کی ہے چینی
اور تھ کن کم ہو سکتی ہے۔ اس تحقیق
میں آپ کو ایک مختصر معلوماتی سیشن
دیا جائے گا اور آپ سے ہے چینی اور تھ کن
کے بارے میں چند سوالات پوچھے جائیں
گے۔

لیفٹ منہ خطرات اور تھ کا

اس تحقیق سے آپ کی صحت کو کوئی
خطرہ نہ ہوگا۔ صرف سوال نامہ مکمل
کرتے وقت کچھ افراد کو ہلکی ذہنی
الچھن یا ہے چینی محسوس ہو سکتی
ہے۔

منہ کے فوائد

اس تحقیق میں شرکت سے آپ کو اپنے
علاج سے متعلق معلومات حاصل ہوں گی جو
آپ کو ذہنی طور پر پرسکون رکھنے میں
ہے سکتی ہیں۔ اس کے علاوہ، اس مدد
تحقیق کے نتائج دوسرے مریہ ضوں کی
بہتر دیکھ بھال میں بھی مددگار ثابت
ہوں گے۔

رازداری کا تحفظ

آپ کی ذاتی معلومات کو مکمل راز میں رکھا جائے گا اور آپ کی شناخت کسی بھی رپورٹ یا شائع شدہ مواد میں ظاہر نہیں کی جائے گی۔
رضاکارانہ شرکت

اس تحقیق میں آپ کی شرکت مکمل طور پر رضاکارانہ ہے۔ آپ کسی بھی وقت بغیر کسی وجہ بتائے تحقیق سے باہر نکل

سکتے ہیں۔ اس سے آپ کے علاج یا دیگر کچھ بہال پر کوئی اثر نہیں پڑے گا۔

رضامندی کا اعلان

میں نے اس تحقیق کے مقصد اور شرائط کو پڑھ لیا ہے اور مجھے ہر بات سمجھا دی گئی ہے۔ میں اپنی مرضی سے اس تحقیق میں شامل ہونے کی اجازت دیتا ہوں۔

شرکت کنندہ کے دستخط تاریخ

ANNEXURE II QUESTIONNAIRE

Section A: Demographic Information

No.	Items					
1	Age	18-22	22-26	27-32	33-38	39 and above
2	Gender	Male	Female			
3	Marital Status	Single	Married			
4	Education Level	No formal education	Primary	Secondary	Graduate & above	
6	Previous Hospitalization	Yes	No			
7	Previous Cardiac Catheterization	Yes	No			

Section B: State Anxiety Questionnaire Instructions

Read each statement carefully and select the response that best describes how you feel right now, at this very moment.

There are no right or wrong answers. Do not spend too much time on any one statement.

Choose the response that best represents your present feelings.

Response Scale

- 1 = Not at all
- 2 = A little
- 3 = Somewhat
- 4 = Very much so

No.	Statement	1	2	3	4
1	I feel calm				
2	I feel secure				
3	I feel tense				
4	I feel strained				
5	I feel at ease				
6	I feel upset				
7	I am presently worrying over possible misfortunes				
8	I feel satisfied				
9	I feel frightened				
10	I feel uncomfortable				
11	I feel self-confident				
12	I feel nervous				
13	I feel jittery				
14	I feel indecisive				
15	I am relaxed				
16	I feel content				
17	I am worried				
18	I feel confused				
19	I feel steady				
20	I feel pleasant				

نہیں بیان

1	م میں پرس کون محسوس کر رہا/رہی ہوں
2	م میں خود کو محفوظ محسوس کر رہا/رہی ہوں
3	م میں تناؤ محسوس کر رہا/رہی ہوں
4	م میں دباؤ محسوس کر رہا/رہی ہوں
5	محسوس کر رہا/رہی ہوں م میں خود کو آرام دہ
6	م میں پریشان محسوس کر رہا/رہی ہوں
7	م میں ممکنہ بدقسمتیوں کے بارے میں فکر مند ہوں
8	م میں مطمئن محسوس کر رہا/رہی ہوں
9	م میں خوفزدہ محسوس کر رہا/رہی ہوں
10	م میں آرام محسوس کر رہا/رہی ہوں
11	م میں خود پر اعتماد محسوس کر رہا/رہی ہوں
12	م میں گھبراہٹ محسوس کر رہا/رہی ہوں
13	م میں کچھ پابٹ محسوس کر رہا/رہی ہوں
14	م میں فیصلہ کرنے میں تذبذب محسوس کر رہا/رہی ہوں
15	میں پرسکون ہوں
16	م میں مطمئن ہوں
17	م میں فکر مند ہوں
18	م میں الجھن محسوس کر رہا/رہی ہوں
19	م میں متوازن محسوس کر رہا/رہی ہوں
20	خوش گوار محسوس کر رہا/رہی ہوں

Section C: Fatigue Assessment Tool

Fatigue Level	Score Range	Patient Response
No fatigue	0	
Very little fatigue	1-9	
Mild fatigue	10-30	
Moderate fatigue	31-60	
Severe fatigue	61-80	
Worst possible fatigue	81-100	

جواب کا مریض	حد کی سکور	سطح کی تفسیر
	0	نہیں تھکنے کوئی
	1-9	تھکنے کی ہلکی بہت
	10-30	تھکنے کی ہلکی
	31-60	تھکنے کی درمیانہ
	61-80	تھکنے کی شدید
	81-100	تھکنے کی شدید انتہائی

ANNEXURE III

PERMISSION LETTER

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- **Mamoona Ramzan**

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