


## RESEARCH ARTICLE

# Effects of intervention on lifestyle changes among coronary artery disease patients: A 6-month follow-up study

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## Abstract

**Aim:** The main aim of the study was to investigate the effects of a nurse-led lifestyle-related risk factor modification intervention on multiple lifestyle behaviours among coronary artery disease patients over six months.

**Design:** A pre-test post-test control group design was conducted in a single clinical centre in Nepal.

**Methods:** A total of 224 eligible patients were randomly assigned to either the usual care group or the intervention group at baseline. The lifestyle intervention consisted of a brief counselling session supplemented with informational leaflets. Standard questionnaires were used to collect self-reported data from patients on multiple lifestyle behaviours: diet, physical activity, adherence to medication, stress, body mass index, smoking and alcohol consumption. General linear model repeated measure analysis was used to estimate the effect of intervention.

**Results:** A statistically significant effect of study group-by-time interaction for diet, adherence to medication, physical activity, and perceived stress was found at 6-month follow-up. Overall, greater improvement in lifestyle habits was found in the intervention group compared with the control group at 6-month follow-up.

## KEYWORDS

coronary artery disease, effects of intervention, lifestyle, risk factors

## 1 | INTRODUCTION

Coronary artery disease (CAD) is the most common form of cardiovascular disease, responsible for 16% of the world's total death (WHO, 2020). CAD is the leading cause of premature death and remains a major cause of disability adjusted life years (DALYs) globally (Roth et al., 2020; WHO, 2020). Since 2000, CAD-related death has been increased globally but especially in low- and middle-income

countries (LMICs) (WHO, 2020). More than 80% of cardiovascular disease deaths were in LMICs, and most cases are reported at an early age compared with high-income countries (Bowry et al., 2015). LMICs like Nepal are in the midst of a health crisis, resulting largely from limited preventative measures, unhealthy lifestyle choices and increased exposure to risk factors (Bhattarai et al., 2020; Gaziano et al., 2010). CAD is the number one cause of death in Nepal, accounting for 20.5% of the total deaths (WHO, 2021).

Clinical Trial Registration: The study is not registered in any Clinical trial registry. The study was designed in 2017 and was implemented immediately after that.

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Diabetes, hypertension and dyslipidaemia are known to be major cardiovascular risk factors. These risk factors are strongly influenced by lifestyle habits (Mozaffarian et al., 2008). The latest EUROASPIRE V survey has reported that the basic lifestyle habits are fundamental risk factors for cardiovascular disease that require more emphasis and focus (Kotseva et al., 2019; Mozaffarian et al., 2008). South Asian population have a higher prevalence of risk factor habits regardless of their residence in South Asia or otherwise (Ahmed et al., 2018; Gaudel et al., 2020; Ghimire & Dhungana, 2018; Khanal et al., 2018). Diet low in whole grains, vegetables and fruits, smoking, alcohol consumption and low physical activity are the lifestyle choices of people in Nepal which are leading risk factors for CAD, contributing to higher incidence of CAD and unacceptable numbers of premature deaths (Bhattarai et al., 2020; Ghimire & Dhungana, 2018).

Interventions for the secondary prevention of CAD is a current priority. Medical and surgical interventions are proven to reduce the incidence of major cardiovascular events among people living with CAD. However, lifestyle risk factors modification is also one of the most effective methods used to regress atherosclerosis among CAD patients (Kotseva et al., 2019; Maniar & Bittner, 2015; Mozaffarian et al., 2008). Adherence to medical management in addition to following healthy lifestyle habits is crucial for secondary prevention of CAD (Hajar, 2017; Kotseva et al., 2019). We may prevent cardiac events or reverse the condition by providing education, counselling and support to patients about healthy lifestyle changes (Dod et al., 2010; von Gaudecker, 2017; Maniar & Bittner, 2015). Similarly, a systematic review of 28 studies on the effect of nurse-delivered lifestyle interventions, revealed positive results of intervention on various outcomes such as weight, dietary behaviours, physical activity and patient satisfaction (Sargent et al., 2012). However, effect of intervention on multiple lifestyle-related risk factors among CAD patients are rarely studied in South Asia. A study conducted among CAD patients in Nepal showed that nurse-led educational intervention improved patients' knowledge of cardiac rehabilitation (Shrestha et al., 2020). Given that there exists a gap in the available literature on how intervention and positive lifestyle changes are connected. Assessing the effectiveness of lifestyle counselling across different populations is important to address health inequalities (Jepson et al., 2010). There is a need to focus on implementing cost-effective interventions against all risk factors to improve outcome in patients with CAD especially in LMICs (Aminde et al., 2018; Khanal et al., 2018; Roth et al., 2020).

In this study, we pursue to address the gap in the literature on effectiveness of low-cost intervention on multiple lifestyle behaviours among patients with limited access to healthcare facility. The lifestyle habits assessed in this study were smoking, unhealthy diet, low physical activity, stress, harmful use of alcohol, obesity or excess weight and medication adherence. We earlier reported the short-term effect of intervention on lifestyle-related risk factors among CAD patients (Gaudel et al., 2021). In this study, we aimed to evaluate both the short- and long-term effect of a nurse-led brief counselling intervention on multiple lifestyle-related risk factors at 1-month and 6-month follow-ups among patients living with CAD in Nepal.

## 2 | METHODS

### 2.1 | Study design and setting

A pre-test post-test control group design was used in this study. The study was conducted on in-patient wards of a National Heart Centre, in Kathmandu, Nepal. The baseline survey was conducted from May 2018 to July 2018 and the follow-up data were collected from November 2018 to January 2019.

