

**THE RELATION BETWEEN
BETA-BLOCKERS
AND
BONE MINERAL DENSITY
AMONG ELDERLY
PATIENTS**

Thesis

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Finally , iam deeply appreciating all my colleagues at geriatric medicine department for their great support towards me.

List of Abbreviations

α : Alpha.

ACE : Angiotensin-converting enzyme.

Acute MI : Acute myocardial infarction.

ADL : Activities of daily living.

AF : Atrial fibrillation.

ANOVA : Analysis of variance.

APS : Antipsychotics.

AR : Aortic regurgitation.

ASH : Asymmetric septal hypertrophy.

AV conduction : Atrioventricular conduction.

AWS : Alcohol withdrawal syndrome.

β : Beta.

β -blockers : Beta blockers.

BD : Bone density.

BMD : Bone mineral density.

BMI : Body mass index.

CAD : Coronary heart disease.

Cbfa1 : Core-Binding Factor, Runt Domain, Alpha Subunit 1.

CCB : Calcium-channel blockers.

CGRP : Calcitonin gene-related peptide.

CHF : Congestive heart failure.

CIs : 95% confidence intervals.

CNS : Central nervous system.

COPD : Chronic obstructive pulmonary disease.

CT scan : Computerized tomography.

CTX : Serum C-terminal telopeptide of type I collagen.

DEXA : Dual x-ray absorptiometry.

DOPS : Danish osteoporosis prevention study.

fDPD : Urine free deoxypyridinoline.

GAD : Generalized anxiety disorder.

GDS : Geriatric depression scale.

GI : Gastrointestinal.

GIT : Gastrointestinal tract.

GMCSF : Granulocyte macrophage colony-stimulating factor.

HCM : Hypertrophic cardiomyopathy.

HDL : High density lipoprotein.

IADL : Instrumental activities of daily living.

IGF : Insulin-like growth factor.

IHSS : Idiopathic hypertrophic subaortic stenosis.

IL : Interleukin.

ISA : Intrinsic sympathomimetic activity.

LV : left ventricle.

MCSF1 : Membrane-bound isoform of CSF1 (macrophage colony-stimulating factor-1).

MMSE : Mini mental status examination.

MRI : Magnetic resonance imaging.

NIMH : The National Institute of Mental Health.

NKA : natural killer cell activity.

OCD : Obsessive-compulsive disorder.

OCIF : Osteoclastogenesis inhibitory factor.

ODF : Osteoclast differentiation factor.

OPGL : Osteoprotegerin ligand.

ORs : Crude odds ratio.

p.c. : personal computer.

PDGF : Platelet-Derived Growth Factor.

PGE2 : Prostaglandin E2.

PINP : Serum procollagen type-I-N-terminal propeptide.

PTH : Parathyroid hormone.

PTSD : Post traumatic stress disorder.

r : Pearson's correlation coefficient.

RANKL : Receptor Activator of NF- κ B ligand ; it is a member of the TNF family of cytokines.

SCD : Sudden cardiac death.

SD : Standard deviation.

SNS : Sympathetic nervous system.

SP : Substance P.

TGF : Transforming growth factor.

TNF : Tumor necrosis factor.

TRANCE : Tumor necrosis factor-related activation-induced cytokine.

US Food and Drug Administration : United states food and drug administration.

VIP : Vasoactive intestinal peptide.

WHO : World Health Organization.

WPW : Wolff-Parkinson-White Syndrome.

X² : Chi square test.

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Introduction

Osteoporosis is a metabolic bone disease characterized by low bone mass and microarchitectural deterioration of bone tissue, leading to enhanced bone fragility and increased fracture risk (**Heaney ,1998**).

World Health Organization (WHO) defines osteoporosis as bone density (BD) that is 2.5 standard deviation (SD) or more below the young adult mean value (T-score < -2.5), while individuals with BD between 1 and 2.5 SD below average (T-score = -1 to -2.5) are said to have osteopenia (**kanis et al.,2001**). Decreased BD imparts increased risk for bone fracture. Every 1 SD decrease in BD of the spine below the mean increases risk for new vertebral fracture by factor of 2.0 - 2.4 (**Stone et al.,2003**).

Dual x-ray absorptiometry (DEXA) is widely accepted as a standard technique for BMD measurements. The standard DEXA measurement consists of spine and hip imaging in anterior-posterior projection (**wasnich , 2001**).

All beta-blockers equally effective for hypertensive patients (**Prichard et al., 2001**), reduce symptoms in stable angina (**Papine et al.,1994**) , reduce mortality when

administered long term after myocardial infarction (**William et al.,2003**), control atrial fibrillation (**Komaroff,1999**), hypertrophic cardiomyopathy, prevention of Intraoperative Cardiac Events, in prophylaxis of Migraine (**Limmroth et al.,2001**) , used in essential tremor and pheochromocytoma (**Sendón et al., 2004**).

Beta blockers build stronger bones; a study done by (**Pasco et al.,2004**) suggests that taking beta-blockers associated with reduced risk of a broken bone.

A role for osteoblastic beta adreceptors in bone regulation is suggested by finding that beta blockers reduce the risk of fracture partly by increasing bone mineral density (**Henry et al.,2004**).

The central nervous system has been shown to regulate bone mass possibly by way of β_2 adrenoceptors on osteoblasts. Animal studies have suggested that beta adrenergic blockers can increase bone formation by inhibiting the catabolic effect of sympathetic nervous system on bone (**Levasseur et al.,2005**) .