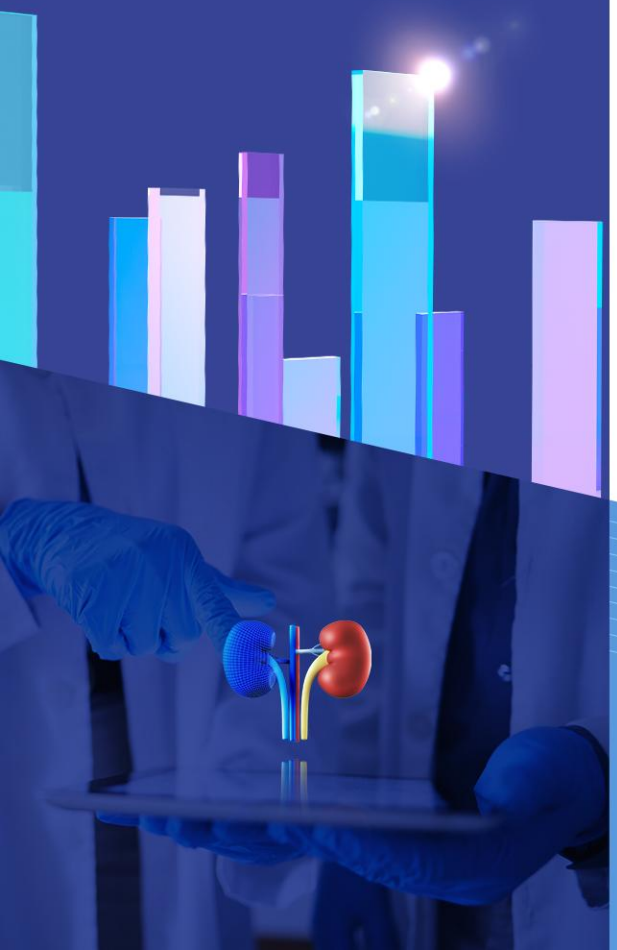
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11-1790399-100124-01



2026

KOREA CKD FACT SHEET

Korea Disease Control and Prevention Agency
National Institute of Health

KNOW-CKD
Korean CKD Cohort

Since 1980
대한신장학회
THE KOREAN SOCIETY OF NEPHROLOGY

Foreword

Dear Members of the Korean Society of Nephrology and Everyone Interested in CKD:

As populations continue to age and the prevalence of chronic diseases such as diabetes and hypertension increases, the burden of disease associated with chronic kidney disease (CKD) is also steadily increasing. Consequently, the importance of early detection and systematic management of CKD has never been greater.

Since 2011, the Korea National Institute of Health has supported the Korean Cohort Study for Outcome in Patients With Chronic Kidney Disease (KNOW-CKD), a nationwide prospective cohort study involving 14 hospitals across Korea. Through this initiative, we have accumulated robust scientific evidence to support the prevention and management of CKD and to inform national health policies.

The 2026 Korea CKD Fact Sheet draws upon findings from the past 15 years of the KNOW-CKD study. It reflects the collective dedication of the patients who participated in the study and the sustained efforts of researchers across the country.

We hope that this publication will enhance public understanding of CKD, promote its use in health management, and serve as a valuable resource for advancing CKD research as well as evidence-based prevention and management policies.

The Korea National Institute of Health remains committed to strengthening research capacity and providing scientific evidence to support public health policies for the prevention and management of CKD and other major chronic diseases, thereby contributing to the improvement of the nation's health.

Thank you.

June 2026

Jae-Hwan Nam

Director, Korea National Institute of Health (KNIH)



Foreword

As an asymptomatic "silent disease," chronic kidney disease (CKD) often suffers from low awareness and delayed early management. Left unchecked, CKD progresses to end-stage kidney disease (ESKD) requiring dialysis or transplantation, severely impairing quality of life, escalating cardiovascular risk, and placing a heavy burden on national health insurance and workforce productivity. Proactive clinical approaches prioritizing prevention alongside treatment are therefore paramount.

Supported by the KNIH, the KoreaN Cohort Study for Outcome in Patients With Chronic Kidney Disease (KNOW-CKD) is Korea's first and largest long-term prospective CKD cohort study. Since 2011, KNOW-CKD has produced over 140 international peer-reviewed publications, uncovering population-specific risk factors and establishing personalized management guidelines tailored to Korean patients.

The 2026 KOREA CKD FACT SHEET provides vital clinical data and statistical evidence on non-dialysis CKD patients in Korea, serving as an essential cornerstone for predictive modeling and clinical practice guidelines.

I extend my sincere gratitude to Principal Investigator Professor Kook-Hwan Oh and all participating researchers for their dedication, as well as to the Korea Disease Control and Prevention Agency (KDCA) and the KNIH for their continuous support since 2011.

We firmly believe this Fact Sheet will enable early identification of high-risk populations to halt ESKD progression, ease the financial burden on national health insurance, and inform future healthcare policies.

Thank you.



June 2026

Bum Soon Choi

President, Korean Society of Nephrology (KSN)

Introduction: 2026 KOREA CKD FACT SHEET

According to the Korean Society of Nephrology Registry (2023), more than 130,000 South Koreans receive renal replacement therapy for end-stage kidney disease (ESKD), while approximately 10% of the population is estimated to have chronic kidney disease (CKD, stages 1–5). The growing prevalence of diabetes, obesity, and hypertension continues to increase the burden of CKD, leading to higher rates of cardiovascular complications and premature mortality.

Despite its substantial public health impact, CKD remains underrepresented in national health statistics. To address this gap, the KoreaN Cohort Study for Outcome in Patients With Chronic Kidney Disease (KNOW-CKD), a nationwide prospective cohort established in 2011 by the Korea Disease Control and Prevention Agency (KDCA) and the Korea National Institute of Health (KNIH), has enrolled and followed approximately 4,000 adults with CKD at 14 tertiary medical centers through 2026.

KNOW-CKD provides comprehensive longitudinal data on kidney function decline, complications, and mortality across major CKD etiologies, including diabetic nephropathy, hypertensive nephrosclerosis, and glomerulonephritis. The study identifies factors associated with disease progression and evaluates the impact of therapeutic and lifestyle interventions, generating evidence that supports clinical practice and healthcare policy.

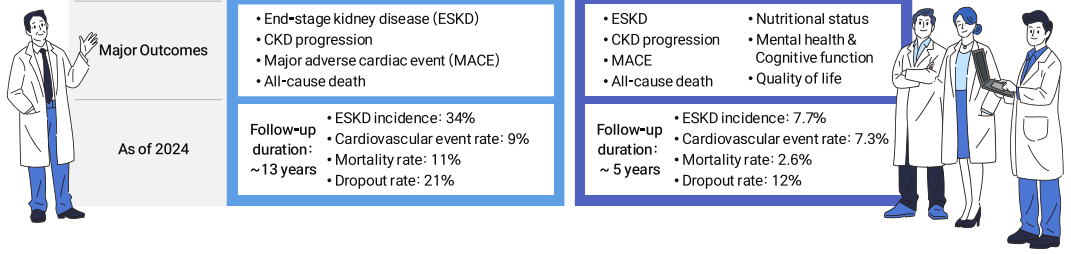
With up to 15 years of follow-up and a dropout rate below 20%, KNOW-CKD represents one of the highest-quality longitudinal CKD cohorts in Asia. Although based at tertiary referral centers, its rigorous design and long-term follow-up offer unique insights into the natural history of CKD in Korea.

The 2026 KOREA CKD FACT SHEET summarizes 15 years of prospective cohort data, including patient characteristics, CKD etiologies, complications, and mortality. We hope this report will serve as a valuable resource for clinicians, researchers, and policymakers, supporting evidence-based clinical care, informed health policy, and future CKD research.

Overview of the KNOW-CKD Study for Improving Survival and Prognosis in CKD Patients

Korea**N** Cohort Study for **O**utcome in Patients **W**ith **C**hronic **K**idney **D**isease **(KNOW-CKD)**

Category	Phase 1 Cohort Enrollment	Phase 2 Cohort Enrollment
Enrollment Period	2011 - 2015	2019 - 2022
Inclusion Criteria	CKD Stages 1–5ND	CKD Stages G3a, G3b, 4
Participating Centers	Tertiary medical centers (9 centers)	Tertiary medical centers (14 centers)
Enrolled Patients	2,238	1,402
Major Outcomes	• End-stage kidney disease (ESKD) • CKD progression • Major adverse cardiac event (MACE) • All-cause death	• ESKD • CKD progression • MACE • All-cause death • Nutritional status • Mental health & Cognitive function • Quality of life
As of 2024	Follow-up duration: ~13 years • ESKD incidence: 34% • Cardiovascular event rate: 9% • Mortality rate: 11% • Dropout rate: 21%	Follow-up duration: ~ 5 years • ESKD incidence: 7.7% • Cardiovascular event rate: 7.3% • Mortality rate: 2.6% • Dropout rate: 12%



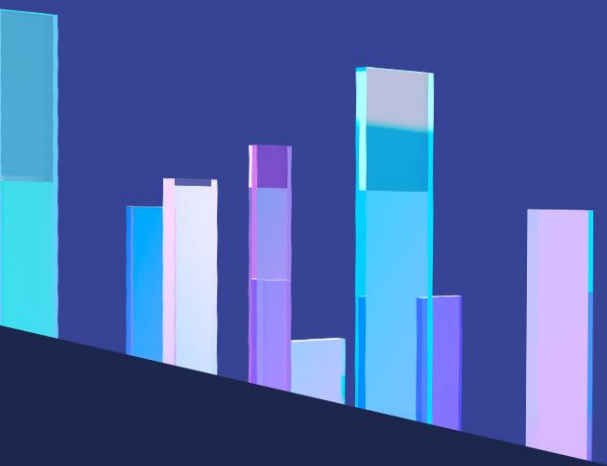
June 2026

Professor Kook-Hwan Oh, M.D., Ph.D.

Principal Investigator, KNOW-CKD Study

Department of Internal Medicine, Seoul National University Hospital

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Ⅰ Overview of KNOW-CKD Cohort

Patient Enrollment and Follow-up

Patient Enrollment and Follow-up

Study subject	• Cohort I : Nondialyzed CKD (Age 20–75) • Cohort II : eGFR 15-60 mL/min/1.73m^2, (Age 40–79)

Exclusion			
• Unable to consent or non-consent	• History of dialysis	• History of any organ transplant	• Pregnancy
• Heart failure(NYHA III or IV)	• Liver cirrhosis	• Previous or current malignancy	

Cohort I

Enrollment period : 2011~2015

Enrollment N = 2,341

Not fulfilling enrollment criteria	16
No standardized eGFR at baseline	83
Not fulfilling enrollment criteria and no standardized eGFR	4

Final selected subjects N = 2,238

Drop out	Withdrew consent	Transfer to other hospital	Drop out by investigator's decision	Total
	224	177	42	443

On follow-up

4yr ≤ FU duration < 5yr	2
5yr ≤ FU duration < 6yr	59
6yr ≤ FU duration < 7yr	266
7yr ≤ FU duration < 8yr	241
8yr ≤ FU duration	1,044
Total	1,612

Event

Doubling of creatinine	632
Dialysis or transplantation	689
CV event	194

Deceased

CV disease	23
Infection	41
Malignancy	25
Sudden death	12
Liver disease	5
Accident	1
Suicide	0
Others	13
Unknown cause	63
Total	183

Cohort II

Enrollment period : 2019~2022

Enrollment N = 1,490

Not fulfilling enrollment criteria	9	Immediate withdrawal of consent	28
Double enrollment	3	Immediate withdrawal of consent and insufficient baseline data	5
Insufficient baseline data	43		

Final selected subjects N = 1,402

Drop out	Withdrew consent	Transfer to other hospital	Others	Total
	166	66	9	241

On follow-up

2yr ≤ FU duration < 3yr	2
3yr ≤ FU duration < 4yr	263
4yr ≤ FU duration < 5yr	281
5yr ≤ FU duration < 6yr	346
6yr ≤ FU duration < 7yr	182
Total	1,074

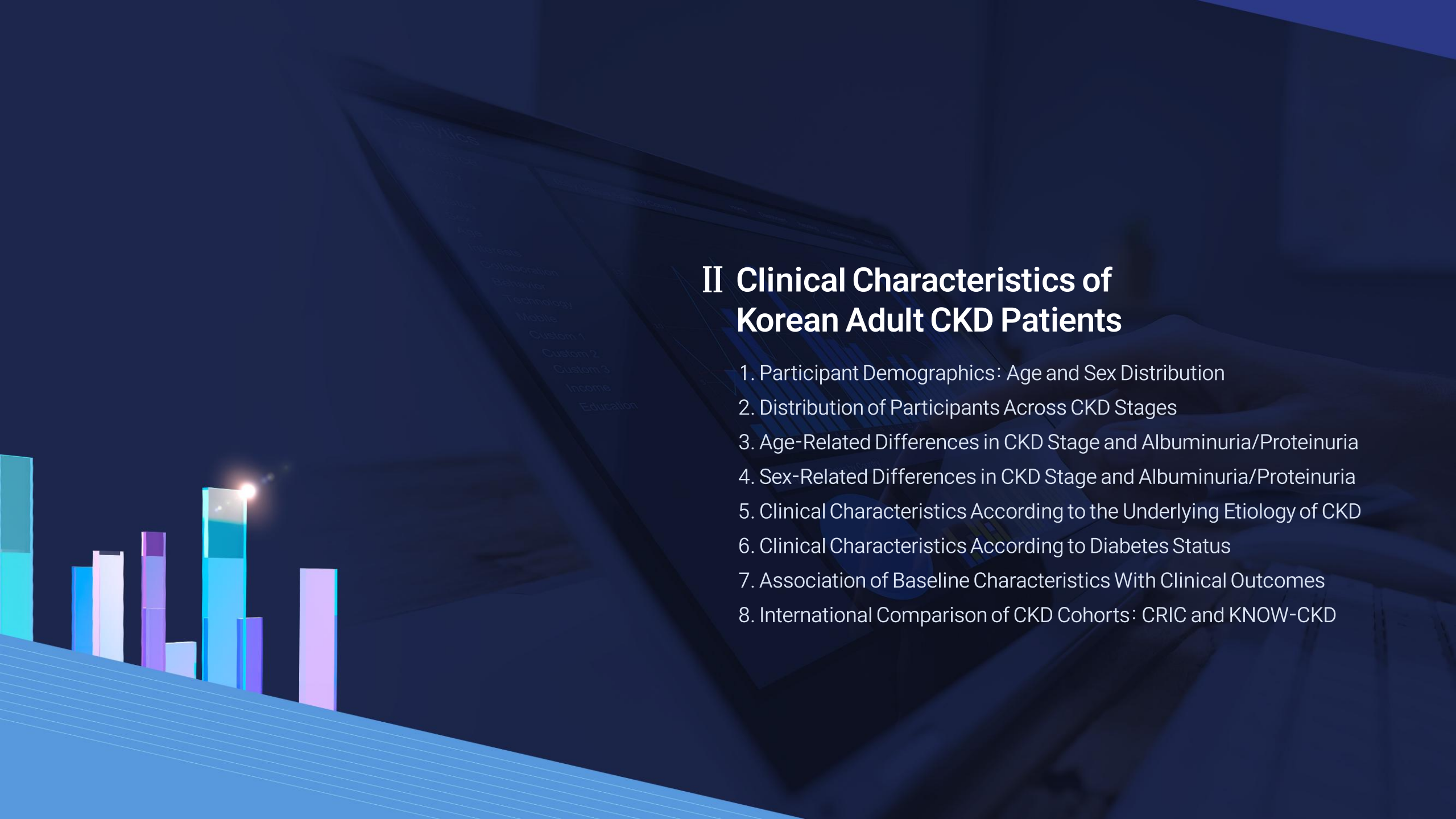
Event

Doubling of creatinine	226
Dialysis or transplantation	202
CV event	141

Deceased

CV disease	12
Infection	15
Malignancy	9
Sudden death	5
Liver disease	0
Accident	3
Suicide	0
Others	12
Unknown cause	31
Total	87

* As of Oct 31, 2025



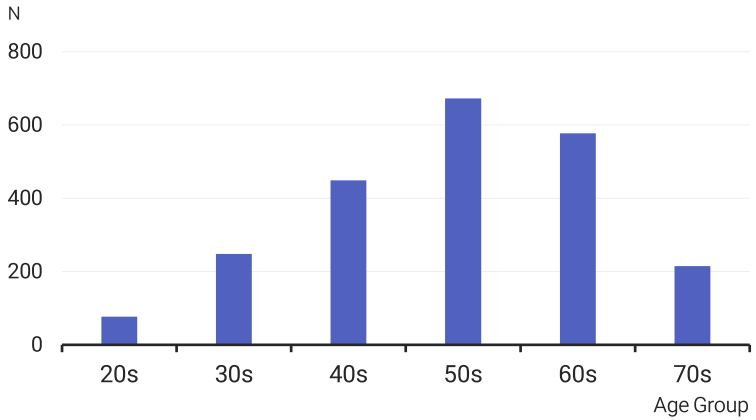
II Clinical Characteristics of Korean Adult CKD Patients

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3. Age-Related Differences in CKD Stage and Albuminuria/Proteinuria
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8. International Comparison of CKD Cohorts: CRIC and KNOW-CKD

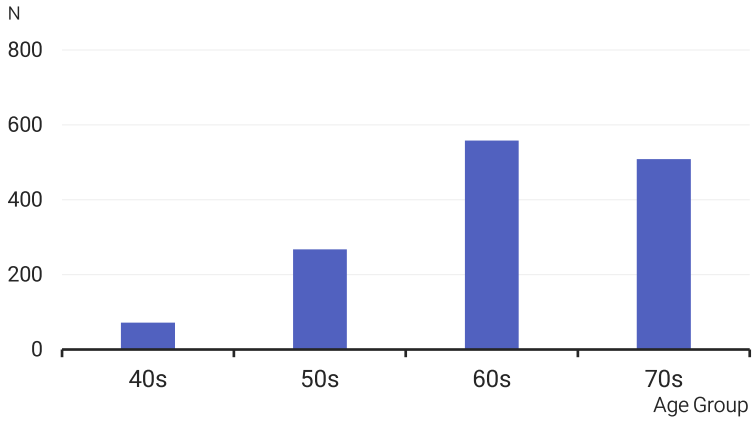
1. Participant Demographics: Age and Sex Distribution

Age Distribution

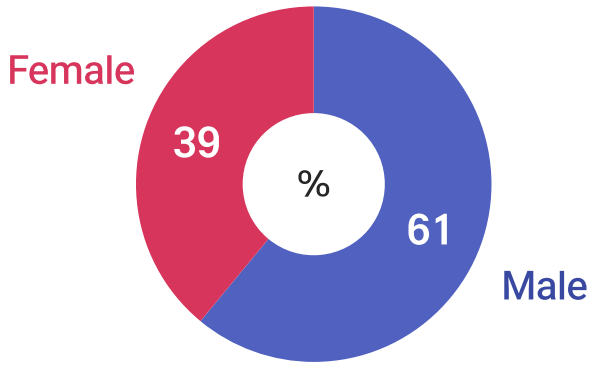
Cohort I

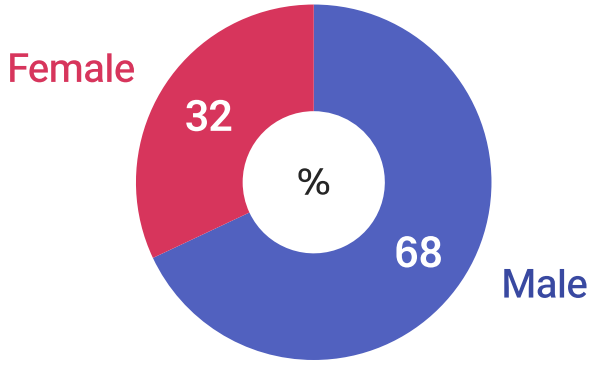


Cohort II

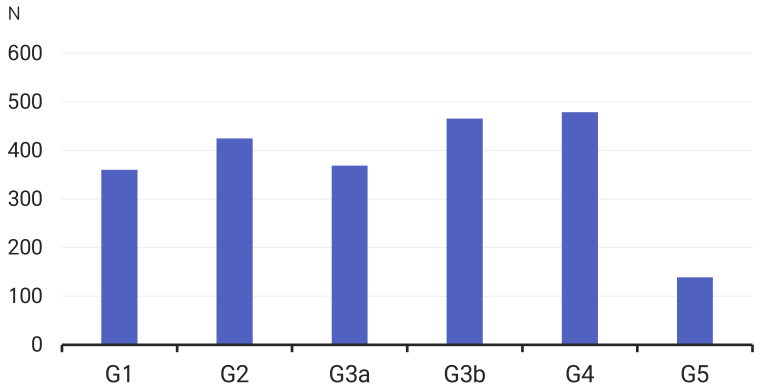


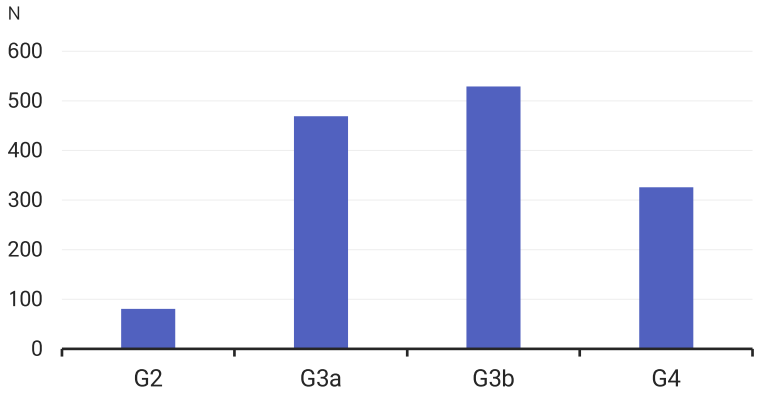
Sex Distribution





CKD Stage



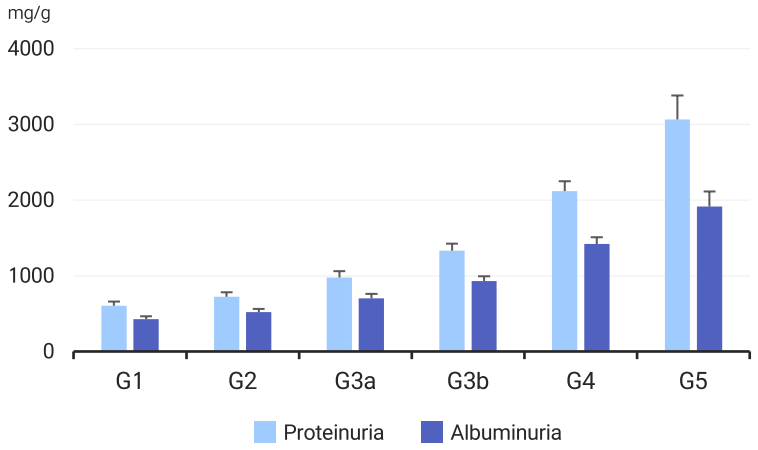


2. Distribution of Participants Across CKD Stages

Proteinuria and Albuminuria

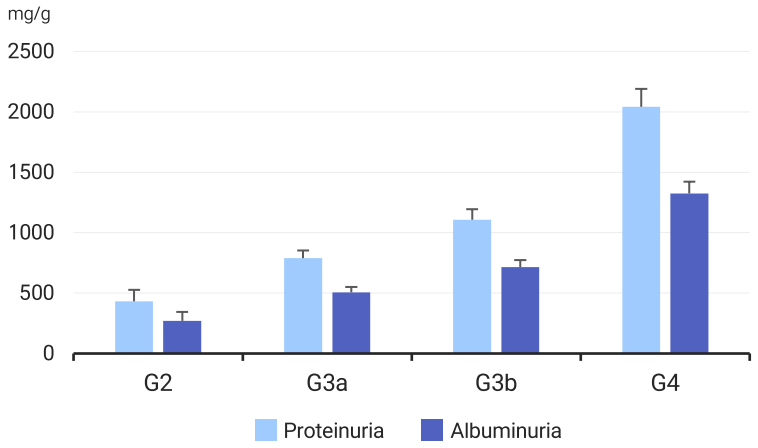
Cohort I

Number	G1	G2	G3a	G3b	G4	G5
2,238	360	425	369	466	479	139

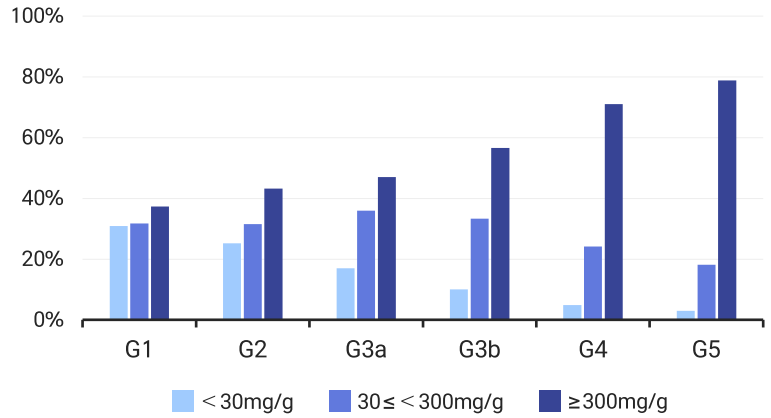


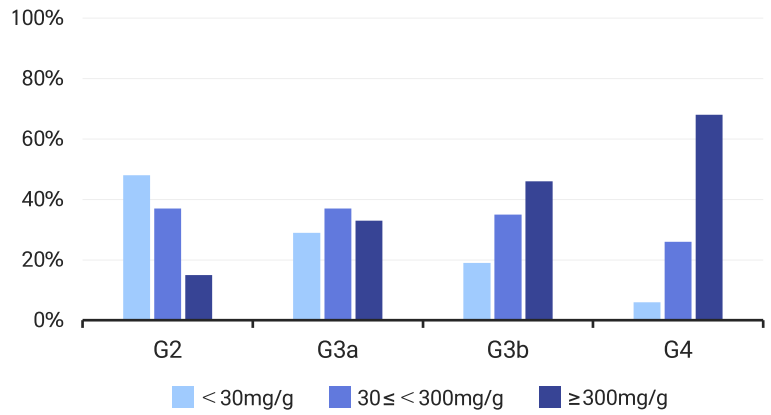
Cohort II

Number	G2	G3a	G3b	G4
1,401	81	468	527	325



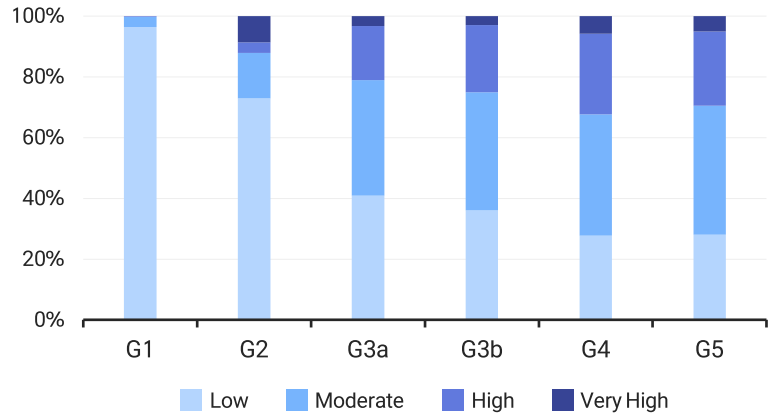
Albuminuria Across CKD stages

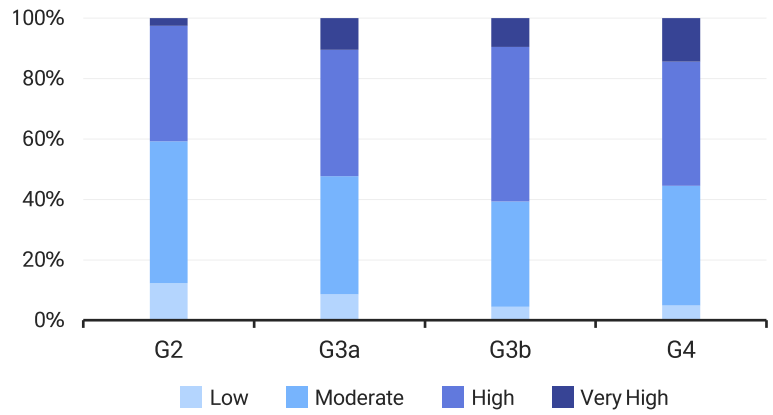




Comorbidity Index Across CKD Stages*

* Age-adjusted Charlson comorbidity index
Low (≤3), Moderate (4–5), High (6–7), Very High (≥8)

