Effectiveness of Coronary Artery Disease Health Education among the patients of Coronary Artery Disease in Tertiary Cardiac Centre

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Abstract

Background and Aim: Secondary prevention of coronary artery disease is vital in preventing the future cardiac events. Inadequate knowledge of the disease is related to non-compliance with the treatment therapy which directly results in disease progression and its complication. The objective of this study is to assess the effectiveness of health education about coronary artery disease among the patients of coronary artery disease in a tertiary cardiac centre.

Methods: A quantitative, prospective, interventional research design was designed to collect the data by non-probability convenience sampling method. Patients diagnosed with coronary artery disease and admitted in different wards of Shahid Gangalal National Heart Centre were included. Data was collected from July 2022 to December 2022 in three phases: prior to health education; within 24 hours of health education and after 3 months. A semi structured face to face interview was used to collect data from the patients, which was then filled in the web-based questionnaire and appropriate statistical methods were used for analysis.

Results: A total of 167 patients were enrolled during the study period. Only 145 (86.8%) patients completed the 3rd phase of data collection. There was a significant improvement in patients' overall knowledge (P value; <.01) as well as knowledge regarding medical (P value; <.01), coronary artery disease risk factors (P value; <.01), exercise (P value; <.01), nutrition (P value; <.01) and psychological risk (P value; <.05). There was a significant improvement (P value; <.01) related to behavior related characteristics like smoking, tobacco consumption, alcohol consumption and physical activity. However, correlation between health behaviors and post intervention knowledge showed a non-significant weakly positive relation of knowledge with education (r=.081), whereas there was non-significant weakly negative relation with physical activity (r=-.0126).

Conclusion: The educational intervention has significant improvement in level of knowledge and change in behavior pattern among the patients of coronary artery disease. This study demonstrates that targeted health education programs can lead to significant improvements in knowledge and behavior among coronary artery disease patients, potentially reducing hospital readmission rates and promoting better long-term disease management.

Keywords: Coronary Artery Disease, Health Education, Tertiary Cardiac Centre

Introduction

The global prevalence of Coronary Artery Disease (CAD) is rising and is a leading cause of death worldwide which affects approximately 1.72% of the world's population.[1] According to the World Health Organization (WHO), CAD remains the leading cause of mortality worldwide, with over 17 million deaths annually.

Studies show that a significant proportion of CAD patients lack sufficient knowledge about their condition, leading to poor treatment adherence and increased complications.[2] In the cohort study of patients with Acute Myocardial Infarction (AMI), 1 in 40 patients experienced recurrent AMI within 1 year of discharge, and patients with recurrent AMI had a 25-fold higher adjusted risk of

36

Effectiveness of Coronary Artery Disease Health Education among the patients of Coronary Artery Disease in Tertiary Cardiac Centre

1-year mortality.[3] Current guidelines support the use of Cardiac rehabilitation in patients after acute coronary syndrome, coronary artery bypass grafting, coronary stent placement, valve surgery, and stable chronic systolic heart failure.[4] A multi-site study focusing on patient education for Cardiac Rehabilitation in Canada demonstrated that evidence and theoretically based comprehensive education intervention significantly improves patients' knowledge, exercise, food intake, and self-efficacy.[5] So, secondary prevention of coronary artery disease is also vital in the maintenance of the quality of life as well as the outcome of the patients. Different studies have shown that inadequate knowledge of the disease is related to non-compliance with the treatment therapy which directly results in disease progression, however, there are limited studies available regarding the effectiveness of CAD health education among the CAD patients. The objective of this study is to assess the effectiveness of CAD Health Education among the CAD patients in tertiary cardiac centre.