### 2.2 | Study participants and randomization

Patients with physician diagnosed CAD were checked systematically on the list of patients admitted at a national heart centre, between May and July 2018. A total of 365 patients with CAD, admitted at a hospital were screened for eligibility, 134 patients were excluded for not meeting the inclusion criteria and seven eligible patients declined to participate in the study. In total, 224 eligible patients were enrolled and randomized into intervention group (IG) and usual care group (UG) in a 1:1 ratio using computer-generated random number sequence after the baseline survey. The sample size was calculated using a priori power analysis with a t-test family. To achieve statistically significant results a power level of 0.80, an alpha level of 0.05 and an effect size of 0.37 were considered, with an estimated attrition rate of 22%, the total sample size of the study was 224 (Iestra et al., 2005; IJzelenberg et al., 2012; Polit, 2014). The inclusion criteria included patients aged over 18 years, admitted with a medical diagnosis of CAD, who were able to communicate in Nepali or English, accessible by telephone and willing to voluntarily participate. Patients with a serious medical and surgical condition, those with hearing, speaking and cognitive problems were excluded from the study.

### 2.3 | Intervention

Counselling in a group of three to five patients with their family members was administered, followed by individual counselling. Patients in IG were invited to attend a counselling session along with their family members on the day of discharge from the hospital. Counselling was given in a separate room of the hospital. Audio-visual material was used for counselling and each session lasted about 45 min on average, with 40 min of minimum and 50 min of maximum time per session. Each participant in the IG received single group counselling session which was followed by an individual counselling to set lifestyle goals for each patient depending on their specific needs. Informational leaflets with pictorial descriptions were given after the counselling session. The intervention was administered to all 112 patients in IG in their local language by the principal investigator, who has received specialized education in cardiovascular nursing. Patients in UG received the usual care and a short session of unstructured counselling for

lifestyle modification. Patients in IG were given detailed information about the symptoms of CAD, how the disease progresses, what pharmacological, percutaneous and surgical management techniques are available, and the importance of lifestyle changes to prevent complications.

The content of the counselling intervention including leaflets were developed based on the informational requirements for Nepali cardiac patients. The study team discussed the content for counselling and leaflets and agreed to include pictorial description. Principal investigator drafted content of counselling and leaflets and revised based on comments from the study team. Nepali version of the content was sent to expert in Nepal including cardiologist, cardiac surgeon and a nurse specialist for the face and content validity in Nepali context. Content validity was important check point to evaluate the extent to which proposed intervention could be valid and probably to be effective in the target population of the intervention. Minor revision in few sentences were made based on expert's suggestion. Information included was optimum as per patient's requirement, simple language was used to ease understanding of patients with little or no knowledge about disease. Aim of counselling was to help patients to know more about their health, care, treatment, importance of adopting healthy lifestyle and ways to modify lifestyle-related health risk factors. Information was illustrated and enhanced by using simple informative pictures. Guidelines for writing patient information leaflets were followed (Eckel et al., 2014; Esselstyn, 2017; Jankovic et al., 2015; Lahtinen et al., 2018; Nishtar, 2002; Olendzki et al., 2006; Second Joint Task Force of European & other Societies, 1998) (Box 1).

## 2.4 | Measurement of variables and data collection

Following standard questionnaires were used to collect data on lifestyle variables: a cardiovascular risk assessment questionnaire (Limited, 2018), The Global Physical Activity Questionnaire (Prevention of Noncommunicable Diseases Department, 2018), Morisky Green Levine Medication Adherence Scale (Morisky et al., 1986) and The Perceived Stress Scale (Cohen et al., 1983). Questionnaires were translated from English to Nepali language and expert opinion and cultural validation were obtained. The questionnaires were pilot tested before data collection.

The principal investigator interviewed patients using questionnaires on seven different lifestyle variables. Information about socio-demographic and clinical variables was also obtained from interview. Baseline data were collected by face-to-face interviews, follow-up data were collected using the same questionnaire by the same investigator through a phone call. A telephone interview was the only feasible option in this study to collect follow-up data from patients who do not visit hospital often and were distributed in different geographic regions. To collect data from each patient using the structured telephone interview took 20 min on average. Patients were considered lost to follow-up only if they do not respond to

three attempted telephone calls made at three different times. Brief description of questionnaires that were used to collect data on lifestyle variables at all three time points (baseline, 1-month follow-up and 6-month follow-up) is given below.

### 2.4.1 | Diet

A cardiovascular risk assessment questionnaire was used to collect data on diet. The questionnaire consists of 10 questions, each scored on a scale of -10 to 10. Based on the score, risk groups were defined as low (-19 to 6), medium (7 to 13) and high risk ( $\geq 14$ ) (Limited, 2018).

### 2.4.2 | Physical activity

Data on patients' physical activity level and sedentary behaviour were collected using the Global Physical Activity Questionnaire. The questionnaire consists of 16 items about activity during work, transport and leisure time. Metabolic equivalent (MET) minutes of activity were computed depending on the patient's response. Patients were considered physically active if they achieved 600 MET minutes throughout the week (Prevention of Noncommunicable Diseases Department, 2018).

### 2.4.3 | Medication adherence

Adherence to medication was assessed using the Morisky Green Levine Medication Adherence Scale. The scale consists of four items, each item was scored as zero or one. Based on scale of 0-4, three groups were categorized: low adherence for a score of 0, medium adherence for 1-2 and high adherence for 3-4 (Morisky et al., 1986).