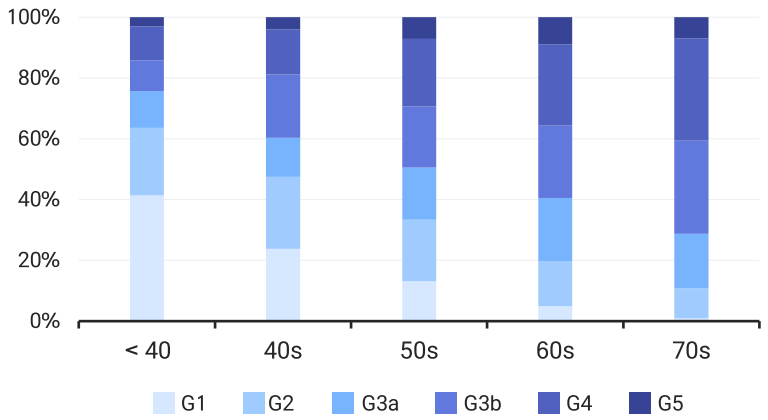




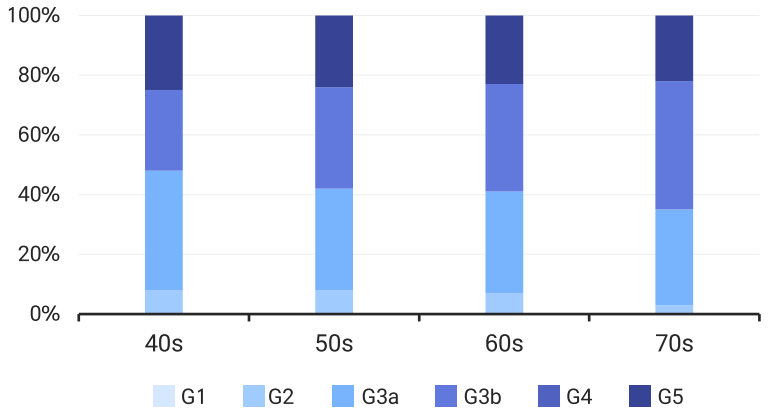
3. Age-Related Differences in CKD Stage and Albuminuria/Proteinuria

CKD stages Across Age Groups

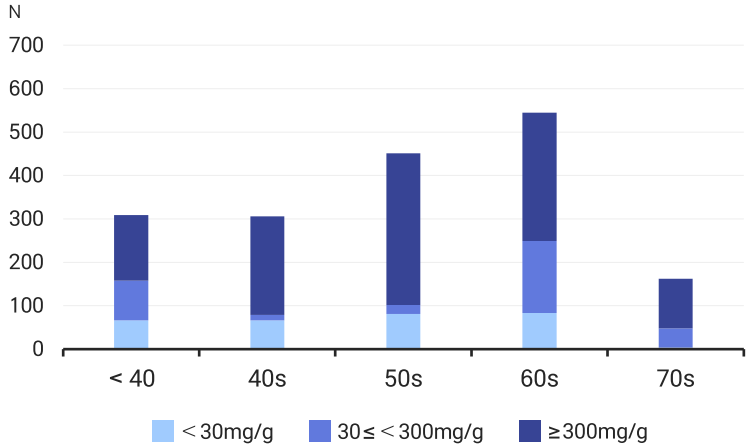
Cohort I

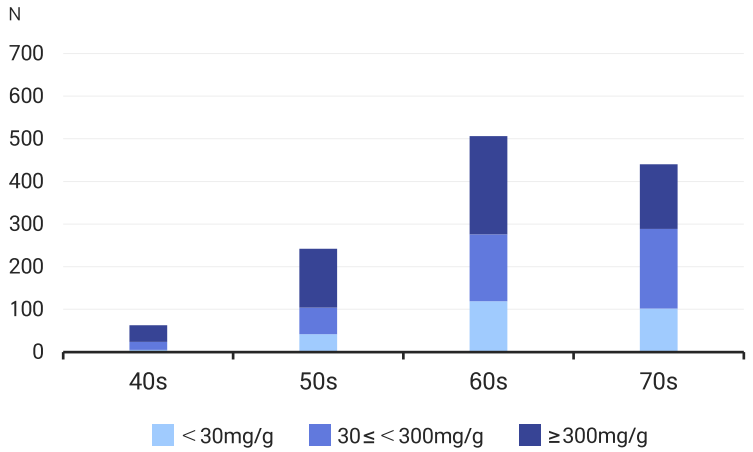


Cohort II

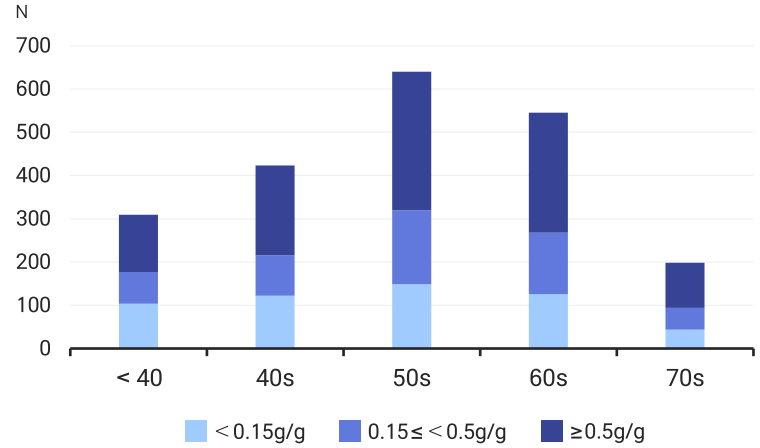


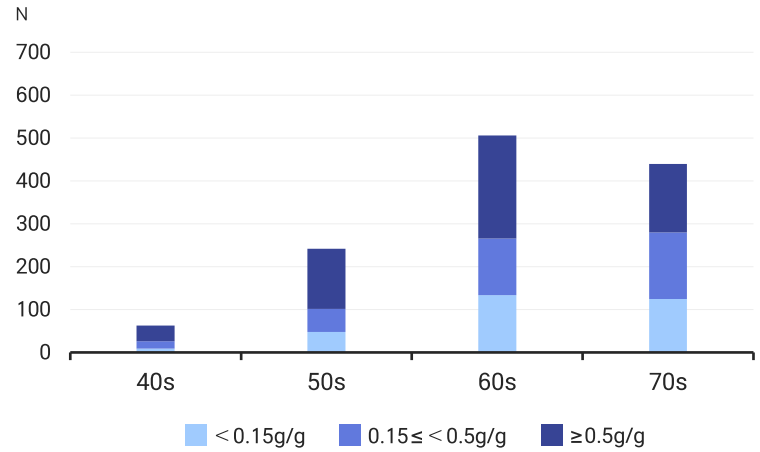
Albuminuria Across Age Groups





Proteinuria Across Age Groups

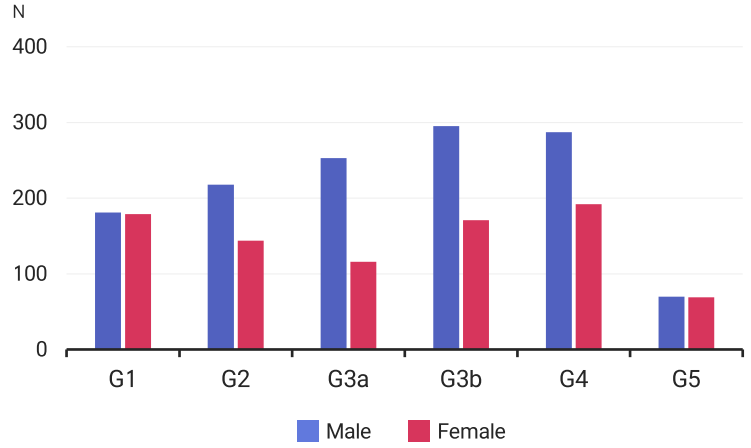


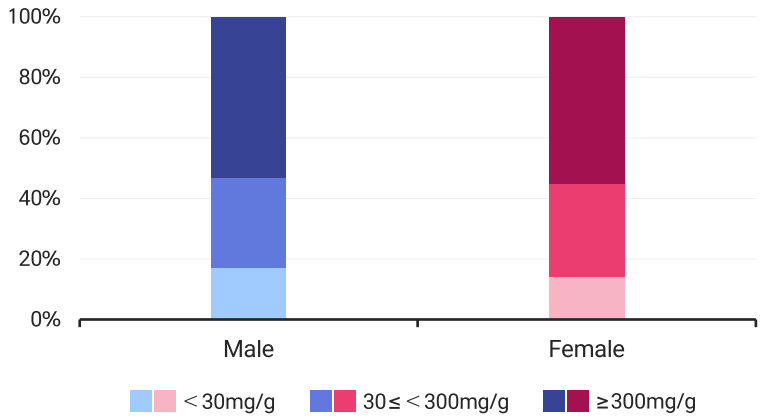


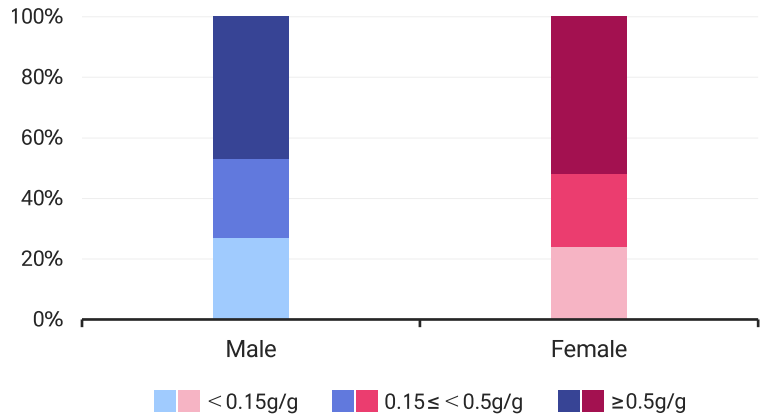
4. Sex-Related Differences in CKD Stage and Albuminuria/Proteinuria

CKD Stages	Albuminuria	Proteinuria

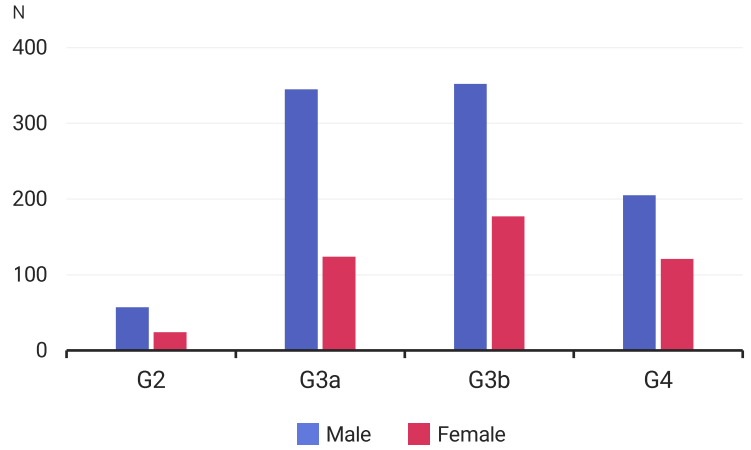
Cohort I

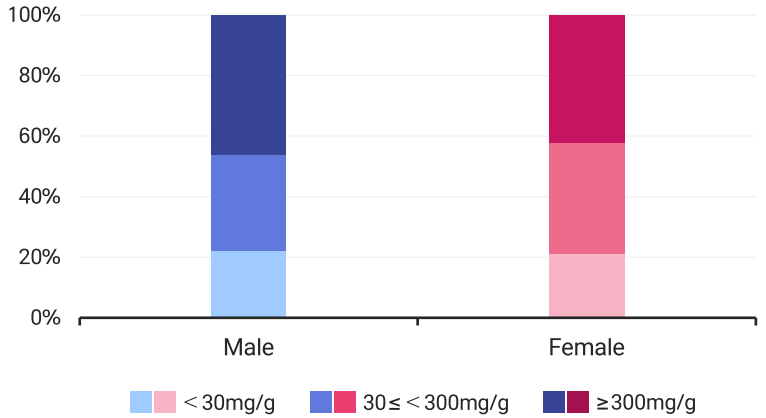


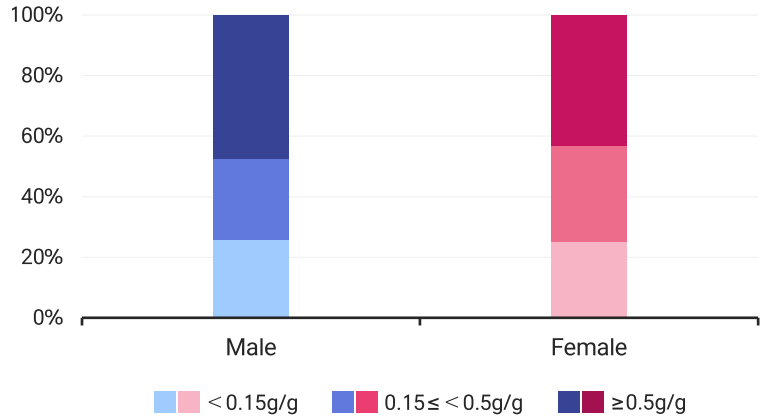




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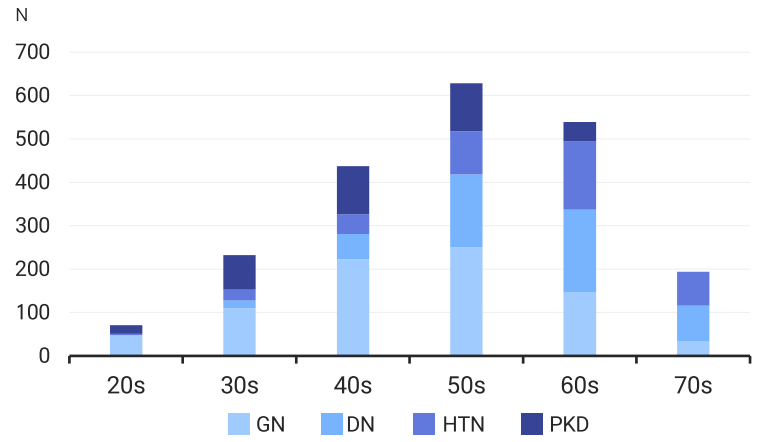




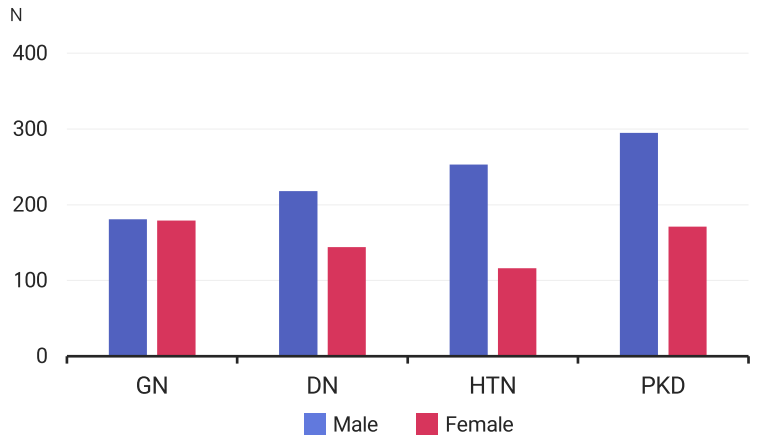


5. Clinical Characteristics According to the Underlying Etiology of CKD

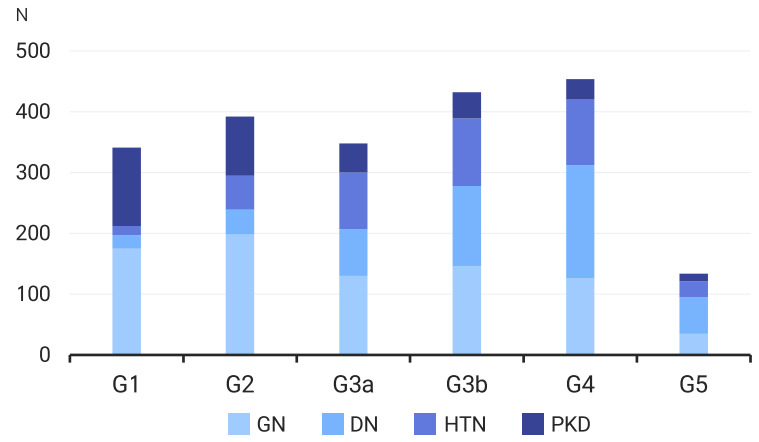
Age Distribution of CKD Etiologies



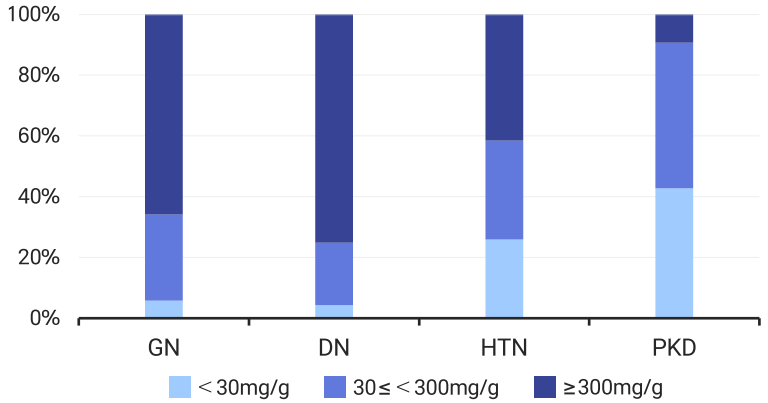
Sex Distribution of CKD Etiologies



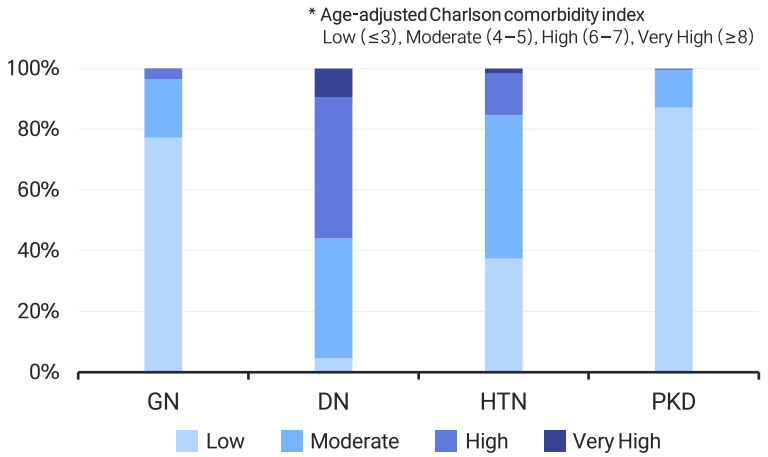
CKD Stages Across CKD Etiologies



Albuminuria Across CKD Etiologies



Comorbidity Index Across CKD Etiologies



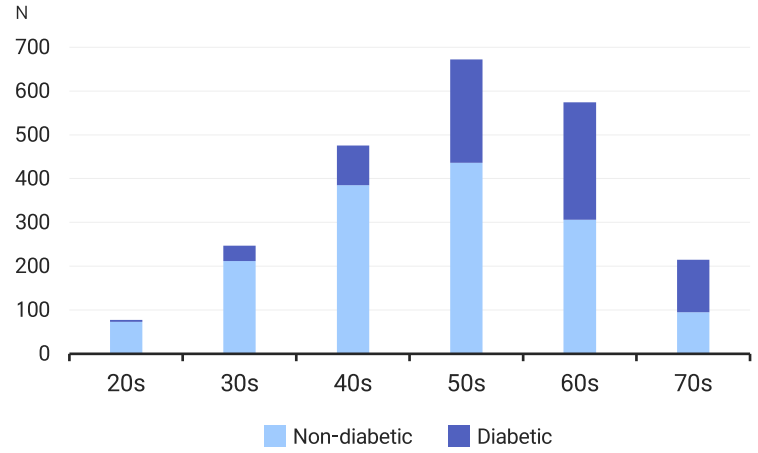


*GN: Glomerulonephritis, DN: Diabetic nephropathy, HTN: Hypertensive nephropathy, PKD: Polycystic kidney disease

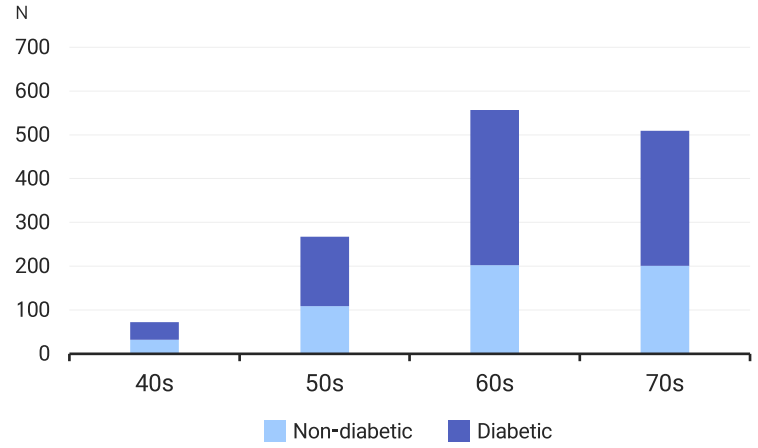
6. Clinical Characteristics According to Diabetes Status (1/2)

Age Distribution

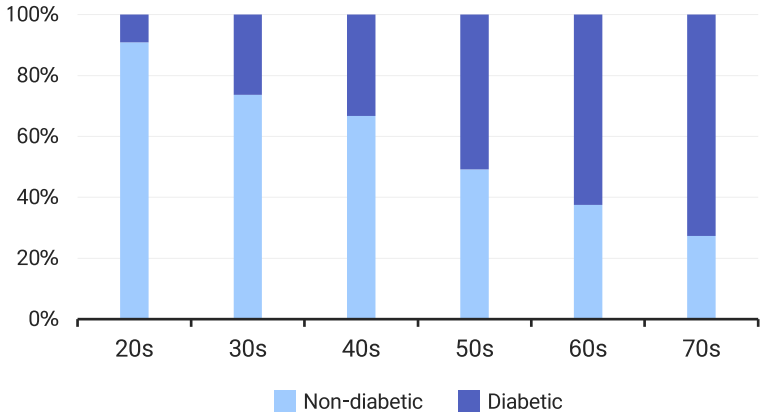
Cohort I

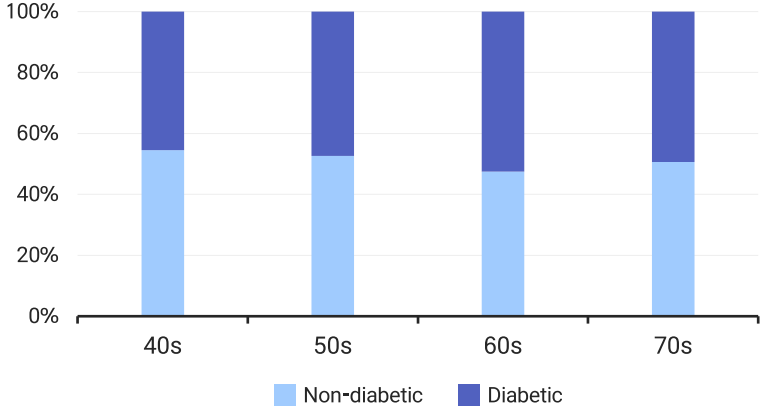


Cohort II

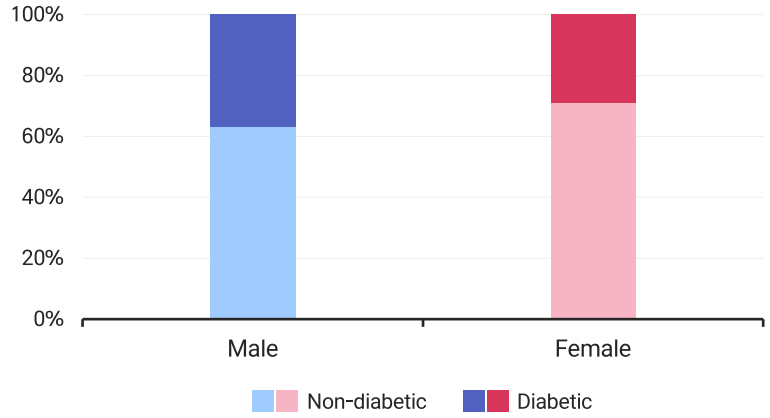


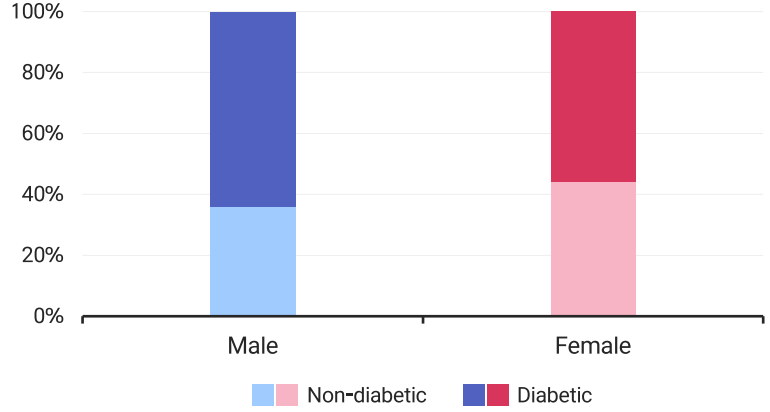
Diabetes Status Across Age Groups





Sex Distribution



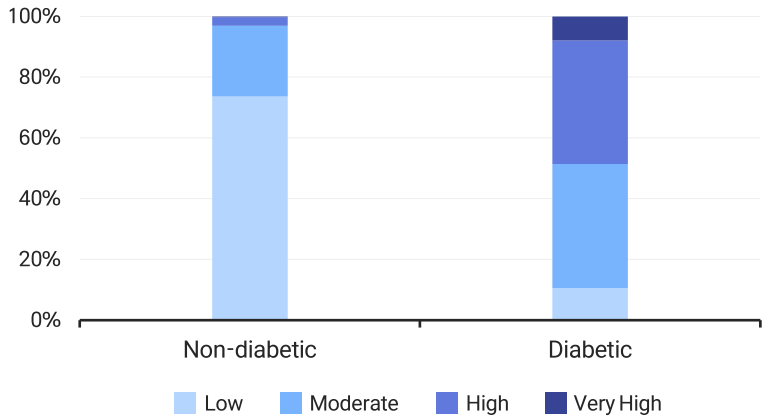


6. Clinical Characteristics According to Diabetes Status (2/2)

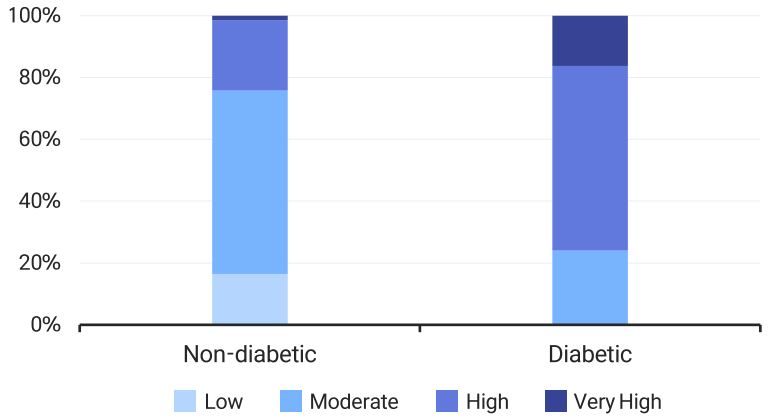
Comorbidity According to Diabetes Status

