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Effect of Health Education Program on Self-Efficacy and Functional Capacity of Patients with Coronary Artery Bypass Surgery in Khartoum State-Sudan, 2015-2019

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Abstract

Coronary heart disease is among the most prevalent and costly of all global health problems. Coronary artery bypass grafting (CABG) has been increasingly used since the 1960s. Coronary heart disease is a leading cause of death worldwide, including Sudan. Self-efficacy and functional capacity is a critical factor for quality of life in patients who has undergone CABG as well as for their caregivers from their families. Aim of the Study: To explore the effects of an educational program on self-efficacy and functional capacity of patients after CABG. 1) There will be no significant difference between the intervention group and control group concerning knowledge regarding Self-efficacy and functional capacity post CABG surgery. 2) The application of our educational program for the patients will enhance the patients with CABG surgery and improve knowledge about Self-efficacy and functional capacity post CABG surgery. 3) There are some socio demographic factors that affect the

response to the educational program. Methods: This was a quasi-experimental, interventional and hospital-based study, including pre-test, a post-test and follow-up test, with a control group, conducted during the period from September 2014 to June 2019. Patients were recruited consecutively to the cases and control group using convenience sampling. The sample consisted of 76 patients; 41 as cases and 35 as control group. The sample included those who had undergone CABG in Khartoum State. Relevant data were collected using a checklist to monitor the effect of a health education program on self-efficacy and functional capacity of the patients. Result: The results showed marked improvement in patients' self-efficacy and functional capacity between pretest and posttest for the study group; p-value = (0.001) in the health status of cases in comparison to the control group. The indices were observed to be higher for patients who received a nursing educational program throughout the study period; p-value = (0.002).

Keywords

Education Program, Self-Efficacy, Functional Capacity, Coronary Artery Bypass Surgery

1. Introduction

Cardiovascular diseases (CVDs) are the leading cause of death globally. An estimated number of 17.9 million people died from CVDs in 2019, representing 32% of all global deaths [1].

According to global and regional projections of mortality and burden of disease, CAD will remain the leading cause of death for the next 20 years [2]. Over three quarters of CVD deaths take place in low- and middle-income countries [1] and Sudan is one of these countries, No recent data on CAD in Sudan were available but it is quite obvious that there is a significant rise in the incidence of CAD [3]. The statistics of Ahmed Qasim Heart Centre showed a rise in the number of CABG surgeries from 15 in 1998 to 120 in 2017. This significant change can be attributed to increased prevalence rates of hypertension, diabetes, smoking and low physical activity. CABG is a common surgical treatment for cardiovascular disease [4].

Recent data suggest that almost 10% of patients who undergo CABG are readmitted to hospital within 30 days of surgery. Patients who lack primary care follow-up have been shown to have worse long-term outcomes [5].

Care after bypass surgery aims to reduce the risk factors for heart disease and includes strategies to help patients and family members stop smoking, control high blood pressure, improve cholesterol levels, begin exercising regularly, reduce weight if necessary, and reduce stress. Some of these changes can be made by adjusting lifestyle habits through diet and exercise. However, lifestyle changes alone may not be adequate and medications are often needed. Regarding discharge from the hospital, patients with an uncomplicated CABG usually go

home after about three to five days in the hospital. However, in some cases, the hospital stay is longer [6].

Typically, recovery after CABG performed using open heart technique may take 6 to 12 weeks. Nowadays, CABG is performed using a minimally invasive technique and estimated time frame for recovery is less than 2 weeks. In most cases, recovery after CABG is such that the patient is able to sit in a chair one day after the procedure, walk after 3 - 4 days, climb stairs after a week and get back to normal activities in 2 weeks. Having said that, one should understand that each body is different and the recovery after CABG for each patient is distinctive [7].