### 2.4.4 | Perceived stress

The Perceived Stress Scale which consists of 10 items, was used to assess the patient's stress. The total score was calculated by summing the items and the sum of scores for each item ranged between zero and 40. Perceived stress was categorized as low for score of 0-13, moderate for 14-26 and high for 27-40 (Cohen et al., 1983).

### 2.4.5 | BMI

BMI was calculated based on the measurement of weight and height ( $\text{weight}/\text{height}^2$ ). The WHO reference was used to categorize BMI into 4 categories: underweight, normal weight, overweight and obese (WHO, 2018).

**BOX 1** Examples of content of the lifestyle-related intervention addressed during counselling

## Diet

- Eat plenty of fresh fruit, vegetables, a variety of whole grain products, lean meat, fish, peas, beans, low-fat dairy products and fibre-rich food.
- Avoid sweets and limit salt intake.

## Physical Activity

- Exercise at least 30 min a day, at least 5 days a week. Regularly perform physical activities like walking, jogging, cycling, swimming, gardening and other moderate-intensity exercises.
- Monitor pulse at rest and during exercise and terminate exercise if any warning signs or symptoms occur.

## Excess weight or Obesity

- Maintain a healthy weight by doing regular physical activity and by consuming healthy diet.
- Keep track of healthy weight by measuring BMI.

## Smoking

- Set a date to give up smoking and stick with the decision. Cravings go away slowly as nicotine in the body fades, and the first 6 weeks after quitting smoking will be harsh, so stay motivated.
- Chewing gum, eating hard candy, making a phone call, squeezing a stress ball, taking deep breaths can be helpful distractions from cravings during the quitting process.

## Alcohol Consumption

- Avoid drinking alcohol or if you drink make sure it is in moderation.
- Excessive alcohol use contributes to high blood pressure and may damage heart muscle, leading to heart failure.

## Perceived Stress

- Identify the causes of stress and accept the things that cannot be changed.
- Try sharing feelings, practicing gratitude, doing exercise, sleeping well, laughing at least once a day, maintaining a positive attitude, meditating, practicing mindfulness, doing deep breathing exercises.

## Medication Adherence

- Take medication regularly and stick with the treatment regimen.
- High medication adherence reduces recurrent myocardial infarction and mortality.

**2.4.6 | Smoking and alcohol use**

In this study, patients who had smoked at least one cigarette or had consumed alcohol during the previous month were defined as current smokers and current alcohol drinkers, respectively. Former smokers and former drinkers were defined as patients who had given up smoking or alcohol consumption for more than one month, respectively.

*Socio-demographic and clinical variables*

The variables included were age in years, gender (male and female), ethnic group (Brahmin, Chhetri, Newar and others), religion (Hindu and others), education (uneducated, primary education, secondary education, bachelor's degree or above), work status (unemployed, employed, retired, entrepreneur, farmer), marital status (married and others), underage children (yes and no), monthly family income, residential area (province 3 and other provinces), co-morbidity (yes, no), CAD severity (no statistically significant stenosis or no coronary angiography performed, single vessel disease, double vessel disease, triple vessel disease or left main stenosis) and revascularization status (no revascularization, percutaneous coronary intervention and

coronary artery bypass graft). Data on these variables were collected at baseline and updated during follow-ups.

**2.5 | Ethical consideration**

Ethical approval for the study was obtained from the Nepal Health Research Council Ethical Review Board (25/2018) and from the hospital under study. Patients were informed about the nature of the study and their right to refuse consent or withdraw at any time during the study without any adverse effect was explained. Informed written consent was obtained from all the participants.

**2.6 | Statistical analysis**

Descriptive statistics were calculated and presented as means, standard deviations for continuous variables, percentage and frequencies for categorical variables. We compared differences between the study groups using chi-squared test or Fisher's exact test, and a Student's *t*-test or Mann-Whitney test for categorical and

continuous variables, respectively. To analyse the intervention's effect on lifestyle-related risk factor habits at 1- and 6-month, a general linear model (GLM) repeated-measures analysis was used. We used the group as the between-subject factor, time as the within-subject factor and risk factor habits as continuous variables for the analysis. We reported mean values with their 95% confidence intervals (CIs) and *p*-values for group, time and group  $\times$  time interaction. The GLM repeated measures analysis results for the smoking and alcohol consumption variables were not reported, as there were few cases of current smoker and alcohol consumer. A *p*-value of  $<.05$  for the two-tailed test was considered as the level of statistical significance. All data analysis was conducted using SPSS 23.0.

### 3 | RESULTS

A total of 224 participants (112 in each group) with CAD were enrolled at baseline, 196 participants (98 in each group) were retained at 1-month follow-up and 184 participants (93 in IG and 91 in UG) were retained at 6-month follow-up and included in the data analysis (Figure 1). Baseline characteristics of the study participants by study group are presented in Table 1. The mean age of participants was 60.0 ( $SD = 11.8$ ) years, and 77% were male.

Among lifestyle factors, no statistically significant difference between the groups was found at baseline, except for adherence to medication ( $p <.001$ ; Table 2). At 1-month follow-up significant difference between the groups was found for diet ( $p =.005$ ), adherence to medication ( $p <.001$ ), perceived stress ( $p <.001$ ), smoking ( $p =.017$ ) and alcohol consumption ( $p =.005$ ).