Methods

Design and Procedure

A quantitative, prospective, interventional research design was used to assess the effectiveness of health education in secondary prevention of CAD. Non-probability, convenient sampling method was used to select the patients who were diagnosed with CAD. A study was performed among the inpatients of Shahid Gangalal National Heart Centre (SGNHC). An ethical approval was taken from the Institutional Review Committee, SGNHC (SGNHC IRC No. 6-2022) and informed written consent was taken from participants prior to data collection. Patients were informed about the study during their first assessment. Data was collected from July 2022 to December 2022 in three phases. A phase I data was collected prior to health education in the admitted ward; phase II data within 24 hours in the same place of phase I, and phase III data was collected after 3 months of educational intervention. The phase III data was acquired during follow up of the patient in Out Patient Department (OPD) or via phone call.

Participants:

In this study the adult patients who were admitted with diagnosis of CAD and willing to give consent were included whereas patients who were critically ill, needed emergency attention and had difficulties in communication were excluded. With the expectation of change in level of knowledge of at least 10% between pre and post test in previous study, sample size was calculated by using population proportion.[6,7] Using the 10% prevalence rate, 5% margin of error, 95% confidence interval and 3095 size of population (total number of patients admitted and discharged annually with the diagnosis of CAD in the year 2020 from SGNHC), and 20 % anticipated non-response rate, we estimated the total sample size of 167.[8] A validated tool - Coronary Artery Disease Education Questionnaire – Short Version (CADE-Q SV) was used for data collection after taking permission from an author.[9] The questionnaire was translated to Nepali language and translated back to English. A semi structured face to face interview was used to collect data from the patients, which was then filled in Kobo Toolbox; the web-based questionnaire.

The Health Educational Program:

Phase I:

In the first phase, the researcher selected patients diagnosed with Coronary Artery Disease (CAD) using convenient sampling. Patients were informed about the details of the study and their role. Those who agreed to participate provided written consent. Baseline data (T1) was collected before any health education intervention. After collecting baseline data, the researcher provided a 30-40 minutes health education session herself. The educational content covered CAD pathophysiology, etiology, signs and symptoms, risk factors, lifestyle modifications, healthy dietary patterns, physical activity, and risk management. The health educational program was reviewed by a cardiologist to ensure adequacy. Participants were encouraged to involve family members, and a brochure with the contents of the educational session was distributed.

Phase II:

During this phase, participants already enrolled were followed up within 24 hours of the health education session, and data collection (T2) was done during this follow-up. In this phase, we plan to assess the knowledge immediately after health education.

Phase III:

After completing 3 months of health education, participants were followed up via phone calls. Participants who could be contacted were met in the OPD for face-to-face data collection, while others were interviewed over the phone. In this phase, we planned to assess the retention of CAD knowledge after 3 months.

Variables:

Baseline variables: Age, sex, education, height, weight, blood pressure, type of disease, mode of treatment, duration of treatment, comorbidities (hypertension, diabetes mellitus, dyslipidemia), behavior patterns (smoking, tobacco use, alcohol consumption, physical activity), knowledge about the disease, lifestyle modification, healthy dietary pattern, physical activity, and risk factors management were assessed.

Outcome variables: Change in behavior patterns and change in level of knowledge about CAD before and after health education were assessed.

Blood pressure was classified according to the Hypertension Guidelines of American College of Cardiology / American Heart Association (ACC/AHA).[10]

Body Mass Index was classified according to the Asia – Pacific Guidelines.[11]

The physical activity, smoking, tobacco use and alcohol consumption was classified according to the Non-communicable Disease Risk Factors: STEPS Survey Nepal 2019 (NCDs STEPS Survey Nepal 2019).[12]

After data collection in Kobo Toolbox, data was coded, classified, and transferred into the International Business Machines Statistical Package for the Social Sciences (IBM SPSS) version 20. The appropriate parametric and non-parametric tests were done. For continuous variables, mean ± Standard Deviation and for categorical values, median and inter quartile range was calculated. The association was determined by using appropriate statistical tests where applicable. A P-value of less than 0.05 was considered to be significant.

