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CKD-EPI equation is better than MDRD equation in predicting coronary artery calcification in CKD patients: from the KNOW-CKD study

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Objectives : Coronary artery calcification (CAC) is prevalent in subjects with low eGFR. It also is a risk factor for poor survival in the general population and patients with CKD. Although low eGFR is associated with CAC, this relation was not significant after adjustment of cardiovascular risk factors in previous studies. Furthermore, little is known about the performance of different equations in predicting CAC in CKD patients. The first aim of this study is to verify a true association between eGFR and CAC after adjustment for various risk factors, and second one is to investigate which equation to estimate GFR is better for predicting CAC in CKD patients without previous coronary heart disease.

Methods : Participants in the prospective KoreaN Cohort Study for Outcome in Patients With Chronic Kidney Disease (KNOW-CKD) study underwent coronary CT to measure coronary artery calcium score (CACS) in 2011–2016. We analyzed 1,643 participants from this cohort after excluding participants with missing data and previous coronary heart disease. We used tobit regression to calculate multivariate-adjusted CACS ratios by different eGFR level and eGFR equations. The performance of eGFR equations was compared using net reclassification improvements (NRI). eGFR was calculated based on MDRD equation (eGFR_MDRD) and three CKD-EPI equations (eGFR_Cr, eGFR_Cys and eGFR_CrCys) using serum creatinine, serum cystatin C and both. In this study, CAC was defined as CACS \geq 100.

Results : Among 1,643 CKD patients, the median [interquartile range] of CACS was 0.5 [0–75.4] and 360 (21.9%) had CAC. The percentages of participants with CAC were 31.3, 30.7, 19.8, 16.2 and 3.9 in groups with eGFR_CrCys (mL/min/1.73 m²) of 0–29, 30–44, 45–59, 60–89 and 90–max, respectively.

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Tobit regression analysis indicated that eGFR 0–29 compared with eGFR 90–max was associated with high CACS when eGFR was calculated from CKD–EPI equations but not from MDRD equation (CACS ratios 2.29, 95% CI 1.11–4.72 for eGFR_Cr; 2.72, 1.30–5.72 for eGFR_Cys; 2.28, 1.08–4.78 for eGFR_CrCys; 2.14, 0.97–4.73 for eGFR_MDRD). NRI favored CKD–EPI equations than MDRD equation for predicting CACS (NRI 10.7%, $P < 0.001$ for eGFR_MDRD vs eGFR_Cr; 14.5%, $P < 0.001$ for eGFR_MDRD vs eGFR_Cys; 14.7%, $P < 0.001$ for eGFR_MDRD vs eGFR_CrCys).

Conclusions : Low eGFR is associated with CAC in CKD patients even after adjusting traditional and non–traditional cardiovascular risk factors, and CKD–EPI equation is better than MDRD equation in predicting CAC in CKD patients.

Keywords : Chronic kidney disease, coronary artery calcification, eGFR, MDRD equation, CKD–EPI equation