Prevalence of Metabolic Syndrome in Patients with Acute Myocardial Infarction in Correlation to Myocardial Infarction Complications

Thesis
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Abstract

The metabolic syndrome is characterized with the clustering of closely associated interdependent atherosclerotic risk factors, including insulin resistance, high blood pressure, low level of high-density lipoprotein (HDL) cholesterol, elevated triglyceride level, increased plasma glucose concentration, and abdominal obesity. The prevalence of the association between acute myocardial infarction (AMI) and metabolic syndrome is remarkably high. The metabolic syndrome is associated with a 2-fold increase in cardiovascular outcomes and 1.5-fold increase in all-cause mortality. Metabolic syndrome was associated with larger infarct size and increased risk of in-hospital complications, including acute renal failure.
Thus, the present study was designed to estimate the prevalence of metabolic syndrome in patients with acute MI and its impact on complications of MI and hospital outcomes.

Key Words: Metabolic Syndrome, Myocardial Infarction Correlation

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List of Abbreviations

2D echo	Two-Dimensional Echocardiogram
AACE	American Association of Clinical Endocrinologists
Apo B	Apolipoprotein B
ACE	Angiotensin Converting Enzyme
ACS	Acute coronary syndrome
AF	Atrial fibrillation
ALT	Alanine transaminase
AMI	Acute myocardial infarction
AMP1	Adiponectin gene Polymorphisms
ARB	Angiotensin receptor blocker
ATP	Adult Treatment Panel
AV	Atrioventricular
B-blockers	Beta blockers
BMI	Body Mass Index
CABG	Coronary artery bypass graft
CAD	Coronary artery disease
CAST	Cardiac Arrhythmia Suppression Trial
CETP	Cholesteryl ester transfer protein
CCU	Coronary care unit
CHD	Coronary Heart Disease
CHF	Congestive heart failure
CK	Creatine kinase
CMR	cardiac magnetic resonance imaging
COX	Cyclooxygenases
CPR	Cardiopulmonary resuscitation
CRP	C-Reactive Protein
CTN	cardiac troponin
DBP	Diastolic blood pressure
DM	Diabetes mellitus
ECG	Electrocardiogram
EGIR	European Group for Study of Insulin Resistance
GPI	Glycoproteins inhibitors

GTN	Glyceryl trinitrate
HDL	High density lipoproteins
H-FABP	Heart-type Fatty Acid-Binding Protein
HMG-CoA	3-hydroxy-3-methylglutaryl coenzyme A
HsCRP	High-sensitivity C-reactive protein
HTN	Hypertension
IABP	Intra-aortic balloon pump
ICH	intracranial hemorrhage
ICU	Intensive Care Unit
IDF	International Diabetes Federation
IHD	Ischemic heart disease
IL	Interleukin
INR	International normalized ratio
IR	Insulin resistance
IRA	Infarct related artery
IV	Intravenous
IVUS	Intravascular ultrasound
LAD	Left Anterior Descending
LBBB	Left Bundle Branch Block
LCX	Left Circumflex
LDL	Low Density Lipoproteins
LDL-P	Low Density Lipoproteins particle
LMWH	Low molecular weight heparin
LV	Left ventricle
LVEf	Left Ventricular ejection fraction
LVF	Left ventricle failure
MI	Myocardial infarction
MR	Mitral regurge
NCEP	National Cholesterol Education Program
NEFA	Non esterified fatty acid.
NSAIDS	Non steroidal anti inflammatory drugs
NSTEMI	Non ST segment elevation MI
PAI-1	plasminogen activator inhibitor-1

PCI	Percutaneous coronary intervention
PCWP	Pulmonary capillary wedge pressure
PDA	Posterior descending artery
PPARs	Peroxisome proliferators-activated receptors
PPAR-γ	Peroxisome proliferators-activated receptor- gamma
PTCA	Percutaneous transluminal coronary angioplasty
RA	Right atrium
RV	Right ventricular
RBBB	Right Bundle Branch Block
RVF	Right ventricular failure
RWMA	Regional wall motion abnormality
SBP	Systolic blood pressure
STEMI	ST segment elevation MI
SVR	Systemic vascular resistance
TG	Triglycerides
TIMI	Thrombolysis in myocardial infarction
TNF	Tumor necrosis factor
t-PA	Tissue plasminogen activator
TZDs	thiazolidinediones
UFH	Unfractionated heparin
UKPDS	United kingdom Prospective Diabetes Study
URL	Upper Reference Limit
U. S	United States
VF	Ventricular fibrillation
VPCs	ventricular premature complexes
VSR	Ventricular septal rupture
WC	waist circumference
WHO	World Health Organization

