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Altered Metabolism of blood Manganese is associated with low level of Hemoglobin in the patients with Chronic Kidney Disease

Minyoung KIM[1], Sungjin CHUNG[1], Seok joon SHIN[2], Chul woo YANG[3], Yoon sik CHANG[1], *Eun sil KOH[1]

[1]Department of Internal Medicine, The Catholic University of Korea Yeouido St.Mary Hospital, Korea,South, [2]Department of Internal Medicine, The Catholic University of Korea Incheon St.Mary Hospital, Korea,South, [3]Department of Internal Medicine, The Catholic University of Korea Seoul St.Mary Hospital, Korea,South

Objectives : Manganese (Mn) has been highlighted in the aspect of relation with anemia or iron deficiency. Although anemia is a common manifestation of chronic kidney disease (CKD), it has barely been established whether blood Mn level have some effect on anemia in CKD patients or not. The purpose of this study is to analyze the relationship between blood Mn level and anemia in the patients with CKD.

Methods : This study was a cross-sectional study based on the pre-dialysis patients with CKD in single center. Total 334 patients, 20 years of age of older, were included from March 2014 to February 2016. Blood Mn level and serum markers regarding anemia, renal function and nutrition were measured and analyzed.

Results : The median value of blood Mn and estimated glomerular filtration rate (eGFR) were 8.30 (inter-quartile range: 5.27 to 11.63ug/L) and 34.35 (inter-quartile range: 12.50-82.07 ml/min/1.73m2). Univariate linear regression showed that blood Mn was correlated with age (ß=-0.49, p <0.001), smoking (ß=-1.588, p=0.009), HBP (ß=-1.470, p=0.006), serum TIBC (ß=0.025, p <0.001), serum transferrin (ß=0.029, p<0.001) and eGFR (ß=-0.036, p<0.001). However, serum iron (ß=0.001, p=0.880) and ferritin (ß=-0.001, p=0.210) were not determinants of blood Mn level. Multiple regression analysis after controlled for covariates, including gender, age, BMI, smoking, diabetes, hypertension, eGFR and serum ferritin showed that the beta coefficient of hemoglobin (Hb) was 0.687 (p <0.001) for blood Mn in all participants. A multivariate logistic regression analysis for anemia (Hb <11.0 g/dL) was performed after adjusted for gender, age, smoking, hypertension, diabetes, ferritin and eGFR; the odds ratio of blood Mn (per 1 ug/L increase) was 0.840 (95% CI: 0.773 to 0.913, p<0.001) showing negative risk factor for anemia.

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Conclusions : In the CKD patients, blood Mn level might have positive association with hemoglobin level. Although the specific mechanism is not known yet, the role of blood Mn level may be important especially in CKD patients for anemia management.

Keywords : Manganese, anemia, CKD