Results:

A total of 167 patients were enrolled in the study. Out of 167 participants, only 145 (86.8%) could be successfully followed up. Among the 22 participants who could not be followed up, 3 had passed away, 2 refused to provide data, and 17 did not answer their

Effectiveness of Coronary Artery Disease Health Education among the patients of Coronary Artery Disease in Tertiary Cardiac Centre

37

phone calls. The mean age of the participants was 49.86 ± 9.56 years, where 85.6% were male. Most of the participants (39.5%) have completed the secondary level of education. Majority of the patients (65.3%) were in the acute stage during the enrollment in the study and 74.8 % patients had undergone Percutaneous Coronary Intervention (PCI) as a mode of treatment. Comorbidities were present in 64.7% of patients where hypertension (46.1%) was the foremost co-morbid condition and 46.1% patients were obese. Most of the patients; 71.9% and 83.8% had their systolic and diastolic blood pressure controlled respectively at the time of enrollment. (Table 1)

Table 1: Socio-demographic and Disease Related Characteristics

(n=167)

S.No.	Variables	No.	%
1	**Sex**		
	a. Male	143	85.6
	a. Female	24	14.4
2	**Education**		
	a. Illiterate	21	12.6
	b. Primary level (class nursery to class 5)	22	13.1
	c. Secondary level (class 6-10)	66	39.5
	d. Higher secondary level (+2)	30	18
	e. Bachelor	17	10.2
	f. Masters	10	6
	g. PhD	1	0.6
3	**Time from diagnosis**		
	• < 1 week (Acute)	109	65.3
	• 1 week to 1 month (Recent)	47	28.1
	• > 1 month (Old)	11	6.6
4	**Mode of Treatment:**		
	• Medical Management (MM)		
	• MM + Percutaneous Coronary Intervention (PCI)	39	23.4
	• MM + Coronary artery Bypass Graft (CABG)	125	74.8
		3	1.8
5	**Comorbidities:**		
	• No	59	35.3
	• Yes	108	64.7
	○ Hypertension	77	46.1
	○ Diabetes	55	32.9
	○ Dyslipidemia	24	14.3
	○ Others	6	3.5

6	**Body Mass Index**		
	• Underweight (Below 18.5 kg/m²)	4	2.4
	• Normal (18.5-22.9 kg/m²)	45	26.9
	• Overweight (23-24.9 kg/m²)	41	24.6
	• Obesity (≥ 25 kg/m²)	77	46.1
7	**Systolic Blood Pressure**		
	• Controlled	120	71.9
	• Uncontrolled	47	28.1
8	**Diastolic Blood Pressure**		
	• Controlled	140	83.8
	• Uncontrolled	27	16.2

Figure 1, shows the behavior pattern of the participants. The behavior of the participants was significantly changed before and after the educational intervention. Most of the patients had smoking (before 35.3% and after 4.1%), tobacco use (before 26.9% and after 4.1%), and alcohol consumption (before 40.7% and after 2.1%). Before the intervention 23.4 % were adopting sedentary lifestyle, 60.5% moderate physical activity and 16.1% vigorous physical activity whereas after intervention 0.7% was adopting the sedentary lifestyle, 98.6% moderate physical activity and 0.7% vigorous physical activity.
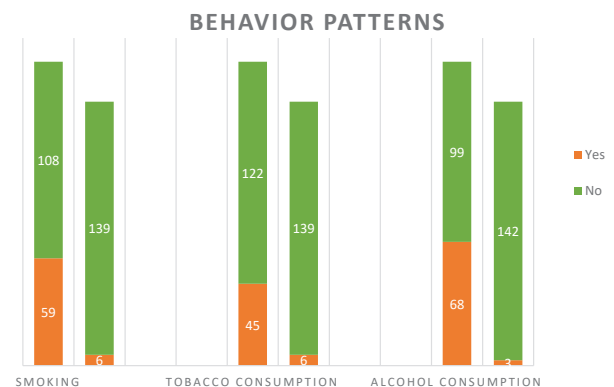

Figure.1: Change in behavior patterns before and after the health educational intervention.