Cohort I

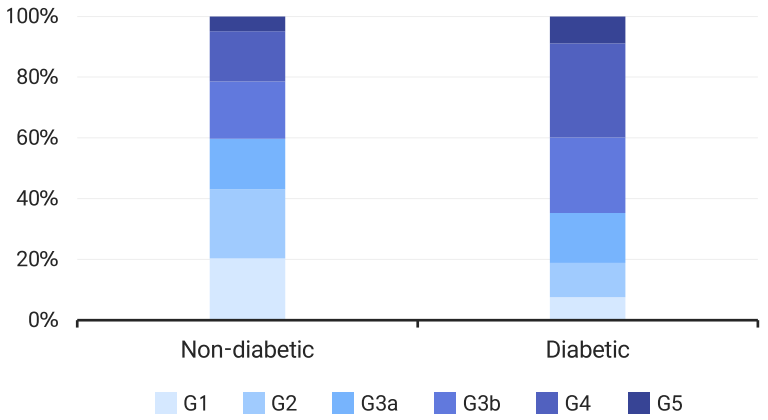
* Age-adjusted Charlson Comorbidity Index
Low (≤3), Moderate (4–5), High (6–7), Very High (≥8)

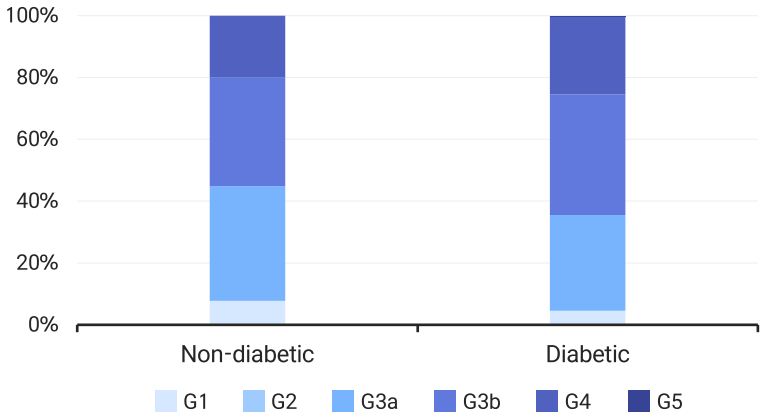


Cohort II

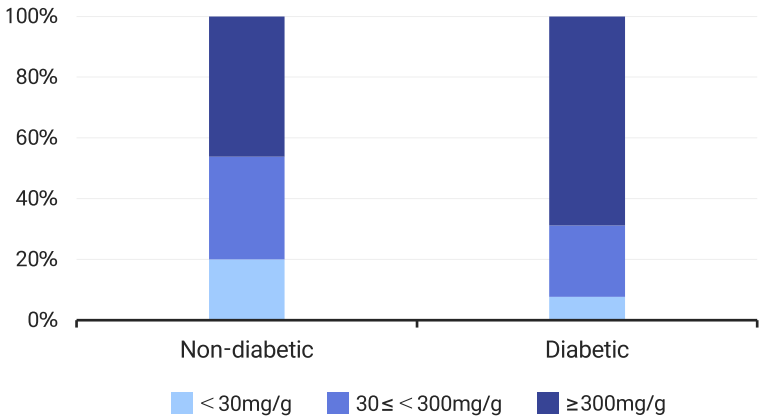


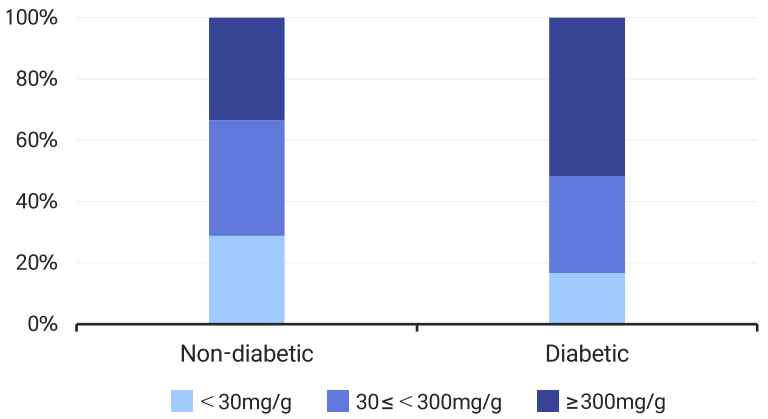
CKD Stages According to Diabetes Status





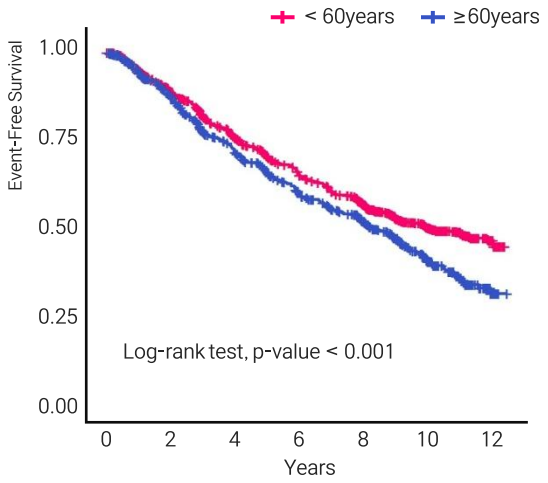
Albuminuria According to Diabetes Status



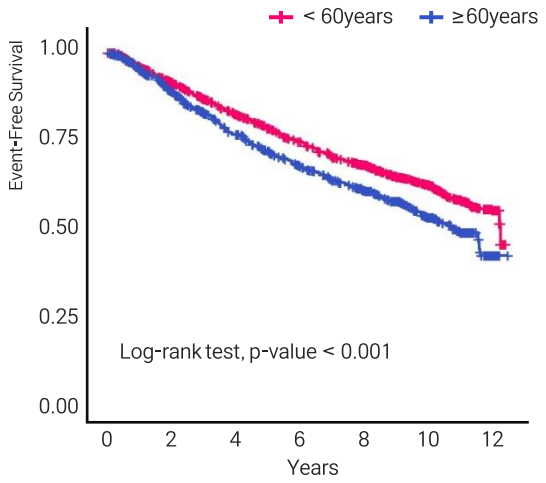


7. Association of Baseline Characteristics With Clinical Outcomes (1/2)

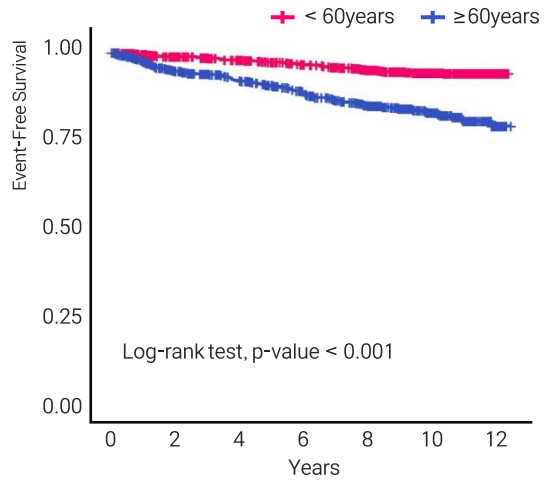
Composite Renal Event



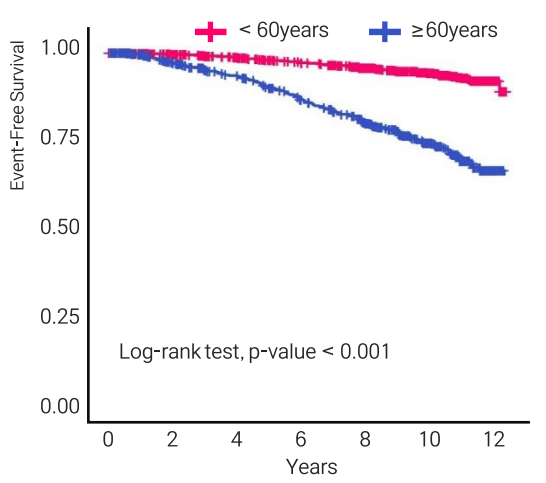
Development of ESKD



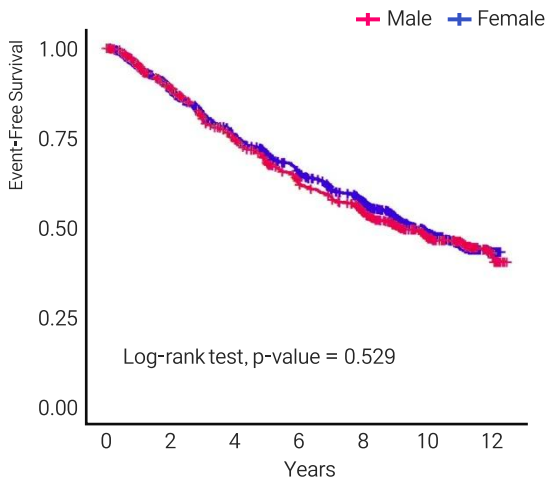
Cardiovascular Event*



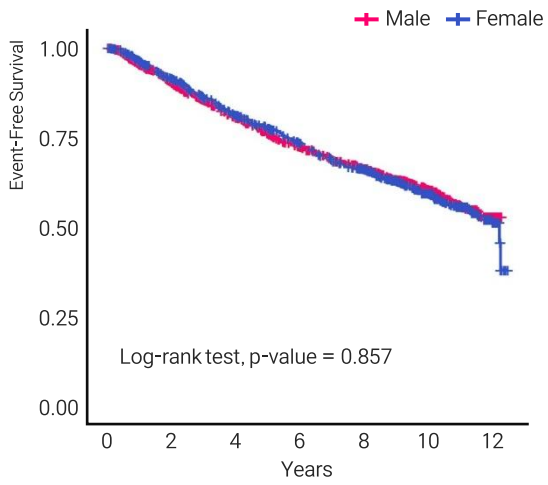
Death



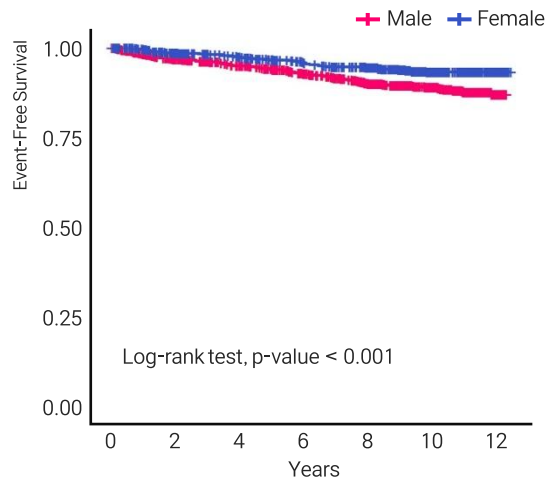
Composite Renal Event



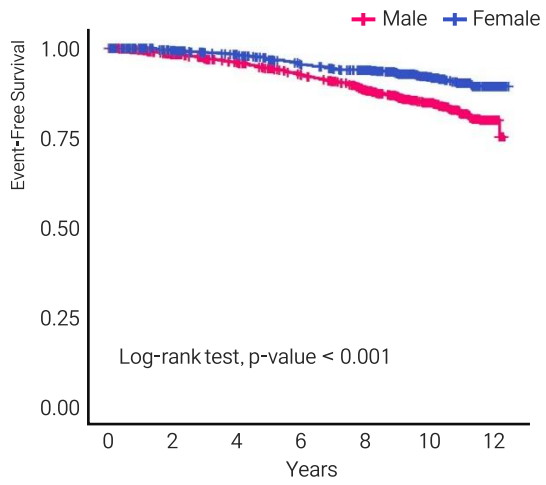
Development of ESKD



Cardiovascular Event*



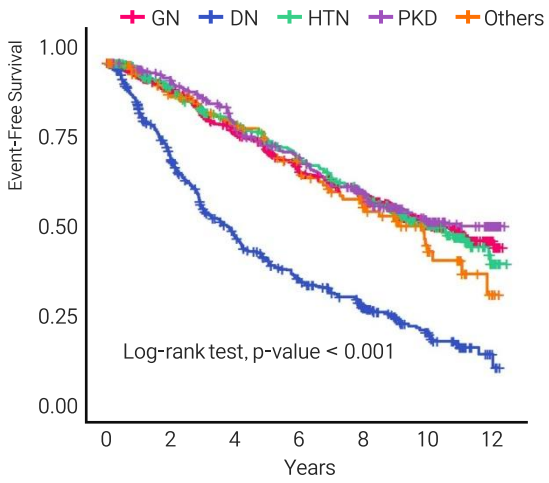
Death



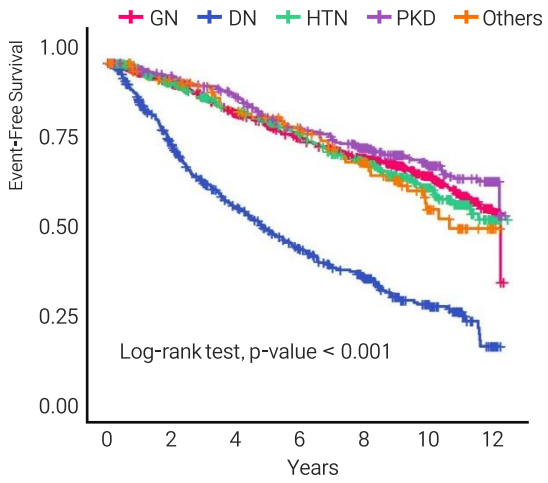
* **Composite renal event**: Doubling of serum creatinine or halving of eGFR or ESKD
* **Cardiovascular event**: Death due to CV event, nonfatal AMI, nonfatal stroke, hospitalization due to heart failure, unstable angina or arrhythmia

7. Association of Baseline Characteristics With Clinical Outcomes (2/2)

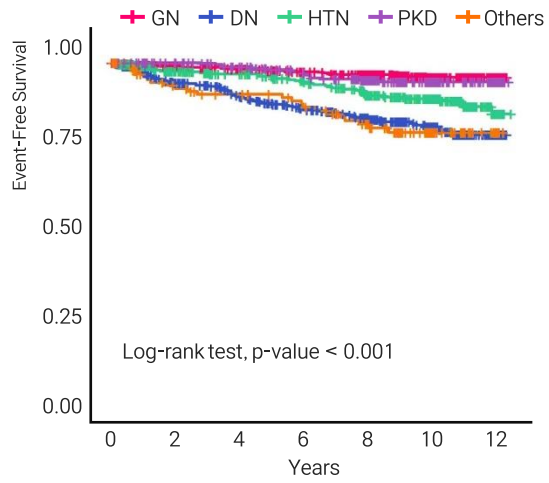
Composite Renal Event



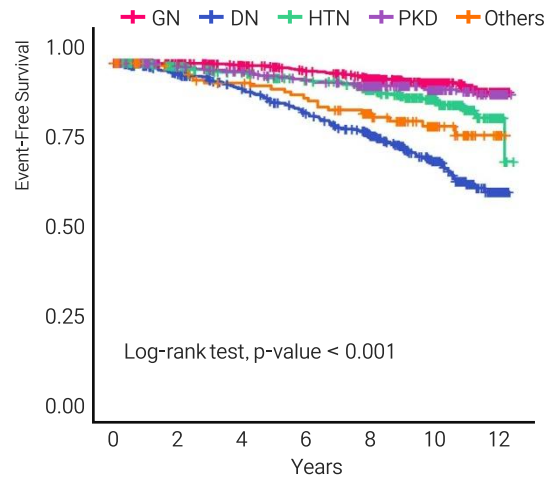
Development of ESKD



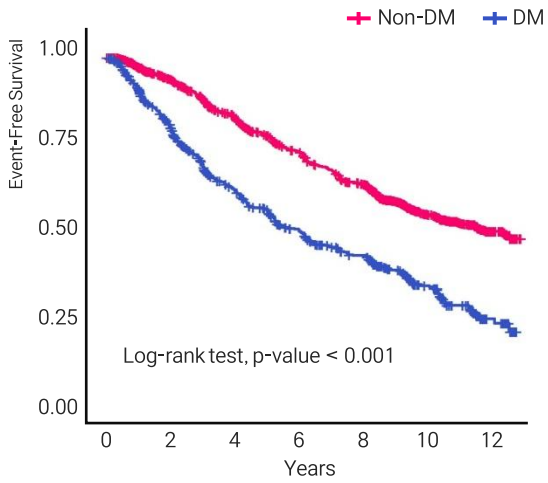
Cardiovascular Event*



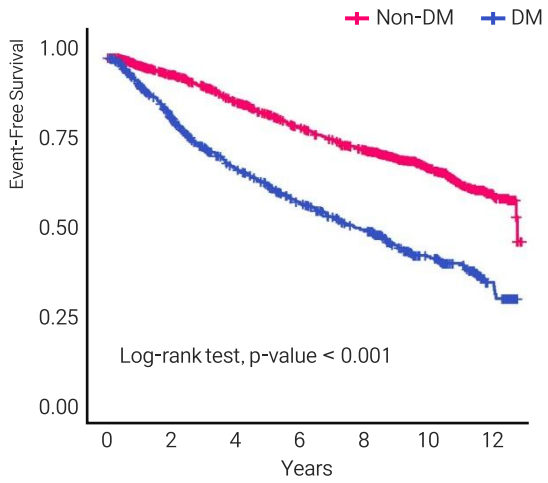
Death



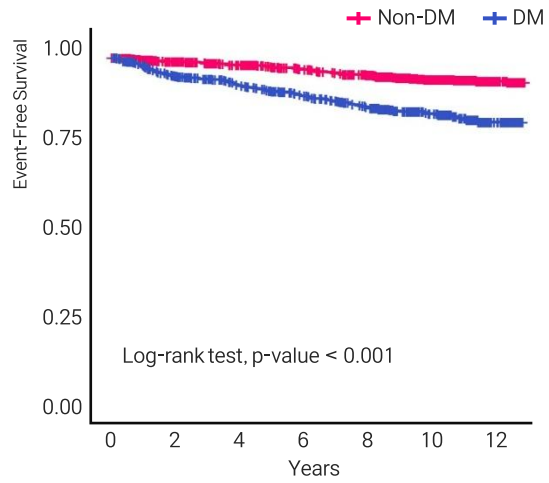
Composite Renal Event



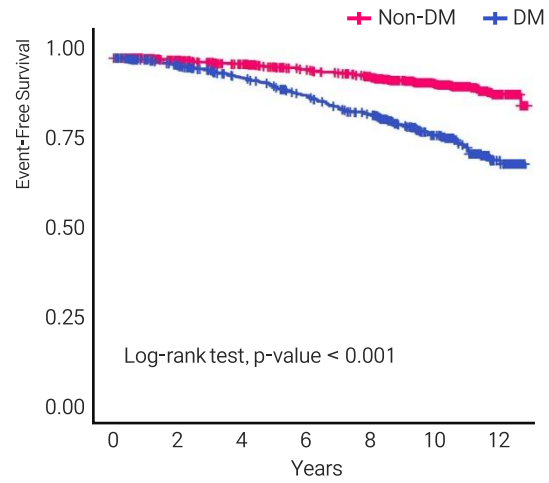
Development of ESKD



Cardiovascular Event*



Death



* GN: Glomerulonephritis, DN: Diabetic nephropathy, HTN: Hypertensive nephropathy, PKD: Polycystic kidney disease
* **Composite renal event**: Doubling of serum creatinine or halving of eGFR or ESKD
* **Cardiovascular event**: Death due to CV event, nonfatal AMI, nonfatal stroke, hospitalization due to heart failure, unstable angina or arrhythmia

8. International Comparison of CKD Cohorts: CRIC and KNOW-CKD

- Total subjects N = 4,953
- CKD progression defined as halving of eGFR or renal replacement therapy

CRIC		KNOW-CKD	Major finding
N = 3,430	Subjects	N = 1,523	
41.7 (N = 570)	Incidence of CKD progression Per 1,000 person-years	67.9 (N = 1,285)	KNOW-CKD showed a higher risk of CKD progression
1.00	Risk of CKD progression	1.66 ↑	1.66-fold higher risk of CKD progression for KNOW-CKD subjects
−1.14	Decline of eGFR (slope) mL/min/1.73m2 /year	−2.51	2.2-fold faster eGFR decline in KNOW-CKD
1.00	Risk of death	0.51 ↓	49% lower risk of death for KNOW-CKD subjects

Significant ethnic difference exists between Korean and American CKD subjects.

