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THE EFFECT OF OBESITY ON CARDIAC REHABILITATION IN PATIENTS WHO HAVE UNDERGONE CORONARY ARTERY BYPASS GRAFT SURGERY (CABG) AT NATIONAL HOSPITAL OF SRI LANKA (NHSL)

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ABSTRACT

Coronary artery disease (CAD) is a most prevalent non-communicable disease in Sri Lank. Coronary Artery Bypass Graft Surgery (CABG) is a main revascularization procedure in CAD. Cardiac rehabilitation is a significant component of post-operative management of CABG. Obesity is considered as a modifiable risk factor for CAD. This was a prospective analytical study conducted using 100 patients from both genders between 40-70 years after CABG surgery from the cardiac rehabilitation program. Data collection was conducted on the first day and the final day of cardiac rehabilitation Phase II (CRP II).There were 33% obese and 67% non-obese. Both groups demonstrated a statistically significant improvement (P <0.0001) after CRPII. But a statistically significant difference (P= 0.02) was founded only in the improvement of cardiovascular endurance in the non-obese group compared to the obese group. So non-obese patients showed a better improvement in cardiovascular endurance compared to the obese patients after CRPII.

1. Introduction

Coronary artery disease (CAD) is considered as a noticeable non-communicable disease in the world (WHO, world health statistics, 2015).World Health Organization has confirmed that CAD is a leading cause of the deaths in the world. Further CAD accounts for 31% of all deaths worldwide. Over three quarters of global deaths due to CAD take place in low and middle-income countries. Sixteen (16) million of the world deaths among people under the age of 70 are occurred due to non-communicable diseases. And eighty two percent (82%) of them are in low and middle income countries. Thirty seven percent from those deaths are caused by CAD (WHO, world health statistics, 2015).

Coronary artery disease is a leading cause of deaths in Sri Lanka (Mendis S. 1998; Mendis S, Ekanayake EM, 1994). The average mortality rate in Sri Lanka due to CAD is 524 deaths per 100,000 per year which is higher than in many high-income countries (Abeywardena MY, Dec 2003). According to autopsy studies, CAD accounted for 34% of deaths in Sri Lanka (Fernando R, Jul 2003). In comparison, CAD accounts for only 17% of deaths in United Kingdom and United State (American Heart Association, 2011). The rate of hospitalization in Sri Lanka between years 2005 to 2010 is increased because of three diseases while heart diseases including CAD accounted for 29% among these three diseases (Premaratne R, Amarasinghe A, Wickremasinghe AR, 2010). The prevalence of CAD in Sri Lanka was 9.3% in year 2009 whereas male-7.2% and female-11.3%) (Katulanda, P et al, 2010).

Coronary Artery Bypass Graft (CABG) surgery is an open heart surgery. Coronary Artery Bypass Graft Surgery is considered as one of the major revascularization procedures for CAD to relieve the obstructions in the coronary arteries.

Cardiac rehabilitation is considered as a major component of post-operative management after CABG surgery. According to literature, 15-50% patients participate in cardiac rehabilitation after CABG surgery with or without a referral from a physician, in south Asian region (Grace et al., 2007). Cardiac rehabilitation is a multiphasic program (Stuart Porter, 2008). There are three phases in cardiac rehabilitation. They are Phase 1 (CRPI), Phase 2 (CRPII) and Phase 3 (CRPIII). Phase 1 is in-patient program which starts just after the revascularization procedure in the hospital. Phase 2 (CRPII) – is an ambulatory outpatient rehabilitation program and Phase 3 (CRPIII) is the maintenance phase.

Phase 2 (CRPII) of the cardiac rehabilitation program is an institutional based phase and patient has to come to outpatient department. Phase 2/ CRPII in National Hospital Sri Lanka, is a one-month program where patients 03 months after CABG surgery visits OPD twice a week for one month. Patients are advised to continue the same exercises at home and record the details. There are four main components in this phase. Those include assessment, education, exercise therapy (warm up exercises, cardiovascular exercises and cool down and relaxation), and; counseling and behavioral interventions.

Obesity has become a major modifiable risk factor for health globally. According to WHO, obesity and overweight are defined as

"abnormal or excessive fat accumulation that presents a risk to health". According to a recent study, prevalence of overweight, obesity and central obesity in Sri Lanka are 25.2 %, 9.2% and 26.2% respectively (Katulanda P et al, 2011).