Table 2 shows the knowledge of patients in three phases (Before health education – T1, Within 24 hours of health education – T2, and after 3 months of health education T3). In Phase 1, most of the patients (94.6%) answered the question of blood pressure control measures correctly whereas 67.7% of the patients did not know about the statins. In phase 2, only 18.6% of patients answered the management of stress incorrectly. In most of the item's, cent percent have answered correctly. In the 3rd phase, 99.3% of patients have given correct answers about the processed food and the diet to lower blood pressure whereas 28.3% have still given the incorrect answer about the statins.

Table 2: Knowledge before and after health educational intervention

S.No.	Variables	Number (Percentage)								
		Correct			Incorrect			I don't know		
		T1	T2	T3	T1	T2	T3	T1	T2	T3
1	Heart disease only happens in older people who smoke or have high cholesterol.	83 (49.7)	167 (100)	132 (79)	55 (32.9)	0	13 (9)	29 (17.4)	0	0
2	Lifestyle changes such as healthy eating can lower your chances of developing heart disease.	111 (66.4)	165 (98.8)	133 (91.7)	15 (9)	2 (1.2)	12 (8.3)	41 (24.6)	0	0
3	"Angina" is chest pain or discomfort in your arm, back or neck.	85 (50.9)	167 (100)	131 (90.3)	7 (4.2)	0	14 (9.7)	75 (44.9)	0	0
4	Resistance training (lifting weights or using elastic bands) can strengthen your muscles and help lower your blood sugar.	134 (80.2)	167 (100)	141 (97.2)	7 (4.2)	0	4 (2.8)	26 (15.6)	0	0
5	Eating more meat and dairy products is a good way to add more fiber to your diet.	82 (49.1)	151 (90.4)	130 (89.7)	51 (30.5)	16 (9.6)	15 (10.3)	34 (20.4)	0	0
6	Medications such as aspirin (ASA) help prevent blood clots from forming.	102 (61.1)	166 (99.4)	140 (96.6)	2 (1.2)	1 (0.6)	5 (3.4)	63 (37.7)	0	0
7	The only effective way to manage stress is to avoid people who cause unpleasant feelings	17 (10.2)	135 (80.8)	51 (35.2)	133 (79.6)	31 (18.6)	94 (64.8)	17 (10.2)	1 (0.6)	0
8	A warm-up before exercising raises your heart rate and lowers your chance of getting angina.	121 (72.5)	166 (99.4)	134 (92.4)	4 (2.4)	0	11 (6.6)	42 (25.1)	1 (0.6)	0
9	Prepared or processed foods, such as canned soup and bacon, usually have a lot of salt (sodium).	125 (74.9)	166 (99.4)	144 (99.3)	19 (11.3)	1 (0.6)	1 (0.7)	23 (13.8)	0	0
10	Depression is common after a heart attack and increases the chance of having another heart attack.	114 (68.3)	166 (99.4)	131 (90.3)	8 (4.8)	0	14 (9.7)	45 (26.9)	1 (0.6)	0
11	"Statin" medications (such as atorvastatin and simvastatin) limit how much cholesterol your body absorbs from food.	6 (3.6)	149 (89.2)	104 (71.7)	48 (28.7)	17 (10.2)	41 (28.3)	113 (67.7)	1 (0.6)	0
12	To help control your blood pressure, eat less salt and exercise regularly.	158 (94.6)	166 (99.4)	143 (98.6)	0 (0)	1 (0.6)	2 (1.2)	9 (5.4)	0	0
13	If you get chest discomfort while walking, speed up to see if it goes away.	87 (52.1)	166 (99.4)	139 (95.9)	47 (28.7)	1 (0.6)	6 (4.1)	33 (19.8)	0	0
14	Trans fat is an unhealthy type of fat that is often found in baked or fried foods.	110 (65.9)	166 (99.4)	134 (92.4)	7 (4.2)	1 (0.6)	11 (7.6)	50 (29.9)	0	0
15	Sleep apnea (pauses in breathing during sleep) can increase your chance of having another heart attack.	76 (45.5)	164 (98.2)	115 (79.3)	37 (22.2)	3 (1.8)	30 (20.7)	54 (32.3)	0	0
16	To control cholesterol, become a vegetarian and avoid eating eggs.	26 (15.6)	152 (91)	115 (79.3)	107 (64.0)	15 (9)	30 (20.7)	34 (20.4)	0	0
17	You are exercising at the right level when your heart rate is in the target zone and you can still talk comfortably.	123 (73.6)	166 (99.4)	137 (94.5)	8 (4.8)	1 (0.6)	8 (5.5)	36 (21.6)	0	0
18	You cannot prevent diabetes with exercise and healthy eating.	101 (60.5)	164 (98.2)	130 (89.7)	32 (19.1)	3 (1.8)	15 (10.3)	34 (20.4)	0	0
19	Stress increases your chance of having a heart attack as much as high blood pressure and diabetes.	146 (87.4)	167 (100)	141 (97.2)	4 (2.4)	0	4 (2.8)	17 (10.2)	0	0
20	To help lower your blood pressure, eat healthy foods more often, such as vegetables, fruits, and whole grains.	146 (87.4)	167 (100)	144 (99.3)	7 (4.2)	0	1 (0.7)	14 (8.4)	0	0

