

Evaluating the Effectiveness of a Tailored Intervention on Medication Adherence among CABG Patients at a Tertiary Care Hospital in Delhi

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Abstract

Introduction: Cardiovascular diseases (CVDs) pose a significant global health challenge, with coronary artery bypass grafting (CABG) being a common surgical intervention for advanced coronary artery disease. In India, CVDs account for a substantial burden, with CVD-related deaths occurring a decade earlier than in the West. Medication adherence is crucial for post-CABG care, but non-adherence remains a concern due to multifaceted factors. Tailored interventions offer promise but lack research in the Indian context.

Methodology: This study employed a one-group pre-test, post-test design to assess a tailored intervention's impact on CABG patients' medication adherence in a Delhi Tertiary Care Hospital. Sixty-six patients participated, receiving tailored interventions addressing individual adherence barriers. Medication adherence was assessed using the Morisky Medication Adherence Scale, with data collected before and three months after CABG.

Results: After the intervention, medication non-adherence rates significantly decreased, with improvements in adherence levels. Significant changes were observed in cholesterol levels, reflecting better medication adherence.

Conclusion: Tailored interventions have significant potential to improve medication adherence among CABG patients, offering personalised support and education. These findings emphasize the importance of a patient-centered approach to cardiac care and hold promise for reducing the burden of cardiovascular disease on healthcare systems.

Key words: Medication adherence, tailored intervention, CABG patients, Morisky medication adherence scale, post-CABG care, cardiovascular diseases.

Introduction

Cardiovascular diseases (CVDs) remain a significant global health challenge; with coronary artery bypass grafting (CABG) being one of the most common surgical interventions for patients with advanced coronary artery disease. CVDs such as ischaemic heart disease and cerebrovascular accidents account for 17.7 million deaths and are the leading cause¹. As per Global Burden of disease study the age-standardised CVD death rate of 272/1,00,000 population in India which is much higher than the global average of 235. CVD occurs in Indians a decade earlier than the Western population². In India, data shows that in 2016, CVDs contributed to 28.1% of total deaths and 14.1% of total disability-adjusted life years (DALYs) compared with 15.2% and 6.9%, respectively in 1990³. While CABG surgery can effectively alleviate symptoms and improve overall cardiac health, optimal post-operative care is essential for successful outcomes. A critical aspect of this care is medication adherence, which plays a pivotal role in preventing post-CABG complications and promoting long-term cardiovascular health.

Medication non-adherence is a pervasive issue in healthcare, affecting patients across diverse medical conditions, including those who have undergone CABG surgery. Non-adherence to prescribed medications after CABG can lead to an increased risk of adverse events, including recurrent cardiac events, hospital readmissions, and decreased quality of life⁴. However, the reasons behind medication non-adherence are multifaceted and complex, encompassing individual patient factors, healthcare system barriers, and medication-related issues⁵.

Tailored interventions have emerged as a promising approach to address medication adherence challenges among post-CABG patients. These interventions are designed to account for individual patient characteristics, preferences, and specific barriers to adherence, thereby enhancing the likelihood of success. However, despite the growing interest in tailored interventions, there is a noticeable research gap, particularly in the Indian healthcare context.

The existing literature on medication adherence among CABG patients predominantly originates from Western healthcare systems, which may not fully capture the unique

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cultural, socio-economic, and healthcare delivery aspects prevalent in India. Furthermore, there is a dearth of studies evaluating the effectiveness of tailored interventions specifically tailored to the needs of CABG patients in India. While general insights into medication adherence exist, the nuances and complexities of the Indian healthcare system and patient population require tailored approaches that have yet to be comprehensively explored.

The objective of this research study is to address this notable research gap by evaluating the effectiveness of a tailored intervention aimed at improving medication adherence among CABG patients receiving care at a tertiary care hospital in Delhi. This research is not only important from a clinical perspective but also holds significant implications for healthcare policy and practice in India, where cardiovascular diseases continue to be a major public health concern. The findings of this study can inform healthcare providers, policymakers, and researchers about the feasibility and impact of tailored interventions to enhance medication adherence among CABG patients in a tertiary care hospital setting in Delhi.

Methodology

This research employed a one-group pre-test post-test research design to assess the effectiveness of a tailored intervention in improving medication adherence among coronary artery bypass grafting (CABG) patients at a tertiary care hospital in Delhi.