The obesity affects in cardiac rehabilitation in many ways. Cardiac rehabilitation revealed a better improvement in non-obese subjects than obese subjects (Kabir A1 et.al (2012). Dissimilar result was shown by another study as exercise capacity shows a better improvement in obese than non obese after cardiac rehabilitation (Lavie CJ and Milani RV 1999). The reason for contradictory data may be obese subjects required a better attention and follow up during the cardiac rehabilitation than non-obese people (Binder RK et.al, 2011). Yet other studies revealed that there is no difference between obese and non-obese people considering the effect of cardiac rehabilitation (Ghashghaei et.al 2012). Some studies indicated functional capacity and lipid profiles were significantly improved in both non obese and obese individuals and no significant difference were between non-obese male and female in response to CRPII programs (Sadeghi Met.al 2012). Hence obesity effect in various manner in cardiac rehabilitation in different ethnical backgrounds.
However no studies found in Sri Lanka to analyze the effect of obesity in Sri Lanka were found up to our knowledge. Moreover the finding of the impact of obesity in CRPII will help to design CRPII more effectively according to obesity.

2. Methodology

The study was conducted at the Cardiac Rehabilitation Unit, National Hospital of Sri Lanka. It was a prospective analytical study with 100 patients. Patients were selected according to convenient sampling method. Inclusion criteria were both men and women who are between 40-70 years from the patients who participates existing CRPII in Cardiology Unit NHSL at the first day of CRPII. Patients with resting blood pressure more than 200mmHg or resting diastolic blood pressure more than 100mm Hg at the time of examination, Patients who had unstable Cardiovascular system, Patients who has any other cardio respiratory/musculoskeletal/neurological disorders, Patients who are diagnosed with psychiatric illnesses and Patients who are any physical or psychological stress at the time of assessment were excluded from the study. There were several data collection tool. They were measuring tape, weighing scale, socio demographic questionnaire, Six-minute walk test (6MWT),Borg scale (BS), Anxiety and depression scale (HAD), Quality of life questionnaire cardiac version (QOL).

Methods of data collection

Study population was the patients who attended in the very first day of the cardiac rehabilitation program (CRPII) after 03 month of CABG surgery in NHSL. From them patient who fulfilled inclusion criteria were taken as the sample in this study after obtaining informed written consent. Data collection was done in two times as pre data collection and post data collection. In the pre data collection was done first day of CRPII. Firstly socio demographical data was assessed using interviewer administered questioner. Then Body mass index and waist to hip ratio was assessed using Measuring tape and weighing scale. Then quality of life and psychological status were assessed using the QLI and HAD scale. Next the physical assessment was done 10 minutes after filling interviewer questionnaire. Physical assessment was evaluated using 6MWT (to measure cardio vascular endurance), BS (to measure fatigue level). After these procedures the data collection 1(pre data collection) was completed.

Then the patients have participated in CRPII for a month period twice a week on every Saturday and Wednesday at Cardiac Rehabilitation Unit of National Hospital. Patients are encouraged to continue the same exercise program with warm up exercises, cardiovascular exercises and cool down and relaxation at the home too. In data collection 2 (Post data collection) were conducted at the last day of CRPII. The data was collected as the same procedure as data collection I.

Data analysis:

The patient was categorized in to obese or non-obese according to body mass index and waist to hip ratio The patients were categorized in to 2 groups (non-obese and obese) according to their body mass index (Non obese: body mass index < 28, Obese: body mass index > 28) (Ministry of Health Sri Lanka, 2013). For men more than 0.88 was considered as obese and for woman more than 0.81 was considered as obese (Snehalatha C, et al, 2003).The data was analyzed using Minitab version 14.The mean of the difference of (pre and post CRPII) of findings of Six minute walk test, Borg scale, Hospital anxiety /depression scale and quality of life index in non-obese and obese groups were compared using paired t test. P value of < 0.005 was considered as a statistically significant difference.

3. Results and Discussion

3.1 Results

3.1.1 Socio demographic data

- **Age distribution**

The mean age of the sample is 58.33 +7.45 years. Mean age of male is 58.61 +7.34 years and mean age of female is 58.58 +7.53 years.