※ Reference: Ko B *et al. Clin J Am Soc Nephrol.* (2026)



Ⅲ Major Complications and Outcomes

Section 1 . Cardiovascular Disease

Section 2 . Dyslipidemia and Obesity

Section 3 . Anemia and Iron Deficiency

Section 4 . CKD–Mineral and Bone Disorder (MBD)

Section 5 . Nutrition, Mental Health, and Quality of Life



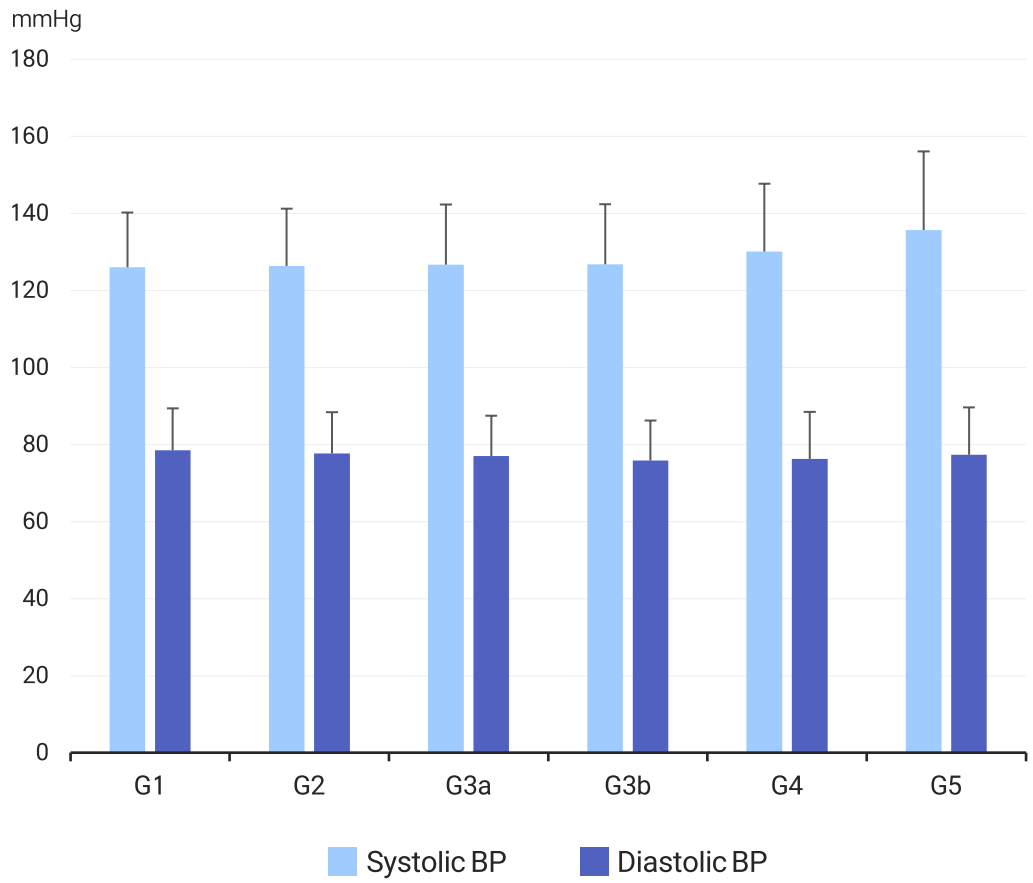
Ⅲ Major Complications and Outcomes

Section 1 . Cardiovascular Disease

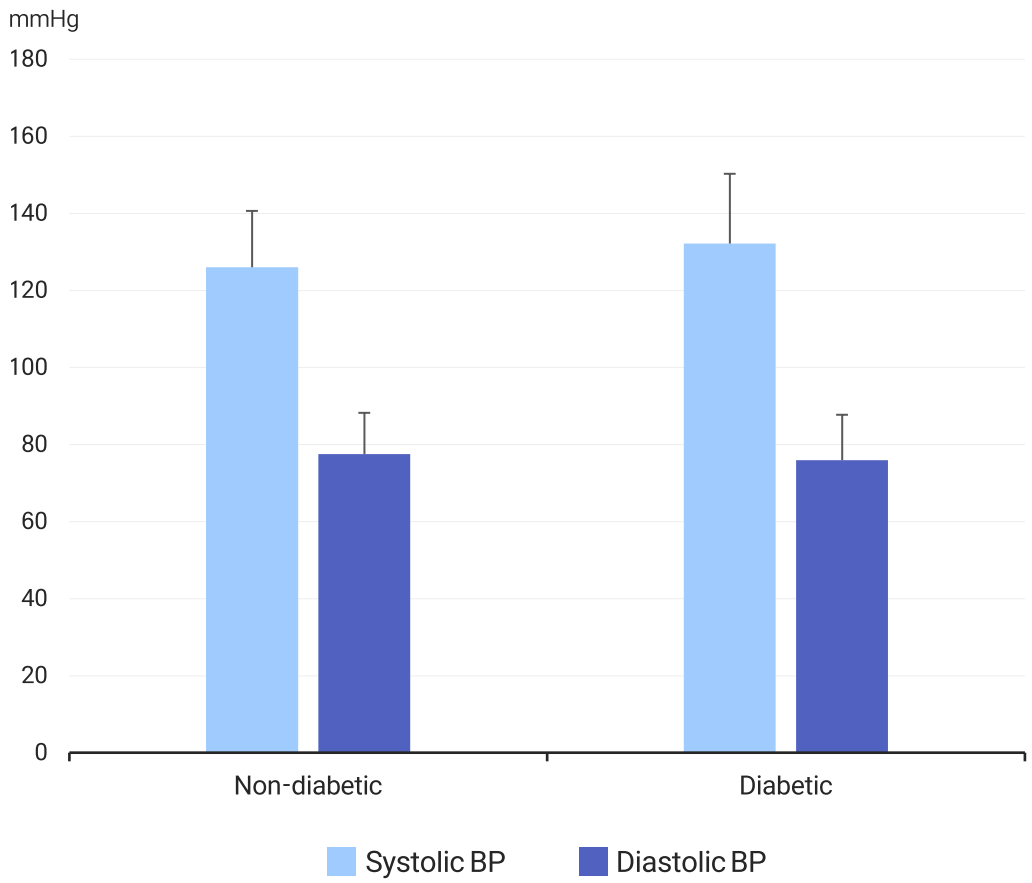
1. Blood Pressure According to CKD Stages and Diabetes Status
2. ACEi/ARB Medication
3. Cardiovascular Comorbidity
4. Blood Pressure and Renal Function Change
5. Blood Glucose Control and SGLT2 Inhibitor Medication
6. Blood Glucose Control and Cardiovascular Events
7. Physical Activity and Cardiovascular Outcome/Mortality

1. Blood Pressure According to CKD Stages and Diabetes Status (1/2)

Blood Pressure by CKD Stage



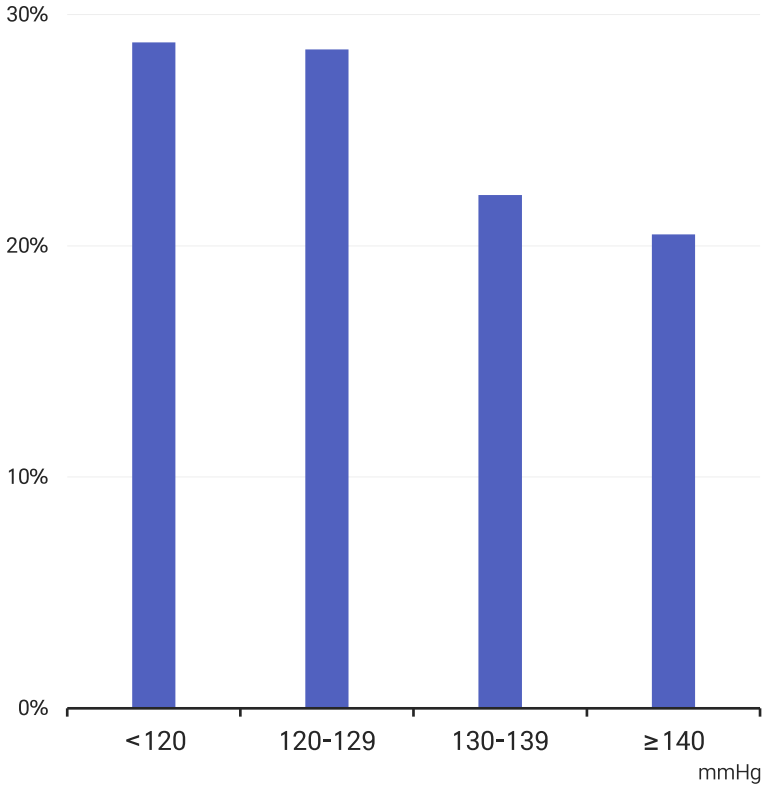
Blood Pressure by Diabetes Status



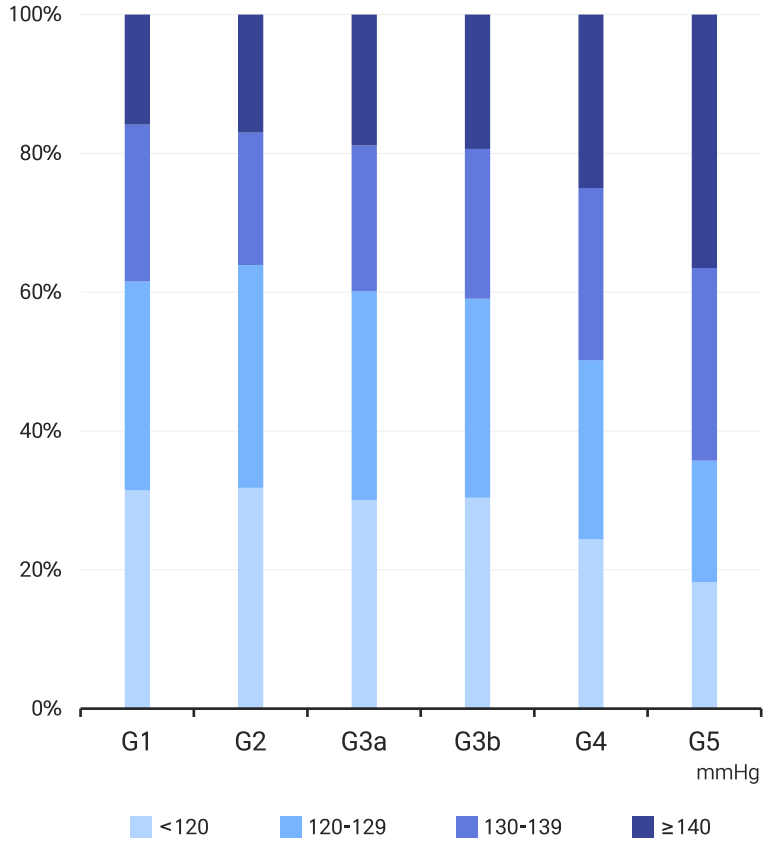
*BP: Blood pressure

1. Blood Pressure According to CKD Stages and Diabetes Status (2/2)

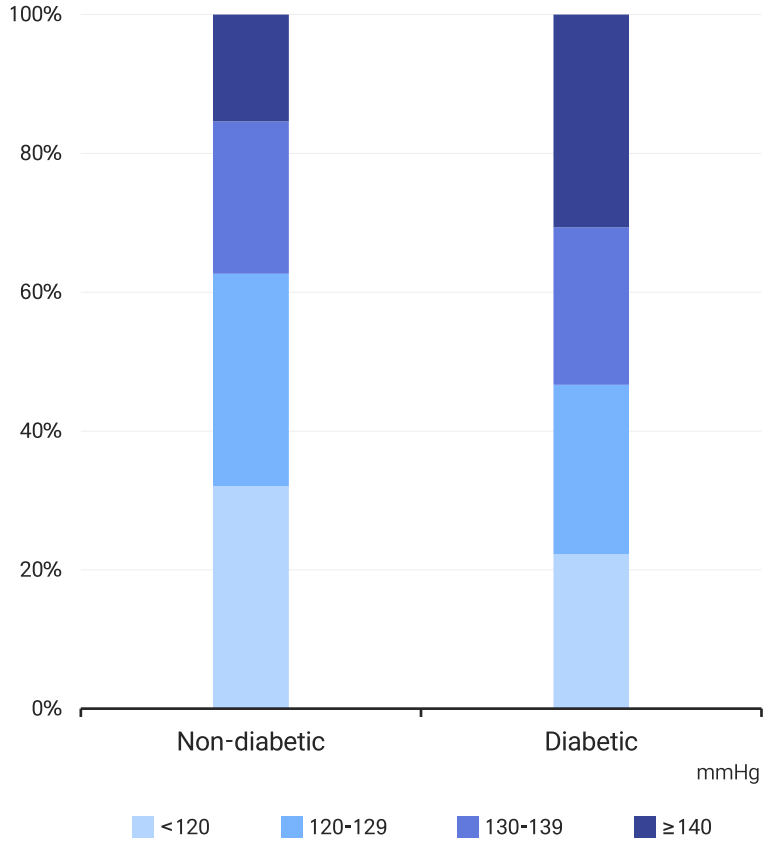
Overall SBP Categories



SBP Categories by CKD Stage



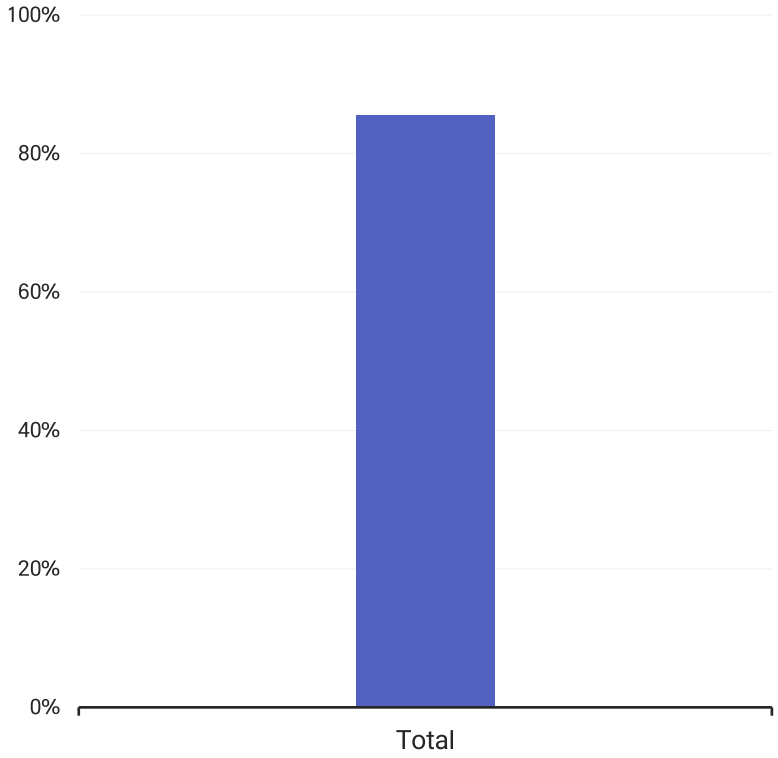
SBP Categories by Diabetes Status



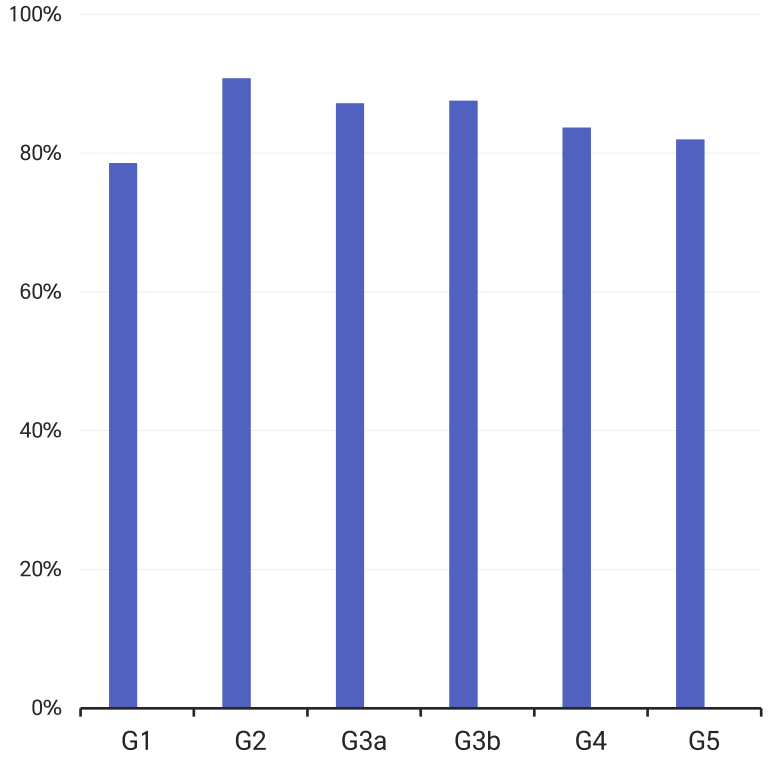
*SBP: Systolic blood pressure

2. ACEi/ARB Medication

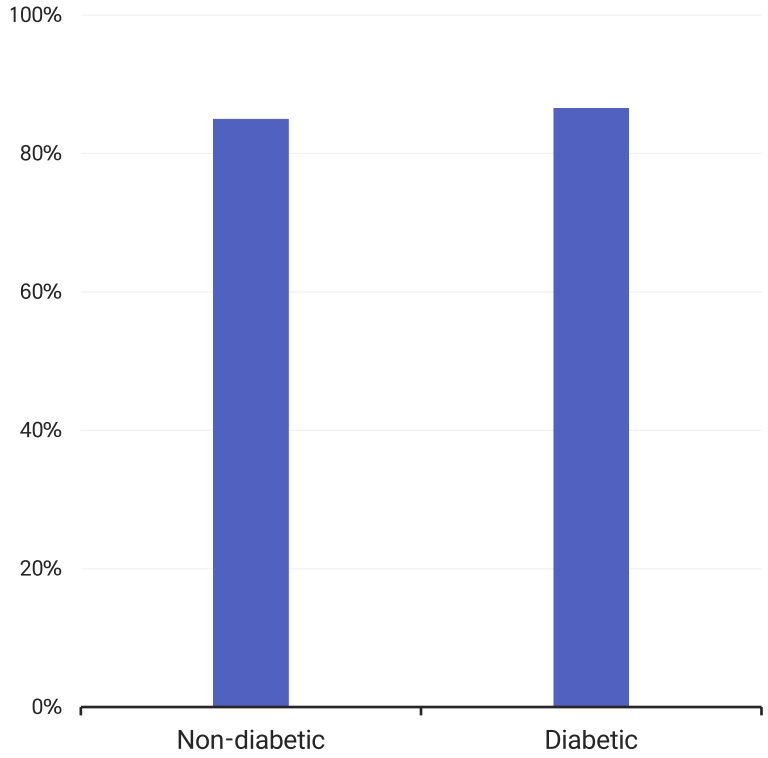
Overall ACEi/ARB* Prescription Rates



ACEi/ARB Prescription by CKD Stage



ACEi/ARB Prescription by Diabetes Status

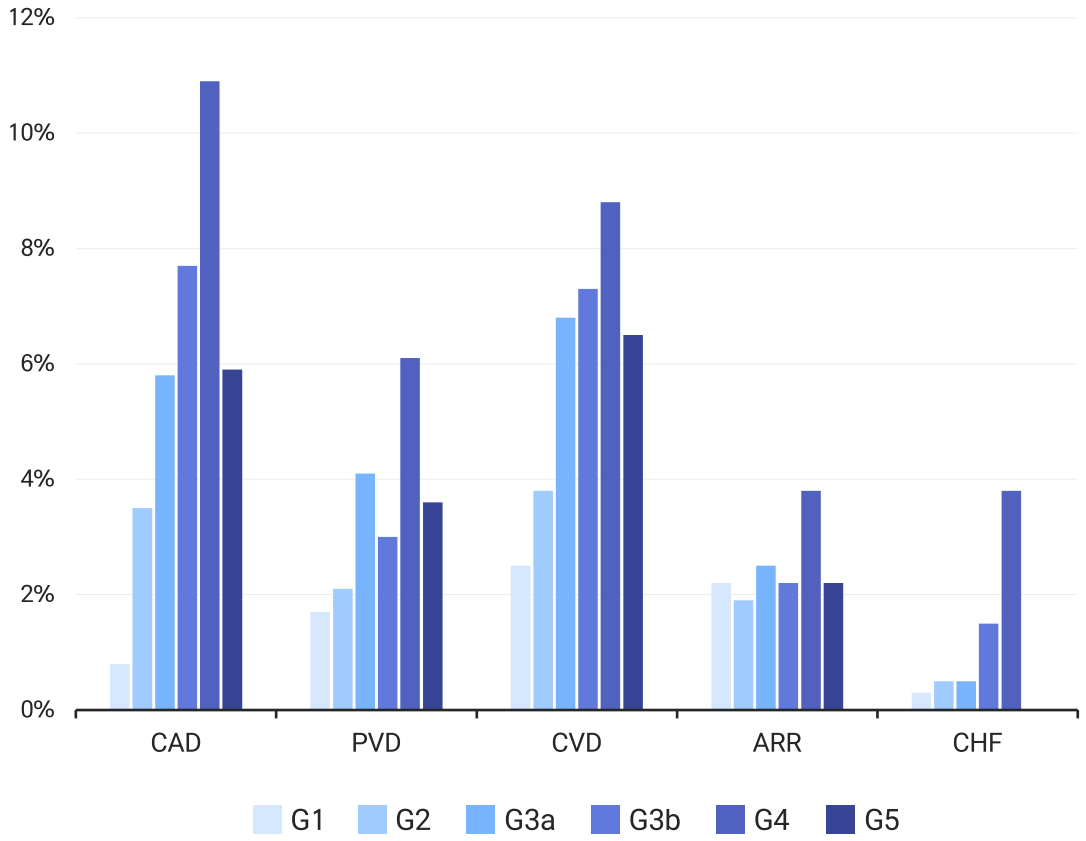


*ACEi: Angiotensin-converting enzyme inhibitor, ARB: Angiotensin II receptor blocker

3. Cardiovascular Comorbidity

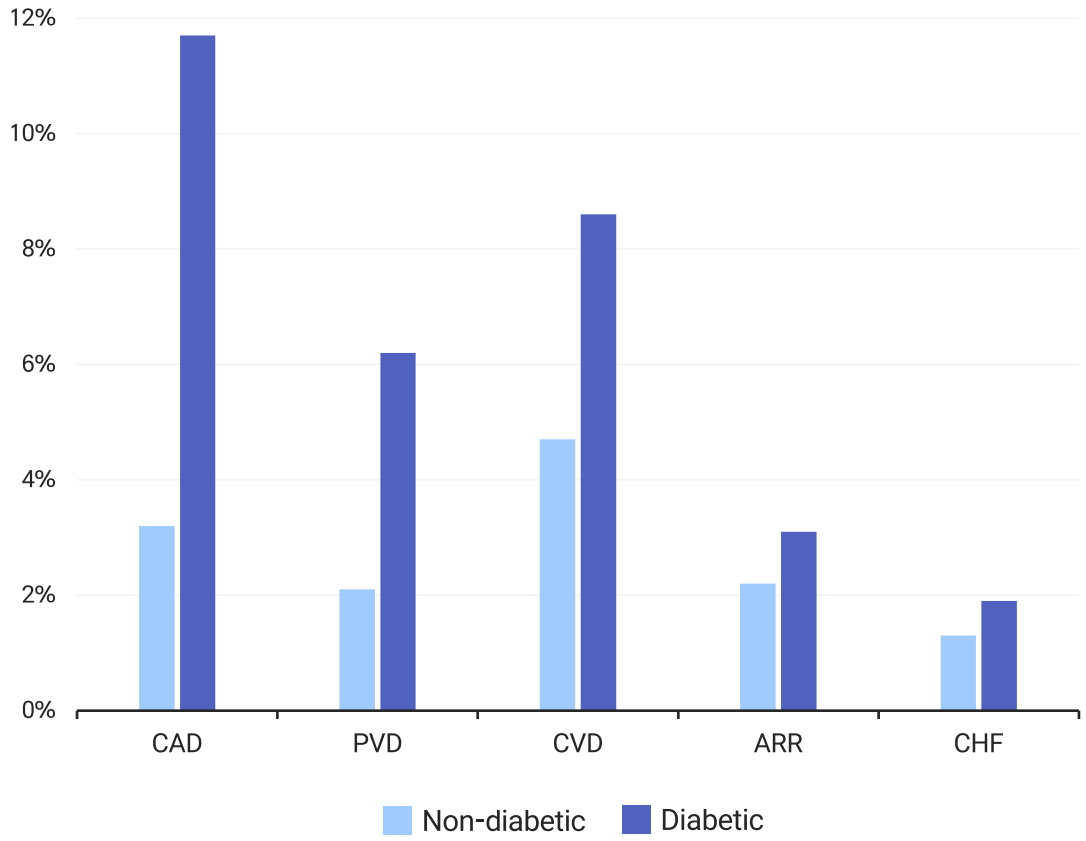
CKD Stage Distribution by Cardiovascular Disease

* % = Percentage of patients with each cardiovascular disease within each CKD stage



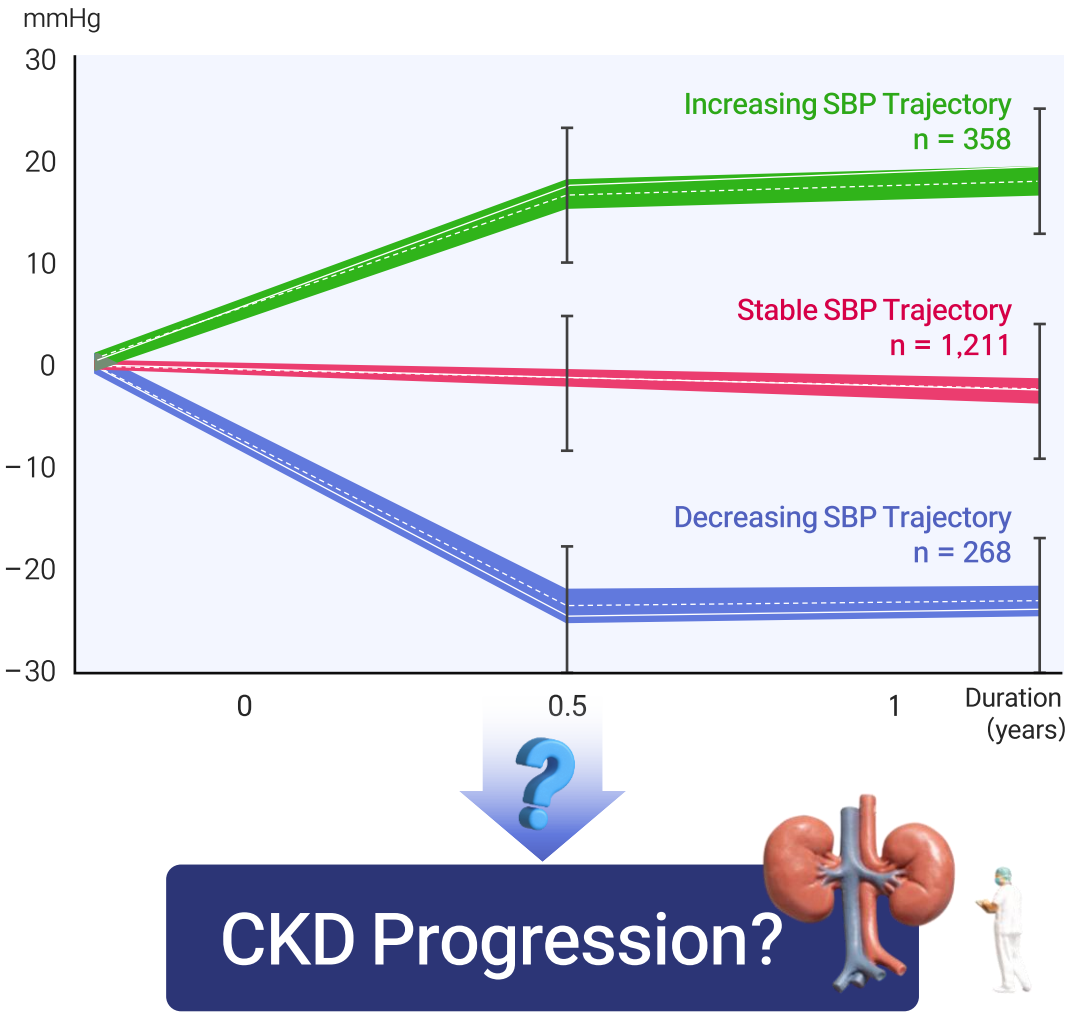
Cardiovascular Disease Prevalence by Diabetes Status

* % = Percentage of patients with each cardiovascular disease according to diabetes status

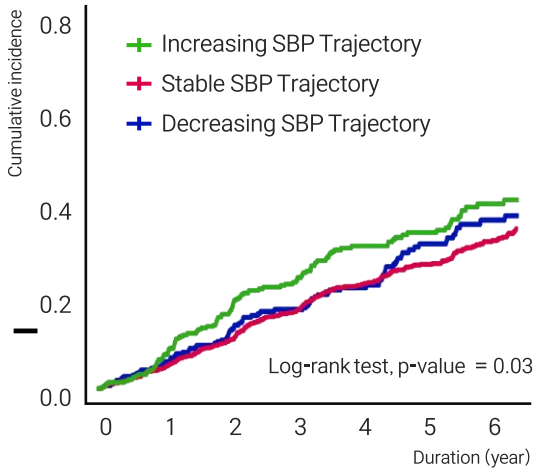


* CAD: Coronary artery disease, PVD: Peripheral vascular disease, CVD: Cerebrovascular disease, ARR: Arrhythmia, CHF: Congestive heart failure

4. Blood Pressure and Renal Function Change



Cumulative Incidence of CKD Progression



Hazard Ratios for CKD Progression

Blood Pressure Trajectory	Hazard Ratios
Increasing SBP Trajectory	1.57
Stable SBP Trajectory	1.00 (Reference)
Decreasing SBP Trajectory	0.91

Based on blood pressure trajectories determined from three consecutive blood pressure measurements during the first year after enrollment, **patients with an increasing BP trajectory had a higher risk of CKD progression than those with stable or decreasing BP trajectories.** These findings highlight the importance of maintaining optimal blood pressure control to slow CKD progression.

