# Effects of Cardiac Rehabilitation Program on Obese and Non-Obese Patients with Coronary Artery Disease

*Thesis*

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# تأثيربرنامج إعادة تأهيل مرضى القلب على مرضى قصور الشريان التاجي البدناء مقارنة بغير البدناء

## رسالة

توطئة للحصول على درجة الماجستير في أمراض القلب والأوعية الدموية


**مقدمة من**

**الطبيب/ عبده صالح علي الماوري**

بكالوريوس الطب والجراحة العامة


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# List of Abbreviations

| | |
|---|---|
| ACC | American College of Cardiology |
| ACE | Angiotensin converting enzyme |
| AHA | American Heart Association |
| AT | Adipose tissue |
| AT1 | Angiotensin receptor 1 |
| ATP III | Adult Treatment Panel III |
| b/m | Beat per minute |
| BMI | Body mass index |
| BP | Blood pressure |
| CABG | Coronary artery bypass grafting |
| CAD | Coronary artery disease |
| CHD | Coronary heart disease |
| CHO | Carbohydrates |
| cm | Centimeter |
| CR | Cardiac rehabilitation |
| CRP | Cardiac rehabilitation program |
| C-RP | C-reactive protein |
| CV | Cardiovascular |
| CVD | Cardiovascular disease |
| DBP | Diastolic blood pressure |
| DM | Diabetes mellitus |
| DXA | Dual energy X-ray absorptiometry |
| ECG | Electrocardiogram |
| ESC | European Society of Cardiology |
| FBS | Fasting blood sugar |
| FC | Functional capacity |
| FFA | Free fatty acids |
| g | Gram |
| GFR | Glomerular filtration rate |
| h | Hour |
| $HbA_{1c}$ | Glaciated haemoglobin |
| HDL-C | High–density lipoprotein cholesterol |
| HF | Heart failure |
| HR | Heart rate |

| | |
|---|---|
| HTN | Hypertension |
| IHD | Ischemic heart disease |
| IL | Interleukin |
| IR | Insulin resistance |
| JNC | Joint National Committee |
| kg | Kilogram |
| km | Kilometer |
| LDL-C | Low-density lipoprotein cholesterol |
| LOE | Level of evidence |
| LP(a) | Lipoprotein a |
| LV | Left ventricle |
| LVEDD | Left ventricular end diastolic dimension |
| LVEF | Left ventricular ejection fraction |
| LVESD | Left ventricular end systolic dimension |
| LVH | Left ventricular hypertrophy |
| $M^2$ | Squared meter |
| METs | Metabolic equivalents in exercise testing |
| mg | Milligram |
| MI | Myocardial infarction |
| min | Minuets |
| ml | Milliliter |
| mm | Millimeter |
| mmHg | Millimeter mercury |
| NCEP | National Cholesterol Education Program |
| NO | Nitric oxide |
| No. | Number |
| OSA | Obstructive sleep apnea |
| P.value | Probability value |
| PAI-1 | Plasminogen activator inhibitor-1 |
| PCI | Percutaneous Coronary Intervention |
| PDA | Peripheral artery disease |
| RVSP | Right ventricular systolic pressure |
| SBP | Systolic blood pressure |
| SCAD | Stable coronary artery disease |
| SCD | Sudden cardiac death |
| SD | Standard deviation |

| | |
|---|---|
| T2DM | Type 2 Diabetes Mellitus |
| TC | Total cholesterol |
| TF | Tissue factor |
| TG | Triglycerides |
| THR | Target heart rate |
| TNF | Tumor necrosis factor |
| VLDL | Very low-density lipoprotein |
| WC | Waist circumference |
| WHO | World Health Organization |
| WHR | Waist to hip ratio |

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# Abstract

**Introduction**: Obesity is strongly associated with coronary artery disease and known as an independent risk factor. So the aim of this study is to investigate the effects of cardiac rehabilitation program in obese and non-obese patients with coronary artery disease.

**Materials and Methods**: 60 patients with coronary artery disease participated in our study. At the beginning of study, body mass index, functional capacity, 12 leads surface ECG, lipid profiles and fasting blood sugar were evaluated and trans-thoracic echocardiography was done to assess left ventricular ejection fraction ,left ventricular end systolic and diastolic dimension. Then, these patients were divided into two groups, patients who had BMI $\geq$ 30 kg/ $m^2$ were known as obese and who had BMI < 30 kg/ $m^2$ were known as non-obese group. All of them completed the period of cardiac rehabilitation program, and three months later all risk factors were examined for the second time in each group. Data were analyzed with SPSS software version 21. For comparing the mean of outcomes, independent t-tests and paired t-tests were used.

**Results:** In comparison between both group (obese versus no-obese) at baseline, our study found functional capacity was significantly higher in non-obese patients than in obese patients, and LDL level was significantly higher in obese patients, while there was no significant difference between both groups regarding total cholesterol, TG, HDL, FBS, LVEF, LVESD and LV end diastolic dimension. In obese group, our study found that there was significant improvement BMI, SBP, DBP, functional capacity, total cholesterol, LDL cholesterol, HDL cholesterol, triglycerides, FBS at the end of CRP but there was no significant change in LVEF, LVESD, and LVEDD. In non-obese group, our study found that there was a significant improvement in BMI, functional capacity, total cholesterol, LDL cholesterol, HDL cholesterol, and triglycerides, FBS, LVEF and LVESD at the end of CRP but there was no significant change in SBP, DBP and LVEDD.

**Conclusion:** our study found that involvement of patients in cardiac rehabilitation program improve their risk factors, functional capacity, lipid profile and echocardiographic parameters and hence cardiac rehabilitation program should be implemented in routine management of patients with coronary artery disease.

**Key Words:** cardiac rehabilitation, coronary artery disease, obesity, risk factor.

# Introduction

Obesity is classified by body mass index (BMI) which is known as an indicator of total adiposity. In adults, it is defined as a BMI ≥30 kg/$m^2$ **(*Canoy D et al.,2007*).**

Obesity has significant adverse effects on cardiovascular disease (CVD) risk factors, including insulin resistance, blood pressure, plasma lipids, left ventricular hypertrophy, and functional capacity (FC) **(*Lavie J &Milani V., 2003*).**

Prevalence of obesity in patients with coronary artery disease (CAD) moves toward 40%. Noticeably overall 80% of patients that referred to cardiac rehabilitation program (CRP) were overweight and obese (***Gunstad J.et al.,2007***).

CRP is known as a way for enhancement and maintenance of cardiovascular health through individualized programs, designed to optimize physical, psychologic, social, vocational, and emotional status by improving coronary risk factors management **(*Eshah N & Bond A. 2009).***

Cardiac rehabilitation and exercise training have beneficial effects on CVD risk factors such as improving plasma lipids, insulin sensitivity, exercise capacity, and lowering mortality ***( Steki G.F. et al., 2010*** ).

Most studies have implied significant reductions in risks among active CAD patients compared to sedentary patients **(*Manzoni G.et al.2011*).**

# Aim of the Work

The aim of this study is to assess the effects of cardiac rehabilitation program in obese and Non-obese patients with coronary artery disease after total revascularization either by PCI or CABG.