Original Article

Effects of Multimodal Care Bundle on Knowledge and Anxiety among Patients Undergoing Cardiac Catheterization

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ABSTRACT

Objective: To evaluate the effectiveness of a multimodal care bundle in two key areas: enhancing patients' knowledge about cardiac catheterization and reducing their anxiety about the procedure.

Study Design: A quasi-experimental one-group (pre-and-post) study

Place and Duration of Study: This study was conducted at the Cardiac Unit of a Tertiary Care Hospital, in Lahore, Pakistan, from 1st June to 30th November 2024.

Methods: A total of 100 participants undergoing cardiac catheterization for the first time, were selected using purposive sampling. Data were collected using a validated questionnaire and analyzed using SPSS version 27.

Results: Highly educated participants experienced significant preprocedural anxiety, primarily due to a lack of adequate knowledge. Overall, the mean Knowledge score improved significantly from 10.64 in the pre-test to 16.00 in the post-test, with an intermediate score of 5.36 two hours before the procedure ($p<0.0001$). Anxiety levels also showed substantial improvement, with mean scores of 6.52 in the pre-test, 6.63 two hours before the procedure, and 13.15 in the post-test.

Conclusion: The structured intervention significantly improves patients' knowledge and reduces anxiety levels associated with cardiac catheterization. The substantial increase in knowledge and marked decrease in anxiety scores highlight the importance of pre-procedural education and support in enhancing patient preparedness and emotional well-being.

Key words: Cardiac catheterization, Multimodal care bundle, Pre-procedural intervention

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INTRODUCTION

Cardiac catheterization is a minimally invasive diagnostic procedure used to identify blockages in coronary arteries. However, limited patient understanding of the procedure can lead to psychological challenges, including heightened anxiety driven by fear of the unknown. Providing patients with comprehensive information about pre-, intra-, and post-procedural care can help alleviate anxiety and promote a faster recovery.

Globally, cardiovascular diseases (CVDs), including coronary artery disease (CAD), cerebrovascular disease, and other cardiovascular disorders, are the leading causes of mortality.

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According to the World Health Organization, approximately 17.9 million people die annually from CVDs, with CAD responsible for 43% of these fatalities.[1] Pakistan, part of the South Asian region with the highest CAD prevalence rates, experienced significant mortality, with CAD-related deaths recorded at 110.65 per 100,000 by 2014.[2] These alarming statistics emphasize the need for effective diagnostic and therapeutic measures, including cardiac catheterization, performed in over 6,000 out of every million individuals annually in Western countries.[3]

Cardiac catheterization is a minimally invasive diagnostic procedure widely regarded as the gold standard for diagnosing, evaluating, and treating cardiac diseases. It involves inserting a thin catheter through the radial or femoral artery, guided via fluoroscopy, to assess coronary arteries and other cardiovascular structures. While highly effective, insufficient pre-procedural knowledge about cardiac catheterization can significantly elevate patient anxiety and adversely impact outcomes. Anxiety related to this procedure is often heightened by factors such as fear of complications, inadequate communication, and insufficient preparation.[4,5]

Pre-procedural anxiety is common among patients undergoing cardiac catheterization, with more than 82% of patients reporting significant anxiety before coronary angiography. Anxiety, defined as a state of nervousness or apprehension, can adversely affect patient outcomes, leading to extended hospital stays, refusal to undergo procedures, or even increased cardiac events. Physiological manifestations of anxiety, such as elevated blood pressure, heart rate, and plasma catecholamine levels, can further complicate the procedure.[6,7]

Nurses play a critical role in addressing these challenges by providing comprehensive patient education to alleviate anxiety.[8] Educational interventions, including face-to-face counselling, written brochures, and video-based materials, improve patient knowledge and reduce anxiety.[9] For instance, portable educational videos have been effective in increasing patient understanding and reducing anxiety levels before coronary angiography and angioplasty.[10] Non-pharmacological methods, such as aromatherapy and hand massages, have also demonstrated potential benefits in lowering anxiety levels, though their effectiveness is less pronounced than structured education programs.[11,12]

Despite these advancements, limited research has focused on multimodal interventions to enhance patient preparation in public hospitals in Pakistan. Many studies have either described the prevalence of anxiety or employed a single educational approach, leaving a gap in evaluating comprehensive preparation strategies. To address this, the current study introduces a multimodal care bundle that includes personalized education, written materials, video demonstrations, and a guided tour of the catheterization unit.