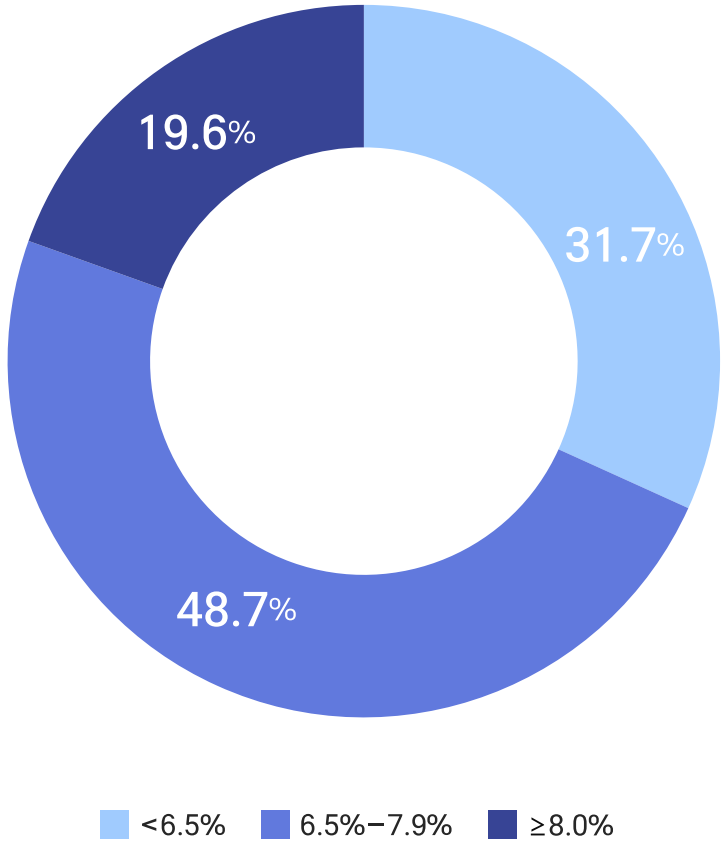
※ Reference : Joo YS *et al. Hypertension.* (2021)

* **SBP**: Systolic blood pressure

5. Blood Glucose Control and SGLT2* Inhibitor Medication

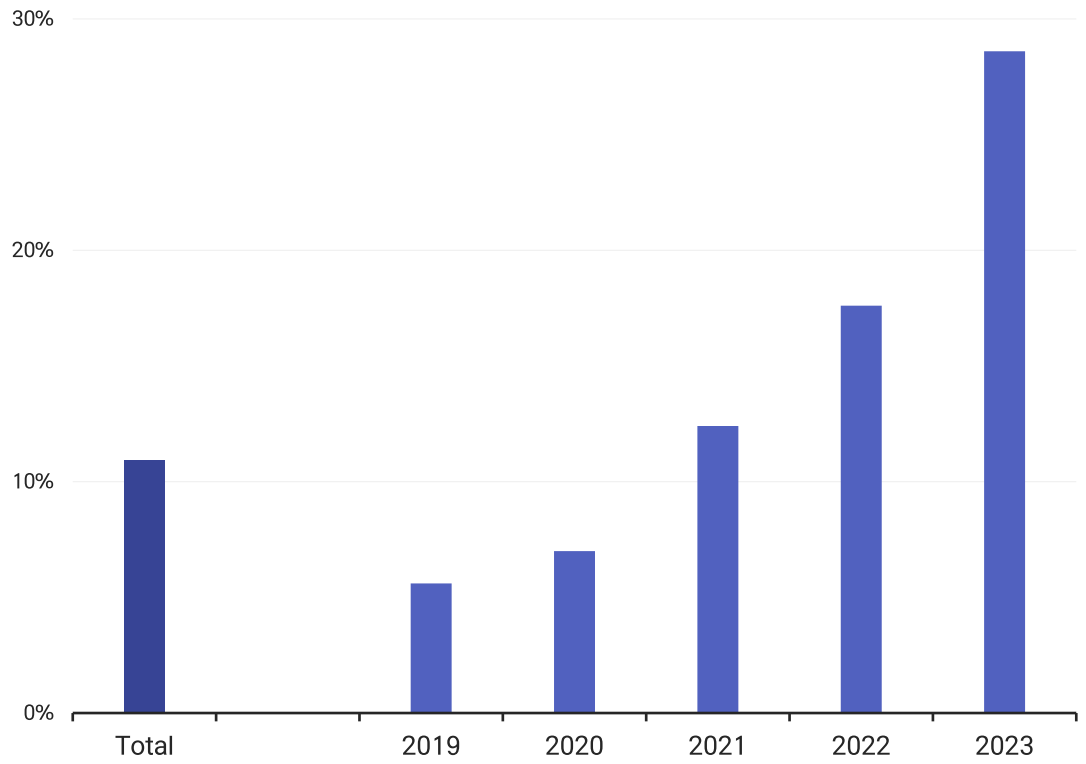
Distribution of Patients by HbA1c Category

※ Note: Results from the Phase 2 cohort of patients with diabetes



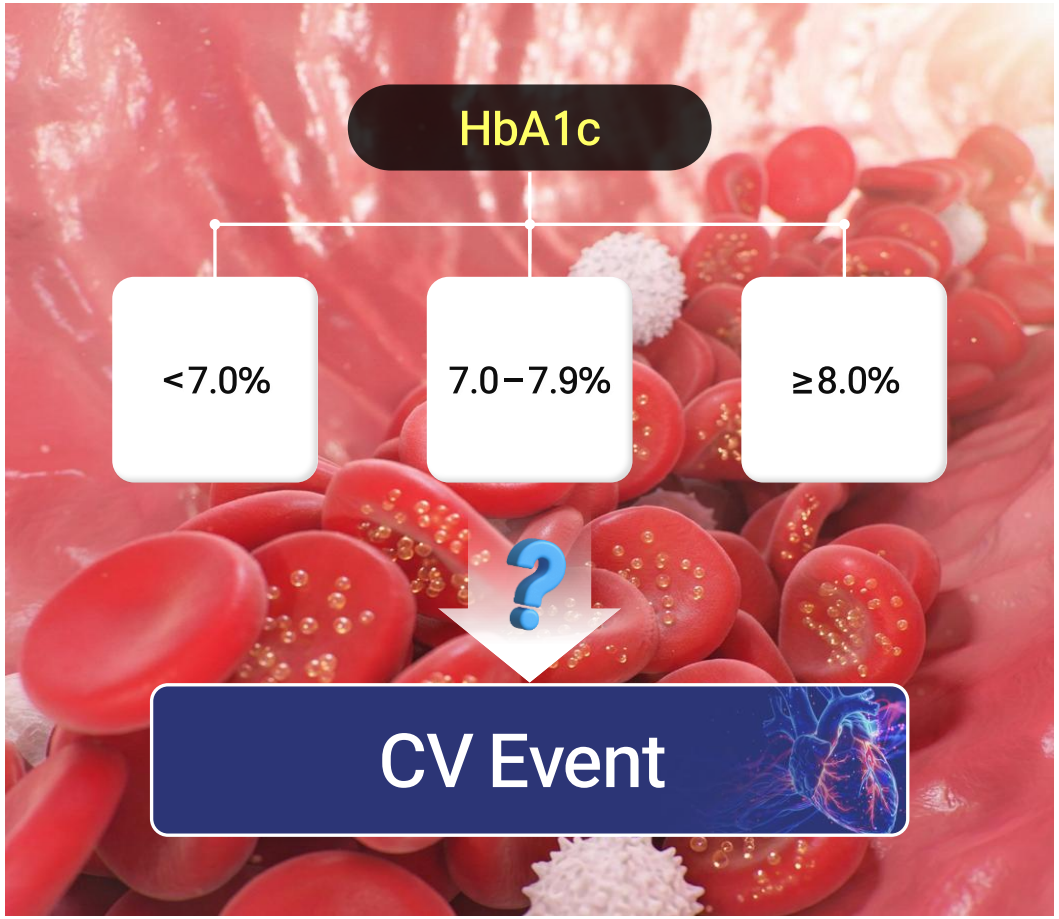
SGLT2 Inhibitor Prescription Rate

※ Note: Results from the Phase 2 cohort of patients with diabetes

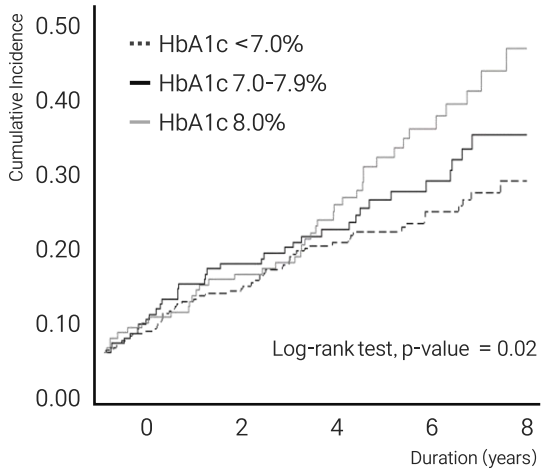


* SGLT2: Sodium-glucose cotransporter 2

6. Blood Glucose Control and Cardiovascular Events



Cumulative Incidence of CV Events



Hazard Ratios for CV Events

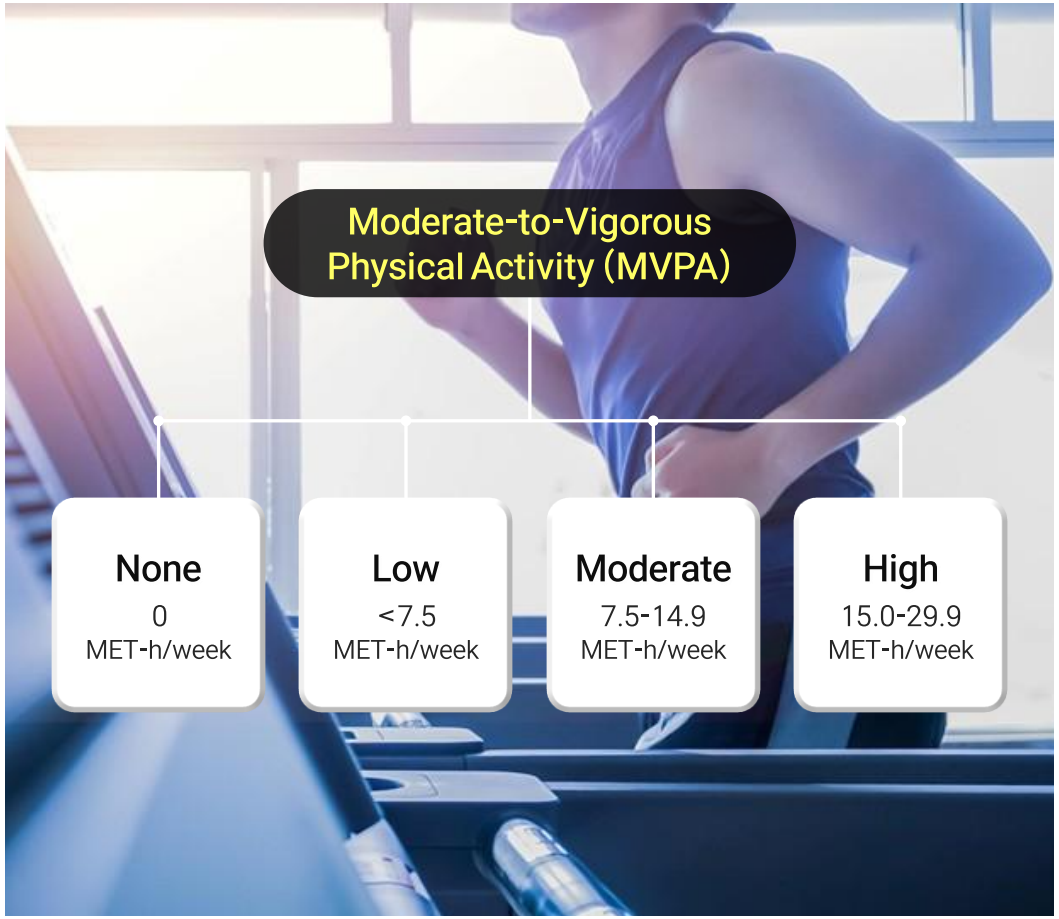
HbA1c Category	Hazard Ratios
<7.0%	1.0 (Reference)
7.0 - 7.9%	1.6
≥8.0%	2.0

Among adults with CKD and type 2 diabetes, **higher HbA1c levels were associated with an increased risk of CV mortality**. These findings suggest that appropriate glycemic control may reduce CV risk in patients with CKD and diabetes.

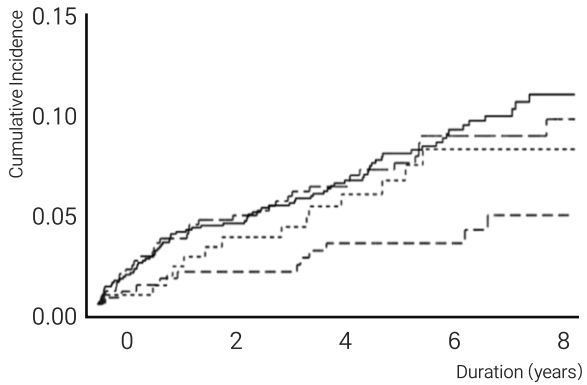
※ Reference : Heo GY *et al. Diabetes Metab J.* (2023)

* CV: Cardiovascular

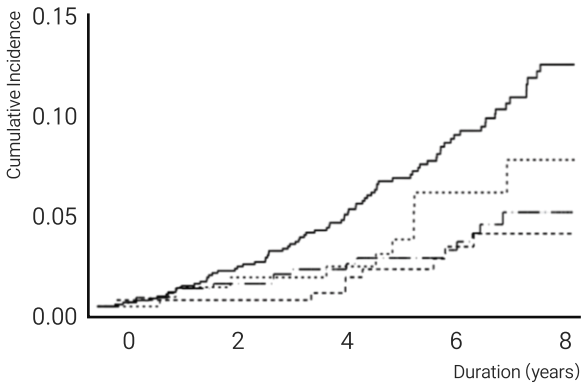
7. Physical Activity and Cardiovascular Outcome/Mortality



Cumulative Incidence of CV Events



Cumulative Incidence of Mortality



None — Low MVPA* — Moderate MVPA — High MVPA

53% ↓ Moderate MVPA *vs.* No MVPA 58% ↓

Among patients with CKD, **maintaining MVPA was associated with lower risks of CV events and mortality.**
In patients with an eGFR <60mL/min/1.73 m², MVPA was also associated with a lower risk of end-stage kidney disease.

※ Reference: Kim JH *et al. J Clin Med*. (2021)

* MET: Metabolic equivalent of task
* MVPA: Moderate-to-vigorous physical activity
* CV: Cardiovascular

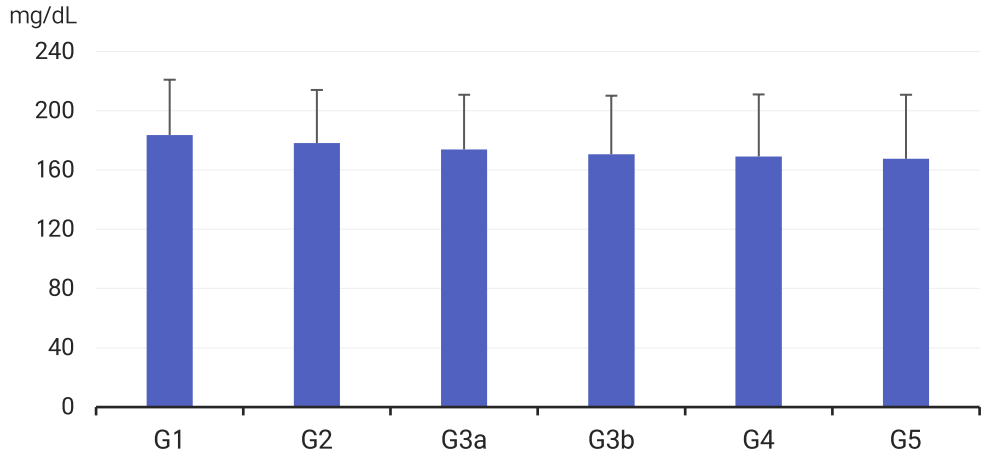
Ⅲ Major Complications and Outcomes

Section 2 . Dyslipidemia and Obesity

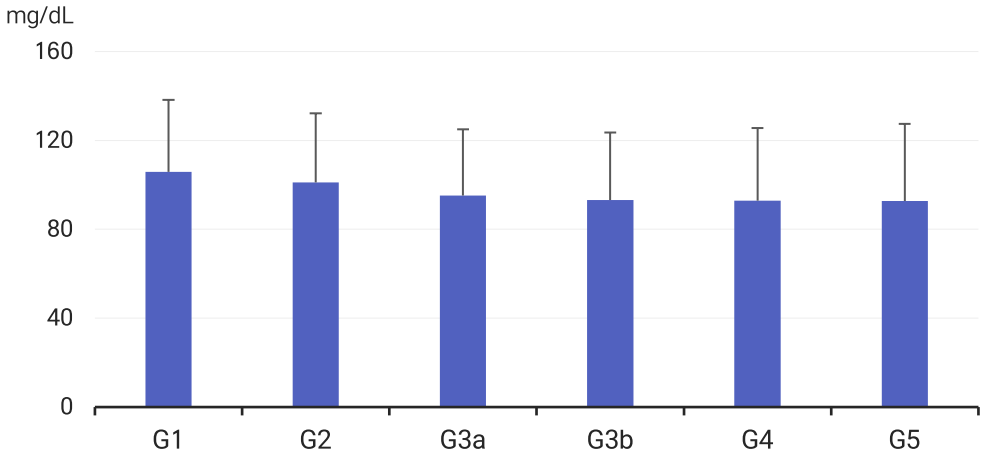
1. Lipid Profiles According to CKD Stages
2. Kidney Function Decline According to BP and Dyslipidemia Control
3. Cardiovascular Outcomes According to Non- HDL Cholesterol Level
4. Kidney Function Decline According to TG Level
5. Association Between Obesity/Central Obesity and Coronary Artery Calcification

1. Lipid Profiles According to CKD Stages (1/2)

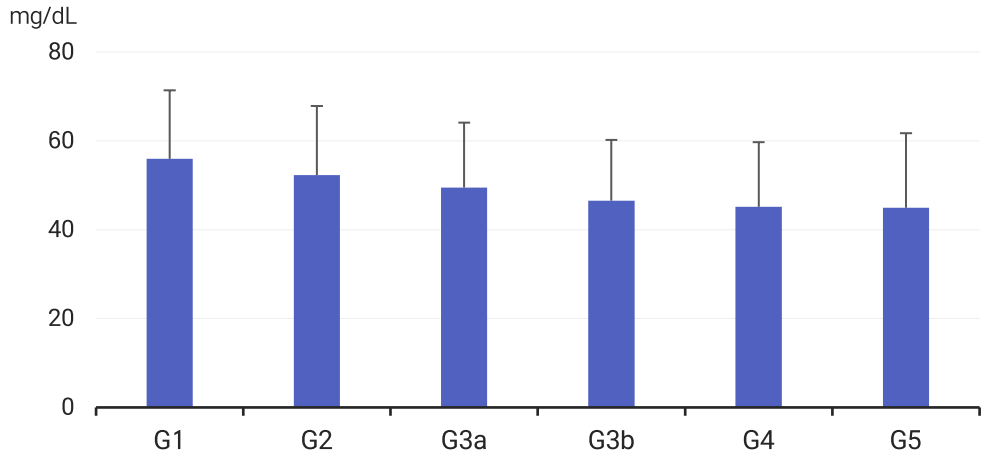
Total Cholesterol



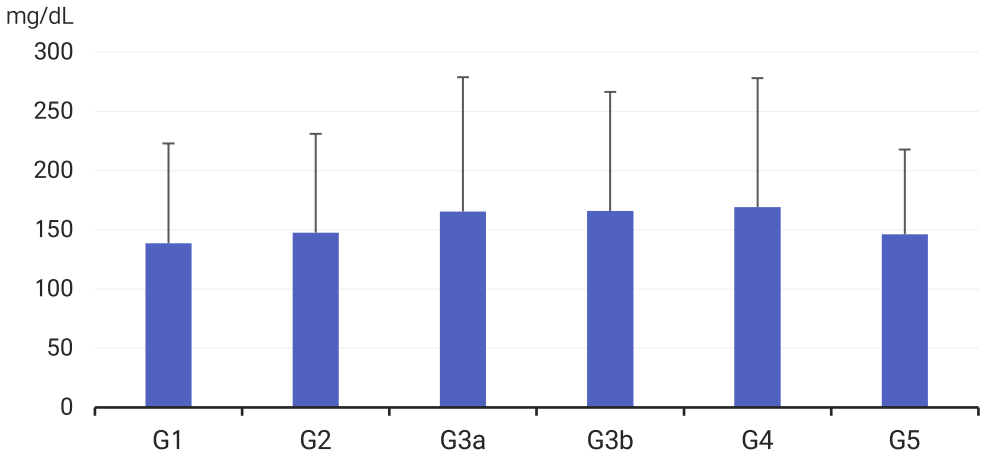
LDL Cholesterol



HDL Cholesterol



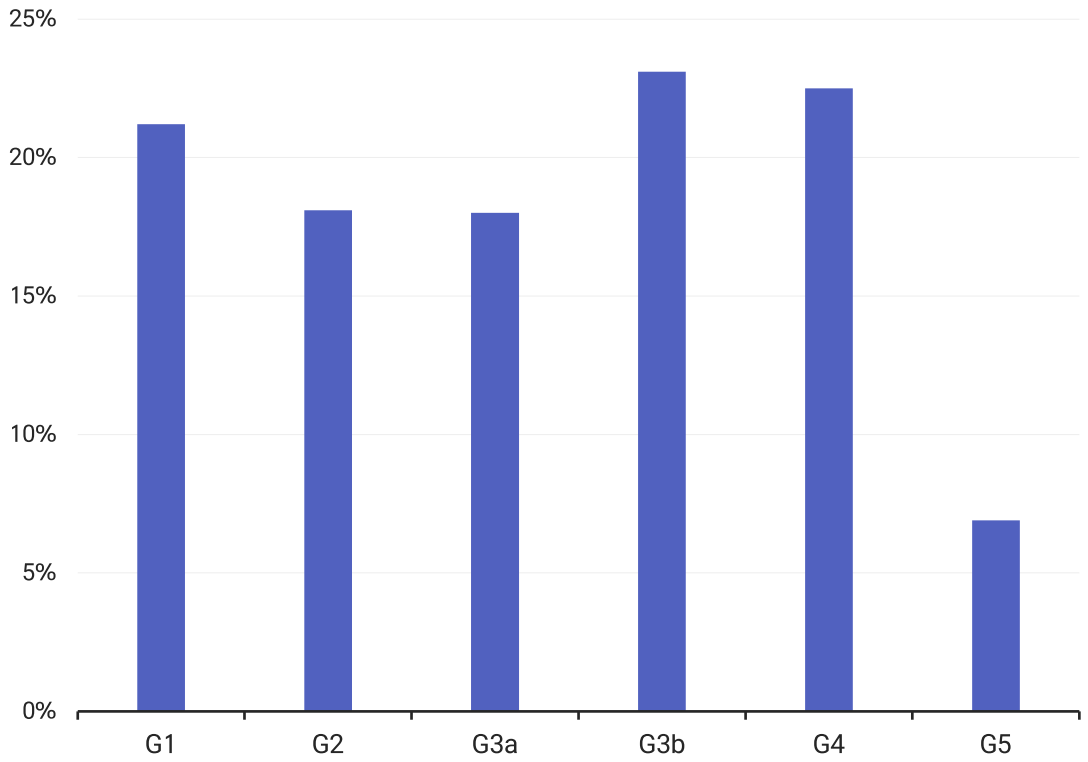
Triglycerides



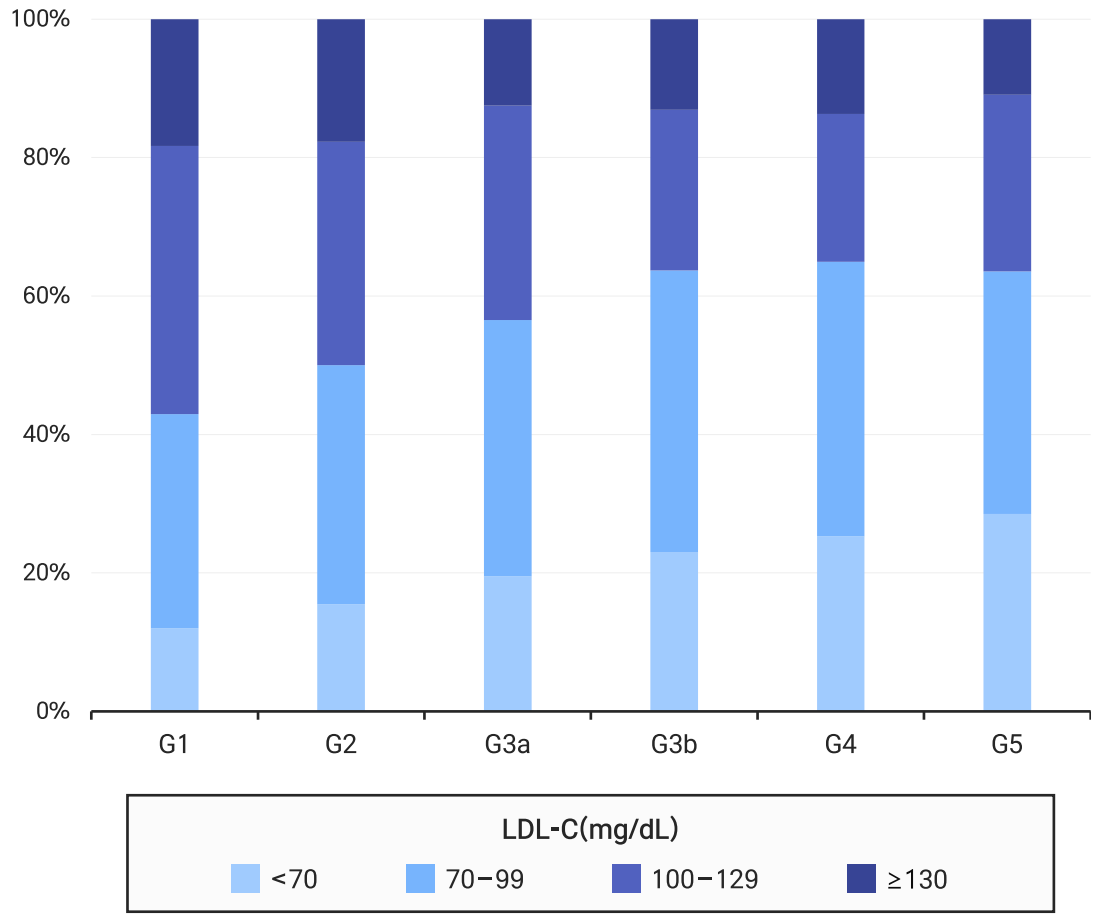
* LDL: Low-density lipoprotein
* HDL: High-density lipoprotein