At 6-month follow-up all the seven studied lifestyle-related risk factors differed significantly between the study groups: diet ( $p =.001$ ), physical activity ( $p =.026$ ), adherence to medication ( $p <.001$ ), perceived stress ( $p <.001$ ), BMI ( $p =.013$ ), smoking ( $p =.012$ ) and alcohol consumption ( $p =.021$ ).

Effects of the intervention on lifestyle-related risk factor changes over the 6-month study period are given in Figure 2. GLM repeated measures analysis indicated improvement in reported dietary habits, physical activity, adherence to medication and perceived stress at follow-ups in IG compared with UG. A steep decline indicating improvement in dietary habits and perceived stress was observed from baseline to 1-month follow-up in both groups. Similarly, a steep improvement was observed in physical activity at follow-ups in IG; however, a steep decline was observed in UG compared with baseline. A steep improvement in adherence to medication was observed from baseline to 1-month follow-up in IG, while from one month to six months the improvement was less in both groups. Nevertheless, a steep decline indicating improvement in BMI was observed from one month to six months for IG. Overall, greater improvement was found in the IG, and the effects of time and time  $\times$  group interaction were statistically significant for diet ( $p <.001$ ), adherence to medication ( $p <.001$ ), and perceived stress ( $p <.001$ ). A statistically significant increase in the mean total physical activity MET minutes per week (group  $\times$  time,  $p =.002$ ) was observed at 6-month follow-up in IG.

The number of lifestyle-related risk factors between study groups at different time points appear in Figure 3. At baseline, all the patients reported at least one lifestyle-related risk factor. At 1-month and 6-month follow-ups, there were patients having no risk factor habits. Patients having only one or two risk factors have increased in number in both groups. Similarly, patients having clustering of more than two risk factor habits has decreased in follow-up compared with baseline. At 1-month follow-up, 15% of patients in IG and 5% of patients in UG reported no risk factor habits; at 6-month follow-up, 12% of patients in IG and 2% of patients in UG reported no risk factor habits.

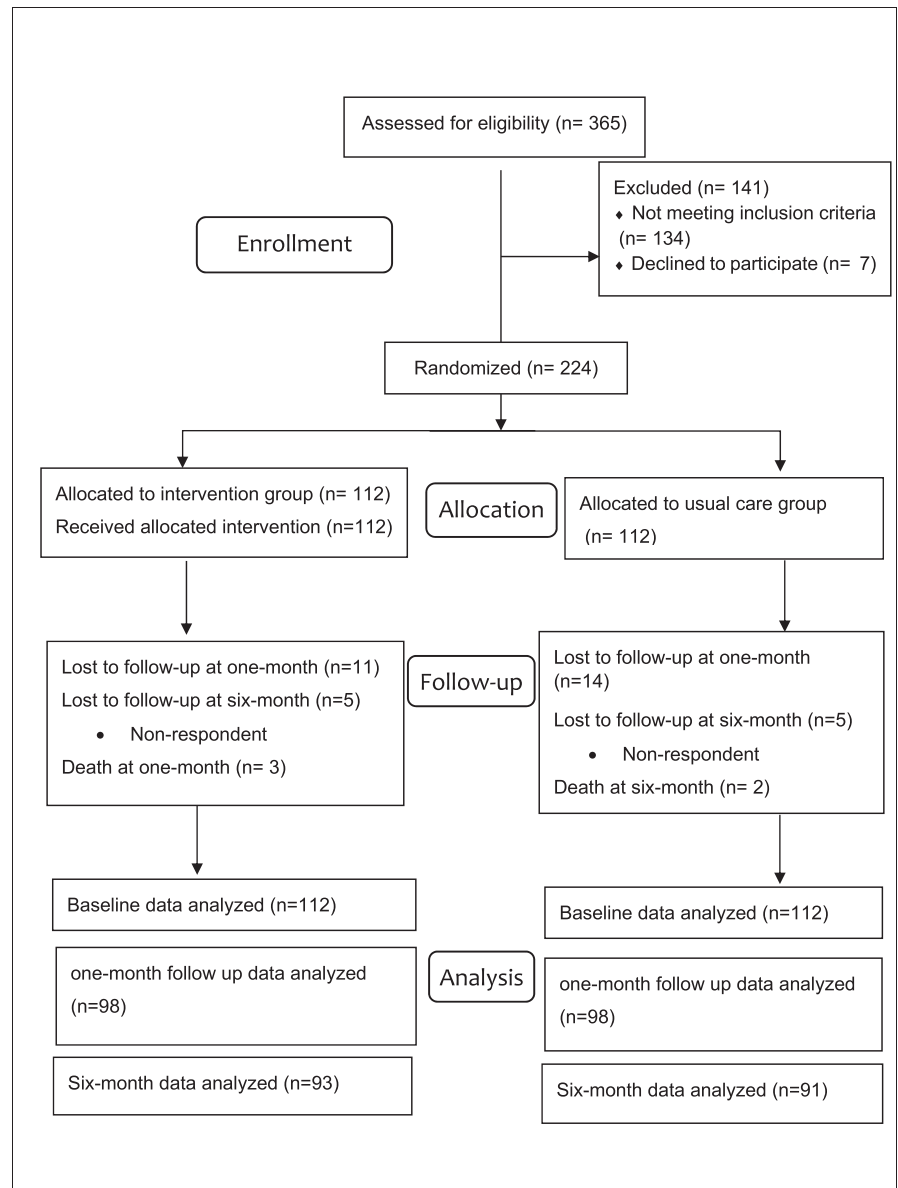
### 4 | DISCUSSION

We found that the one-time nurse-led counselling intervention supplemented with information leaflets had an impact in improving lifestyle-related risk factor habits of CAD patients in both short and long term. We studied multiple lifestyle-related risk factor habits simultaneously. The results show a positive effect of the intervention on dietary habits, physical activity, medication adherence and perceived stress in IG at follow-ups compared with UG. We found a statistically significant reduction in the number of lifestyle-related risk factor habits in IG at the 1-month and 6-month follow-ups compared with UG. There were not any changes in the methods and study outcomes after the study commenced.

