Comparing Different Frequency Cardiac Rehabilitation Programs in Stable Ischemic Heart Disease Patients

Thesis

Submitted for the Partial Fulfillment of Master Degree in Cardiology

By

Remon Wadie Mossaad
M.B.CH.B

Supervised by

Prof. Dr. Mohammed Ayman Saleh
Professor of Cardiology
Faculty of Medicine - Ain Shams University

Ass.Prof.Dr.Ahmed Mohammed ElMissiri
Assistant Professor of Cardiology
Faculty of Medicine - Ain Shams University

Faculty of Medicine
Ain Shams University
2017

First thanks to **ALLAH** *to whom I relate any success in achieving any work in my life.*

I wish to express my deepest thanks, gratitude and appreciation to ***Prof. Dr. Mohammed Ayman Saleh,*** *Professor of Cardiology Faculty of Medicine - Ain Shams University for his meticulous supervision, kind guidance, valuable instructions and generous help.*

Special thanks are due to ***Ass. Prof. Dr. Ahmed Mohammed ElMissiri,*** *Assistant Professor of Cardiology Faculty of Medicine - Ain Shams University for his sincere efforts, fruitful encouragement.*

Remon Wadie Mossaad

List of Contents

Title	Page No.
List of Tables	i
List of Figures	iii
List of Abbreviations	v
Introduction	1
Aim of the work	3
Review of Literature	
▪ Cardiac Rehabilitation	4
▪ Exercise Prescription	18
Patients and Methods	28
Results	55
Master Table	82
Discussion	86
Study Limitations	95
Summary	96
Conclusions	100
Recommendations	101
References	102
Arabic Summary	

List of Tables

Table No.	Title	Page No.
Table (1):	Comparison between the 2 groups regarding demographic data.	56
Table (2):	Comparison between the 2 groups regarding Clinical data at baseline.	57
Table (3):	Comparison between the 2 groups regarding laboratory findings at baseline.	58
Table (4):	Comparison between the 2 groups regarding echocardiographic measurements at baseline.	59
Table (5):	Comparison between the 2 groups regarding clinical data and anthropometry at follow-up.	61
Table (6):	Comparison between the 2 groups regarding laboratory findings at follow-up.	63
Table (7):	Comparison between the 2 groups regarding echocardiographic measurements at follow-up.	64
Table (8):	Comparison between patients in group I (at baseline and follow-up) regarding clinical data and anthropometry.	70
Table (9):	Comparison between patients in group I (at baseline and follow-up) regarding laboratory findings.	72
Table (10):	Comparison between patients in group I (at baseline and follow-up) regarding echocardiographic measurements.	73
Table (11):	Comparison between patients in group II (at baseline and follow-up) regarding clinical data and anthropometry.	75
Table (12):	Comparison between patients in group II (at baseline and follow-up) regarding laboratory findings.	77

List of Tables **cont...**

Table No.	Title	Page No.
Table (13):	Comparison between patients in group II (at baseline and follow-up) regarding echocardiographic measurements.	78
Table (14):	Comparison between percentage of change due to CR program regarding clinical data and anthropometry between groups I and II.	80
Table (15):	Comparison between percentage of change due to CR program regarding laboratory findings between groups I and II.	81
Table (16):	Comparison between percentage of change due to CR program regarding echocardiographic measurements between groups I and II.	81

List of Figures

Fig. No.	Title	Page No.
Figure (1):	Burden of CVD in Egypt	4
Figure (2):	Colour Doppler echocardiography in the different apical views was used to assess the degree of mitral regurgitation via tracing regurgitant jet area as the mosaic colour flow within the LA, both as a relative ratio of MR jet / LA area	41
Figure (3):	Measuring PASP via tracing maximum velocity of tricuspid regurgitation jet (TR Vmax) by continuous wave Doppler across the tricuspid valve in the apical 4 chamber view	42
Figure (4):	Bar chart showing statistically significant difference between the number of dyslipidemic patients within the 2 groups	56
Figure (5):	Box and whisker showing statistically significant difference regarding the BMI measurements between the 2 groups in comparison after rehabilitation program.	64
Figure (6):	Bar chart showing a highly statistically significant difference regarding the CCS angina score between the 2 groups in comparison after rehabilitation program	65
Figure (7):	Bar chart showing statistically significant difference regarding the dyspnea NYHA class between the 2 groups in comparison after rehabilitation program	65

List of Figures **cont...**

Fig. No.	Title	Page No.
Figure (8):	Box and whisker showing statistically significant difference regarding serum cholesterol measurements between the 2 groups in comparison after rehabilitation program.	66
Figure (9):	Box and whisker showing statistically significant difference regarding serum LDL measurements between the 2 groups in comparison after rehabilitation program.	66
Figure (10):	Box and whisker showing statistically significant difference regarding serum HDL measurements between the 2 groups in comparison after rehabilitation program.	67
Figure (11):	Box and whisker showing statistically significant difference regarding serum TGDs measurements between the 2 groups in comparison after rehabilitation program.	67
Figure (12):	Box and whisker showing statistically significant difference regarding METs achieved between the 2 groups in comparison after rehabilitation program.	68