The study was undertaken in two in-patient units at Dr RML hospital, a leading Government healthcare facility specializing in cardiovascular care in Delhi, India. This hospital serves a diverse patient population and provides comprehensive post-CABG care. Prior approval from the institutional ethics committee was taken. A total of 66 patients were included in the study that were posted for elective CABG, based on inclusion and exclusion criteria. Patients who were willing to participate in the study, aged more than 18 years, able to communicate in Hindi or English were included and patients with cognitive impairments or communication barriers that could affect their ability to provide accurate information were excluded. Purposive sampling technique was employed. Sample size calculation was done on an estimated prevalence of medication non-adherence among post-CABG patients, with a margin of error of 5% and a confidence level of 95%. Additionally, to account for attrition during the follow-up period, the sample size increased by 10%.

Medication adherence was assessed on first day of hospitalisation using structured interviews with patients. Data on socio-demographic characteristics, physiological and biochemical parameters were obtained; medical history, prescribed medications, and other relevant variables

were collected through medical records and patient interviews. A validated Morisky Medication Adherence Scale (MMAS), was used to quantify adherence levels. Thereafter patients received a multifaceted tailored intervention designed to address individual barriers to medication adherence. Implementation of intervention was done by a trained nurse who was working in the CTVS Ward. Pre-test, post-test assessment, data collection and administration of interventions were done by the same nurse to each patient, individually.

Components of the intervention were medication counselling in which Individualised counselling sessions with a nurse to discuss the importance of medication adherence, potential side-effects, and strategies to overcome adherence challenges. Medication regimen simplification in which simplification of complex medication regimens to enhance patient understanding and compliance. Patient education which includes tailored educational materials and discussions to improve patients' understanding of their medications and their role in post-CABG recovery. Medication reminders includes implementation of reminder systems (alarm in mobile phone). Individualised discharge counselling, clarification of doubts and reinforcement in order to ensure the medication adherence was done. Weekly telephonic contacts were made to address their questions, concerns, or issues related to their medications and positive reinforcement was done. After 3 months, post-CABG adherence was reassessed using the same scale employed on the day of hospitalisation before CABG. Data was collected from May 2022 to February 2023. There were 6 patients unable to follow-up due to mortality; a total of 60 patients were included in the final analysis. All the data were entered into an Excel sheet. Statistical analysis was performed using software (SPSS version 26). Descriptive statistics was used to summarise patient demographics, physical and clinical parameters, and medication adherence levels. t-tests, Chi-squared tests, Fisher's exact test, McNemar test, were used to assess associations between variables. In the present study, past smoking, tobacco use, and alcohol intake means they stopped taking these since the last 6 month. Scoring of MGL score was 0 to Yes and 1 to No. For low adherence 0, moderate adherence score 1 - 2, and for high adherence scoring was 3 - 4.

Result

In this study, initially comprising 66 patients, 6 individuals were excluded due to attrition, resulting in a final sample size of 60 participants. The mean age of the included patients was 57.42 ± 9.23 years (as shown in Table I), and there was a notable male predominance. The majority of the participants identified as Hindu, were married, and resided in nuclear families. A significant proportion had received

education up to the primary school level and were engaged in skilled occupations. Furthermore, most participants belonged to the upper-lower socio-economic class and lived in urban areas. Notably, data revealed that 51.7% of patients had a history of past smoking, 40% had a history of past alcohol intake, and 32.5% had used tobacco in the past (Table II). Significant association was found with education of the patient ($p < 0.001$), (Table III).

Table I: Sample characteristics of CABG patients N = 60.

Variable	Mean	SD
Age (years)	57.42	9.23
Duration of illness (years)	8.89	8.71
Weight (Kg)	64.40	10.02
Height (cms)	162.89	9.20
BMI (Kg/m ²)	24.39	4.36
Heart rate (per minute)	78.98	12.36
SBP (mm Hg)	127.53	19.95
DBP (mm Hg)	77.78	7.92
Ejection fraction (%)	42.59	8.86
Total cholesterol (mg/dL)	204.43	26.54
LDL (mg/dL)	127.35	19.16
HDL (mg/dL)	33.92	3.31
TG (mg/dL)	188.42	29.25

Table II: Frequency and percentage distribution of socio-demographic characteristics of CABG patients N = 60.

S.No.	Variable	Categories	n	%
1.	Gender	Male	100	83.3
		Female	20	16.7
2.	Religion	Hindu	94	78.3
		Muslim	18	15
		Christian	1	0.8
		Sikh	7	5.8
3.	Marital Status	Single	1	0.8
		Married	119	99.2
4.	Type of Family	Joint Family	49	40.8
		Nuclear Family	71	59.2
5.	Education of the patient	Profession	7	5.8
		Honors Graduate	10	8.3
		Intermediate or Diploma	7	5.8
		High school certificate	28	23.3
		Middle school certificate	25	20.8
		Primary school certificate	33	27.5
6.	Occupation of the patient	Legislators, Senior Officials and Managers	1	0.8
		Professionals	8	6.7
		Technicians and Associate Professionals	1	0.8
		Clerks	0	0
		Skilled Workers and Shop & Market Sales Workers	29	24.2

