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Medicine

CORRELATION OF SERUM MAGNESIUM WITH LIPID PROFILE IN CKD PATIENTS ON MAINTENANCE HEMODIALYSIS

P Dhurvey — associate professor Department of Medicine, Hamidia Hospital and Gandhi Medical College, Bhopal

Rajaram Barde* — associate professor Department of Medicine, Hamidia Hospital and Gandhi Medical College, Bhopal *Corresponding Author

ABSTRACT **OBJECTIVE** The objective This study was performed to determine the correlation between serum magnesium (Mg) and lipid profile in patients on maintenance hemodialysis (MHD).**MATERIAL &METHOD** This hospital-based cross-sectional observational study was conducted at the Department of Medicine, Hamidia Hospital and Gandhi Medical College, Bhopal . Fifty patients with end-stage kidney disease on MHD treatment (29 males and 21 females) were studied. The mean frequency being two to three sessions /week of hemodialysis and each session lasted for four hours. After obtaining informed written consent, the general information of each patient was recorded on a proforma. After overnight fasting, blood samples was drawn for complete hemogram, blood urea , serum creatinine, lipid profile and serum Mg. **RESULTS** The serum magnesium was significantly correlated with diabetes in the study. (P < 0.001) The mean BMI in CKD patients was 18.37 ± 1.82 kg/m2 In the present study most of the CKD patients was in Stage 5. i.e. 43 cases. Total serum Cholesterol levels (>200 mg/dl) was found higher than normal in 15 cases and the mean was 174.1 ± 44.62. The mean Serum Triglyceride levels was 144.54 ± 58.09 mg/ dl in CKD patients and it correlated significantly with serum magnesium. The mean HDL-C levels was 39.26 ± 6.40 mg/dl were lower in CKD patients found. in 30 patients among 50 cases. Serum magnesium in CKD patients significantly correlated with Age (P< 0.001), systolic blood pressure(p<0.001), serum Triglyceride levels (P=0.02), The mean age of the studied CKD patients was 45.46 ± 15.60 years (Range 18-76).**CONCLUSION** Magnesium may affect the metabolism of TG and HDL in liver and kidneys. The association of dyslipidemia with serum Mg levels is not clearly understood, and further large clinical studies are needed to understand this association better.

KEYWORDS : ESRD,HEMODIALYSIS,Mg,HDL

INTRODUCTION:

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).[1] The risk factors for coronary heart disease (CHD) in the general population remain predictive of CHD among patients with chronic kidney disease (CKD) as well.[2] Cardiovascular disease is the leading cause of death in patients on MHD, accounting for almost 50% of the deaths.[3] The incidence of cardiac death in dialysis and transplant patients has been estimated to be four- to 20- folds higher than in the general population.[4] Hyperlipidemia has been incriminated as a risk factor for atherosclerotic vascular disease in dialyzed patients,[5] and is characterized by hypertriglyceridemia without cholesterol accumulation. Other dyslipidemias consist of decreased HDL cholesterol and elevated serum lipoprotein (LP-a); the low-density lipoprotein (LDL) cholesterol is usually not elevated. LP-a is an independent risk factor for cardiovascular disease.[6] A number of investigators have shown an increase in LPa in HD patients. Cressman et al have suggested that elevated levels of lipoprotein also correlate with cardiovascular mortality. Elevated serum magnesium (Mg) can be a problem in patients on MHD. Because kidneys are the major route of excretion of Mg from the body, increased serum Mg would be expected in patients with renal insufficiency.[7] Mg may be normal or decreased in dialysis patients, which is probably due to decreased dietary intake combined with impaired intestinal absorption. In patients on chronic HD, the major determinant of Mg balance is concentration of Mg in the dialysate. Thus, in patients with CKD, there may be reduced intake, impaired absorption from the intestine, use of diuretics and acidosis, which may result in decreased serum Mg, wher as reduced renal excretion may cause accumulation of Mg resulting in increased serum Mg levels in CKD patients. Bone concentration and total body Mg also appear to be increased.[8] Data have shown a correlation between dyslipidemia and serum Mg concentration in patients on HD. Therefore, we designed this study to assess the association between serum Mg and dyslipidemia in patients on end-stage renal disease.