1. Lipid Profiles According to CKD Stages (2/2)

Statin Use by CKD Stage



LDL-Cholesterol Categories by CKD Stage



* LDL: Low-density lipoprotein, LDL-C: Low-density lipoprotein cholesterol

2. Kidney Function Decline According to BP and Dyslipidemia Control

Risk of CKD Progression by SBP and LDL-Cholesterol (LDL-C)

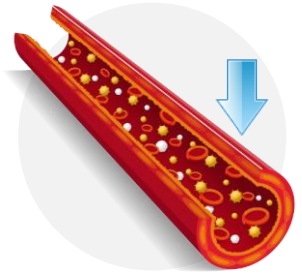
SBP (mmHg)	LDL-C (mg/dL)	Hazard Ratio
≥ 120	≥ 70	1.00 (Reference)
≥ 120	< 70	0.96
< 120	≥ 70	0.74
< 120	< 70	0.64

Among patients with CKD, **achieving both SBP <120mmHg and LDL-C <70mg/dL was associated with a lower risk of CKD progression.**

※ Reference: Kim KW *et al. Hypertens Res.* (2023)



SBP
<120mmHg

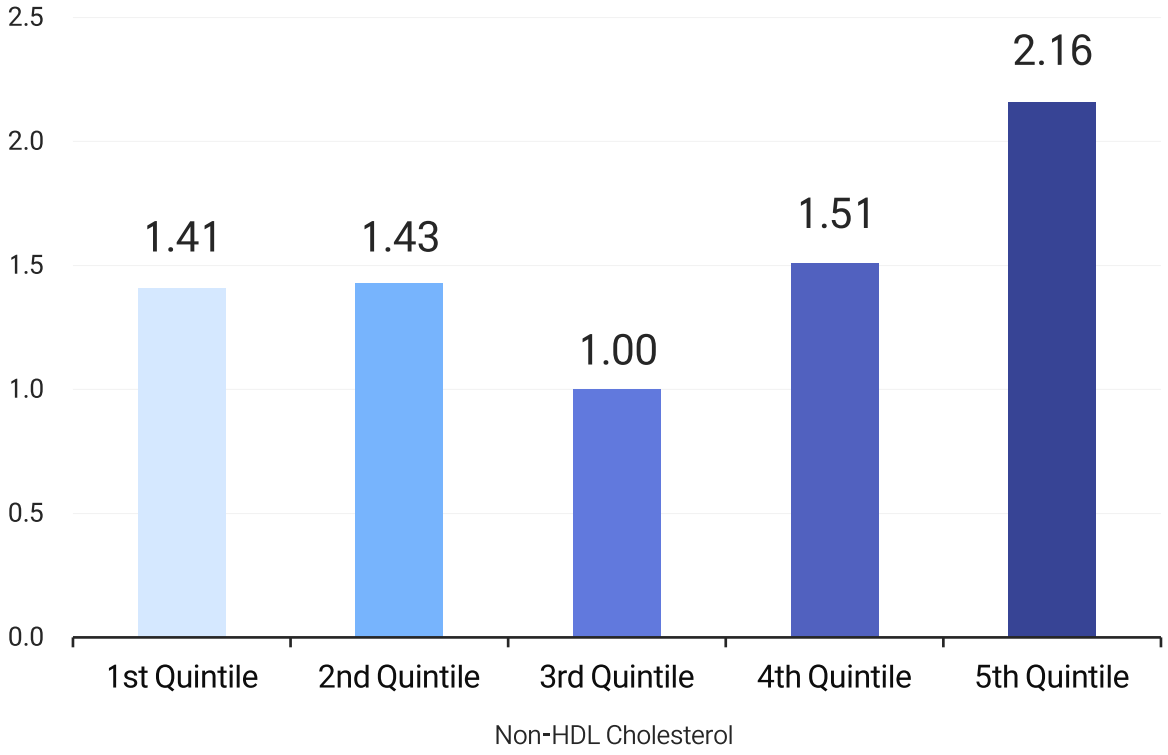


LDL-C
<70mg/dL

* SBP: Systolic blood pressure, LDL-C: low-density lipoprotein cholesterol

3. Cardiovascular Outcomes According to Non-HDL Cholesterol Level

Hazard Ratios for Composite CV Outcomes by Non-HDL Cholesterol Quintile



Non-HDL Cholesterol (mean ± SD, mg/dL)				
1st Quintile	2nd Quintile	3rd Quintile	4th Quintile	5th Quintile
79.1 ± 11.2	103.1 ± 5.2	120.8 ± 5.3	140.9 ± 6.2	179.8 ± 27.6

Higher serum **non-HDL cholesterol levels were associated with an increased risk of adverse CV outcomes** in patients with pre-dialysis CKD. This association **remained consistent across subgroups stratified by age, sex, BMI, eGFR, and UACR.**

Subgroup Analysis

- Age: <60 *vs.* ≥60years
- BMI: <23 *vs.* ≥23kg/m²
- eGFR: ≥45 *vs.* <45mL/min/1.73m²
- UACR: <300 *vs.* ≥300mg/g



※ Reference: Suh SH *et al. Nutrients* . (2022)

* CV: Cardiovascular, SD: Standard deviation, BMI: Body mass index, eGFR: Estimated glomerular filtration rate, UACR: Urinary albumin-to-creatinine ratio

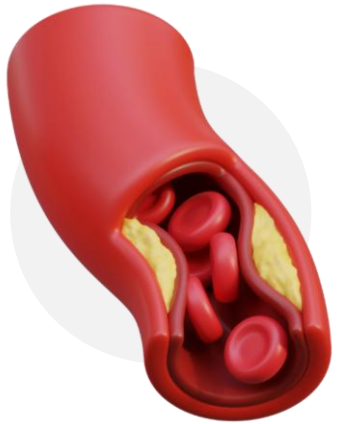
4. Kidney Function Decline According to TG Level

Risk of Kidney Function Decline by Serum Triglyceride Quartile

Triglyceride Quartile	Number of Participants	Triglyceride Level (mean ± SD, mg/dL)	Hazard Ratio
1st Quartile	539	79.1±11.2	1.00 (Reference)
2nd Quartile	539	111.4 ± 11.7	1.25
3rd Quartile	540	160.1 ± 17.2	1.10
4th Quartile	540	286.2 ± 108.6	1.43

Among 2,158 adults with CKD, patients were categorized into triglyceride quartiles according to their serum triglyceride levels. Compared with Q1 (the lowest quartile), patients in Q4 (the highest quartile) had a 43.3% higher risk of kidney function decline.

※ Reference: Suh SH *et al. Front Nutr.* (2022)

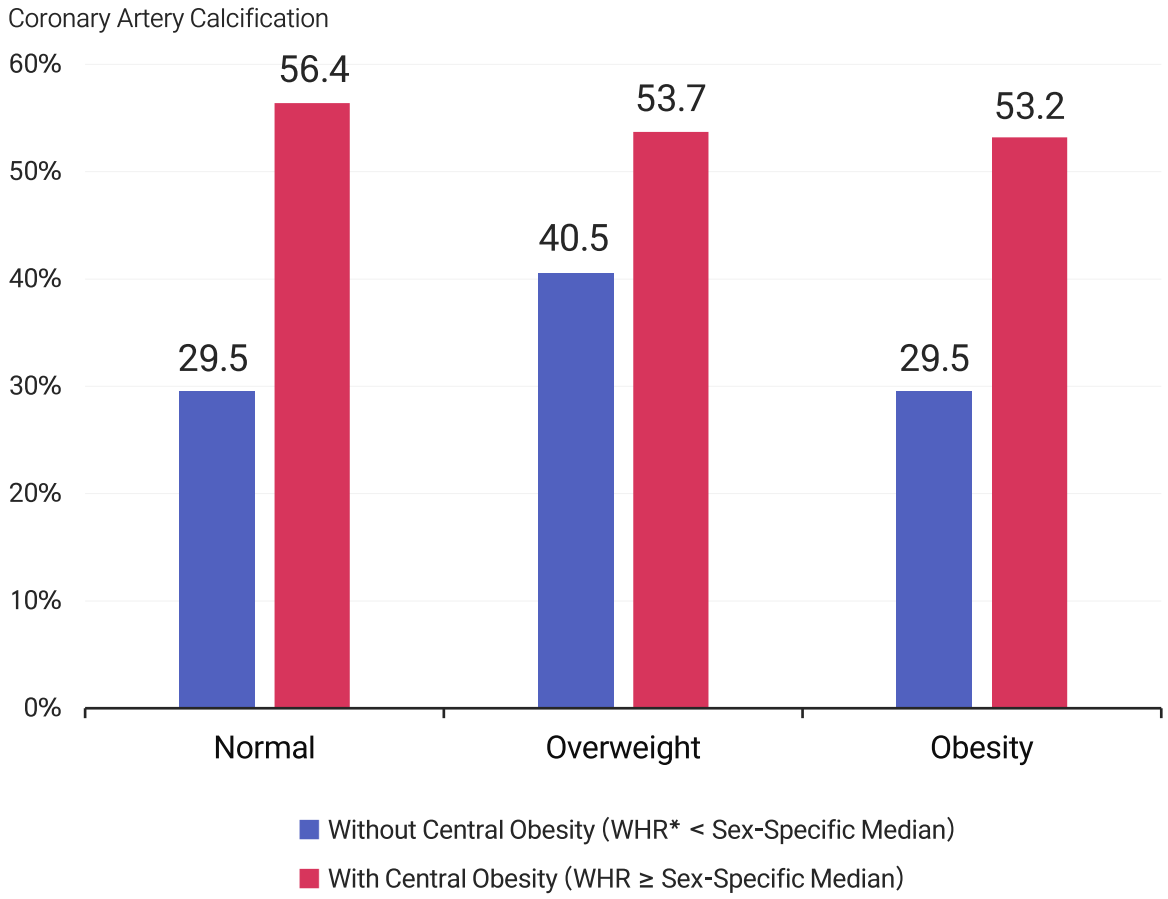


Highest TG Quartile (4th quartile)
43.3% Higher Risk of CKD Progression

* TG: Triglyceride, SD: Standard deviation

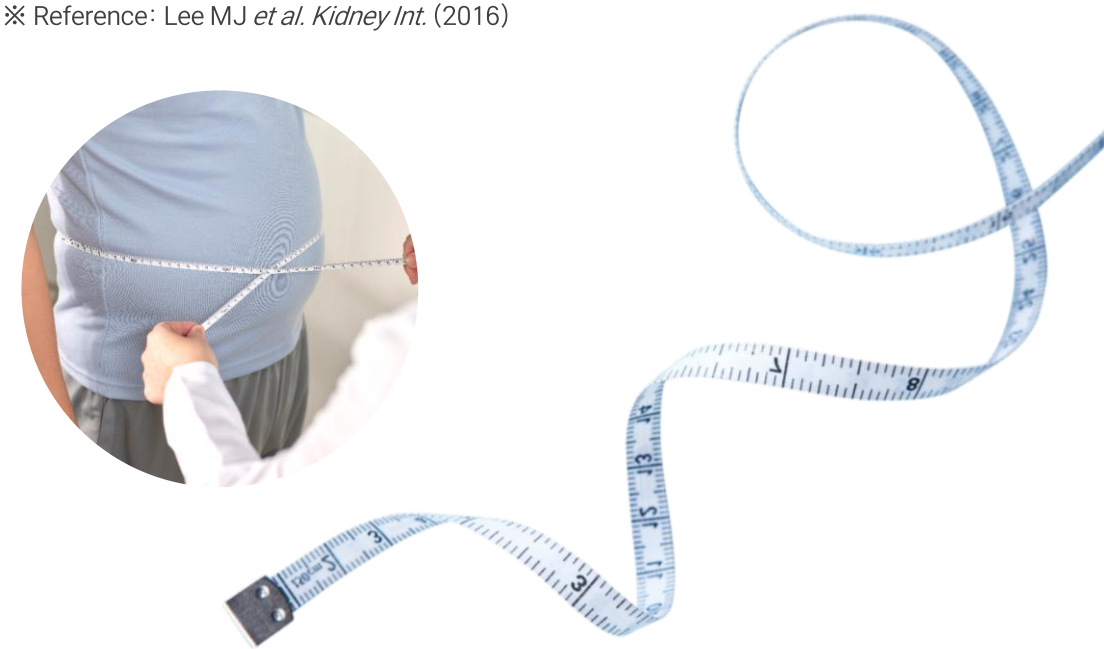
5. Association Between Obesity/Central Obesity* and Coronary Artery Calcification

Coronary Artery Calcification by Obesity (Based on BMI) and Central Obesity



Even among individuals with normal BMI, those with central obesity had the highest prevalence of coronary artery calcification.
These findings suggest that assessment and **management of central obesity are important in patients with CKD, regardless of BMI.**

※ Reference: Lee MJ *et al. Kidney Int.* (2016)



* WHR: Waist-to-hip ratio, BMI: Body mass index
* Central obesity was defined as a WHR at or above the sex-specific median.

Ⅲ Major Complications and Outcomes

Section 3 . Anemia and Iron Deficiency

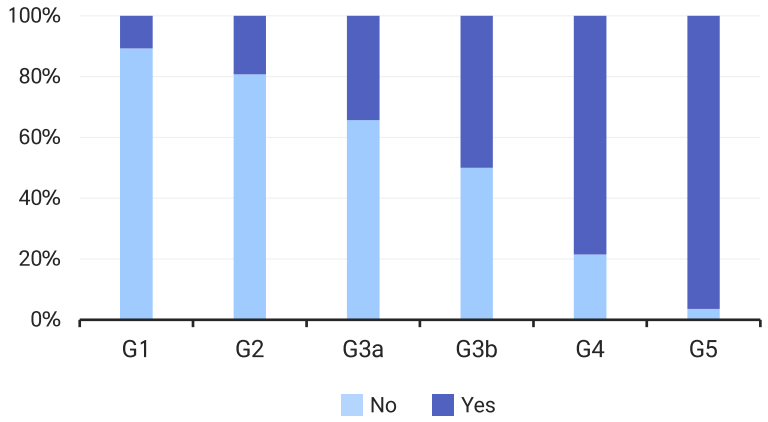
1. Anemia and Iron Status
2. International Comparative Analysis for Anemia
3. Association Between Anemia and Mortality

1. Anemia and Iron Status

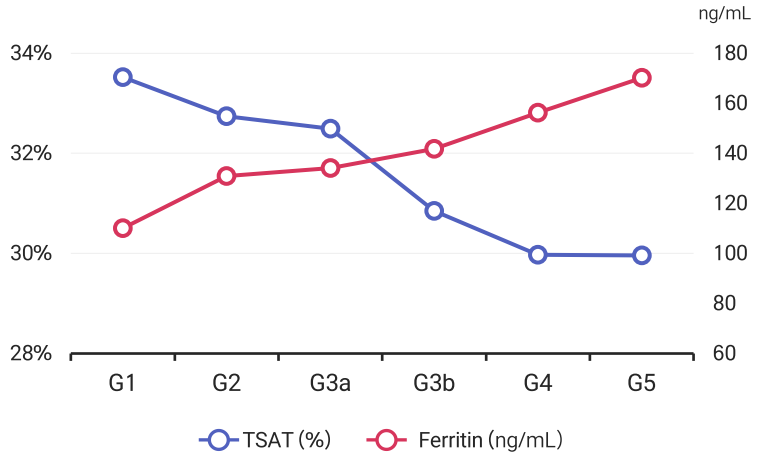
Definition

- Anemia: Hemoglobin < 13 g/dL in men, < 12 g/dL in women, or patients receiving erythropoiesis-stimulating agents (ESAs)
- Iron deficiency: TSAT < 20% or ferritin < 100 ng/mL
- Iron deficiency anemia: Patients with both iron deficiency and anemia

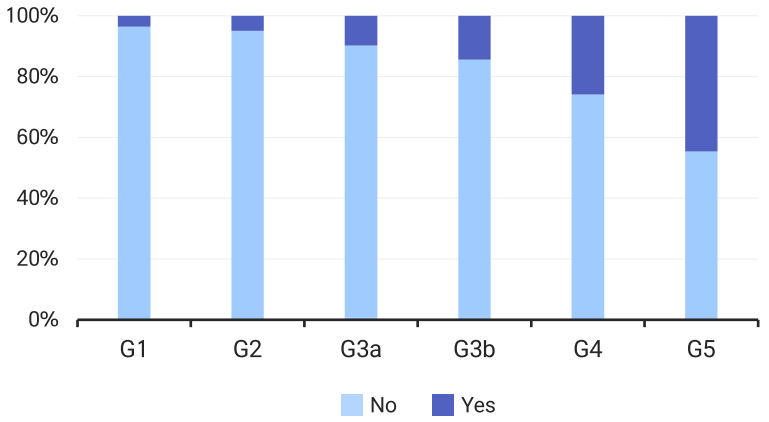
Prevalence of Anemia by CKD Stage



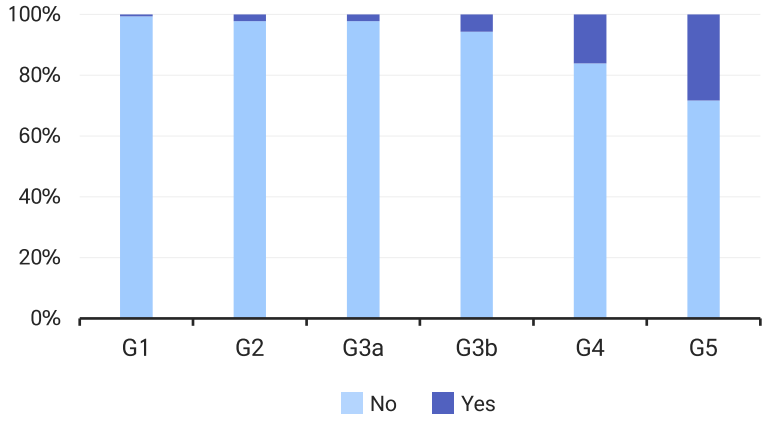
TSAT* and Ferritin Level by CKD Stage



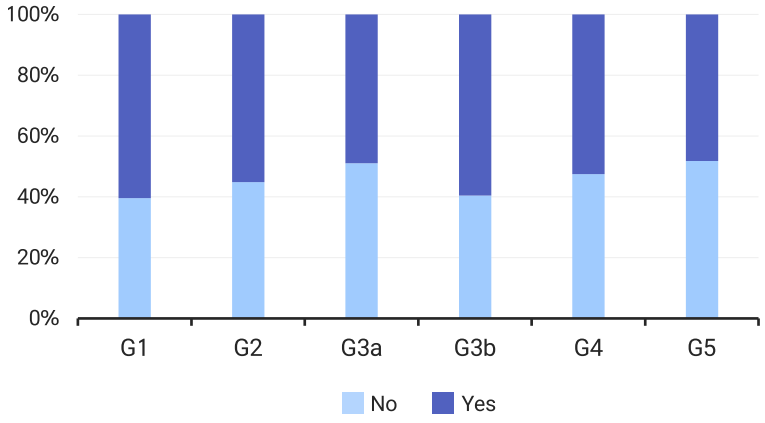
Iron Supplement Prescription Rate by CKD Stage



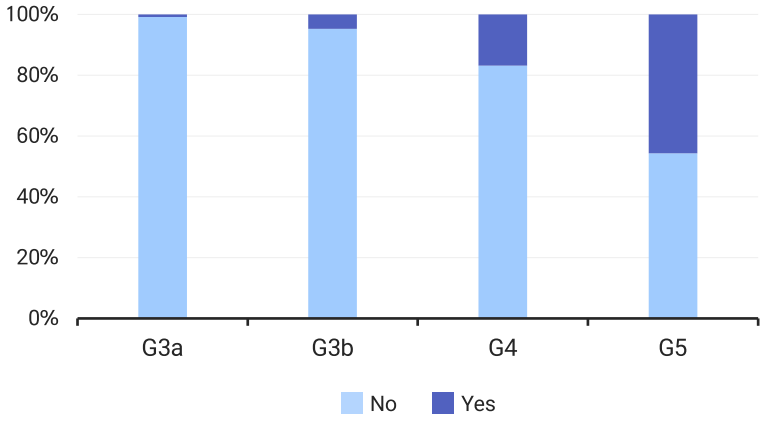
Prevalence of Severe Anemia(Hb* < 10 g/dL) by CKD Stage



Prevalence of Iron Deficiency by CKD Stage



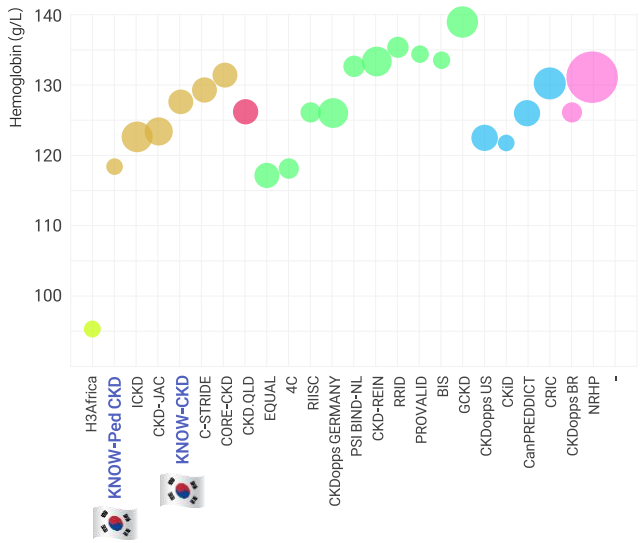
ESA Prescription Rate in CKD Stages 3–5

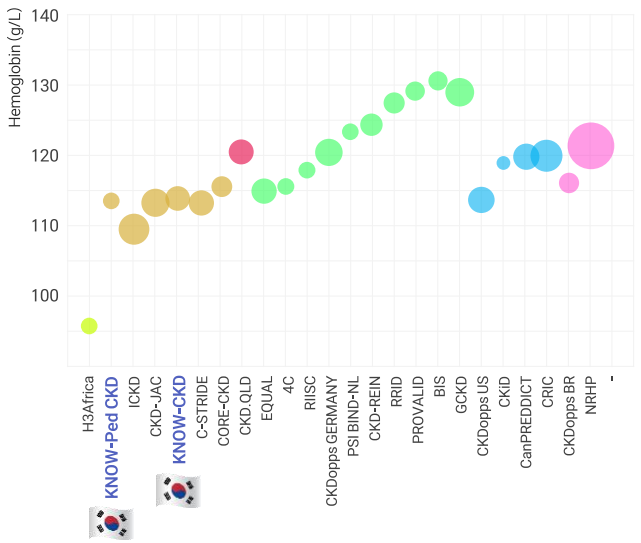


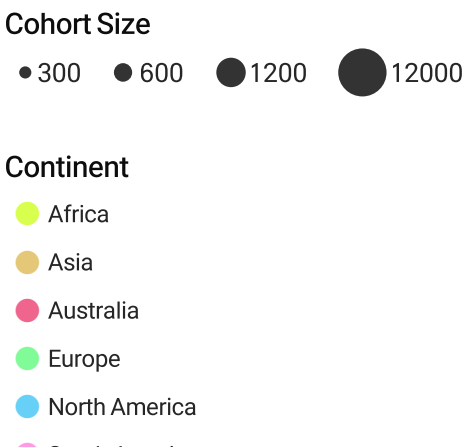
* Hb: Hemoglobin, TSAT: Transferrin saturation

2. International Comparative Analysis for Anemia

Bubble Chart of Mean Hemoglobin Levels across Participating Cohorts and Regions

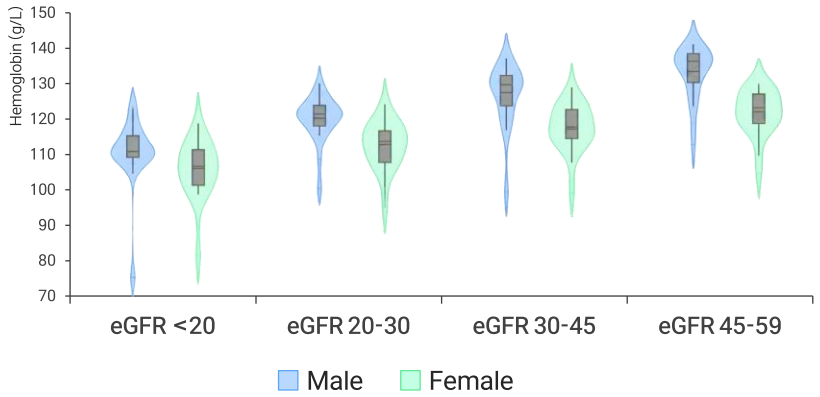








Distribution of Hemoglobin Levels by Sex across eGFR Levels in All Patients with CKD



Female patients with CKD in Asia and Africa exhibited lower hemoglobin levels. Furthermore, hemoglobin levels in females were consistently lower than those in males across all eGFR strata.

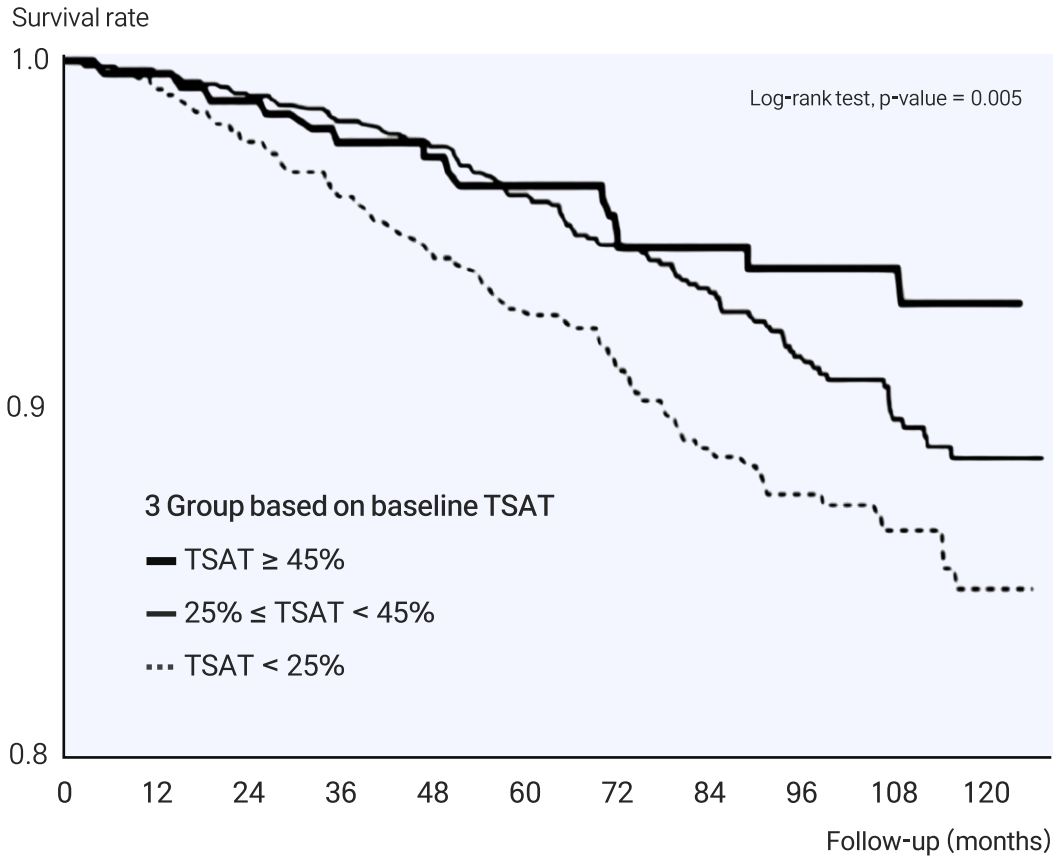
Lower eGFR, female sex, older age, lower body mass index (BMI), and diabetes were identified as significant risk factors for anemia. However, as these risk factors alone do not fully account for anemia, further exploration of additional contributing factors is warranted.