By addressing cognitive and emotional needs, this intervention seeks to improve patient outcomes, set a standard for anxiety management, and guide future clinical practices in cardiac care.[13,14]

METHODS

This quasi-experimental one-group pre-and-post study was conducted at the Cardiac Unit of a Tertiary Care Hospital in Lahore, Pakistan, from 1st June to 30th November 2024. The software Epitool was used to determine the sample size n= 100 with a 1.96 sample standard deviation and 95% confidence interval. All males and females, adults aged 20 to 65 years, communicate effectively, without acute medical conditions (e.g, asthma, arthritis, fractures, burns) and scheduled for their first elective CC procedure were included. The patients who have previously attended an educational program related to knowledge and anxiety levels for CC, psychological issues (e.g, hallucinations, depression) and undergo emergency cardiac catheterization procedures were excluded. The study utilized a structured questionnaire consisting of three sections: the first section gathered demographic information such as gender, age, marital status, residence, education, smoking habits, and co-morbidities; the second assessed participants' knowledge related to cardiac catheterization 11 items based. Incorrect answers receive a score of 1. Partially correct answers are awarded a score of 2. Correct and complete answers are given a score of 3.The total score of each patient's knowledge will be graded as: <17 = poor knowledge, 17-25 = fair knowledge and 26-33 = good knowledge. The third section evaluated anxiety levels by using the Hospital Anxiety and Depression Scale (HADS)[18] tool·grading as: 0-7 = normal, 8-10 = borderline abnormal (borderline case) and 11-21 = abnormal (case). In the preprocedural phase, scheduled CC patients provided written consent, after which their knowledge and anxiety levels were assessed on admission (day) using designated tools. During the interventional phase, held two hours before the procedure to assess participants' knowledge and anxiety levels the educational intervention (MMCB) consisted of two 45-minute sessions per week for four days and delivered either during the morning/evening shift. The sessions included face-to-face interaction, an educational pamphlet on CC, and patient preparation. Patients viewed pictures of the CC Lab and a 10-minute video detailing the procedure, pre-and post-care, and patient experiences. Additionally, the researcher demonstrated deep breathing exercises, which the patients then practiced. The post-procedural phase evaluates these levels of knowledge and anxiety, after the CC procedure. Quantitative data was entered by using SPSS-27. The normality of the knowledge and anxiety scores was assessed using the Shapiro-Wilk test and for pair testing, Cohen's d test was used. A p-value of <0.05 was considered statistically significant for all analyses.

RESULTS

There were 66 (66%) males and 34 (34%) females while 4 (4%) between 30-39 years, 29 (29%) between 40-49 years, 52 (52%) between 50-59 years age group and 15 (15%) between 60-69 years. The majority of the patients (64%, n=64) were married, 1% (n=1) were unmarried, 28% (n=28) were widowed, and 7% (n=7) were divorced. Seventy five (75%) of the patients resided in urban areas while 25 (25%) were from rural areas. Five (5%) had primary education, 16 (16%) had middle school education, 49 (49%) had completed matriculation, 25 (25%) had an intermediate level of education, 4 (4%) were graduates, and 1 (1%) had a postgraduate education. Thirty one (31%) patients were smokers, while 69 (69%) were non-smokers. Seventy five (57%) patients had hypertension, 36 (36%) had diabetes and 7 (7%) had ischemic heart disease (Table 1).