Before leaving the hospital, it is important for the patient and family to participate in and understand the discharge plan. After bypass surgery, it is common to start new medications and stop or adjust the doses of previous medications. Concerning wound care, after discharge from the hospital, the patient is usually given instructions about how to care for their chest and/or leg wounds. It is important to follow these instructions closely and to notify a healthcare provider immediately if there are some inquiries or concerns [6].

Regular exercise improves cardiovascular health consistently. It helps you regain cardiovascular fitness and return to everyday activities. Your treating doctor may advise on the intensity and duration of exercise depending on the severity of your heart disease [8]. Patients are encouraged to serially increase activity as tolerated to achieve the standard activity recommendations, and it is important that patients do not become sedentary at home after discharge [5]. It is generally recommended that the patient slowly increases the amount and intensity of the activities over the first 3 months. Do not exercise outside when it is too cold or too hot. Stop if you feel short of breath, dizzy, or if you feel any pain in your chest. Do not do any activity or exercise that causes pulling or pain across your chest, such as using a rowing machine or weight lifting. Keep your incision areas protected from the sun to avoid sunburn [9] [10].

Return to paid employment may be facilitated by CABG surgery. CABG surgery is followed by a net loss to paid employment of working age patients which increases with age, and is more likely for those in blue-collar occupations and women. Health-related quality of life among participants under 60 years of age at follow-up was better for those who returned to work after CABG surgery [11]. As for fitness to drive, private driving is permitted 4 weeks after CABG surgery [12]. For care and hygiene, the patient should ask someone to stand nearby while you shower or do other activities, just in case you need help.

2. Study Instrument

This was a prospective experimental study with pre-test, a post-test and follow-up tests and a control group. The study was conducted during the period from September 2015 to June 2019 at three hospitals, namely: Al-Shaab Teaching Hospital, Sudan Cardiac Center and Ahmed Qasim Teaching Hospital.

Ahmed Gasim Hospital which started its heart surgery program in 1998, Sudan Heart Center which started its program in 2000 and AlShaab Teaching Hospital, which was the first hospital to enter the field of heart surgery in 1959. Sudan heart center and Al-Shaab Teaching Hospital are specialized centers located in Khartoum state, it provides medical and nursing services for entire people such as cardiac and respiratory diseases, cardiothoracic surgery and vascular surgery from all over the country. Ahmed Gasim Hospital is the largest complex for heart surgery, kidney transplantation and catheterization operations in Khartoum North Furthermore, they are privileged with good human equipment facilities. The participants enrolled in our study were Sudanese and non-Sudanese adult patients presenting to the abovementioned hospitals. The total coverage of coronary bypass graft patients who had fulfilled the inclusion criteria was 138 patients included at the study.

Regarding the distribution of the participants, from the Sudan Cardiac Centre, there were 45 patients; from Ahmed Qasim hospital the participants were 56 patients; at Al-Shaab Teaching Hospital, the participants were 37 patients. Convenience sampling technique was considered to be suitable for this study. This method of sampling technique was chosen because it was convenient for the author in terms of the availability of patients in specialized hospitals for the study. Moreover, after returning to the statistical Bureau of the three hospitals—which were mentioned above—the number of surgeries was found out (CABG) over past year 2014.

One of the main reasons for adopting the convenience sampling technique is the fact that it eliminates selection bias. The educational program consisted of two phases: the pre-intervention phase, during which a baseline survey was conducted; and the intervention phase, from May 15th to July 5th 2017, during which the education program was given through lectures, small group work, demonstration and booklets, brochures, posters, bedside teaching, videos and lectures regarding knowledge and self-care ability of post-CABG patients. Regarding post-intervention monitoring, the researchers started a post-test after a memory gap of three months. The same tools were using to compare between pre- and post-intervention programs which were conducted to evaluate the effect of the program on self-care efficacy and functional capacity for post-CABG patients.