T1- Before health education, T2- Within 24 hours of health education, T3- After 3 months of health education. N = 167 in T1 & T2, N = 145 in T3

Effectiveness of Coronary Artery Disease Health Education among the patients of Coronary Artery Disease in Tertiary Cardiac Centre

39

Figure 2 shows the change in mean of the knowledge in different phases. The least mean score of knowledge was found in medical knowledge in phase I (1.65 ± 0.97), psychosocial risk (3.75 ± 0.41) and (2.43 ± 0.69) in phase II and III respectively. The mean score was increased from phase I to phase II in all areas. The mean score of phase III was also higher than the 1st phase but it was slightly decreased compared to phase II. There was a significant improvement (P <0.001) in patients' knowledge from phase I to Phase II and phase I to phase III in the overall sample.
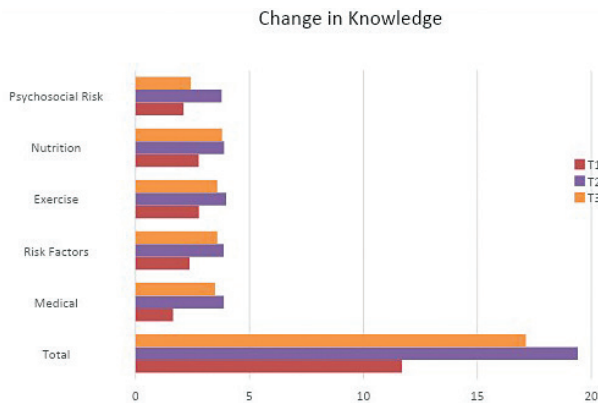

Figure 2: Change in Knowledge after health educational intervention

T1- Before health education, T2- Within 24 hours of health education, T3- After 3 months of health education. N = 167 in T1 & T2, N = 145 in T3

Table no 3. Correlation among health behaviors, duration of treatment and Post – health education knowledge

N=145

Variables	Pearson correlation (r)	P value
Physical Activity	-0.126	0.131
Education	0.081	0.331
Comorbidity	0.034	0.686
Duration of treatment	0.107	0.198
Pre-health education knowledge	0.067	0.421

P value significant at <0.05

Table 3 displays the correlation among health behaviors and post health education knowledge. Result showed a non-significant weakly positive relation between post health education knowledge and level of education (r=0.081), duration of treatment (r= 0.107), pre-CR knowledge (r= 0.067) and there was non- significant weakly negative relation between post health education knowledge and physical activity (r= -0.126), and co-morbidity (r= -0.034).