※ Reference: Canney M, Oh KH, Kang AHG *et al. Kidney Int Rep* . (2023)

*eGFR: estimated glomerular filtration rate

3. Association Between Anemia and Mortality

Survival by TSAT* Levels



Hazard Ratios for All-Cause Mortality and MACE by TSAT Level

All-cause mortality		MACE
1.44	Hazard ratio	1.38

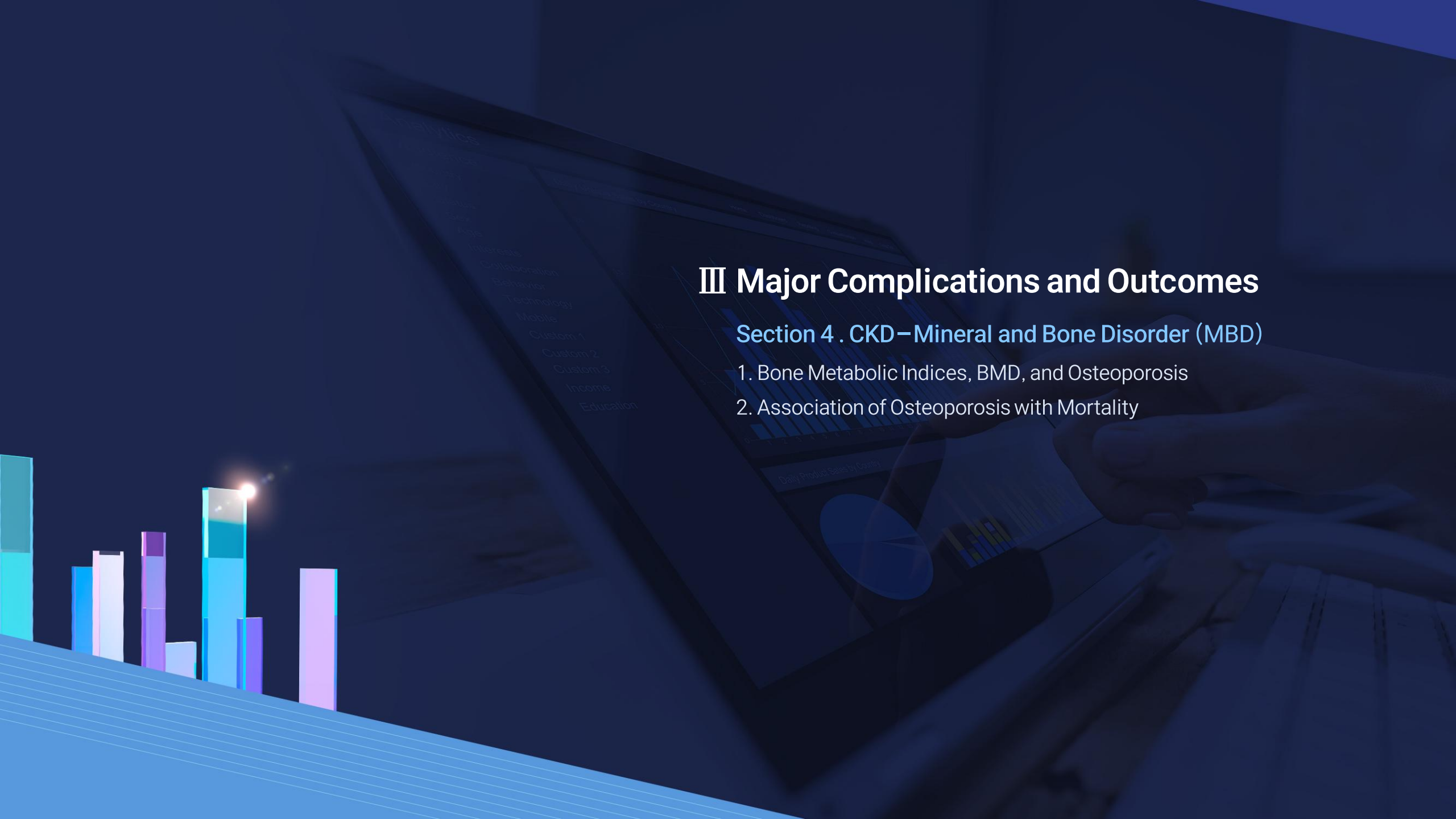
Compared with the TSAT 25% to <45% group, patients with TSAT < 25% demonstrated **a significantly increased risk of mortality (44% increase in hazard ratio), whereas no significant increase was observed in the risk of MACE.**

※ Reference: Jo E and Kim HJ *et al. Kidney Res Clin Pract.* (2024)

* Major adverse cardiac event (MACE)
A composite of cardiovascular death, non-fatal myocardial infarction, non-fatal stroke, or hospitalization due to unstable angina



* TSAT: Transferrin saturation



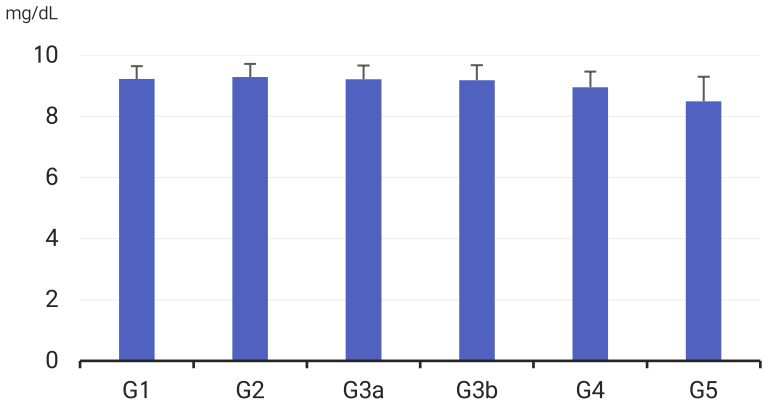
Ⅲ Major Complications and Outcomes

Section 4 . CKD–Mineral and Bone Disorder (MBD)

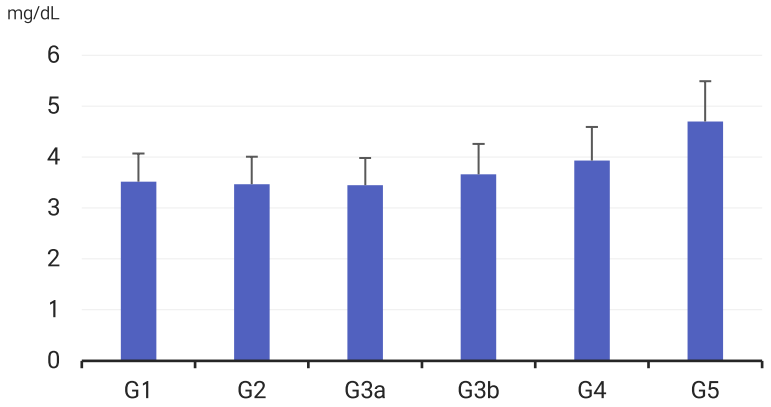
1. Bone Metabolic Indices, BMD, and Osteoporosis
2. Association of Osteoporosis with Mortality

1. Bone Metabolic Indices, BMD, and Osteoporosis

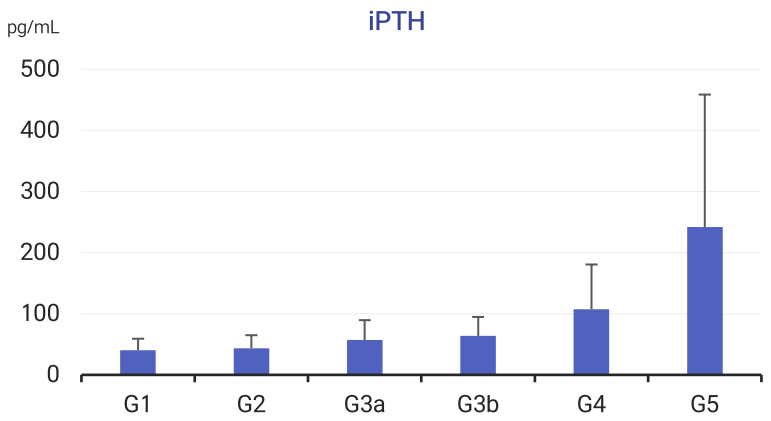
Serum Calcium Level by CKD Stage



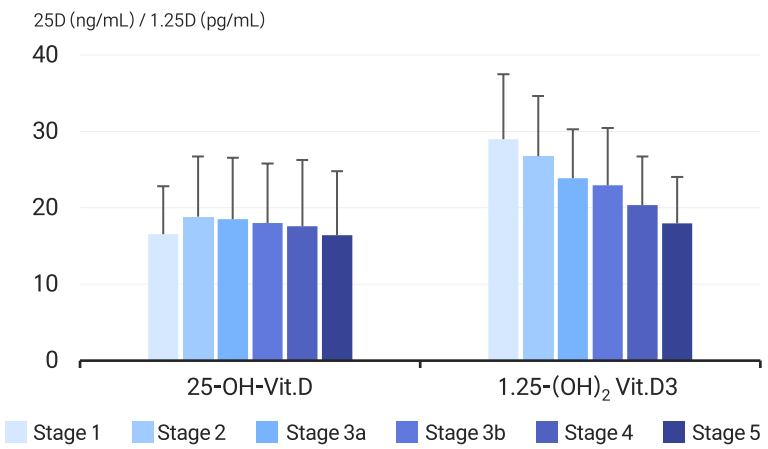
Serum Phosphorus Level by CKD Stage



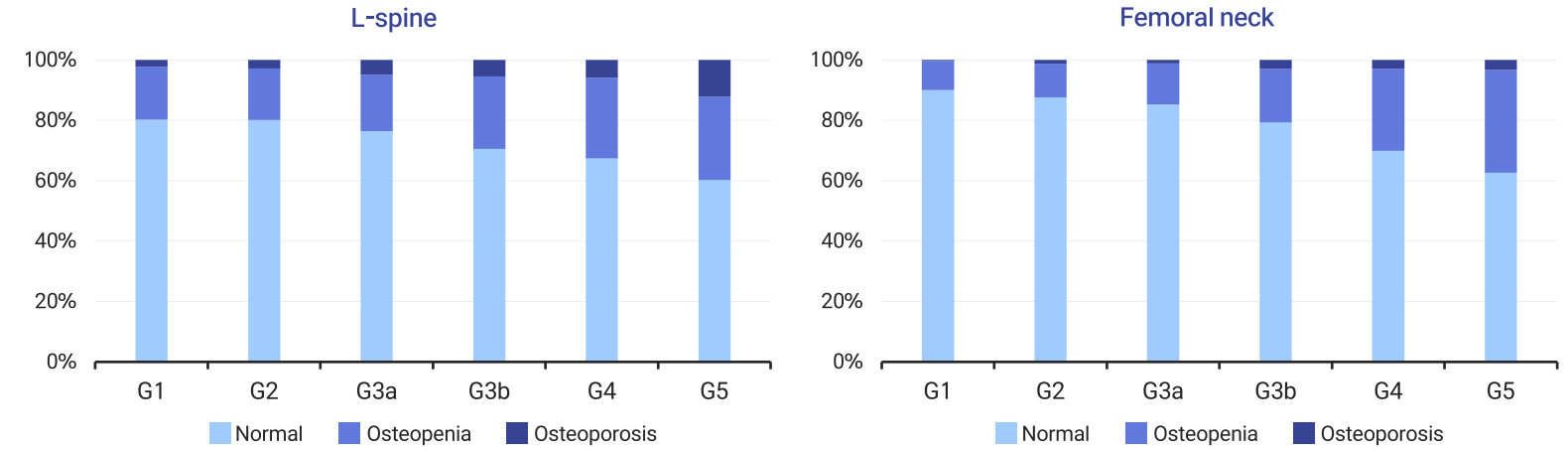
Serum Parathyroid Hormone Level by CKD Stage



Serum Vitamin D Level by CKD Stage

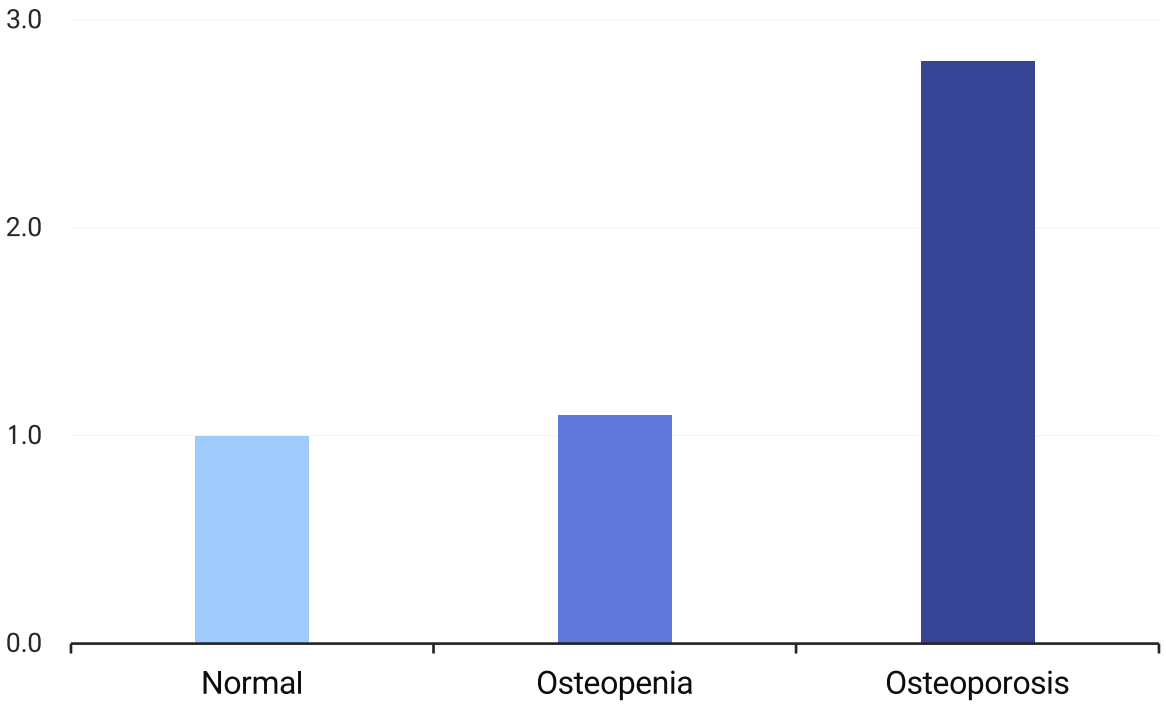


Prevalence of Osteopenia/Osteoporosis by CKD Stage



2. Association of Osteoporosis with Mortality

Mortality Risk by Bone Mineral Density Status

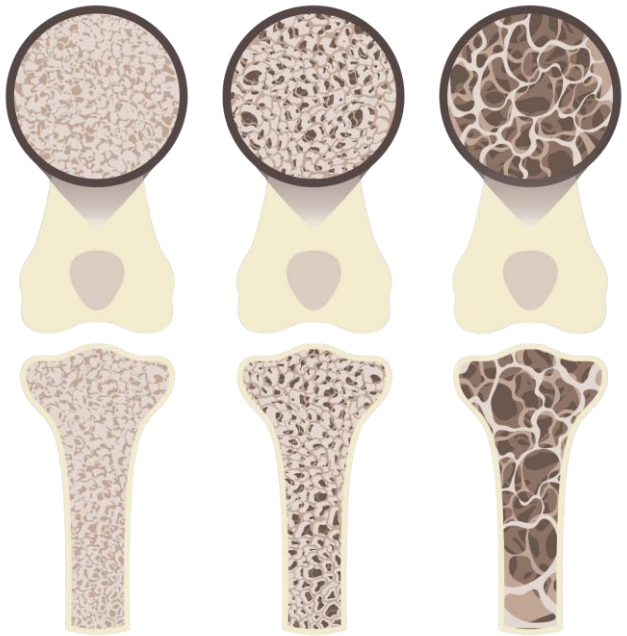


T-Score Ranges of Femoral Neck Bone Mineral Density

Normal (n = 1,503)	Osteopenia (n = 492)	Osteoporosis (n = 94)
T-score ≥ -1	-2.5 < T-score ≤ -1	T-score < -2.5

In an analysis of 2,089 adult patients with CKD stratified by femoral neck BMD T-scores, **all-cause mortality was significantly higher in patients with osteoporosis than in those with normal BMD (hazard ratio ~2.96).**

※ Reference: Suh SH *et al. J Clin Med.* (2023)



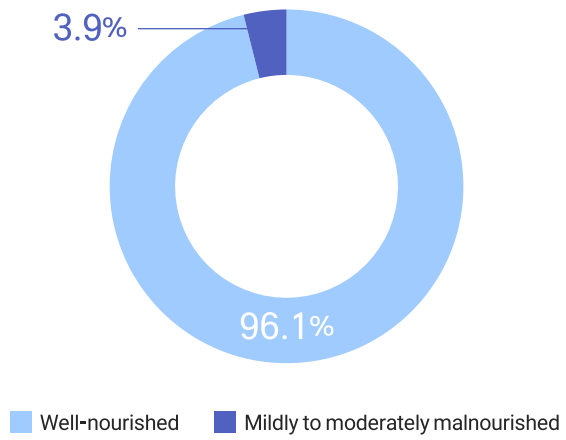
Ⅲ Major Complications and Outcomes

Section 5 . Nutrition, Mental Health, and QoL

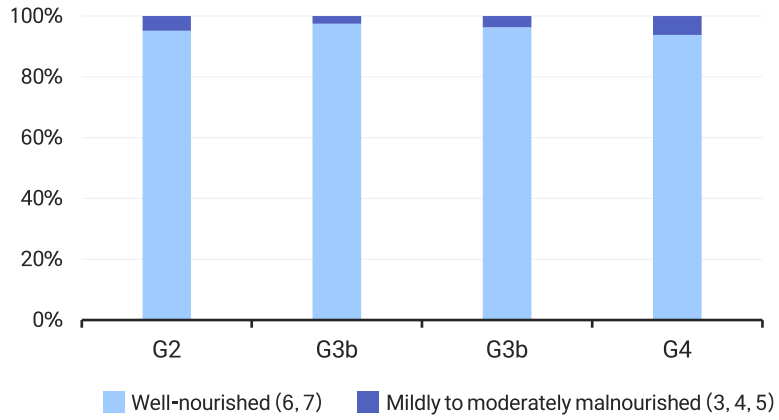
1. Nutrition, Diet, and Sarcopenia
2. Mental Health and Cognitive Function
3. QoL According to CKD Stages and Diabetes Status
4. Association of QoL with Sleep Duration
5. Effect of Renal Function Decline on QoL

1. Nutrition, Diet, and Sarcopenia (1/2)

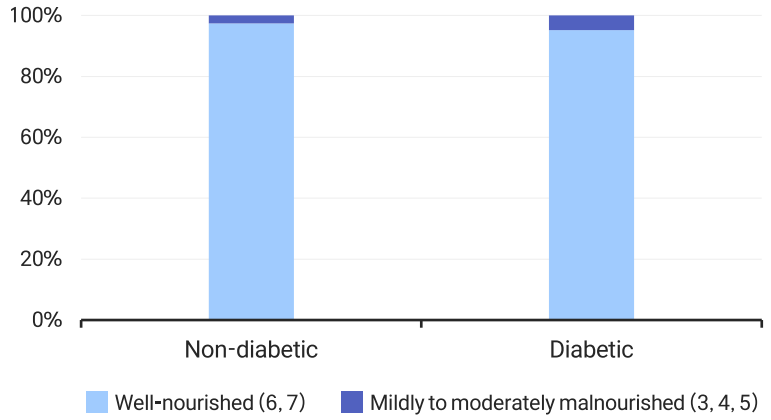
Nutritional Status by SGA*



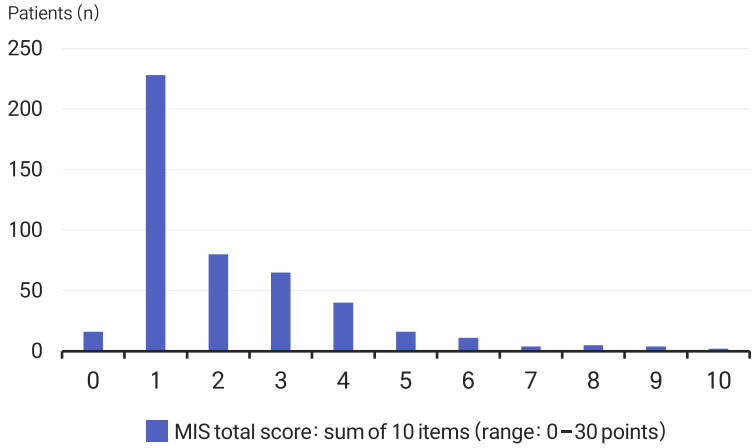
SGA Score Distribution by CKD Stage



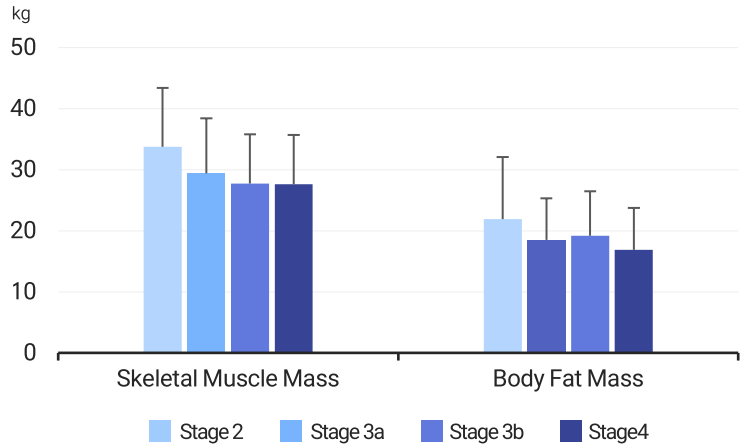
SGA Score Distribution by Diabetes Status



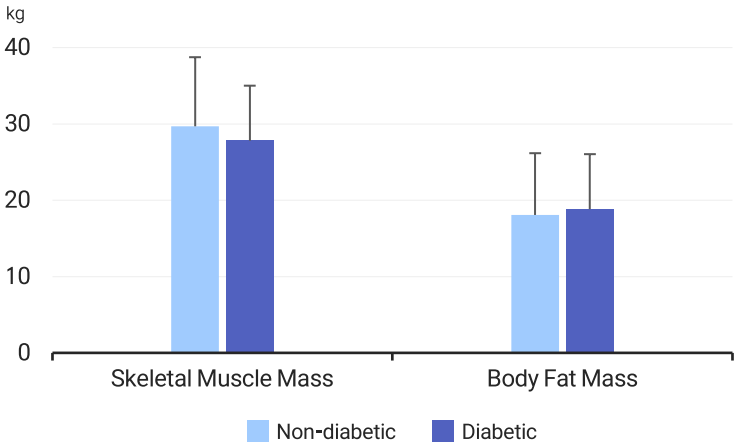
Distribution of MIS* Scores



Body Composition Parameters by CKD Stage



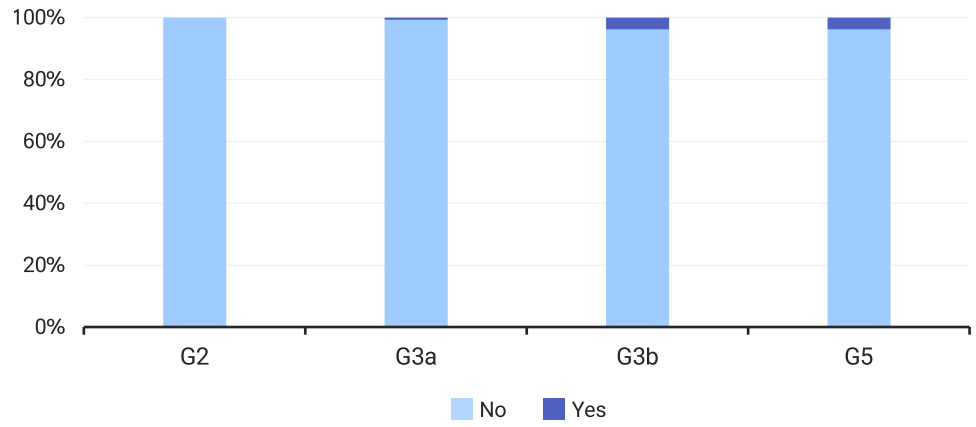
Body Composition Parameters by Diabetes Status



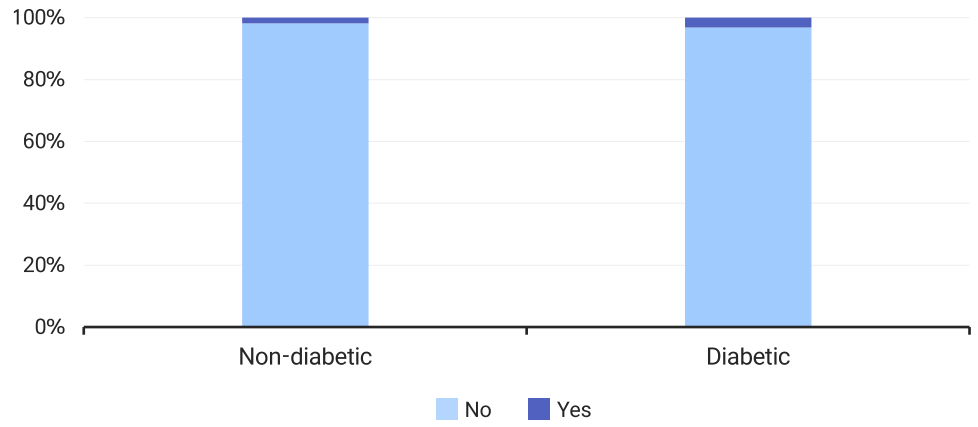
* SGA: subjective global assessment
* Analyses of MIS(malnutrition-inflammation score) and bioimpedance body composition were performed in 623patients who completed nutritional evaluation at 4centers (out of total N = 1,404)

