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Cardiovascular death in patients with type 2 diabetes with or without kidney disease: a nationwide population-based study

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Objectives: Type 2 diabetes is a well-known risk factor of mortality, and the risk is exacerbated by coexisting with diabetic kidney disease (DKD). We aimed to elucidate the risk of mortality according to the stage of DKD with overall exploration for the causes of death.

Methods: Subjects with type 2 diabetes were extracted from the Nationwide Health Insurance Database of South Korea between 2009 and 2012. DKD was categorized based on the estimated glomerular filtration rate (eGFR) and albuminuria: subjects with eGFR ≥90 mL/min/1.73 m^2 were defined as no DKD (without albuminuria) and stage 1 DKD (with albuminuria), and 2 to 5 stages of DKD were defined based on the eGFR following the KDIGO guideline. Patients who received renal replacement therapy were excluded. The cause of death was investigated based on the ICD-10 code. We used Cox-proportional hazard model to identify the risk of mortality.

Results: A total of 2,614,662 patients with type 2 diabetes were enrolled in this study. Most causes of death showed a higher incidence in an advanced stage of DKD and stage 1 DKD compared to no DKD. The risk for all-cause mortality was significantly increased in stage 1 DKD (adjusted hazard ratio [aHR] 1.57) compared to stage 2 (aHR 0.96) and stage 3 (aHR 1.39) DKD. Cardiovascular causes of death including hypertension, ischemic heart disease, cerebrovascular disease, and atherosclerosis were well discriminated according to the stage of DKD. The impact of albuminuria was prominent in all types of cardiovascular death, and the risk was specifically higher in stage 1 than stage 3 DKD in cerebrovascular disease (aHR 1.80 vs. 1.43) and atherosclerosis (aHR 7.78 vs. 1.69).

Conclusions: The risk for mortality was different according to the stage of DKD. Even in patients with favorable eGFR, the presence of albuminuria significantly increased the risk for mortality, especially in cerebro-cardiovascular causes.