Discussion

In this study, 167 patients participated in the phase I and II out of which 86.8% completed the phase III. The study showed a significant improvement in the level of knowledge among the patients of coronary artery disease after a health educational intervention.

The mean age of the participants in this study was 49.86 ± 9.56 years. The similar finding was reported in the study done by Tawalbeh et al, in a University Affiliated Hospital of North Jordan where the mean age of the patient was 54 ± 0.97 years.[13] Most of the patients (85.6 %) in the study were male which was similar to findings noted in the study done by Margret et al, in National University Hospital of Iceland (81.5%) and Tawalbeh et al in the University Affiliated Hospital in the North Jordan (82.10%).[13,14] A study done by Gaudel et al in National Heart Centre of Nepal showed that 14.0% had completed the Bachelor degree which was similar to the finding of our study (16.8%). It might be due to the similar culture and settings of the study.[15]

Our study showed that, most of the patients (74.8%) had undergone the Percutaneous Coronary Intervention (PCI) as a mode of treatment whereas in the study conducted by Gaudel et al, only half (50.5%) of the patients had undergone PCI.[15] Around two third (64.7 %) of the patients had comorbidities present among the participants in our study. Contrary to our findings, 82.8% of the patients had comorbidities present in the study done by Gaudel et al.[15] In our study, most of the patients had hypertension (46.1 %) followed by DM (32.9%) and dyslipidemia (14.3%). The similar finding was found in the study done by Eby Korah in T.M.M. Hospital Thiruvalla, Kerala where hypertension 53.33%, DM 26.67% and dyslipidemia 36.67 % was present among the patients of coronary artery disease.[16] The similarities in the comorbidities of the studies might be due to the similar socioeconomic status, food behavior and lifestyle among the study subjects. The finding of our study showed that 70.7% had BMI above the normal range. The similar finding was noted in the study done in Kerala (86.6 %).[16] But contrary to our findings, only 27.6 % of patients had increased BMI in the study done in National Heart Centre of Nepal.[15] The causes of contrary findings in our study might include a variety of factors, such as genetic backgrounds, dietary intake, physical activity, and cultural attitudes towards body weight.

In our study, 35.3% of patients were current smokers which significantly decreased to 4.1 % at 3 months of follow up after the educational intervention (P value < 0.001). Similarly, study done by Gaudel et al; showed that 30.4% of current smoker has been decreased to 12.9% after intervention at 6 months follow up.[15] Alcohol consumption was found to be present in 40.7% of the patients which was significantly changed to 4.1% after educational intervention at the follow up of 3 months (P value < 0.001). Similar to our findings, 30.4% of current drinkers declined to 12.9% at the follow-up of 6 months after the intervention.[15] In our study, 23.4% adopted a sedentary lifestyle which was significantly decreased to 0.7 % after educational intervention (P value < 0.001). Similarly, studies done in National Heart Centre of Nepal, Tertiary Care Centre of South India and multicentric studies of Canada showed the significant improvement after intervention with the P values of 0.026, <0.0001 and <0.001 respectively.[5,15,17] The psychological impact might have contributed to the observed similarities in behavior patterns among CAD patients following interventions. Detailed information about the harmful effects of smoking and alcohol on heart health provided in educational interventions helps patients understand the direct link between these behaviors and the progression of CAD, thereby motivating them to change their habits.