- **Gender distribution**

From whole population 81% were male and 9% were female. In obese group 60.60% were male and 39.04 were female. In non-obese group 91.04 % were male and 8.96 were female

- **prevalence of obesity**

There were 33 obese patients and 67 non-obese patients. The gender and age distribution of the study runs closely in both obese and non-obese groups. However there were high male and less female percentages in non-obese group (male 91.04% and female 8.96%).

Figure 01 demonstrates the prevalence of obesity among the population

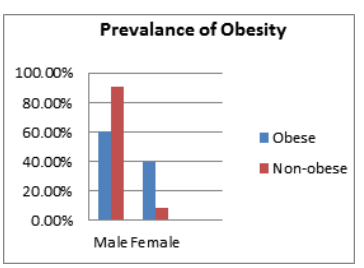

Figure 01: Prevalence of obesity among the study population

- **Level of education**

We categorized the educational levels in to following categories, which are A (grade 5 and below), B (grade 6-10) and C (G. C.E O/L – A/L and above). When considering about the level of education, level C was the most distributed educational level (42.4 % in obese and 56.7% in non-obese) and level A was the least distributed educational level in the study (21.2% in obese and 16.4% in non-obese)

Monthly income

Four monthly income levels were categorized as A (Less than Rs.20, 000. 00), B (Rs >20,000.00 to Rs.50, 000.00), C (Rs >50,000.00 to RS.100, 000.00), D (More than Rs.100, 000.00).When considering about the level of income level B was the most distributed income level (48.5% in obese and 52.2 % in obese and level A was the least distributed income level in both groups (18.2 in obese and 20.9 % in obese).

3.1.2 Effectiveness of CRPII among obese group

The effectiveness of CRPII among obese group was compared using

two sample t tests. The mean values of pre and post results of Six-minute walk test, Borg scale, Hospital anxiety & depression scale and Quality of life index were compared. All the above test values improved significantly after cardiac rehabilitation.

Table 2: Effectiveness of CRPII among obese group

	Pre-test(Mean+ SD)	Post-test(Mean+ SD)	P value
Six-minute walk test	356.4+58.7	437.3+68.2	<0.0001
Quality of life index	18.58+0.75	19.50+1.0	<0.0001
Hospital anxiety & depression scale	13.46+4.15	7.82+3.25	<0.0001
Borg scale	7.52+1.62	4.61+1.30	<0.0001

3.1.2 Effectiveness of CRPII among non- obese group

The effectiveness of CRPII among non-obese group was compared using two sample t test. The mean values of pre and post results of Six-minute walk test, Borg scale, Hospital anxiety & depression scale and Quality of life index were compared. All the above test values improved significantly after cardiac rehabilitation

Table 03: Effectiveness of CRPII among non-obese group

	Pre-test(Mean+ SD)	Post-test(Mean+ SD)	P value
Six-minute walk test	373 +62.6	470+66.3	<0.0001
Quality of life score	18.6 +0.86	19.6+1.3	<0.0001
Hospital anxiety & depression scale	12.96 + 4.15	7.19+3.40	<0.0001
Borg scale	6.79+1.83	3.58+1.57	<0.0001

3.1.2 Comparison of pre and post test results of obese group with pre and post test results of non-obese group

The difference on pre and post test results of obese group with pre and post test results of non-obese group were compared. The improvement of Six-minute walk test, Borg scale, Hospital anxiety & depression scale and Quality of life index in obese with non-obese group were compared using paired t test. According to table 4 the mean values of QOL, HADS were improved in non-obese group than obese group, but the difference is insignificant. Yet the value of Six minute walks test had a significant improvement in non-obese group than obese group.

Table 04: Comparison of pre and post test results of obese group with pre and post test results of non-obese group

	Differences in obese(Mean+ SD)	Differences in Non obese(Mean+ SD)	P-value
Six-minute walk test	80.9+26.7	97.0+33.4	0.02
Quality of life score	0.93+0.78	1.03+0.93	0.60
Hospital anxiety & depression scale	5.64+2.67	5.76+3.23	0.85
Borg scale	2.91+1.55	3.21+1.69	0.39

3.1 Discussion

3.2.1 Distribution of socio demographic status among study population:

The results of this study showed a comparatively similar distribution of socio-demographic status among both obese and non-obese group. Similar to the results of this study; Bjarnason-Wehrens et.al (2003) concluded by their cohort study that there was no clear evidence on the effect of socio-economical status of patients to their cardiac rehabilitation program. Some evidence suggests poor socio-economical data (income, education and transport) act as a barrier to cardiac rehabilitation (Shamila S et al, 2013).And people with poor socio-economical status leaves the cardiac rehabilitation without proper completion. So special attention is required on them (Kirsten M et al, 2008).