A statistically significant improvement in patient reported dietary habits was found from baseline to follow-ups in IG in our study. Our findings are consistent with the results of a systematic review (LIN et al., 2010) on behavioural counselling to prevent cardiovascular disease by promoting healthy diets in adults. That study suggests that even low-intensity dietary counselling results in a moderate increase in healthy dietary habits like increased fruit and vegetable intake and a decrease in dietary fat intake (LIN et al., 2010). Similarly, another study from Western Nepal reported a positive impact of educational intervention on lifestyle modification, such as limited salt intake and avoiding fatty foods, among hypertensive patients (Sharma et al., 2014).

Based on patients self-reported data, we found that the mean level of physical activity in MET minutes per week significantly increased in IG at follow-ups. Almost 87% of patients in IG and 74% of patients in UG self-reported being physically active, as their mean level of total physical activity in MET minutes per week was  $\geq 600$  at the 6-month follow-up. In contrast to our findings, a previous study by Hardcastle et al. (2013) reported an inadequate effect of a motivational interviewing intervention on physical activity, as the participants did not meet 600 MET minutes per week for total physical activity. Nonetheless, the study showed the effectiveness of a counselling intervention for patients with a particularly high risk of cardiovascular disease. Similarly, a systematic review reported mixed effects of low-intensity physical activity counselling interventions (LIN et al., 2010). These differences were plausible due to the differences in the selection of the participants. The present study

**FIGURE 1** Flow diagram (CONSORT) of participants through each stage of the study



comprised patients with CAD in contradict to the participants who only exhibit CVD risk factor in the study by Hardcastle et al., (2013). And the systematic review by LIN et al., (2010) excluded the interventions that targeted persons with known cardiovascular disease or combination of its risk factors.

Patients in IG reported to have achieved a decrease in body weight during the follow-ups, reaching statistical significance at the 6-month follow-up. IG and UG did not differ at 1-month follow-up; however, the difference became statistically significant at 6-month follow-up. We found only 15% of patients in IG and 20% of patients in UG were overweight at the 6-month follow-up. In contrast to our findings, a previous randomized controlled trial reported that a motivational interviewing intervention had no improvements in BMI at 12 months of post-intervention. Yet, the study has reported a statistically significant improvement in BMI between baseline and six months among obese and hypercholesteraemic patients who were at high risk of cardiovascular disease (Hardcastle et al., 2013). The

reason for improvement in BMI in our study could be due to patients in our study were at increased risk of getting cardiovascular event due to recent MI or hospitalization due to CAD.

Patients reported higher adherence to medication at 1-month and 6-month follow-ups in both study groups compared with baseline, with statistically significant increase in adherence among IG compared with UG. In concurrent with our finding, a previous retrospective cohort study conducted at Midwestern USA reported that patients who had a brief face-to-face counselling session demonstrated greater medicine adherence and persistency than a comparison group (Taitel et al., 2012). Similarly, another study from Nepal among older hypertensive patients reported that counselling intervention improved medication adherence among patients (Shrestha et al., 2019).

Patients in both groups reported greater reduction in perceived stress at 1-month follow-up than at 6-month follow-up. However, a statistically significant decrease in perceived stress was found in

TABLE 1 Background characteristics of the retained population at 6-month follow-up

Characteristics	Total (n = 184)	Intervention Group (n = 93)	Usual care Group (n = 91)
Age in years (mean $\pm$ SD)	60.0 $\pm$ 11.8	60.9 $\pm$ 11.9	59.1 $\pm$ 11.8
Gender, n (%)			
Male	142 (77.2)	77 (82.8)	65 (71.4)
Female	42 (22.8)	16 (17.2)	26 (28.6)
Cast/Ethnic group, n (%)			
Brahmin	50 (27.2)	23 (24.7)	27 (29.7)
Chhetri	38 (20.7)	23 (24.7)	15 (16.5)
Newar	34 (18.5)	18 (19.4)	16 (17.6)
Others	62 (33.6)	29 (31.2)	33 (36.2)
Religion, n (%)			
Hindu	160 (87.0)	80 (86.0)	80 (87.9)
Others	24 (13.0)	13 (14.0)	11 (12.1)
Education, n (%)			
Uneducated	48 (26.1)	19 (20.4)	29 (31.9)
Primary education	72 (39.1)	38 (40.9)	34 (37.4)
Secondary education	43 (23.4)	23 (24.7)	20 (21.9)
Bachelor's degree or above	21 (11.4)	13 (14.0)	8 (8.8)
Work status, n (%)			
Unemployed	12 (6.5)	6 (6.5)	6 (6.6)
Employed	46 (25.0)	19 (20.4)	27 (29.7)
Retired	55 (29.9)	32 (34.4)	23 (25.3)
Entrepreneurs	22 (12.0)	13 (14.0)	9 (9.9)
Farmer	49 (26.6)	23 (24.7)	26 (28.5)
Marital status, n (%)			
Married	172 (93.5)	89 (95.7)	83 (91.2)
Others	12 (6.5)	4 (4.3)	8 (8.8)
Underage children, n (%)			
Yes	28 (15.2)	15 (16.1)	13 (14.3)
No	156 (84.8)	78 (83.9)	78 (85.7)
Monthly family income (NPR) (Median $\pm$ IQR)	10,000 $\pm$ 17,000	15,000 $\pm$ 16,000	5,000 $\pm$ 17,000
Residential area, n (%)			
Province 3	93 (50.5)	49 (52.7)	44 (48.4)
Other provinces	91 (49.5)	44 (47.3)	47 (51.6)
Co-morbidity, n (%)			
Yes	152 (82.6)	77 (82.8)	75 (82.4)
No	32 (17.4)	16 (17.2)	16 (17.6)
CAD Severity, n (%)			
No significant stenosis/No CAG performed	40 (21.7)	21 (22.6)	19 (20.8)
Single vessel disease	58 (31.5)	34 (36.6)	24 (26.4)
Double vessel disease	47 (25.6)	24 (25.8)	23 (25.3)
Triple vessel disease/Left main stenosis	39 (21.2)	14 (15.0)	25 (27.5)
Revascularization, n (%)			
No revascularization	57 (31.0)	25 (26.9)	32 (35.2)
PCI	107 (58.1)	61 (65.6)	46 (50.5)
CABG	20 (10.9)	7 (7.5)	13 (14.3)