		Skilled Agricultural and Fishery Workers	29	24.2
		Craft and Related Trade Workers	3	2.5
		Plant and Machine Operators and Assemblers	2	1.7
		Elementary Occupation	16	13.3
		Unemployed	31	25.8
7.	Total monthly income (Rupees)	≥ 123,322	0	0
		61,663 - 123,321	1	0.8
		46,129 - 61,662	1	0.8
		30,831 - 46,128	8	6.7
		18,497 - 30,830	25	20.8
		6,175 - 18,496	43	35.8
		≤ 6174	42	35
8.	Socio-Economic Status	Upper Middle Class	9	7.5
		Lower Middle Class	31	25.8
		Upper Lower Class	71	59.2
		Lower	9	7.5
9.	Residence	Urban	68	56.7
		Rural	52	43.3
10.	Smoking	Past	62	51.7
		Current	5	4.2
		Never	53	44.2
11.	Alcohol Intake	Past	48	40
		Current	4	3.3
		Never	68	56.7
12.	Tobaccouse	Past	39	32.5
		Current	5	4.2
		Never	76	63.3
13.	Family history of CAD	Yes	31	25.8
		No	89	74.2
14.	Type of investigation undergone	Angiography	0	0
		Echocardiography	0	0
		TMT	0	0
		ECG	2	1.7
		Echocardiography, ECG and Angiography	118	98.3
15.	Type of treatment undergone	Medication	109	90.8
		Thrombolytic therapy	1	0.8
		Coronary Angioplasty	8	6.7
		Intra coronary stent	1	0.8
		Any other, specify	1	0.8
16.	Comorbidity history	Diabetes mellitus	30	25
		Hypertension	18	15
		Diabetes mellitus and Hypertension	25	20.8
		Bronchial asthma	0	0
		Any other chronic illness	0	0
		No comorbidity history	47	39.2
17.	Dietary habits	Non-Vegetarian	74	61.7
		Vegetarian	46	38.3

It was observed that 53.3% of patients had a lapse in medication adherence, primarily due to forgetfulness, while 81.7% displayed carelessness, and 45% discontinued their medication when they perceived an improvement in their condition. Furthermore, 8.3% ceased medication intake if they experienced a worsening of symptoms after administration. However, following the implementation of a tailored intervention, these rates significantly decreased to 0%, 10%, 1.7%, and 0%,

respectively ($p < 0.001$), (Table IV). This intervention yielded an overall enhancement in medication adherence, transitioning from a moderate level (2.05 ± 1.17) to a high level (3.88 ± 0.32) ($p < 0.001$), (Table V).

Table III: Association of pre-test and post-test medication adherence of CABG patients with selected variables N = 60.

Variable	Pretest		Post-test	
	Test Value	p-value	Test Value	p-value
Age	-0.100	0.278	0.084	0.360
Gender	-0.097	0.294	-0.115	0.213
Religion	0.123	0.182	-0.009	0.919
Marital status	0.015	0.870	-0.092	0.319
Type of family	0.038	0.680	-0.074	0.423
Education of the patient	0.086	0.350	-0.291	0.001*
Occupation of the patient	-0.209	0.022*	-0.059	0.525
Total monthly income	-0.041	0.659	-0.133	0.146
SES	-0.038	0.684	-0.172	0.061
Residence	0.244	0.007&	-0.049	0.598
Smoking	0.036	0.700	0.082	0.373
Alcohol Intake	-0.008	0.929	-0.124	0.177
Tobacco use	0.017	0.853	-0.044	0.636
Family history of CAD	-0.087	0.345	-0.077	0.405
Type of investigation undergone	-0.158	0.084	0.173	0.059
Type of treatment undergone	0.006	0.949	-0.107	0.244
Co-morbidity history	0.185	0.044*	0.051	0.582

Table IV: Comparison of change in MGL pre-post scores in the experimental group N = 60.

MGL	Baseline		Day 75		Test value	p-value
	Yes	No	Yes	No		
MGL 1	32 (53.3)	28 (46.7)	0	60 (100)	30.031	<0.001*
MGL 2	49 (81.7)	11 (18.3)	6 (10)	54 (90)	41.023	<0.001*
MGL 3	27 (45)	33 (55)	1 (1.7)	59 (98.3)	22.321	<0.001*
MGL 4	5 (8.3)	55 (91.7)	0	60 (100)	-	0.063

McNemar test: *indicates a significant difference at $p \leq 0.05$.

Table V: Post-hoc Bonferroni test for comparison of medication adherence scores of CABG patients between pre-test and post-test N = 60.