2.1. Sample Selection Technique

The 138 patients were recruited consecutively before being allocated as interventional/case group or control group using random sampling. The two options (*i.e.* case or control) were written each on a piece of paper, which was then folded and participants were selected randomly by drawing lots. In this random selection way, cases/intervention group (subject to intervention) and control group (not subjected to the educational program) were determined. Throughout study period, some participants were lost due to various reasons, including but not limited to: deaths, major post-operative complications, participant's decision and

miscommunication with the patient. The final sample consisted of 76 patients, 41 in the interventional group and 35 in the control group.

After implementation of the program, postoperative self-efficacy and functional capacity of the intervention group were measured using a checklist. This tool was used to measure the level of daily living activities, which is in turn used as a parameter to measure self-care ability of the patient. The said activities included: walking, going out of the house, walking inside or around the house, stair climbing, lifting objects, driving and returning back to work. In addition, the research sought to determine the items that measure the functional capacity of the patients, such as pain, appetite, angina, shortness of breathing, etc. These items will be measured by using interval scale to rates, "zero mark" [13].

2.2. Practical Training

The study sought to give the candidate demonstration on how to perform:

1) Breathing and coughing exercise and use incentive spirometer;

2) Mobilization and leg exercises before and after surgery;

3) Ambulation 3 - 5 minutes around the unit two to three times per day before discharge (modified six minutes' walk test according to thoracic society);

4) Counting pulse rate and relating rating of perceived exertion to activities performed;

5) Climbing a flight of stairs without distress;

6) Performing upper extremity activity guidelines (sternal guidelines) after cardiac surgery;

7) Performing self-care for the daily living activities (ADLs);

8) Relating plans for resuming other ADLs (*i.e.*, driving, sexual relations, and other strenuous life activities);

9) Putting plans to carry out walking or biking exercise program.

For each activity, when the participant responded as "I don't do this", the participant was awarded zero mark; "I do this less than before disease" one mark; "I do this same as before disease" two marks, and three marks for "I do this more than as before disease".

After obtaining the consent from each participant, he/she was interviewed before the operation and the first data were collected by a questionnaire. The filling of the questionnaire required about 15 - 20 minutes. The intervention took about three weeks for the educational program to post-CABG patients. The program was divided into two sessions: when the participant gave their consent and during discharge to home. The participants received tailored material which addressed self-efficacy and functional capacity.

The education program was meant to effect three parts, as will be detailed below.

2.3. Phases of the Study

1) The First part was during the hospitalization period, and it consisted of information about knowledge of cardiac disease, CABG surgery, preparation for

CABG surgery, how to deal with instrument and machine in ICU and how to motivate and integrate physical activities into the patient's lifestyle.

2) The second part was during discharge, and it aimed: to motivate participants to evaluate the physical activities and self-care strategies which included: the management of fluid intake, nutrition and symptoms, engagement in personal hygiene and usual physical activities, taking medications as prescribed, and monitoring the development of and managing CABG complications such as difficulty of breathing and fluid overload. Symptoms are "subjective experiences reflecting changes in a person's bio-psychosocial function, sensation, or cognition." Symptoms that are commonly experienced post-CABG include: pain, dizziness, difficulty of breathing, nausea, edema, sleep disturbances, and mood alterations.

3) The third part was at home, and it consisted of removing the reminders/cues which had given stimulus to the control group to check whether they would engage in an unhealthy lifestyle. The participants in the intervention group received brochures, booklets and posters in the first week and fourth week after discharge. The participants were then contacted by telephone to motivate them and to find the barriers to performing the physical activity and participating in the method elected and to analyze how the participants work after removing the reminders/cues to check whether they would engage in non-physical activity and unhealthy behavior, and adding cues or reminders to help them engage in physical activity and healthy behavior.

At the first follow-up of the second week after discharge, the participants were contacted by the researchers by telephone to assess the commitment of the participant to stay healthy. Then data regarding daily living activities were collected on discharge day and again during post-discharge period during the second follow-up (4th or 5th weeks post-operative day).

