# Prevalence of Chronic Kidney Disease in Korea: the Korean National Health and Nutritional Examination Survey 2011~2013

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## OBJECTIVES

Chronic kidney disease (CKD) is increasingly recognized as a major global health problem. CKD has been identified as a risk factor for premature death and as a predictor of worse quality of life.
The purpose of the present study was to provide nationally representative, population-based prevalence estimates of CKD among Korean adults in clinically relevant subpopulations from the Korean National Health and Nutrition Examination Survey (KNHANES) 2011-2013 data.

## METHODS

We evaluated the prevalence of chronic kidney disease using the data of non-institutionalized adults aged ≥20 years (n = 15,319) from the KNHANES 2011~2013 because urine albumin concentrations were measured since 2011.
The eGFR was calculated from the serum creatinine level standardized to IDMS using the CKD-EPI creatinine equation.
The urine albumin-to-creatinine ratio (ACR) was calculated in mg of albumin per g of creatinine (mg/g).
We used five eGFR categories (G1, eGFR ≥90 mL/min/1.73 $m^2$; G2, eGFR 60~89 mL/min/1.73 $m^2$; G3a, eGFR 45~59 mL/min/1.73 $m^2$; G3b, eGFR 30~44 mL/min/1.73 $m^2$; G4-5, eGFR <30 mL/min/1.73 $m^2$) and three albuminuria categories (A1, ACR <30 mg/g; A2, ACR 30~300 mg/g; A3, ACR >300 mg/g) according to the KDIGO staging system.
CKD was defined as an ACR ≥30 mg/g or an eGFR <60 mL/min/1.73 $m^2$.
The analyzed sociodemographic characteristics included age, sex, education level , household income, residential area, smoking, diabetes, hypertension, and cardiovascular disease.

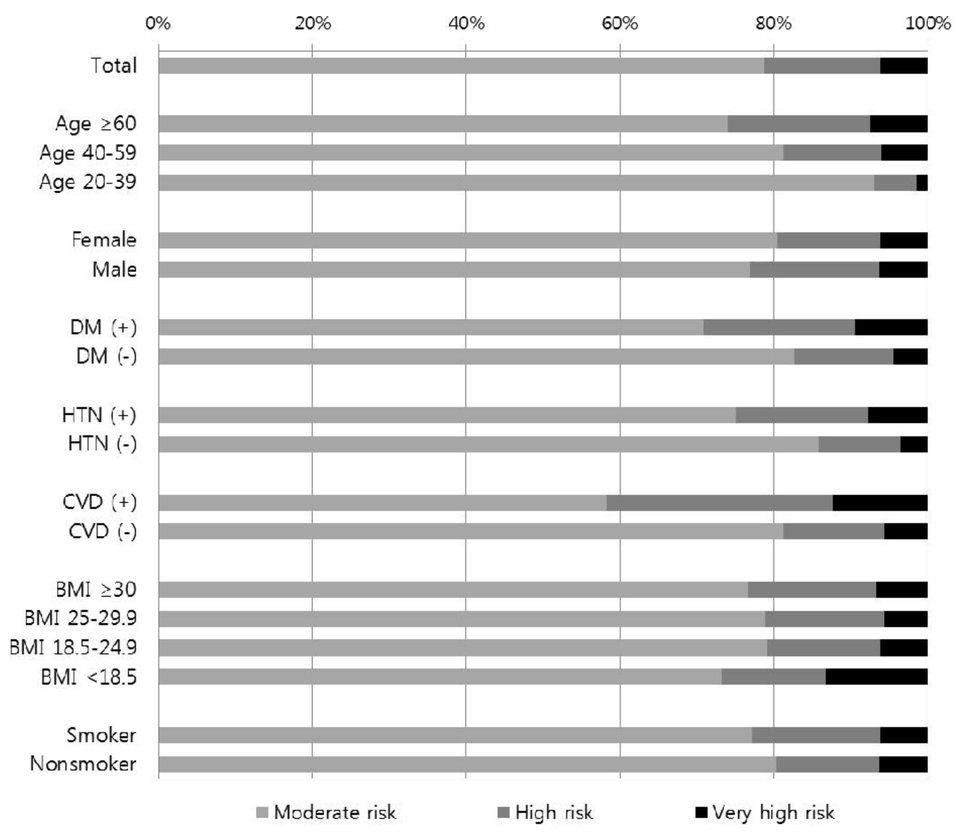


Figure 1. Proportions of risk categories in various subpopulations with chronic kidney disease
DM, diabetes mellitus; HTN, hypertension; CVD, cardiovascular disease; BMI, body mass index