Abbreviations: CABG, coronary artery bypass graft; IQR, interquartile range; NPR, Nepalese rupees; PCI, percutaneous coronary intervention.

TABLE 2 Comparison of lifestyle-related risk factors between groups at baseline, 1-month and 6-month follow-ups

Variable	Baseline			1-month follow-up			6-month follow-up		
	Intervention Group (n = 112)	Usual care Group (n = 112)	p-value	Intervention Group (n = 98)	Usual care Group (n = 98)	p-value	Intervention Group (n = 93)	Usual care Group (n = 91)	p-value
Diet, n (%)									
Low risk	71 (63.4)	86 (76.8)	.063	94 (95.9)	81 (82.7)	.005*	90 (96.8)	74 (81.3)	.001*
Medium risk	35 (31.3)	20 (17.9)		4 (4.1)	17 (17.3)		3 (3.2)	16 (17.6)	
High risk	6 (5.3)	6 (5.3)		–	–		–	1 (1.1)	
Physical activity, n (%)									
MET minutes per week ≥600	73 (65.2)	81 (72.3)	.313	79 (80.6)	75 (76.5)	.602	81 (87.1)	67 (73.6)	.026*
MET minutes per week <600	39 (34.8)	31 (27.7)		19 (19.4)	23 (23.5)		12 (12.9)	24 (26.4)	
Adherence to medication, n (%)									
High	11 (9.8)	36 (32.1)	<.001*	85 (86.7)	42 (42.9)	<.001*	82 (88.2)	50 (54.8)	<.001*
Medium	70 (62.5)	45 (40.2)		13 (13.3)	50 (51.0)		10 (10.7)	38 (41.8)	
Low	8 (7.1)	9 (8.1)		–	6 (6.1)		1 (1.1)	3 (3.4)	
No medication	23 (20.6)	22 (19.6)		–	–		–	–	
Stress, n (%)									
Low stress	4 (3.6)	1 (0.9)	.275	34 (34.7)	9 (9.2)	<.001*	20 (21.5)	5 (5.5)	<.001*
Moderate stress	104 (92.8)	109 (97.3)		64 (65.3)	87 (88.8)		73 (78.5)	84 (92.3)	
High stress	4 (3.6)	2 (1.8)		–	2 (2.0)		–	2 (2.2)	
BMI, n (%)									
Underweight	6 (5.4)	7 (6.3)	.153	4 (4.1)	7 (7.1)	.126	–	3 (3.3)	.013*
Normal weight	75 (67.0)	73 (65.2)		67 (68.4)	67 (68.4)		79 (84.9)	65 (71.4)	
Overweight	29 (25.8)	23 (20.5)		26 (26.5)	18 (18.4)		14 (15.1)	18 (19.8)	
Obese	2 (1.8)	9 (8.0)		1 (1.0)	6 (6.1)		–	5 (5.5)	
Smoking status, n (%)									
Current smoker	39 (34.8)	33 (29.5)	.078	7 (7.1)	15 (15.3)	.017*	8 (8.6)	17 (18.7)	.012*
Former smoker	37 (33.0)	28 (25.0)		59 (60.2)	40 (40.8)		55 (59.1)	35 (38.5)	
Never smoker	36 (32.2)	51 (45.5)		32 (32.7)	43 (43.9)		30 (32.3)	39 (42.8)	
Alcohol consumption, n (%)									
Current Drinker	34 (30.4)	18 (16.1)	.102	9 (9.2)	15 (15.3)	.005*	12 (12.9)	15 (16.5)	.021*
Former Drinker	19 (16.9)	15 (13.4)		38 (38.8)	16 (16.3)		32 (34.4)	15 (16.5)	
Never Drinker	59 (52.7)	79 (70.5)		51 (52.0)	67 (68.4)		49 (52.7)	61 (67.0)	

Abbreviation: MET, metabolic equivalent.

\*p-value &lt;.05 were considered statistically significant.