PATIENTS AND METHODS:

Fifty patients with diagnosis of chronic kidney disease who are on routine dialysis for more than 3 months admitted to medicine department of Hamidia Hospital and GMC Bhopal were taken for the study. The patient excluded were patient having Acute renal failure, History of carotid surgery, Malignancy; Significant illness and patients on Magnesium therapy. Information was collected through prepared proforma for each patient and informed consent was obtained from each participant. The study protocol was approved by Institutional Ethics Committee of Gandhi medical college, Bhopal. History of smoking, DM, hypertension. Cardiovascular event, hyperlipidemia and use of statin and magnesium therapy were evaluated. A complete clinical examination was done with special reference to signs of CKD like pallor, puffiness of face etc. Blood pressure was measured with standard mercury sphygmomanometer and cuff, after the subject had rested in supine position for 15 minutes.. Hypertension was defined as blood pressure >140/90 mm Hg or if patient is already on antihypertensive drug. The morning urine sample and blood samples were collected after 8 hours of overnight fasting for complete hemogram, blood urea levels, serum creatinine levels, serum elecrolytes and lipid profile (Total cholesterol, Triglycerides and HDL) and serum magnesium. All the biochemical parameters were measured by standard laboratory technique.. Glomerular filtration rate (CFR) was calculated by Cockcroft Gault Equation. Dialysis was performed using DIALOG + DIALYSIS MACHINE with ultrafiltration rate from 500 to 800 mt/hr and temperature of diasylate to he maintained at 36.5 0 C. the diasylate solution used was as follows: Sodium 7900 mmol/L, Pottasium 2.00 mmol/L, Calcium 1.7Smrnol/L, Magnesium 0.75 mmol/L, Acetate 4.0 mmol/L and Chloride 86.0 mmol/L.

STATISTICAL METHODS:

for different parameters, mean and standard deviation were calculated.. The values of P which are < 0.05 were treated as significant. The qualitative variables (like sex, diabetes) were compared using x2 test. The statistical software SPSS Ver. 20 was used for statistical analysis. Univariate correlation analysis was used to confirm the significance of variables with serum magnesium levels.

RESULTS:

The study included 50 cases of CKD Patients on dialysis ; 29 male and 21 females. The mean age of the studied CKD patients was 45.46 ± 15.60 years (Range 18-76). Maximum patient in the study were in age group of 50 to 60 years. The mean haemoglobin was 8.86 ± 1.71gm/dl, mean blood urea was 149.9± 60.81 and mean creatinine was 6.88 ± 3.24 mg/dl. Diabetes Mellitus was the etiology of CKD in 28% patients. The serum magnesium was significantly correlated with diabetes in the study. (P < 0.001) The mean BMI in CKD patients was 18.37 ± 1.82 kg/m2 In the present study most of the CKD patients was in Stage 5. i.e. 43 cases. Total serum Cholesterol levels (>200 mg/dl) was found higher than normal in 15 cases and the mean was 174.1 ±

44.62. The mean Serum Triglyceride levels was 144.54 ± 58.09 mg/ dl in CKD patients and it correlated significantly with serum magnesium. The mean HDL-C levels was 39.26 ± 6.40 mg/dl were lower in CKD patients found. in 30 patients among 50 cases. Serum magnesium in CKD patients significantly correlated with Age (P< 0.001), systolic blood pressure(p<0.001), serum Triglyceride levels (P=0.02), FBS (p= 0.04).

Table-1genderwise Distribution Of Patients[total-50]

GENDER	TOTAL NO OF PTs	%
MALE	29	58%
FEMALE	21	42%

Table-2agewise Distribution Of Patients[total-50]

AGE[yr]	<20	21-30	31-40	41-50	51-60	>60
NO OF PTs	2	10	10	8	12	8

Table-3 Value Of S. Magnesium In Patients[total-50]

TOTAL	HYPOMAGNESAEMIA	NORMAL MAGNESIUM	HYPOMAGNESAEMIA
50	13	13	24

Table-4 Basic Clinical And Laboratory Characteristic Of Study

Parameters	MEAN ± SD
Age	45.46 ± 15.60
Sex(M/F)	29 / 21
Height	158.94 = 8.37
Weight	46.46 ± 5.07
BMI	18.37± 1.82
Diabetes (Y / N)	14 / 36
Pulse	74.5±14.80
Systolic blood pressure	162.24 ± 20.40
Diastolic blood pressure	98.08 + 12.45
Haemoglobin	8.861 1.71-
Fasting blood sugar	126.8 ± 74.24
Blood urea	149.9 ± 60.81
Serum creatinine	6.88 ± 3.24
GFR	10.95 ± 714
Number of dialysis	20.98 ±14.48
Serum albumin	3.01 ± 0.56
HDL	39.26 ± 6.40
Triglycerides	144.54 ±58.09
Total cholesterol	174.1 ± 44.62
Magnesium	2.35 ± 0.98