We have conducted a pre test (T1) prior to health education and post test after health education; within 24 hours (T2) and at 3 months follow up (T3). The mean score of knowledge was 11.69 ± 3.73 in T1, which has been increased to 19.41 ± 0.80 in T2 and 17.13 ± 1.84 in T3 with the significant P-value of <0.001. Similarly, in the study done in 3 hospitals of Canada showed the mean score of Pre-Cardiac Rehabilitation (CR) 15.58 ± 2.42 and post-CR 16.69 ± 2.99 with the

40

Effectiveness of Coronary Artery Disease Health Education among the patients of Coronary Artery Disease in Tertiary Cardiac Centre

significant P value of < 0.001.[5] Likely, a study done in the hospitals of Iceland showed the significant improvement of knowledge after health education with the mean score of 13.8 ± 3.2 at the time of discharge and 14.8 ± 2.8 at the time of 6 months follow-up (P value < 0.001).[14] The knowledge was grouped into subscales: medical, risk factors, exercise, nutrition and psychosocial risk. The knowledge scores of medical, risk factors, exercise and nutrition was significantly improved with the P value of <0.001 and psychosocial risk with the P value of 0.005. The study done in Canada showed the significant improvement in the subscales of exercise and psychosocial risk (P value <0.001) whereas other subscales like medical, risk factors and nutrition didn't show the significant improvement.[5] Moreover, in the study done in Iceland showed the significant improvement (P value <0.001) in risk factors, exercise and psychosocial risk and (P value 0.002) in medical subscales whereas there was non-significant improvement (P value 0.108) in nutritional sub scale.[14] Our findings align with previous studies, which reported that health education interventions led to a significant improvement in the level of knowledge and behavior patterns among cardiac patients. This consistency suggests that structured education programs can have a meaningful impact across diverse patient populations. High prevalence of CAD and the growing burden on healthcare systems, implementing similar education modules across cardiac centers could improve clinical outcomes and reduce hospital readmissions.

The correlation among different variables (physical activity, education, comorbidity, duration of treatment and pre health education knowledge) and post health education knowledge was found to be non-significant. Similar to our findings, the study conducted in Canada shows non-significant correlation among physical activity and education with post CR knowledge.[5] Contrary to our findings, the study conducted in Canada shows the significant correlation of Post-CR knowledge with Pre- CR knowledge (P value <0.001).[5]

The level of knowledge was low in phase I; which might be due to low level of formal education, limited access to reliable health information resources, lack of motivation to seek information etc. Public awareness campaigns, community-based programs, integration of health education in the curriculum of the students, regular screening and prevention programs can help to improve the educational level of the general population.

Though the level of knowledge was increased significantly in phase II; it has been slightly decreased in phase III. The level of knowledge might have decreased overtime due to poor recall and retention, desensitization and lack of access to continuous education. Regular follow up sessions for education, personalized education plans, patient empowerment and telehealth services can help to maintain a high level of understanding about their condition leading to better management and outcome of the disease. Moreover, government and health authorities can promote continuous learning by integrating health education in health care systems, promoting continuous education, enhancing public health campaigns, improving health literacy, strengthening health care infrastructure and regulating health information.

The strength of our study is the use of standardized and validated tool. The study can be a guideline for the formulation of policies regarding education about cardiovascular disease.

Limitations

There are few limitations in our study. The absence of a control group in this study is a major limitation. In this study, the use of a control group was not possible because education was a part of the care in the centre. Moreover, it is a single centered study; the result of our study could not be generalized to other hospitals.

Conclusions

Our study concluded that the educational intervention supplemented with the brochure with the content of the educational session significantly improved the level of knowledge along with the change in behavior patterns.

These educational interventions need to be implemented repeatedly to prevent the decline in knowledge and its practice in daily routines. These interventions and their practical changes might lead to a reduction in CAD risk factors, resulting in a decrease in CAD within the population/community. One limitation of this study is the short follow-up period, which might not reflect long-term changes in behavior. Future research could explore the sustained impact of education on patient outcomes over a longer period or compare the effectiveness of different delivery methods, such as in-person versus online education programs.

Conflict of Interest: None

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Effectiveness of Coronary Artery Disease Health Education among the patients of Coronary Artery Disease in Tertiary Cardiac Centre

41

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