Time point	Mean and SD	p-value
Pre-test	2.05 ± 1.17	0.245
Post-test (3 months)	3.88 ± 0.32	<0.001*

*Level of significance $P < 0.05$.

The difference in serum total Cholesterol levels was significant at the end of 3 months in the post-test group (p

<0.0001). There were substantial reductions observed in LDL cholesterol and triglyceride levels ($p < 0.0001$), alongside a significant enhancement in HDL cholesterol by the end of the 3-month follow-up within the post-test group ($p < 0.0001$), (Table VI).

Table VI: Comparison of Biochemical parameters before and after the intervention in experimental group N = 60.

Biochemical parameters	Mean \pm SD		p-value
	Day-1	Day - 75	
T Cholesterol (mg/dL)	196.10 ± 20.56	149.13 ± 22.87	<0.0001\$
LDL Cholesterol (mg/dL)	120.82 ± 14.05	92.97 ± 9.05	<0.0001\$
HDL Cholesterol (mg/dL)	34.47 ± 2.68	54.40 ± 3.52	<0.0001\$
TG (mg/dL)	180.52 ± 28.62	144.02 ± 25.95	<0.0001\$

*Chi-square test, **Fisher's exact test.

Discussion

The findings of this study provide compelling evidence that tailored interventions have a positive impact on medication adherence among patients recovering from cardiovascular events. This aligns with the idea that comprehensive, patient-centered care provided by nurses can extend beyond physical rehabilitation and extend to medication management. The discussions with participants revealed that the personal connection and ongoing support offered by nurses played a pivotal role in fostering adherence to prescribed medications.

Previous studies have also shown the effects of tailored intervention on the reduction of hospital readmission, and its positive effects such as the improved control of the patients' BP and drug adherence. Our results are similar to the accumulated evidence of the efficacy of such interventions on clinical outcomes^{6,7}. Many studies that have evaluated the effectiveness of nonpharmacological CAD prevention interventions have shown that individual counselling had significant impact on the control of BP^{8,9}. There was a significant change in the biochemical profile such as serum TC, TG, and LDL were found to be significantly reduced in the patients at 3 months' follow-up ($p < 0.01$) whereas HDL was significantly increased in the patients ($p < 0.01$); it was in contrast to the study which has shown the significant increase in the HDL in control group^{10,11}. The reduction in the lipid level in this study might be attributed to the effect of medication along with the tailored support and education¹². This argument is supported by the result of previous studies' findings which demonstrated significantly better adherence to the medication in the experimental group which showed a successful reduction in TG, TC, and LDL at 3 months ($p < 0.01$)^{12,13}. Few studies have shown the significant reduction in the total cholesterol and LDL level at

the end of 6 months follow-ups ($p < 0.025$)^{14,15}.

This we believe is the effect of tailored intervention and improved drug adherence as shown previously^{16,17}. We found superior medication adherence in the post-test. It is pivotal as non adherence of anti-platelet drugs can cause thrombosis.

Implications for Future Research and Clinical Practice:

The findings of this study underscore the importance of tailored interventions in improving medication adherence among patients who underwent CABG. Future research in this area should explore the long-term effects of these interventions, assess cost-effectiveness, and examine their applicability across diverse healthcare settings. Furthermore, healthcare institutions should consider the integration of tailored interventions into standard cardiac rehabilitation protocols.

Limitations: It is essential to acknowledge the limitations of this study. Limitations of the study were the absence of a control group, and the sample size may not fully represent the diversity of CABG patients, and self-reporting of medication adherence can be subject to recall bias. Additionally, the study was conducted in a specific healthcare setting, which may limit the generalisability of the findings. Only some predefined parameters were assessed for the effect of an intervention. Short duration of 3 months follow-up could be a major limitation.

Conclusion

Uses of tailored interventions demonstrate significant potential in enhancing medication adherence among individuals recovering from cardiovascular events.

The success of tailored interventions in promoting medication adherence can be attributed to the personalised support and education provided to patients. Nurses, as trusted healthcare professionals, were able to address patients' concerns, explain the importance of medications, and clarify any misconceptions. This tailored approach increased patients' understanding of their medications and motivated them to adhere to their prescribed regimens.

This research highlights the importance of a patient-centered, multidisciplinary approach to cardiac care and provides valuable insights for healthcare providers and policymakers aiming to optimise outcomes in cardiovascular rehabilitation programs. Antiplatelet therapy, beta blockers, nitrates, ACE-inhibitor, and lipid lowering therapy plays a pivotal role in improving the condition and preventing occurrence of future cardiac events, Further investigation and implementation of these strategies holds the promise of improving the overall well-being of cardiac patients and reducing the burden of cardiovascular disease on healthcare systems.

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