After confirming their eligibility for the study group, the pre-test interviews were scheduled for the intervention group and non-intervention group; the pre-test and post-test were 12 weeks apart. At the session, educational material printed in Arabic language was distributed to the intervention group (see the annexure).

The educational material included:

- PowerPoint presentations (lectures).
- Booklets.
- Brochures.
- Posters.
- Bedside teaching.
- Videos.
- Lectures.

Resources requirements:

- Places: classrooms, seats and laboratories in the study area.
- People: lectures and practice skills were presented and demonstrated by re-

searchers and six register nurses in different cardiac units at the study areas.

- Equipment: computers, extent of computer access, software, data display and printed material.

2.4. Pilot Test

A pilot test was conducted on May 22nd 2017, and it took about three months. The aim of the pilot test was to find out the practicability and feasibility of the tools of the study. This step was conducted among 10 participants. The sampling technique used was the random sampling. Informed consent was taken from each participant in the pilot test sample. The pilot test was carried out in order to identify the possible problems and to revise the data collection methods before starting the actual research, to decide if the selected tools are appropriate. The pilot test was also used to find out if the questions are understood and easily answered by the respondents, and to assess if the sequence of the questions is logical, clear and the translation was accurate. The sample of pilot study was selected randomly. After finishing the pilot test, the questions in the interviews/questionnaires were edited twice, by removing misunderstandings and unclear questions, changing the sequence, rephrasing, and so on. The finalized tools were used to assess the knowledge of the participants in the sample regarding the suggested educational program for post-CABG patients. The pilot test finding revealed that the study was feasible and practicable.

2.5. Data Collection

The data collected in both pre-test and post-test were organized, categorized and tabulated using numbers and percentages, through the application of statistical procedures and using the package of SPSS, version 22. The statistical procedures used in the study included descriptive statistics (frequency, percentage and cumulative percent, arithmetic mean and standard deviations) and inferential statistical methods (T-test to present the differences between the cases group and the control group). P-value was set at 0.05 and 95% confident interval should be used where appropriate. Chi-square will be used for the association between the demographic data and the study variables.

An official letter was taken from the National Ribat University to the hospital authorities. Approvals from Khartoum State Ministry of Health and from the administrative authorities of Cardiothorathic centers, respectively, were also obtained.

2.6. Operational Definition

Self-efficacy is a personal belief in one's capability to organize and execute courses of action required to attain designated types of performances [14].

2.7. Strengths and Limitations of the Study

2.7.1. The Strength of Study

- Control group in addition to pre- post comparison to support the study

strength.

- To author best knowledge of the researcher no similar previous study in the Sudan.
- The other studies are suggested by our study should address various surgical units GIT, ENT ect.

2.7.2. Limitations Include of Study

- If Wad Medani Cardiac Center was included in this study, it would have been more comprehensive at the national level. This center was.
- Included in our study due to financial and researcher facilities.
- The study did not include patients who underwent an off-pump CABG surgery.
- Due to the contextual nature of this study the result cannot be generalized.

3. Results

Socio demographic variables age, gender, occupation and others clinical characteristics in both group's study group (cases) and control were comparable There is statically significant difference between two group *p* value = 0.15, 0.22, 0.25. The males were majority than the female in study group 36 (87.8) and control 27 (77.1) group *p* value = 0.22. The similar percentage risk factors of CAD for both study groups more in male than female similar result found in literature review (68). According to their education level There is statically significant difference our study showed that majority for both study group 31 (75.6%) and control 25 (71.4%) groups were educated and this one importance factor that made the participant more cooperative during the study period. *p* value = 0.016 (**Table 1**).

Clinical characteristics (myocardial infarction, diabetes mellitus and hypertension p value = 0.71 is statistically significantly differ while is admission to ICU p value = 0.46, admission to hospital p value = 0.28, and number of grafts p value = 0.31 do not statistically significantly differ among the majority of patients in both the study group case and control groups (**Table 2**).