List of Abbreviations

Abb.	Full term
AACVPR	*American association of cardiovascular and pulmonary rehabilitation*
ACS	*acute coronary syndrome*
ADA	*American Diabetes Association*
AHA	*American Heart Association*
AMI	*Acute myocardial infarction*
BACPR	*British Association for Cardiac Prevention and Rehabilitation*
BMI	*Body mass index*
BP	*Blood pressure*
CACR	*Canadian Association of Cardiac Rehabilitation*
CAD	*Coronary artery disease*
CCS	*Canadian Cardiovascular Society*
CHD	*Coronary heart disease*
CHF	*Congestive heart failure*
Chol	*Cholesterol level*
CR	*Cardiac rehabilitation*
CRP	*Cardiac rehabilitation program*
CVD	*Cardiovascular disease*
CVDPR	*Cardiovascular disease prevention and rehabilitation*
DBP	*Diastolic blood pressure*
EACPR	*European Association for Cardiovascular Prevention and Rehabilitation*
ECG	*Electrocardiography*
EF	*Ejection fraction*
ESC	*European Society Cardiology*
FBS	*Fasting blood sugar*
HBA1C	*Glycosylated hemoglobin*
HCF	*High contact frequency*

List of Abbreviations **cont...**

Abb.	Full term
HDL	*High density lipoprotein*
HR	*Heart rate*
HRmax	*Maximal heart rate*
HRrest	*Resting heart rate*
IHD	*Ischemic heart disease*
JA	*Jet area*
JBS	*Joint British Societies for the prevention of cardiovascular disease*
LA	*Left atrium*
LCF	*Low contact frequency*
LDL	*Low density lipoprotein*
LV	*Left ventricular*
LVEF	*Left ventricular ejection fraction*
MET	*Metabolic equivalent*
MHR	*Maximal heart rate*
MHz	*Mega Hertz*
MI	*Myocardial infarction*
MR	*Mitral regurgitation*
NHP	*Nottingham health profile questionnaire*
NSTEMI	*Non-ST elevation myocardial infarction*
NYHA	*New York Heart Association*
QOL	*Quality of life*
PASP	*Pulmonary artery systolic pressure*
PCI	*Percutaneous coronary intervention*
PTCA	*Percutaneous transluminal coronary angioplasty*
RBS	*Random blood sugar*
S/S	*Symptoms and signs*
SBP	*Systolic blood pressure*
SIGN	*Scottish Intercollegiate Guideline Network*

List of Abbreviations **cont...**

Abb.	Full term
SOB	*Shortness of breath*
SPSS	*Statistical package for social science*
STEMI	*ST elevation myocardial infarction*
TC	*Total cholesterol*
TG	*Triglycerides*
TGD	*Serum triglycerides*
THR	*Target heart rate*
TR	*Tricuspid regurgitation*
VO2peak	*Maximal oxygen uptake*
WHO	*World Health Organisation*

Abstract

This study showed the favorable effect of CRP on lipid profile (including TC, TG, HDL, and LDL) of patients with CVD, we suggest that for achieving the most favorable impact on lipid levels in patients with CVD, a multifactorial CRP that include exercise training, dietary education, and psychological support and counseling should also include educational sessions on the importance of pharmacological as well as nonpharmacological treatments of serum lipids

From a public health perspective, it is essential to emphasize that overweight / obese individuals with risk factors or with established type 2 diabetes and CVD can reap important cardio-metabolic benefits from physical activity, cardiac rehabilitation and healthy eating regardless of changes in adiposity. Thus, overweight/obese individuals considered at increased risk for CVD and type 2 diabetes due to sedentary lifestyle, poor diet, and a high BMI should be encouraged to engage in regular physical activity and consume a more nutrient-dense diet, regardless of whether the healthier lifestyle leads to weight loss.

Higher frequency and intensity CR programs have more favourable effect than lower ones in context of more improvement in anthropometric measures, effort tolerance, symptomatology, laboratory and echocardiographic measurements so they should be encouraged more and indidually tailored according to each single patient's circumstances.

Key words: *Ischemic heart disease - Maximal heart rate- Myocardial infarction- Metabolic equivalent*

Introduction

Percutaneous coronary intervention (PCI) is an effective and established treatment for clinically significant coronary artery disease (CAD) ***(Eagle et al., 2004; Bravata et al., 2007).***

The term cardiac rehabilitation (CR) refers to coordinated, multifaceted interventions designed to optimize a cardiac patient's physical, psychological, and social functioning, in addition to stabilizing, slowing, or even reversing the progression of the underlying atherosclerotic processes, thereby reducing morbidity and mortality ***(Taylor et al., 2004).***

Recent meta-analyses of randomized studies on the effects of exercise-based CR in patients with CAD have demonstrated a statistically significant reduction in total and cardiac mortality ranging from 20% to 32% in patients undergoing CR compared with those receiving standard medical care ***(Geol et al., 2011; Taylor et al., 2006).***

Recently, the widespread use of primary PCI has enabled early ambulation of patients with acute myocardial infarction (AMI) and acute coronary syndrome (ACS) by reducing acute phase complications, resulting in minimal physical deconditioning. As a result, many AMI patients leave a hospital early without participating in a recovery phase (phase II) out-patient CR program ***(Kamakura et al., 2011).***

Recommended exercise training frequency Similar to exercise intensity, should also be set individually. In addition to initial fitness of the patient, factors that should be taken into account include physical activity related to the profession of the patient and his or her daily life activity ***(Oldridge et al., 1988; Sesso et al., 2000).***

Most early trials of exercise-based cardiac rehabilitation consisted of three exercise sessions per week for eight weeks or longer.