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INTRODUCTION

Metabolic syndrome is represented by a cluster of risk factors associated with insulin resistance syndrome. The literature reports important variations in prevalence of metabolic syndrome, depending on diagnostic criteria. At the present time there are more than five definitions for metabolic syndrome. The definition most frequently accepted in clinical practice was first described in 2001 and updated in 2005 by the National Cholesterol Education Program, Adult Panel III (NCEP APIII). This definition establishes that three or more of the following criteria should be met to diagnose metabolic syndrome: fasting (FBG) blood glucose ≥100 mg/dl, triglycerides (TG) ≥150 mg/dl, low high-density lipoprotein cholesterol (HDL-c) (<40 mg/dl in males, <50 mg/dl in females), hypertension ≥130/85 mmHg or under hypertension treatment, and abdominal obesity detected using waist circumference (WC) (>102 cm for males and >88 cm for females)[1].

The metabolic syndrome is associated with a 2-fold increase in cardiovascular outcomes and 1.5-fold increase in all-cause mortality[2].

The prevalence of MS in patient with AMI is high as shown by many studis (between 40%-50%)[3-5]. Risk factors of metabolic syndrome: hypertension, dyslipidemia, and obesity are thought to be the factors responsible for the increased morbidity in this group of patients[3].

Increased blood glucose level was also thought to affect the prognosis as increased morbidity and mortality in patients with diabetes following AMI is well-described[6-8]. Long term survival can be improved

via intensive insulin treatment among diabetics with elevated glucose on presentation[9].

In long-term follow-up, high blood glucose was associated with increased rates of death, recurrent myocardial infarction (MI), heart failure, decreased ejection fraction, and increased infarct size[10].

Among patients who have a history of AMI, metabolic syndrome was recently shown to be associated with a higher rate of all-cause death and the composite of cardiovascular death, nonfatal stroke, and nonfatal MI[11]. Metabolic syndrome has also been shown to be associated with a higher incidence of severe heart failure following AMI[4].

Abdominal obesity, insulin resistance, atherogenic dyslipidemia, elevated blood pressure, prothrombotic and proinflammatory states are the principal factors of this multifaceted syndrome. The prevalence of cardiovascular disease and cardiovascular disease related morbidity and mortality has been reported to be significantly higher in patients with MS[12]. Moreover, metabolic syndrome has been shown to be associated with poor in-hospital outcome in patients with acute myocardial infarction (AMI)[4].

AIM OF THE WORK

1. The prevalence of metabolic syndrome in patients with acute myocardial infarction.
2. The correlation between metabolic syndrome and myocardial infarction complications.

CHAPTER I

Acute Myocardial Infarction

Introduction:

Acute myocardial infarction (AMI), more commonly known as a heart attack, which is a medical condition that occurs when the blood supply to a part of the heart is interrupted most commonly due to plaque. Plaque is buildup in the coronary arteries, it is a material composed mainly of lipid, cholesterol and calcium[13-14]. The resulting ischemia diseases causes damage and potential death of heart muscle, atherosclerotic coronary heart disease, congestive heart failure and angina pectoris of acute chest pain and myocardial infarction[14-15].

There are two basic types of acute myocardial infarction:

1. Transmural: involves the whole thickness of the heart muscle and is usually a result of complete occlusion of the area's blood supply[16].

2. Subendocardial: involves small area in the subendocardial wall. The subendocardial area is farthest from the heart's blood supply and is more susceptible to this type of pathology[16].

Clinically, myocardial infarction is further subclassified into ST elevation MI versus non ST elevation MI based on ECG changes[17].

Aetiology:

Heart attack rates are higher in association with intense exertion, be it psychological stress or physical exertion, especially if the exertion is

more intense than the individual usually performs[18]. One observed mechanism for this phenomenon is the increased arterial pulse pressure stretching and relaxation of arteries with each heart beat which, as has been observed with intravascular ultrasound, increases mechanical "shear stress" on atheromas and the likelihood of plaque rupture[18].

There is an association of an increased incidence of a heart attack in the morning hours[19-21]. Some investigators have noticed that the ability of platelets to aggregate varies according to a circadian rhythm, although they have not proven causation[22]. Some investigators theorize that this increased incidence may be related to the circadian variation in cortisol production affecting the concentrations of various cytokines and other mediators of inflammation[23].

Risk factors:

Risk factors for myocardial infarction include: (see table 1)

- Age[24].
- Gender: At any given age men are more at risk than women, particularly before menopause[18].
- Diabetes mellitus (type I or II)[25].
- High blood pressure[26].
- Dyslipidemia/hypercholesterolemia (abnormal levels of lipoproteins in the blood), particularly high low-density lipoprotein, low high-density lipoprotein and high triglycerides[26].
- Tobacco smoking, including secondhand smoke[26].