Table 1. Odds ratio for CKD: complex samples analysis

| Characteristic[a] | Crude odds ratio | Age-sex adjusted odds ratio | Fully adjusted odds ratio[c] |
|---|---|---|---|
| Age, 20-year increment | 3.6 (3.2–3.9) | 3.6 (3.2–3.9) | 2.4 (2.1–2.8) |
| Female sex | 1.2 (1.1–1.4) | 1.0 (0.9–1.1) | 1.2 (0.9–1.5) |
| Diabetes | 6.0 (5.1–7.0) | 3.4 (2.8–4.0) | 2.7 (2.2–3.2) |
| Hypertension | 5.9 (5.1–6.8) | 3.2 (2.7–3.7) | 2.5 (2.1–3.0) |
| Diagnosed cardiovascular disease | 4.8 (3.9–5.9) | 2.0 (1.6–2.5) | 1.6 (1.3–2.0) |
| Body mass index[b], kg/$m^2$ | | | |
| ≥30.0 | 2.4 (1.8–3.1) | 3.4 (2.5–4.6) | 2.1 (1.5–3.0) |
| 25.0–29.9 | 1.8 (1.6–2.0) | 1.8 (1.5–2.0) | 1.4 (1.2–1.7) |
| <18.5 | 1.0 (0.7–1.4) | 1.3 (0.9–2.0) | 1.6 (1.0–2.5) |
| Smoker | 1.0 (0.9–1.2) | 1.2 (0.9–1.5) | 1.1 (0.9–1.4) |
| Education, <high school graduate | 3.5 (3.1–4.0) | 1.1 (1.0–1.4) | 0.9 (0.8–1.1) |
| Household income, lower 1/4 | 2.9 (2.5–3.3) | 1.2 (1.0–1.3) | 1.1 (0.9–1.3) |
| Residential area, rural | 1.7 (1.4–2.0) | 1.2 (1.0–1.4) | 1.3 (1.0–1.5) |

Note: Data are presented as odds ratio (95% confidence interval) for CKD.
Abbreviation: CKD, chronic kidney disease
[a] The group without each corresponding characteristic served as the reference.
[b] The group with a body mass index of 20.0–24.9 kg/$m^2$ served as the reference.
[c] The odds ratio was adjusted for all other variables, and the variables included in the model were age, sex, diabetes, hypertension, cardiovascular disease, body mass index category, smoking, education, income, and residence.

## RESULTS

The total prevalence estimate of chronic kidney disease for adults aged ≥20 years in Korea was 8.2%.
By disease stage, the prevalence of chronic kidney disease was as follows: stage 1, 3.0%; stage 2, 2.7%; stage 3a, 1.9%; stage 3b, 0.4%; and stages 4~5, 0.2%.
When grouped into three risk categories according to the 2012 Kidney Disease: Improving Global Outcomes guidelines, the proportions for the moderately increased risk, high risk, and very high risk categories were 6.5%, 1.2%, and 0.5%, respectively.
Figure 1 shows the percentages of the moderately increased risk (78.7%), high risk (15.0%), and very high risk (6.2%) categories among the CKD patients. The proportions of the high risk and very high risk categories were increased in subpopulations with older age, diabetes, and cardiovascular disease.
Factors including older age, diabetes, hypertension, cardiovascular disease, body mass indexes of ≥25 kg/$m^2$ and <18.5 kg/$m^2$, and rural residential area were independently associated with chronic kidney disease (Table 1).

## CONCLUSIONS

Based on this comprehensive analysis, evidence-based screening strategies for chronic kidney disease in the Korean population should be developed to optimize prevention and early intervention of chronic kidney disease and its associated risk factors.

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