Table No.1: Demographic characteristics of knowledge and anxiety among patients about cardiac catheterization (n= 100)

Variable	Frequency	%.
Gender: Male	66	66.0
Female	34	34.0
30 – 39	4	4.0
40 – 49	29	29.0
50 - 59	52	52.0
60 – 69	15	15.0
Marital status		
Married	64	64.0
Unmarried	1	1.0
Widow	28	28.0
Divorced	7	7.0
Residence		
Urban	75	75.0
Rural	25	25.0
Education		
Primary	5	5.0
Middle	16	16.0
Matric	49	49.0
Intermediate	25	25.0
Graduate	4	4.0
Postgraduate	1	1.0
Smoking: Yes	31	31.0
No	69	69.0
Co-morbidities		
Hypertension	57	57.0
Diabetes	36	36.0
IHD	7	7.0

The knowledge scores increased by an average of 10.64 points, supported by a high t-value (83.947), a statistically significant p-value (<0.05), and a 95% confidence interval (CI) of 9.577 to 7.209. A large effect size (Cohen's d = 8.395) highlights the intervention's strong impact. Before 2 Hours vs. Post-Testing: Scores further increased by 5.36 points, with a t-value of 18.324, a p-value <0.001, and a narrow 95% CI (2.152 to 1.509), demonstrating precision. The large effect size (Cohen's d = 8.395) confirms the intervention's meaningful effect. Pre-Testing vs. Post-Testing: Overall, knowledge improved by 16 points with an extremely large effect size (Cohen's d = 10.546), showing substantial gains across all comparisons (Table 2).

Pre-testing versus before 2 hours: anxiety scores decreased by 6.52 points, with a narrow and precise 95% confidence interval (CI) of 6.302 to 6.738. A high t-value (59.479), a p<0.05, and a large effect size (Cohen's d = 5.948) confirm a substantial reduction. Before 2 hours vs Post-Testing: Anxiety scores further decreased by 6.63 points, with a precise 95% CI of 6.469 to 6.791. The t-value (81.628), p<0.001, and very large effect size (Cohen's d = 5.948) indicate continued significant improvement. Pre-Testing vs. Post-Testing: Overall, anxiety was reduced by 13.15 points, with a 95% CI of 12.904 to 13.396, a t-value of 105.865, and extremely large effect sizes. The reductions in anxiety were statistically significant across all comparisons (p<0.05), demonstrating the intervention's meaningful impact (Table 3).

Table No.2: Comparison of Knowledge Levels in the pre-, 2 hours before and after the intervention (groups)

Knowledge		Mean	SD	Diff.	t value	p value	95% CI		Cohen's d
							LL	UL	
Pair 1	Pre-Testing	14.30	1.494	10.640	83.947	0.000	9.577	7.209	8.395
	Before 2 hours	24.94	1.523						
Pair 2	Before 2 hours	24.94	1.523	5.360	18.324		2.152	1.509	1.832
	Post-Testing	30.30	1.521						
Pair 3	Pre-Testing	14.30	1.494	16.00	61.412		7.016	5.264	7.016
	Post-Testing	3.30	1.521						

Table No.3: Comparison of anxiety levels in the pre-, 2 hours before and after the intervention (groups)

Anxiety		Mean	SD	Diff.	t value	p value	95% CI		Cohen's d
							LL	UL	
Pair 1	Pre-Testing	18.92	1.502	6.520	59.479	0.000	6.302	6.738	5.948
	Before 2 hours	12.40	1.271						
Pair 2	Before 2 hours	12.40	1.271	6.630	81.628		6.469	6.791	8.163
	Post-Testing	5.77	1.153						
Pair 3	Pre-Testing	18.92	1.502	13.150	105.865		12.904	13.396	10.546
	Post-Testing	5.77	1.153						

SD= Standard Deviation, Diff= Difference, LL= Lower limit, UL= Upper Limit, CI= Confidence Interval

DISCUSSION

In terms of gender distribution, the majority of participants in this study were male (66%) and 34% were female. These findings align with previous research which reported that the demographic data for patients undergoing diagnostic cardiac catheterization showed that approximately two-thirds were male, and more than half were over sixty years old.[15] The age distribution in our study revealed that most participants were between 50-59 years (52%), with a smaller percentage in the younger age groups, which is consistent with studies by Shaheen et al[2] and Inamdar & Chendake[13], which reported similar age distributions in cardiac catheterization patients.

