Correlation of Serum Magnesium with Dyslipidemia in Non Diabetic Chronic kidney disease Patients

Thesis

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Abbreviations

2-MG	2-monoacylglycerol
ABCA1	adenosine triphosphate Binding Cassette A1
ACAT	acyl-CoA cholesterol acyltransferase
ACR	albumin-to-creatinine ratio
ApoA	Apolipoprotein A
ApoB-100	Apolipoprotein B-100
ApoB-48	Apolipoprotein B-48
apoC-III	Apolipoprotein C-III
ApoE	Apolipoprotein E
ARIC	atherosclerosis risk in communities
ATP	Adenosine triphosphate
BMI	Body mass index
CE	cholesteryl esters
CETP	cholesteryl ester transfer protein
Ch	cholesterol
CKD	Chronic kidney disease
CKDEPI	Chronic Kidney Disease Epidemiology Collaboration
CM	chylomicrons
COPII	coat protein II complex

COPII	Coatomere Protein II
CRF	chronic renal failure
CVD	cardiovascular disease
DGAT	acyl-CoA: diacylglycerol acyltransferase
DM	Diabetes mellitus
DNA	Deoxyribonucleic acid
EGF	epidermal growth factor
eGFR	estimated glomerular filtration rate
ER	endoplasmic reticulum
ESKD	end stage kidney disease
ESRD	End stage renal disease
FFA	free fatty acids
FGF-23	fibroblast growth factor 23
GFR	Glomerular filtration rate
GPx 1	glutathione peroxidase 1
Hb	Hemoglobin
HBsAg	hepatitis B virus surface antigen iPTH
HCV Ab	Hepatitis C virus antibody
HD	Hemodialysis
HDL	high-density lipoprotein
HDL-C	High density lipoprotein cholesterol

HMG-CoA reductase	hydroxyl-3-methylglutaryl-CoA reductase
hs-CRP	high-sensitivity C reactive protein
HTN	Hypertension
IDL	Intermediate-density lipoprotein
IHD	Ischemic heart disease
iPTH	Intact Parathyroid hormone
K+	potassium
KDIGO	Kidney Disease: Improving Global Outcomes
KDOQI	Kidney Disease Outcome Quality Initiative
KEEP	Kidney Early Evaluation Program
LCAT	Lecithin cholesterol acyltransferase
LDL	low density lipoproteins
LOX-1	lectin-like oxidized-LDL receptor 1
Lp(a)	Lipoprotein(a)
LP-a	lipoprotein (a)
LPL	lipoprotein lipase
LRP	Lipoprotein receptor-related proteins
MDRD	Modification of Diet in Renal Disease
Mg	magnesium
MHD	maintenance hemodialysis

MPO	myeloperoxidase
MTP	microsomal triglyceride transfer protein
Na+	sodium
NIDDK	National Institute of Diabetes and Digestive and Kidney Diseases
NKDEP	National Kidney Disease Education Program
NKF	National Kidney Foundation
n-LDL	Native low-density lipoproteins
NOS	nitric oxide synthase
OxLDLs	Oxidized low-density lipoproteins
PAF-AH	platelet-activating factor acetylhydrolase
PCR	protein-creatinine ratio
PD	peritoneal dialysis
Pl	phospholipids
PLTP	phospholipid transfer protein
PON	paraoxonase
Pr	proteins
PTH	Parathyroid hormone
RANKL	receptor activator of nuclear factor-kB ligand
RCT	reverse cholesterol transport
RDA	recommended daily allowance

S1P	sphingosine-1-phosphate
Scr	serum creatinine
SR- B1	scavenger receptor protein
T2DM	type 2 diabetes mellitus
TG	Triglycerides
TRPM	transient receptor potential channel melastatin
USA	United States of America
VLDL	Very-low-density lipoprotein
VSMCs	Vascular smooth muscle cells

Abstracts

In patients with CKD, dyslipidemia is a very common complication; disturbances in lipid metabolism are seen even at the early stages of CKD and subsequently progress with the deterioration of renal function.

Serum magnesium level may be elevated, normal or decreased in CKD patients. These alterations of magnesium balance increase with the advanced stages of CKD.

Data have shown a correlation between serum magnesium concentration and dyslipidemia in CKD patients by altering lipid metabolism and these alterations might contribute to the dramatic increase in cardiovascular events and mortality observed in the CKD population.

So, this study was conducted to assess the association between serum Mg level and lipid parameters in CKD patients with stage 4, stage 5 predialysis and stage 5 on hemodialysis.

Key words:

apoC-III: Apolipoprotein C-III, ATP: Adenosine triphosphate, COPII: coat protein II complex, COPII: Coatomere Protein II

INTRODUCTION

Patients with chronic kidney disease (CKD) often have risk factors of death from cardiovascular disease (CVD) including both traditional and non-traditional risk factors. Among the traditional risk factors, dyslipidemia is modifiable. Because TG-rich lipoproteins (VLDL and IDL) are increased in CKD, particularly in advanced stages ***(Shoji et al.., 2012).***

Also dialysis patients are at extraordinarily high risk for death; the annual mortality rate in United States dialysis patients was 200 death/1000 patient-years. Cardiac disease is the major cause of death, accounting for approximately 40 percent of all-cause mortality in patients receiving either hemodialysis or peritoneal dialysis ***(USRDS Annual Data Report 2011).***

Dyslipidemia is a very common complication of CKD; disturbances in lipoprotein metabolism are evident even at the early stages of CKD and usually follow a downhill course that parallels the deterioration in renal function. Recently published studies indicate that

dyslipidemia in these patients may actively participate in the pathogenesis of CVD as well as in the deterioration of renal function (***Tsimihodimos et al., 2011)***.

Dyslipidemia is highly prevalent in patients on maintenance hemodialysis (MHD), with predominance of the atherogenic triad, i.e. hypertriglyceridemia, elevated very low density lipoprotein (VLDL) and reduced high-density lipoprotein (HDL) ***(Pennell et al., 2006)*.**

Dyslipidemia has been identified to play a major role in the pathogenesis of vascular calcification, thus leading to atherosclerosis and cardiovascular disease ***(Massy and Drueke, 2012).***

Hypomagnesaemia seems to be involved in the pathogenesis of ischemic heart disease by altering lipoprotein composition and modifying post myocardial arrhythmia ***(Reinhart et al., 2011).***

Also there is significant hypomagnesaemia in CKD, which is strongly associated with atherogenic dyslipidemia. However, it is unknown whether this result is due to cause or result ***(Dey et al., 2015).***

There is positive correlation between serum Mg and serum LP-a, serum TG and serum HDL ***(Ansari et al., 2012).***

The association of dyslipidemia with serum Mg levels is not clearly understood, and in need of better understand **(Ansari et al., 2012)**

It still remains to be identified if dyslipidemia is directly associated with low serum magnesium levels or not ***(Reinhart et al., 2011).***