The overall total postoperative self-efficacy and functional capacity of the patients was poor, medium, good and very good by 19.5%, 22%, 51.2% and 3% of them respectively at the post-educational program measurement while at the follow-up measurement these grades were scored by 25.7%, 40%, 31.4% and 2.9% of the patients respectively. P-value = 0.021 < 0.05 (CI 95%) indicates increase of total postoperative self-efficacy and functional capacity of the patients after implementation of the intervention (**Figure 1**). P value = 0.021 < 0.05 marking a significant difference. A similar result was found in another study in which, during the second month, statistical significant differences were observed when comparing between cases and control groups ($p \leq 0.05$) [15].

Furthermore, the results revealed marked improvement in the health status of the study group (cases) as compared to the control group (**Table 3** & **Table 4**). A similar finding was reported by another study which stated that participants, who were receiving the supportive educative telephone program, demonstrated

Table 1. Socio-demographic characteristics of the case group and the control group.

Characteristic	Case	Control	P value
Age	n (%)	n (%)	
<45 years	1 (2.4)	0 (0.0)	
45 - 60 years	20 (48.8)	20 (57.1)	0.15
>60 years	20 (48.8)	15 (42.9)	
Total	41 (100.0)	35 (100.0)	
Gender			
Male	36 (87.8)	27 (77.1)	
Female	5 (12.2)	8 (22.9)	0.22
Total	41 (100.0)	35 (100.0)	
Education			
Not educated	7 (17.1)	8 (22.9)	
Pre-university	31 (75.6)	25 (71.4)	0.016
University	3 (7.3)	2 (5.7)	
Total	41 (100.0)	35 (100.0)	
Occupation			
Free business	10 (24.4)	15 (42.9)	
Employee	14 (34.1)	8 (22.9)	
Retiree	17 (41.5)	12 (34.3)	
Total	41 (100.0)	35 (100.0)	0.25
3 - 7 days	31 (75.6)	20 (57.1)	
>7 days	3 (7.3)	6 (17.1)	
Total	41 (100.0)	35 (100.0)	
Body mass index (BMI)			
Underweight (<18.5)	3 (7.3)	2 (5.7)	
Normal (18.5 - 24.9)	15 (36.6)	13 (37.1)	
Overweight (25 - 29.9)	19 (46.3)	15 (42.9)	0.52
Obese (≥30)	4 (9.8)	5 (14.3)	
	41 (100.0)	35 (100.0)	

significantly greater level of knowledge than that of the control group. Marshall *et al*. (1989) revealed that the study and control group had higher total knowledge scores after surgery and the patient's recovery was determined by percentages of indices of self-efficiency and knowledge level. The indices were found to be higher for patients who received nursing education program throughout the period of study.

Table 2. Clinical characteristics of the case group and the control group from the three cardiac centers during the period September to December 2017.

Medical history	Case	Control	P value
Diabetes mellitus	13 (31.7)	8 (22.9)	0.71
Hypertension	12 (29.3)	12 (34.3)	
Myocardial infarction	16 (39.0)	15 (42.9)	
Total	41 (100.0)	35 (100.0)	
Duration of admission in intensive care unit			
3 days	12 (29.3)	13 (37.1)	0.46
3 - 7 days	27 (65.9)	17 (48.6)	
>7 days	2 (4.9)	5 (14.3)	
Total	41 (100.0)	35 (100.0)	
Number of grafts			
One	13 (31.7)	8 (22.9)	0.31
Two	13 (31.7)	10 (28.6)	
Three	9 (22.0)	12 (34.3)	
>3 grafts	6 (14.6)	5 (14.3))	
Total	41 (100.0)	35 (100.0)	
Duration after admission to hospital			
3 days	7 (17.1)	9 (25.7)	0.28
3 - 7 days	31 (75.6)	20 (57.1)	
>7 days	3 (7.3)	6 (17.1)	
Total	41 (100.0)	35 (100.0)	

Also, Fredericks, Guruge and Sidani reported similar findings in their study which examined the effects of the elements of educational characteristics on knowledge, behavior and symptom frequency; their results also reported statistical significant differences between patients who received educational interventions through combined media, on a one-to-one basis as opposed to the use of one medium in a group setting [17].

