

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

Thesis

*Submitted for partial fulfillment of Master Degree in
Cardiology*

Presented by

Abdo Saleh Ali Almaweri

M.B.B.Ch

Under Supervision of

Prof. Dr. Walaa Adel Abdel Halim

*Assistant Professor of Cardiology
Faculty of Medicine - Ain Shams University*

Dr. Tariq Rashed Mohammed

*Lecturer of cardiology
Faculty of Medicine - Ain Shams University*

Dr. Ahmed Mohammed ElMissiri

*Lecturer of cardiology
Faculty of Medicine - Ain Shams University*

Faculty of Medicine

Ain Shams University

2016

تأثير برنامج 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

تحت إشراف

الأستاذة الدكتورة / ولاء عادل عبدالحليم

أستاذ مساعد أمراض القلب

كلية الطب — جامعة عين شمس

الدكتور / طارق رشيد محمد

مدرس أمراض القلب

كلية الطب — جامعة عين شمس

الدكتور / أحمد محمد المسيري

مدرس أمراض القلب

كلية الطب — جامعة عين شمس

كلية الطب

جامعة عين شمس

٢٠١٦


بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

قالوا

سبحانك لا علم لنا
إلا ما علمتنا إنك أنت
العليم العظيم

صدق الله العظيم

سورة البقرة الآية: ٣٢



Acknowledgement

*First, I thank **God** for granting me the power to proceed and accomplish this work.*

*I would like to express my deepest gratitude to Prof. **Dr. Walaa Adel Abdel halim**, Assistant Professor of Cardiology, Faculty of Medicine - Ain Shams University, for her valuable supervision and encouragement throughout the accomplishment of this work.*

*I am very grateful to **Dr. Tariq Rashed Mohammed**, Lecturer of cardiology, Faculty of Medicine - Ain Shams University, for his great help throughout the course of this thesis , He offered me much of her time, effort, scientific support.*

*Words could never express my sincere thanks to **Dr. Ahmed Mohammed EI Missiri**, Lecturer of cardiology, Faculty of Medicine, Ain Shams University, for his kind supervision, suggestion of the idea of this work, put the research plane, encouragement and great help throughout the course of this study.*

Finally I would like to express my deepest gratitude for all my professors, colleagues, patients ,my parents, my wife and my children for whom I dedicate this work ,because without their support ,I wouldn't have reached here today .

List of Content

Subjects	Page
• List of Abbreviation.....	I
• List of Figures	IV
• List of Tables	VI
• Introduction.....	1
• Aim of the Study	3
• Review of Literature.....	
- Chapter 1: Obesity.....	4
- Chapter 2: Cardiac Rehabilitation.....	35
• patients And Methods	84
• Results.....	93
• Discussion	120
• Summary	135
• Conclusion	138
• Study Limitations	139
• Recommendations.....	140
• References.....	141
• Arabic Summary	-

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

✍ List of Abbreviations

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

List of Abbreviations

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

List of Figures

No.	Figure	Page
Figure (1)	Induction of insulin resistance and inflammation in obesity; effects on cardiovascular disease.	11
Figure (2)	Adipose tissue products work directly at the vessel wall and through the liver to modulate the atherogenic environment of the vessel wall. In obesity, the production of metabolites, cytokines, and hormones by adipose tissue is altered. In the case of visceral adipose tissue, these factors will have favored access to the liver through the portal circulation. At the liver, adipose tissue– derived factors influence the composition and level of circulating lipoproteins and the levels of systemic inflammatory and clotting system components.	16
Figure (3)	Mechanism of dyslipidemia in obesity	22
Figure (4)	Potential cardio protective effects of regular physical activity, especially aerobic endurance training	39
Figure (5)	Investigational algorithm outlining the principles for the diagnosis and management of cardiovascular disease (CVD) in diabetes mellitus (DM) patients with a primary diagnosis of DM or a primary diagnosis of CVD	74
Figure (6)	Therapeutic options to treat modifiable risk factors.	76
Figure (7)	Gender distribution among the study case	94
Figure (8)	Distribution of risk factors among study population.	95
Figure (9)	Effect of CRP on smoking in whole study cohort	98
Figure (10)	Comparison of clinical, laboratory and echocardiographic findings in the whole cohort.	101
Figure (11)	Continu.. Comparison of clinical, laboratory and echocardiographic findings in the whole cohort	102
Figure (12)	Difference of baseline data between study groups.	106
Figure (13)	Difference between obese and non-obese patients at the end of CRP	109
Figure (14)	Effects of CRP on different parameters in obese patients	112
Figure (15)	Effects of CRP on different parameters in non-obese patients.	116
Figure (16)	Comparison of pre-post CRP changes on different variables between obese and non-obese patients.	119

List of Tables

No.	Tables	Page
Table (1)	World health organization (WHO) classification of obesity	6
Table (2)	Abdominal obesity and heart disease: INTERHEART study	15
Table (3)	Criteria for metabolic syndrome definitions	24
Table (4)	Postmyocardial infarction depression clinical practice Guidelines	57
Table (5)	Problems of cardiac patients and partners related to sexual activity	59
Table (6)	Adult Treatment Panel III Goals for Patients with CHD and CHD equivalent.	62
Table (7)	Intervention strategies as a function of total cardiovascular risk and low density lipoprotein cholesterol level.	67
Table (8)	Distribution of the studied cases as regards demographic data.	94
Table (9)	Distribution of the risk factors among the all studied cases.	95
Table (10)	Baseline laboratory findings in the whole cohort.	96
Table (11)	Baseline echocardiographic findings in the whole cohort.	96
Table (12)	Comparison of laboratory and echocardiographic findings in whole cohort before and after CRP	98
Table (13)	Comparison of laboratory and echocardiographic findings in whole cohort before and after CRP.	100
Table (14)	Comparison of baseline clinical characteristics	104
Table (15)	Comparison of laboratory and echocardiographic findings at baseline	105
Table (16)	Comparison of clinical characteristics between study groups at end of CRP	107
Table (17)	Comparison of laboratory and echocardiographic data between study groups at the end of CRP	108
Table (118)	Comparison of clinical findings of obese patients before and after CRP	110
Table (19)	comparison of laboratory and echocardiographic data of obese patients before and after CRP	111
Table (20)	Comparison of clinical findings of non-obese patients before and after CRP	113
Table (21)	Comparison of laboratory and echocardiographic data of	115

✍ List of Tables

No.	Tables	Page
	non-obese patients before and after CRP	
Table (22)	Comparison of post-pre CRP changes of clinical variables between obese and non-obese patients	117
Table (23)	Comparison of post-pre CRP changes of laboratory and echocardiographic variables between obese and non-obese patients	118

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 ≥ 30 kg/ m² were known as obese and who had BMI < 30 kg/ m² 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/m² (*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.