Twice weekly exercise has since been found to increase maximum physical working capacity to the same extent as thrice weekly exercise ***(Jolliffe et al., 2000; Wenger et al., 1995).***

Aim of the Work

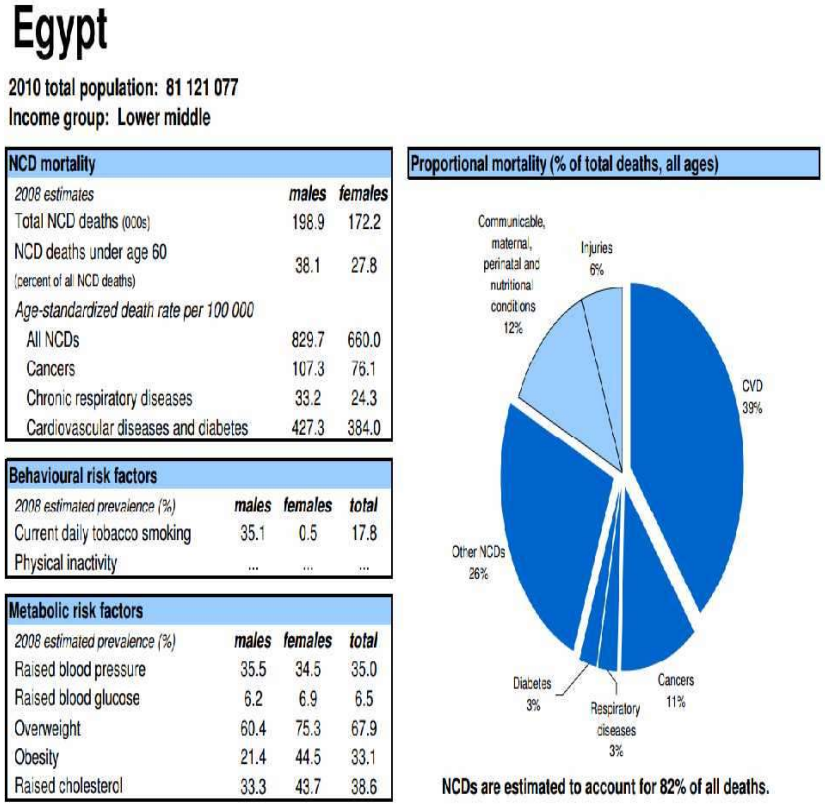
The aim of this study was to compare the effects of short term (6 weeks) twice weekly cardiac rehabilitation program " high contact frequency (HCF) group " to the once weekly (12 weeks) " low contact frequency (LCF) " program in patients with stable coronary artery disease (CAD) after total revascularization by PCI regarding symptomatology, effort tolerance, laboratory changes, anthropometric parameters and echocardiographic measurements.

Chapter 1:

Cardiac Rehabilitation

Background

Cardiovascular disease **(CVD)** is the most common cause of mortality and morbidity in the world, accounting for **30%** of all-cause mortality **(Mathers CD, et al. 2011)**. In Egypt, CVD accounts for **39%** of all-cause mortality for non-communicable diseases in all ages **(Alwan A et al. 2010)**



Egypt

2010 total population: 81 121 077
Income group: Lower middle

NCD mortality		
2008 estimates	***males***	***females***
Total NCD deaths (000s)	198.9	172.2
NCD deaths under age 60 (percent of all NCD deaths)	38.1	27.8
Age-standardized death rate per 100 000		
All NCDs	829.7	660.0
Cancers	107.3	76.1
Chronic respiratory diseases	33.2	24.3
Cardiovascular diseases and diabetes	427.3	384.0

Behavioural risk factors			
2008 estimated prevalence (%)	***males***	***females***	***total***
Current daily tobacco smoking	35.1	0.5	17.8
Physical inactivity	...	...	...

Metabolic risk factors			
2008 estimated prevalence (%)	***males***	***females***	***total***
Raised blood pressure	35.5	34.5	35.0
Raised blood glucose	6.2	6.9	6.5
Overweight	60.4	75.3	67.9
Obesity	21.4	44.5	33.1
Raised cholesterol	33.3	43.7	38.6

Proportional mortality (% of total deaths, all ages)

NCDs are estimated to account for 82% of all deaths.

Figure (1): Burden of CVD in Egypt ***(WHO, 2010).***