Regarding residence, 75% of the participants lived in urban areas, a finding consistent with studies by Anise Hassan Abdelaal et al[10] and Meseer & Al-Dujaili[14], while contrasting with other studies such as Inamdar & Chendake,[16] where a larger proportion of participants were from rural areas.

The academic qualifications of participants varied, with the majority having completed secondary education (49%) or intermediate education (25%). These findings were consistent with those of Inamdar & Chendake[16] and Yap et al[11], which showed higher percentages of participants with secondary education. Regarding smoking habits, 31% of patients were smokers, which comparable to findings conducted in Peshawar found that hypertension (65.7%), stress (73.1%), and smoking (50.6%) were key risk factors for ischemic heart disease (IHD).[17]

Many CC patients lack sufficient knowledge about the procedure, leading to discomfort and fear. Nurses play a crucial role in assessing and educating patients, which helps reduce anxiety and enhances comfort.[3]

The present study found a significant improvement in patients' knowledge of CC, with a mean increase of 10.64 points from Pre-Testing to 2 hours before the procedure ($p<0.001$). These results align with previous research by Shaheen et al[2], which showed similar findings, and Inamdar & Chendake[16], where 13.33% of patients had poor knowledge before the intervention. The study found that patient education based on the MMCB approach significantly improved knowledge, with an overall increase of 16 points in the post-test phase. This result agrees with the findings by Inamdar & Chendake[16], and Yap et al[11], who reported a high percentage of patients showing good knowledge after receiving education. Moreover, these findings were also supported by another study which reported that significant improvements in knowledge and reduced anxiety ($P = 0.00$), supporting the multimodal care bundle as an effective method for cardiac catheterization.[18]

The results of this study demonstrated a significant reduction in anxiety levels after the intervention and anxiety scores decreased by a mean of 6.52 points after the educational session 2 hours before the procedure and by another 6.63 points post-procedure. These findings are consistent with studies by Anise Hassan Abdelaal et al[11] and Yap et al[12], which reported similar reductions in anxiety after educational interventions. Additionally, research by Shaheen et al[2] and Inamdar & Chendake[20] supports the notion that education can significantly reduce anxiety, with some studies indicating a shift from moderate to low anxiety levels after receiving information. The reduction in anxiety in this study suggests that providing patients with detailed information about the procedure and addressing their concerns through educational interventions can lead to a marked improvement in their emotional well-being.

The reduction in anxiety levels can be attributed to the comprehensive approach used in the intervention, which included not only educational pamphlets but also a video demonstration and face-to-face interactions. Such multimodal interventions have been shown to enhance patient understanding and comfort, leading to lower anxiety levels as reported by Oshvandi et al.[3] Moreover, patient satisfaction and comfort were notably improved when patients felt informed about the process, which aligns with findings from previous research by Yap et al.[11]

CONCLUSION

Multimodal Care Bundle (MMCB) significantly benefited patients awaiting cardiac catheterization. It improved their knowledge with large effect sizes ($d>0.8$) and statistically significant p-values ($p<0.05$) across all comparisons, indicating a substantial impact on enhancing patient understanding. Additionally, the MMCB effectively reduced anxiety and panic levels associated with unfamiliar environments and procedural uncertainties. Often, the information provided by nurses and physicians, due to their busy schedules and limited availability, is insufficient to alleviate extreme patient anxiety. In such scenarios, nurses can play a pivotal role by implementing MMCB interventions to address these concerns. The MMCB is not only a cost-effective and practical approach but also highly accessible, making it a valuable tool for improving patient outcomes related to cardiac procedures.

Author's Contribution:

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Drafting or Revising Critically:	Muhammad Afzal, Muhammad Farhan Tabassum
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