Table 5 Correlation With Respect To Serum Magnesium:

Parameters	P	R
Age	0.001 [s]	-0.523
Height	0.551	-0.086
Weight	0.363	-0.131
BMI	0.692	-0.057
Pulse	0:288	-0.153
Systolic blood pressure	0.001 [s]	-0.459
Diastolic blood pressure	0.166	-0.199
Haemoglobin	0.157	-0.203
Fasting blood sugar	0.040 [s]	-0.397
Blood urea	0.366	0.131
Serum cretinine	0.749	-0.046
GFR	0.904	0.018
Number of dialysis	0.394	-0.122
SERUM ALBUMIN	0.908	0.017
HDL	0.245	0.167
Triglycerides	0.029 [s]	-0.310
Total cholesterol	0.079	-0.250
Mean CIMT	0.001 [s]	-0.536

DISCUSSION:

In our study,the lipid profile was derranged in relation to serum magnesium. Magnesium showed positive correlation with HDL. ie (p= 0.14) but was not significant. The magnesium was significantly negatively correlated with serum triglycerides, with p value (p < 0.001). Magnesium was negatively correlated with total cholesterol levels p value (p = 0.096) which is not significant. Thus the lower serum magnesium level may be associated with dyslipidemia in patients on maintance hemodialysis the pattern of dyslipidemia in our study showed hypertriglyceridemia , increases cholesterol and decreased HDL. These lipid abnormalities are well recognised risk factors for atherosclerotic vascular disease in HD patients and thus there is strong need to focus on underlying causes and treatment of hyperlipidemia.

In J. Elementol,[9] No statistically significant effect of magnesium concentration on the content of lipids analysed in blood serum was found.. Magnesium content in blood serum was also positively correlated with HDL cholesterol in men of both groups. A positive effect on LDL-cholesterol was observed in the group of older women and that of younger men. However, also small negative correlation between Mg and LDL-cholesterol contents was obtained in older men. Similarly we found positive correlation of serum magnesium with HDL and negative correlation of magnesium with cholesterol and triglycerides. In Nasri, Baradaran et al 2004,[10]. Meaningful positive correlation (hut statistically non-significant) was obtained between Mg and total cholesterol. In Feng Liu et al,(11) 98 chronic HD patients were recruited,), high-density lipoprotein cholesterol (HDL-c) levels, carotid artery plaque (CAP), and carotid intima-media thickness (CIMT)' (all p<0.05, respectively) were higher in patients with low serum magnesium There was no significant correlation between Mg and low-density lipoprotein cholesterol (LDL-c), lipoprotein-a (LP-a), cholesterol (TC), serum triglycerides (TG) (p>0.05, respectively)in contrast we found significant correlation with triglycerides and non significant with cholesterol and HDL.In Ansari MR et al,[12] studied 50 patients and concludes that there was a significant positive correlation between serum Mg and serum lipoprotein-a $_{((P-a)}$ (r = 0.40. P c 0.007), serum HDL (r = 0.31, P < 0.01) and serum TG (r = 0.35, P < 0.005). There was no significant correlation between serum Mg and *serum* LDL-c and serum TC. The serum TG and LP-a levels were significantly increased while HDL-c was significantly lower in MHD patients. The serum TC, LDL-c and very lowdensity lipoprotein-c were not significantly elevated. In Robles Nit et al [13], twenty-five hemodialysis patients reported a positive significant correlation between serum magnesium levels and serum total cholesterol, and serum triglycerides.

CONCLUSION:

Magnesium may affect the metabolism of TG and HDL in liver and kidneys, and it may be involved in enzymes responsible for lipoprotein synthesis, but these factors are not clearly understood and further large studies are needed in this regard. Our results indicate that patients with CKD undergoing MHD show significant dyslipidemia. As a first means of controlling hyperlipidemia, body weight normalization, dietary modification, regular exercise and education about diet should be applied. The association of dyslipidemia with serum Mg levels is not clearly understood, and further large clinical studies are needed to understand this association better.

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