3.2.2 Obesity prevalence:

The prevalence of obesity in this study is 33%. Among the obese group males accounted 24.7% and 68.4% females has been recorded. The result is similar compared with the recent findings in Sri Lanka (Katulanda P et al, 2011) .That is 26.2% of all population is obese. When comparing the results of our study with the World health organization's recent findings, they said that 11% of men and 15% of female are obese from whole world population. That is comparing the prevalence of obesity among male with female of the world the percentage of female are more than the male population. However our study finding shows a higher value from world health statistics-2015.

3.2.3 Outcomes of cardiac rehabilitation:

Cardiac rehabilitation can be considered as an important and effective component of post-operative-management of CABG (Stuart Porter, 2008). In this study the outcomes of cardiac rehabilitation is assessed using several measures. Those are cardiovascular endurance using six-minute walk test & Borg scale, anxiety and depression using Hospital anxiety & depression scale and quality of life using quality of life questioner cardiac version. Then the improvement of outcomes of cardiac rehabilitation between obese and non-obese people after cardiac rehabilitation program was compared. Six-minute walk test, quality of life anxiety and depression scale and Borg scale values show highly significant (p value < 0.001) in both obese and non- obese groups. According to literature there are other contributing factors e.g. age, nutrients, history of infractions and living environment which affect improving cardiovascular endurance, anxiety/ depression and overall quality of life of patient who undergone coronary artery bypass grafting surgery other than Cardiac rehabilitation (Warener M ,2012).

According to Ciftçi C et.al, (2005) cardiac rehabilitation improves overall quality of life and functional capacity of the patients after CABG in both men and women. Similarly in our study cardiac rehabilitation improved overall quality of life and functional capacity after CABG in both men and women. There was a better improvement in anxiety and depression from cardiac rehabilitation. Similarly literature revealed that cardiac rehabilitation depressive symptoms were reduced among patients after CABG (Pinto DM et. al, 2013). Cardiac rehabilitation shows a positive impact on anxiety/depression and panic symptoms according to Pourafkari et.al, (2016). Sharif F et.al (2012) conducted a study on effect of cardiac rehabilitation on anxiety and depression after CABG; and concluded that the cardiac rehabilitation improves depression after CABG but not the anxiety. Our results go similar with depression but controversial with anxiety.

3.2.4 Comparison of outcomes of cardiac rehabilitation among obese and non-obese groups: Cardiovascular endurance:

Similar to results of this study; Lavie CJ and Milani RV (1996) revealed that there was a significant improvement in cardiovascular endurance in non-obese group than obese group. Contrast to that, Gunstad J et.al (2007) indicated that there was a less improvement in cardiovascular endurance in obese group comparing to non-obese group. Ghashghaei et.al (2012) and Sadeghi Met.al (2012) concluded that there was a significant improvement in cardiovascular endurance in both obese and non-obese group but there was not any significant difference among obese and non-obese group after CRP.

3.2.4.1 Quality of life:

Gunstad J et.al (2007) concluded that there was a less improvement is quality of life in obese group than non- obese as the results of his

study. But Hevey et.al (2003) highlighted that there was no any significant difference in improvement of quality of life among obese and non-obese.

3.2.4.2 Anxiety & depression:

Contrast to the results of this study; Hevey et.al (2003) suggests that there was no any significant difference improvement of anxiety and depression among obese and non-obese

4 Conclusion

Cardiac rehabilitation can be considered as one of contributing factor in patient's recovery after CABG.CRP II helps to improve cardiovascular endurance, fatigability, anxiety, depression and quality of life status in both obese and non-obese groups. But within this components cardio vascular endurance shows better improvement in non-obese than obese group. So obesity has an effect in improvement of cardiovascular endurance in CRPII.

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