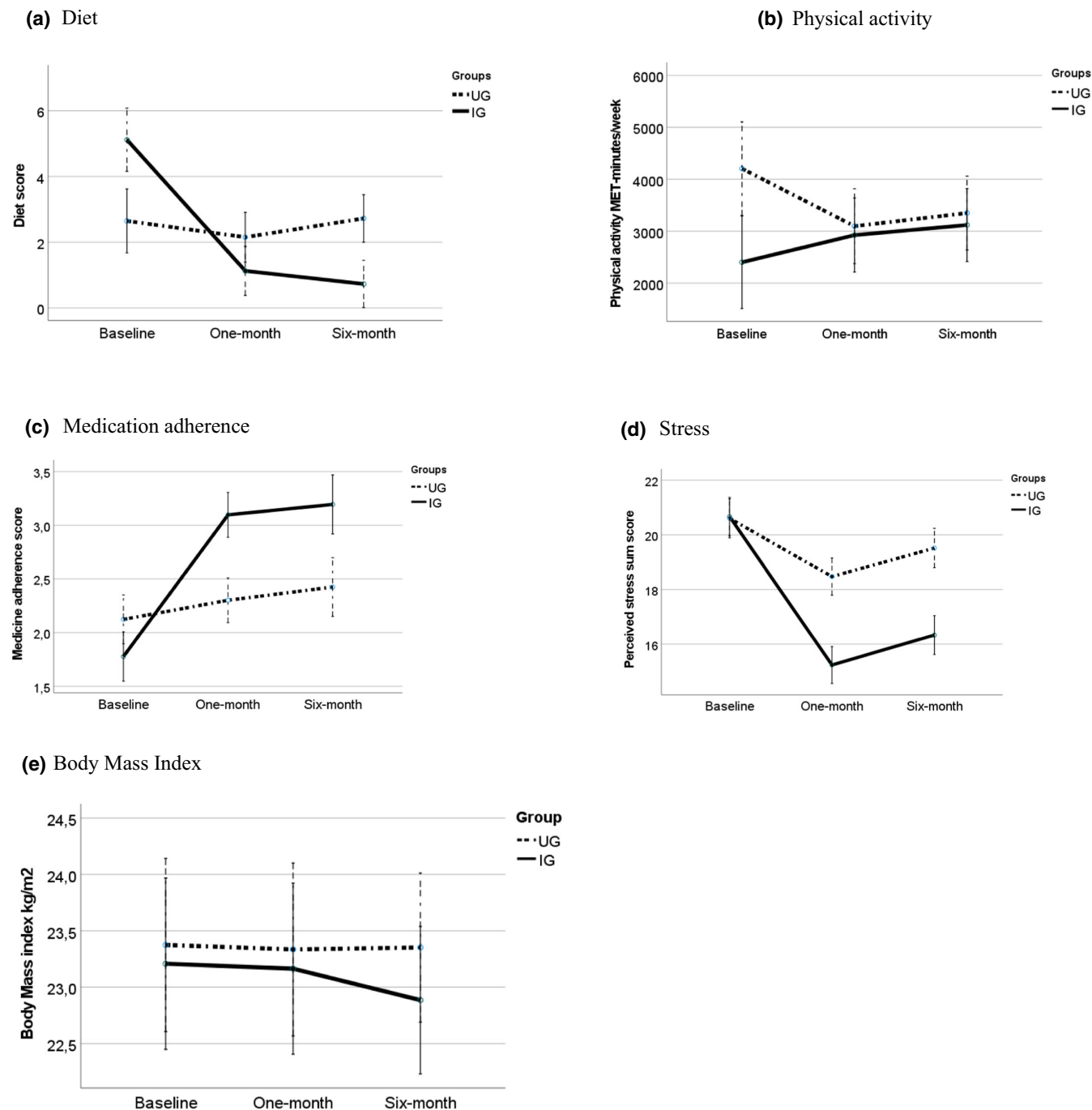


FIGURE 2 (a–e) Changes in lifestyle-related risk factor from baseline to 6-month follow-up. Error bars indicate 95% Confidence interval of mean from general linear model repeated measures analysis. Abbreviations: IG: Intervention Group, UG: Usual care Group

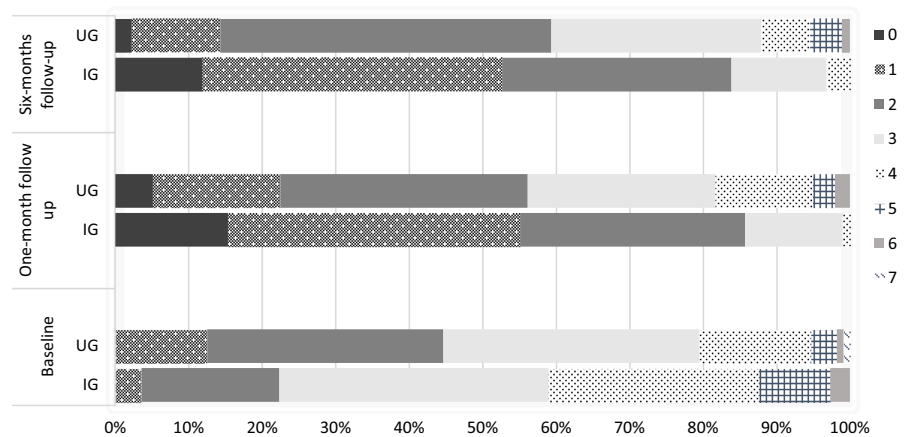
IG compared with UG at both follow-ups. In line with our finding, previous studies reveal that interventions aimed at raising positive feelings, cognitions or behaviours are effective in reducing participants' perceived stress (Chakhssi et al., 2018; Momeni et al., 2016).