The effectiveness of the applied educational program was clearly observed through the results displayed in **Figure 2** below. The levels of overall total postoperative self-efficacy and functional capacity of the patients were poor, medium, good and very good by 19.5%, 22%, 51.2% and 3% of the participants respectively at the post-intervention measurement, while at the follow-up measurement these grades were scored by 25.7%, 40%, 31.4% and 2.9% of the patients respectively. P-value = 0.021 < 0.05 (CI 95%) indicates increase of total postoperative self-efficacy and functional capacity of the patients after the implementation of the intervention program. (**Table 5**)

Table 3. Distribution of patients according to differences in their early postoperative self-efficacy and functional capacity scores (case group and control group).

Items	Case (n = 41)	Control (n = 35)	SE	CI 95%		T	df	P
	Mean ± SD	Mean ± SD		Lower	Upper			
Self-efficacy	4.07 ± 2.59	3.46 ± 2.45	0.58	−0.54	1.78	1.06	74	0.293
Functional capacity	4.78 ± 3.11	3.89 ± 2.89	0.69	−0.49	2.28	1.29	74	0.201

Table 4. Differences in late postoperative self-efficacy and functional capacity score grades between case group and control group.

Items	Groups			
	Case (n=41)		Control (n=35)	
	N	%	N	%
Postoperative self-efficacy				
Poor (0 - 24%)	6	14.6	20	57.1
Average (25% - 49%)	13	31.7	3	8.6
Good (50% - 75%)	13	31.7	9	25.7
Very good (76% - 100%)	9	22.0	3	8.6
Total	41	100.0	35	100.0
Postoperative functional capacity				
Poor (0 - 24%)	8	19.5	10	28.6
Average (25% - 49%)	11	26.8	12	34.3
Good (50% - 75%)	17	41.5	10	28.6
Very good (76% - 100%)	5	12.2	3	8.6
Total	41	100.0	35	100.0

Table 5. Distribution of patients according to differences in their late postoperative self-efficacy and functional capacity measurement (post-intervention group and control group).

Items	Post (n = 41)	Control (n = 35)	SE	CI 95%		T	df	P
	Mean ± SD	Mean ± SD		Lower	Upper			
Self-efficacy	4.73 ± 2.36	2.91 ± 2.44	0.55	0.72	2.92	3.30	74	0.002
Functional capacity	4.46 ± 2.73	4.00 ± 3.05	0.66	−0.86	1.78	0.70	74	0.487

Data analysis revealed that the study group had benefited from the educational program through the improvement in the self-efficacy measurement during the study period. When the scoring of self-efficacy measurements was used (**Figure 2**), the data revealed highly significant differences between study and control group for CABG patients, during the period of follow-up ($p \leq 0.001$).

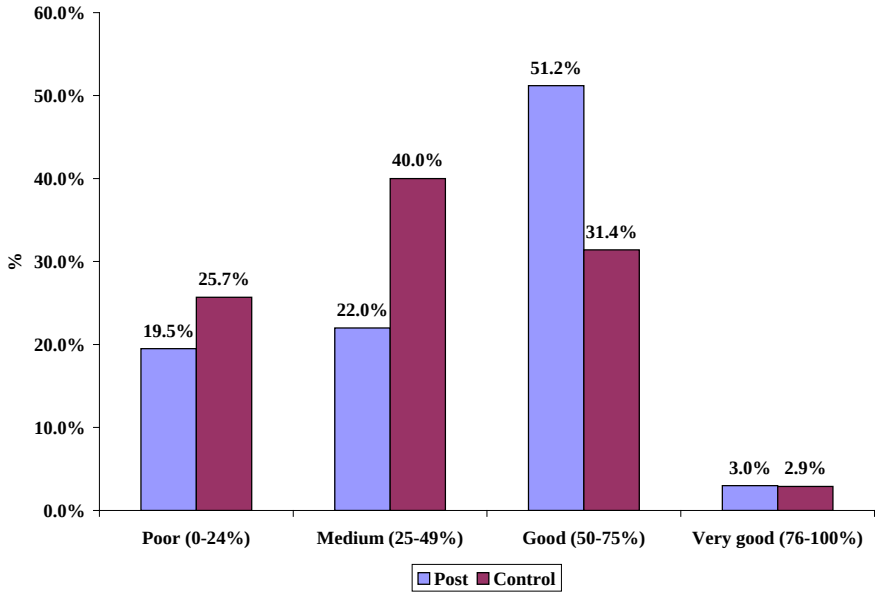

Figure 1. Distribution of patients according to differences in their total post-operative self-efficacy and functional capacity regarding CAD—case and control group. P-value = 0.021 < 0.05 significant difference.

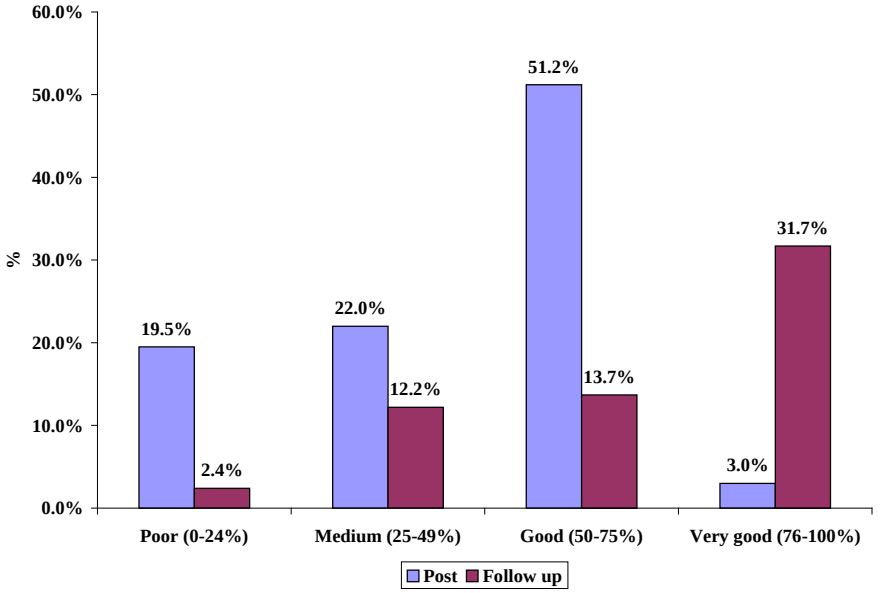

Figure 2. The CABG surgery patients' differences in the score grades of their self-efficacy and functional capacity in the early post-operative test compared to the late (follow up) postoperative test, p-value = 0.001.

These results indicated improvement of the self-efficacy measurement for both the study and the control groups, but the nursing educational program played more vital and essential part in such improvement.

When the scoring of self-efficacy measurements was used (**Figure 2**), the data revealed highly significant differences between the intervention group and the control group for CABG patients during the period of follow-up (p-value ≤

0.001). High determined for both study and control groups (p-value ≤ 0.001). These results indicated improvement of the self-efficacy measurement for both the study and the control groups but the nursing education program which was applied played more vital and essential part in such improvement.

4. Conclusion

Conclusion: Our study revealed marked improvement in health status of the intervention group, with high indices of self-efficacy and functional capacity.

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Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this manuscript.

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