We found that smoking habits differed significantly between the groups at follow-ups. Less than one-tenth of patients in IG and more than one-sixth of patients in UG reported to be current smokers at 6-month follow-up. Comparatively, fewer patients in IG than in UG self-reported as current smokers at follow-ups. A similar finding was reported in a systematic review on individual behavioural

counselling for smoking cessation: face-to-face individual counselling from a healthcare worker for smoking cessation was more effective at 6-month follow-up when pharmacotherapy was not offered to any participants (Lancaster & Stead, 2017).

A statistically significant difference between the groups in their alcohol consumption habits were found at follow-ups. Comparatively fewer patients self-reported as current alcohol drinkers in IG than in UG. In contrast to our findings, a previous study conducted in Nepal on the effectiveness of counselling on alcohol consumption delivered by community-based counsellors, reported no significant

**FIGURE 3** Number of lifestyle-related risk factors between study groups at baseline, at 1-month and at 6-month follow-ups. Abbreviations: IG: intervention group, UG: usual care group, number of risk factors are numbered from 0 to 7



effect in the intervention group when compared to control group participants (Jordans et al., 2019). This variance could be attributed to the fact that Jordans et al., (2019) included participants who were diagnosed with alcohol use disorder, but in our study >50% of the study participants reported to have never drunk alcohol and only <5% reported harmful or dependent use of alcohol in the baseline survey (Gaudel et al., 2020). A previous review of reviews on the effectiveness of interventions in changing health behaviours reported that counselling intervention for alcohol use is most successful in changing health behaviours for mild-to-moderate alcohol consumption or binge drinking of participants (Jepson et al., 2010).

We found a reduced total number of lifestyle-related risk factor habits in both groups during 1-month and 6-month follow-ups; however, a greater reduction was found in IG than UG. There were not any changes in the methods and study outcomes after the study commenced. Our participants' reasons for adopting healthy lifestyle habits could be their perception of being unhealthy. People tend to adopt lifestyle changes to improve their health, usually after they fall sick (Lakerveld et al., 2008). In agreement with our finding, previous studies on the effect of lifestyle counselling interventions have reported that interactively implemented patient-centred lifestyle counselling improves the adherence to healthier lifestyle habits (von Gaudecker, 2017; Jepson et al., 2010; Sargent et al., 2012). A steeper and more positive trend at 1-month than at 6-month follow-up in this study could be due to participants' initial enthusiasm for change immediately after their hospital visit.

#### 4.1 | Strengths and limitations

The randomized control study design and use of multifaceted standard data collection questionnaires are the strengths of the study. The intervention was given by a nurse investigator, ensuring the same quality of intervention to every patient in the IG. Another strength of the study is the use of feasible and sustainable intervention that is easy to implement and adopt in a clinical setting.

Our study had some limitations. Self-reported data from participants might have caused social desirability or recall bias in both the study groups. We did not use matched randomization technique to

randomize the study patient in our study. This may have created apparent imbalances between the groups in some variables at baseline which is one of the limitations of the study. Lack of double blinding could have caused unconscious inclination of the investigator towards IG. Possible contamination between IG and UG could be another study limitation, although the intervention was administered on the day of discharge from hospital to minimize contamination between groups. Using a telephone interview method for the follow-up data collection could be another study limitation. However, telephone interviews can produce high-quality data comparable to face-to-face interviews (Canning et al., 2018; da Silva et al., 2014). The generalizability of this study's findings is limited due to the small sample size from a single cardiac centre.

#### 4.2 | Implications for nursing practice

Lifestyle intervention as delivered by a nurse improved lifestyle habits in patients with CAD. Providing effective lifestyle intervention is crucial to bring about healthy lifestyle changes among CAD patients. A modest improvement of lifestyle habits has sustainable effects in reducing cardiovascular events. The prevalence of lifestyle risk factors among CAD patients highlights the inadequacies of the current health strategy. Thus, lifestyle counselling interventions for patients with CAD should be incorporated by nurses as a part of routine health care.

#### 4.3 | Conclusion

The one-time nurse-led brief lifestyle counselling intervention supplemented with pictorial information leaflets significantly improved the lifestyle habits of CAD patients. The counselling intervention was effective even when multiple lifestyle-related risk factors, in terms of dietary habit, physical activity, perceived stress, overweight/obesity, smoking, alcohol consumption and adherence to medications were addressed simultaneously. Thus, more research should be focused on lifestyle risk factors and effective interventions to change them. This study reported the effects of intervention at 6-month

follow-up, a further study to address the long-term impact of intervention in a larger population is recommended.

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## CONFLICT OF INTEREST

The authors declare no conflict of interest.

## AUTHOR CONTRIBUTIONS

Pramila Gaudel: Conceptualization, methodology, formal analysis, investigation, writing original draft, project administration, writing – review and editing and funding acquisition. Subas Neupane: Conceptualization, methodology, formal analysis, supervision, validation and writing – review and editing. Anna-Maija Koivisto: methodology, validation, formal analysis. Marja Kaunonen: Conceptualization, methodology, supervision, validation, project administration and funding acquisition. Anja Rantanen: Conceptualization, methodology, supervision, validation, project administration and funding acquisition.

## ETHICAL APPROVAL

Ethical approval for conducting study was obtained from the corresponding country's national health research council and also from the hospital's ethical board.

## DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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