1. Nutrition, Diet, and Sarcopenia (2/2)

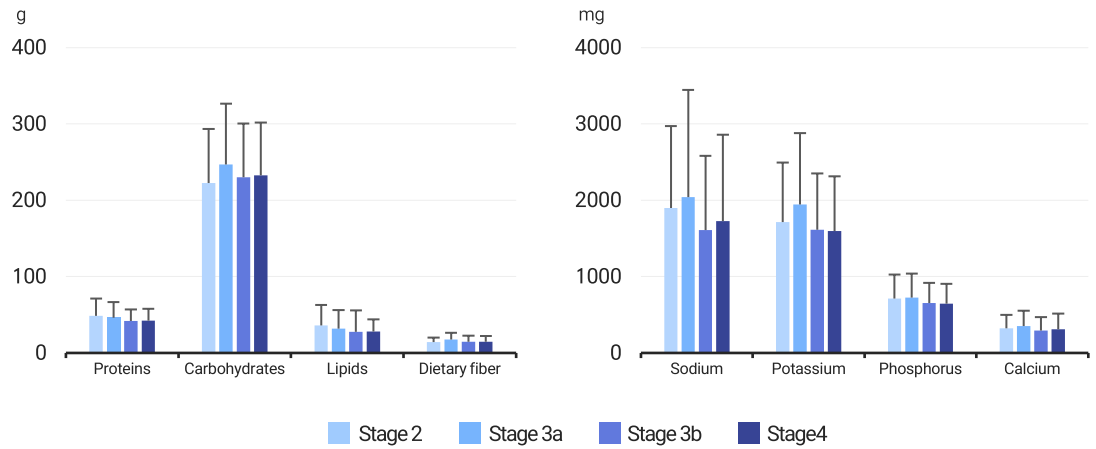
Prevalence of Sarcopenia by CKD Stage



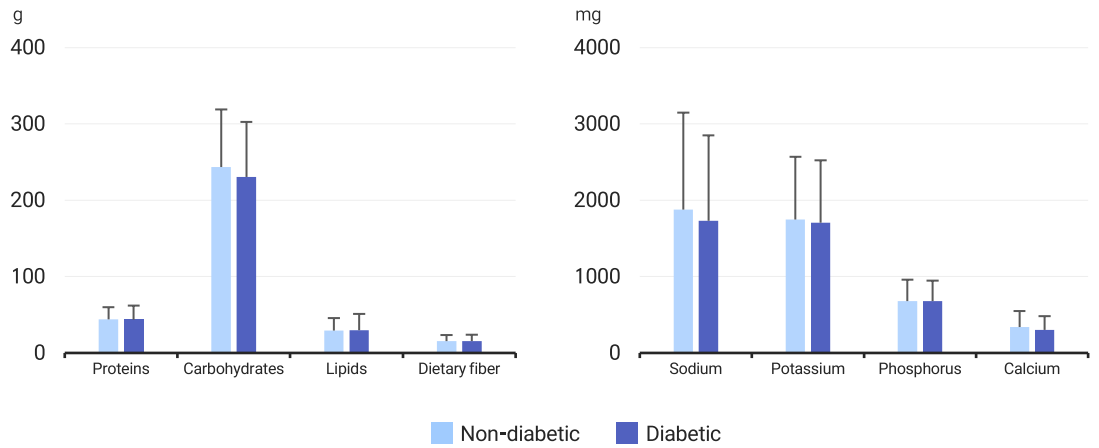
Prevalence of Sarcopenia by Diabetes Status



Daily Nutrient Intake by CKD Stage



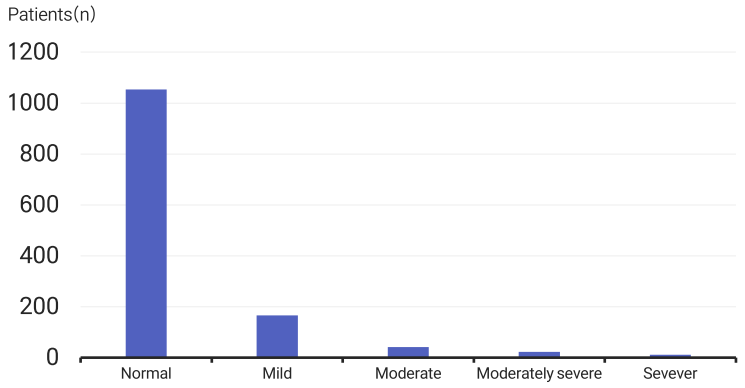
Daily Nutrient Intake by Diabetes Status



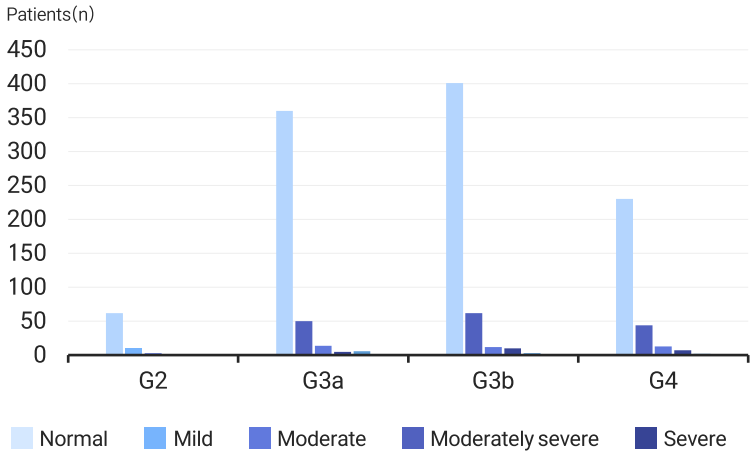
* **Sarcopenia** was defined as the presence of low hand grip strength (HGS; <28 kg in men and <18kg in women) combined with low appendicular skeletal muscle mass adjusted for height squared (ASM/Ht^2; <7.0kg/m^2 in men and <5.7kg/m^2 in women).

2. Mental Health and Cognitive Function

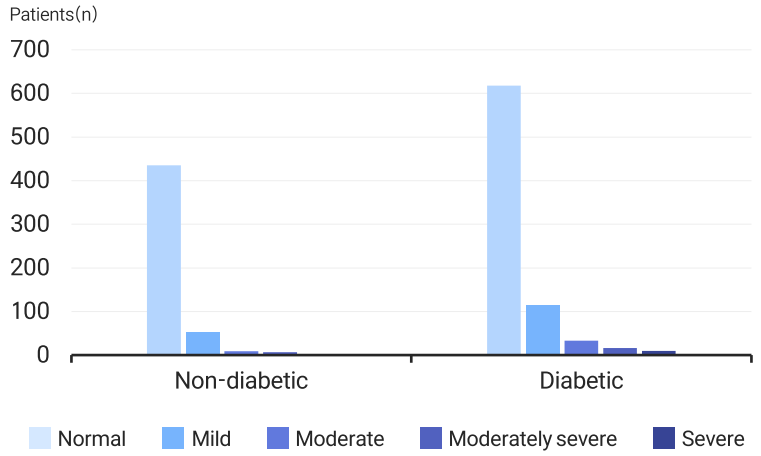
Depressive Symptoms Assessed by PHQ-9



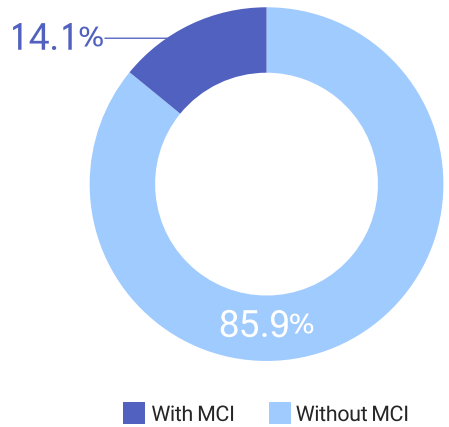
Depressive Symptoms by CKD Stage



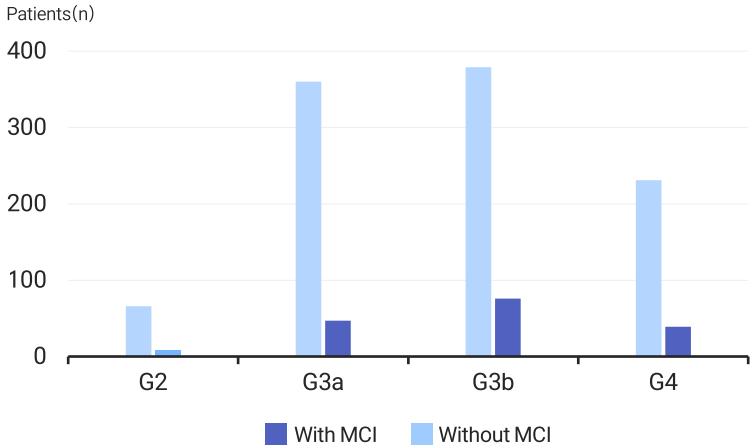
Depressive Symptoms by Diabetes Status



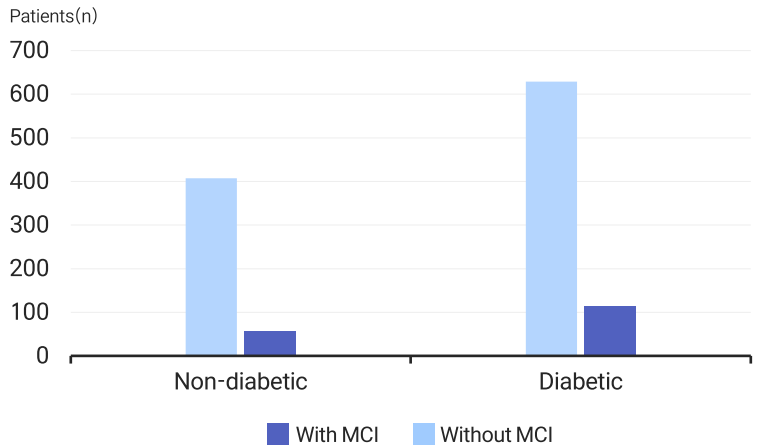
Prevalence of MCI Assessed by K-MoCA



Cognitive Impairment by CKD Stage



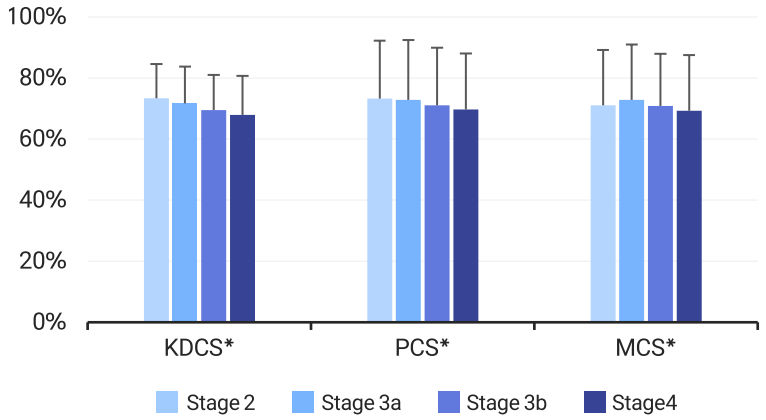
Cognitive Impairment by Diabetic Status

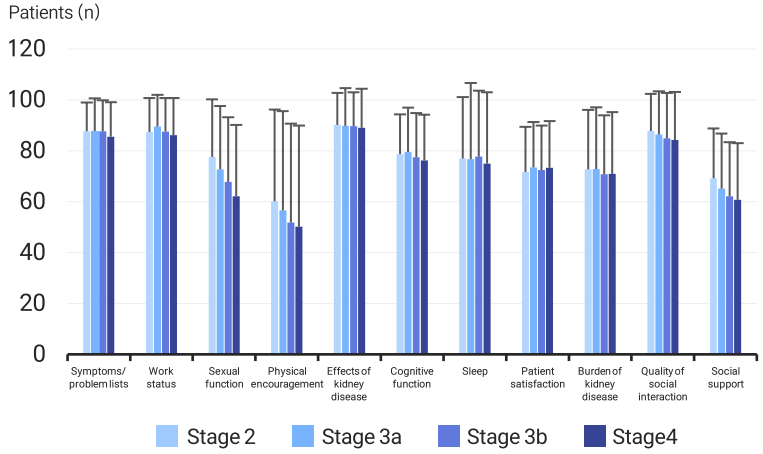


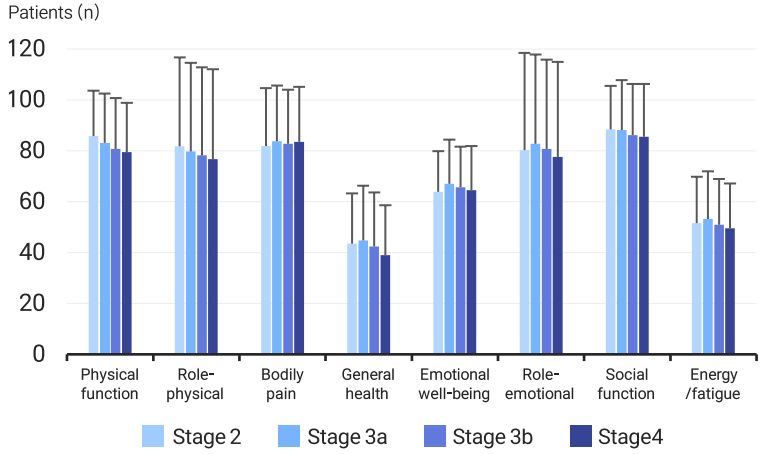
* MCI: Mild cognitive impairment
* PHQ-9: Patient Health Questionnaire-9 – A self-reported 9-item questionnaire scored on a 0–3 scale per item (maximum total score: 27 points, with higher scores indicating greater symptom severity)
* K-MOCA: Korean version of Montreal Cognitive Assessment

3. QoL According to CKD Stages and Diabetes Status

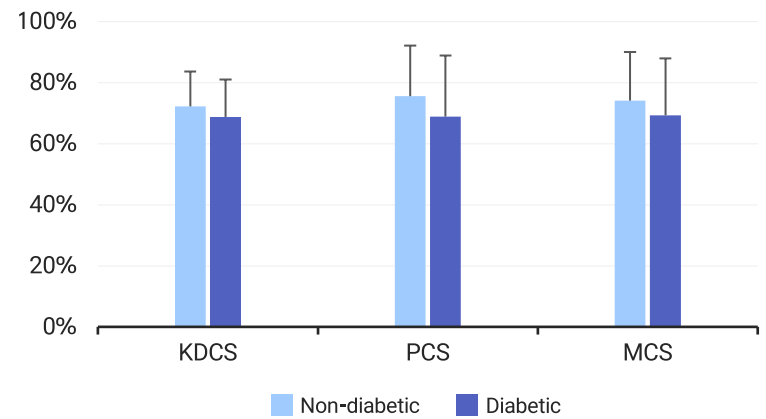
QoL According to CKD Stages ▸▸▸ SF-36 Domain / CKD-Targeted domain

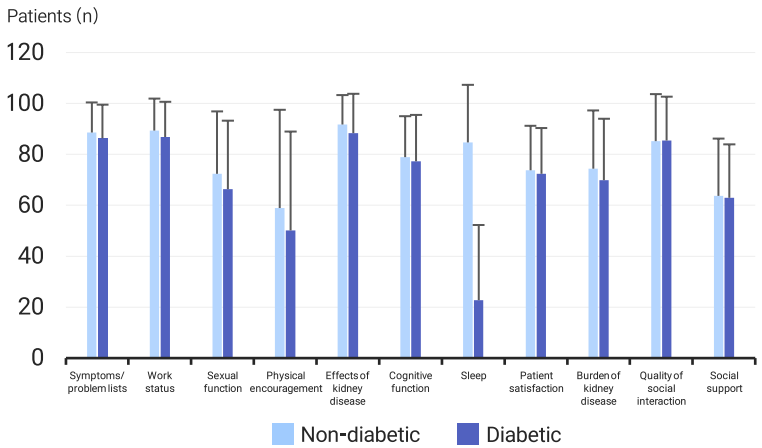


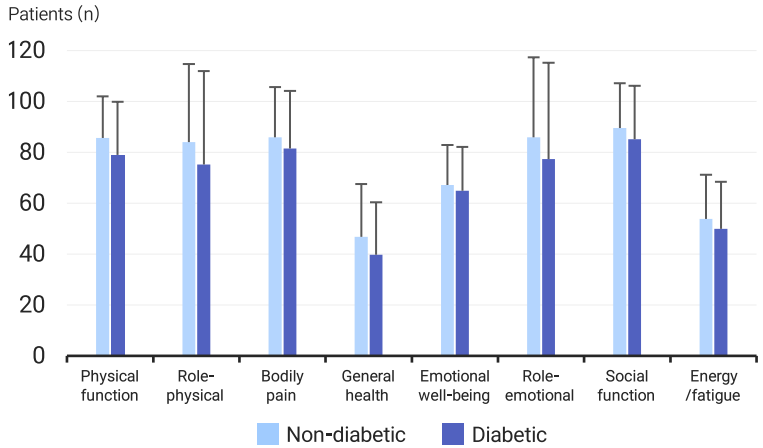




QoL According to Diabetes Status ▸▸▸ SF-36 Domain / CKD-Targeted domain



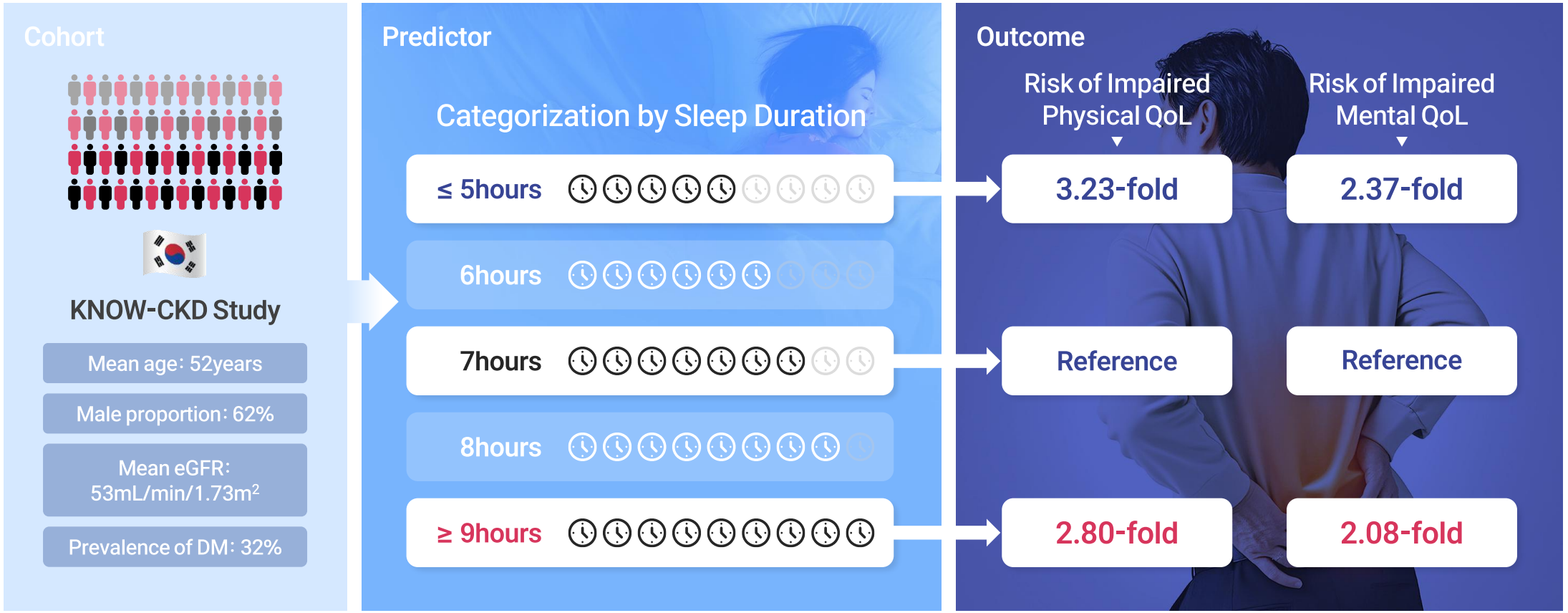




* KDCS(Kidney Disease Component Summary) : Measures kidney disease-specific quality of life using 43 items across kidney disease-specific domains.
* PCS(Physical Component Summary) & MCS(Mental Component Summary) : Measure general quality of life using 36 items (SF-36 domains) assessing physical and mental health, respectively.

4. Association of QoL with Sleep Duration

Association of Sleep Duration with Quality of Life in Non-Dialysis Patients with CKD

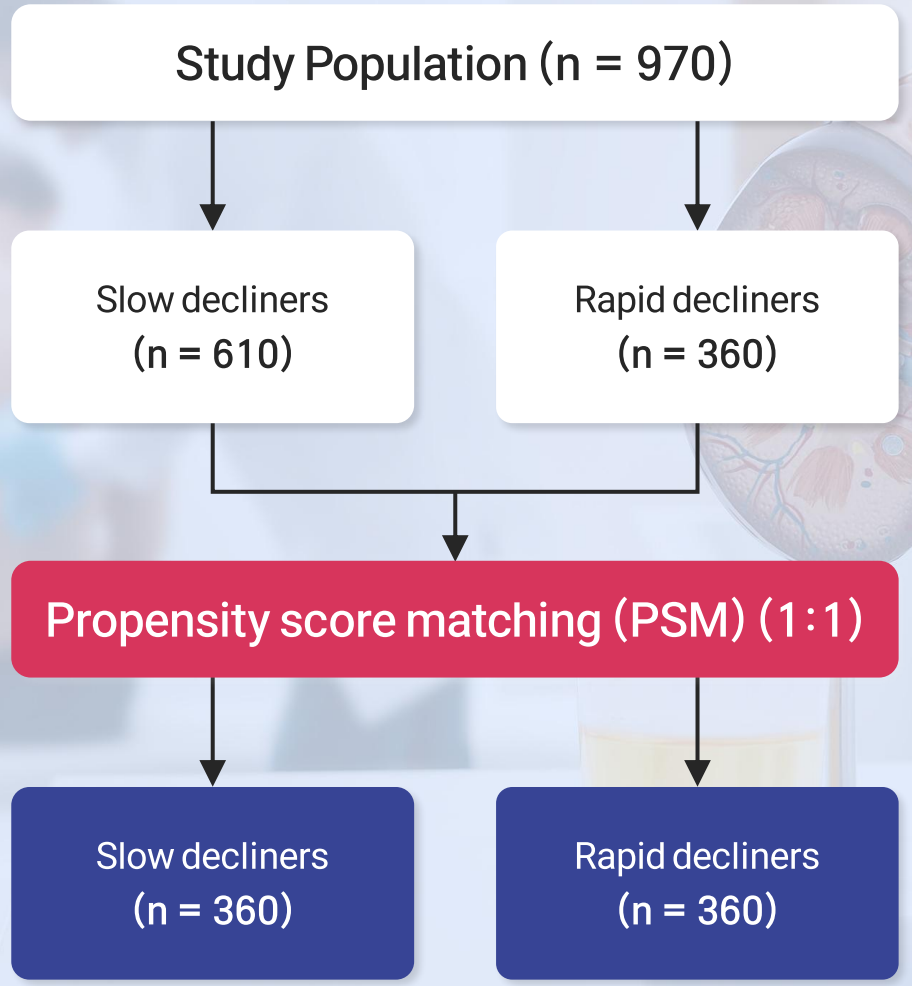


Both **short (<5hours)** and **long (≥9hours)** sleep durations are significantly associated with impaired quality of life in non-dialysis CKD patients.

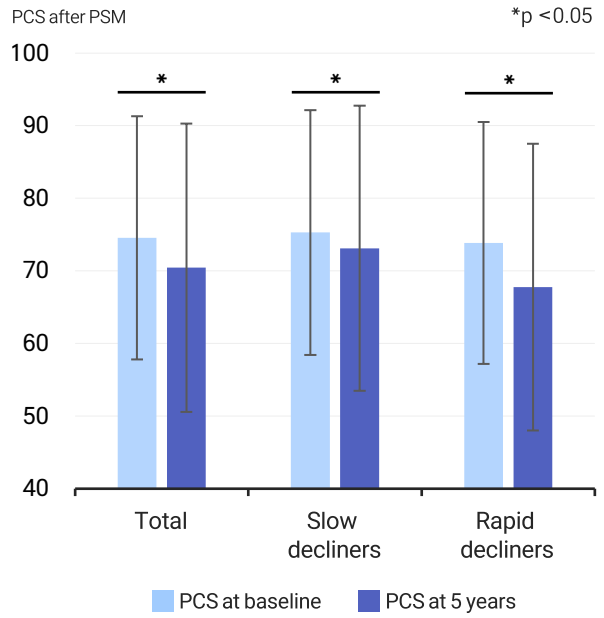
※ Reference: Sung SA *et al. Clin J Am Soc Nephrol.* (2018)

*QoL: quality of life

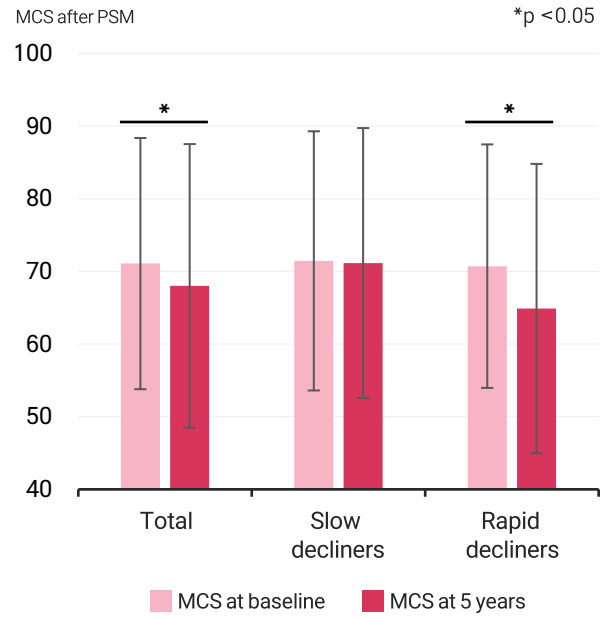
5. Effect of Renal Function Decline on QoL



Physical Component Summary(PCS) Scores



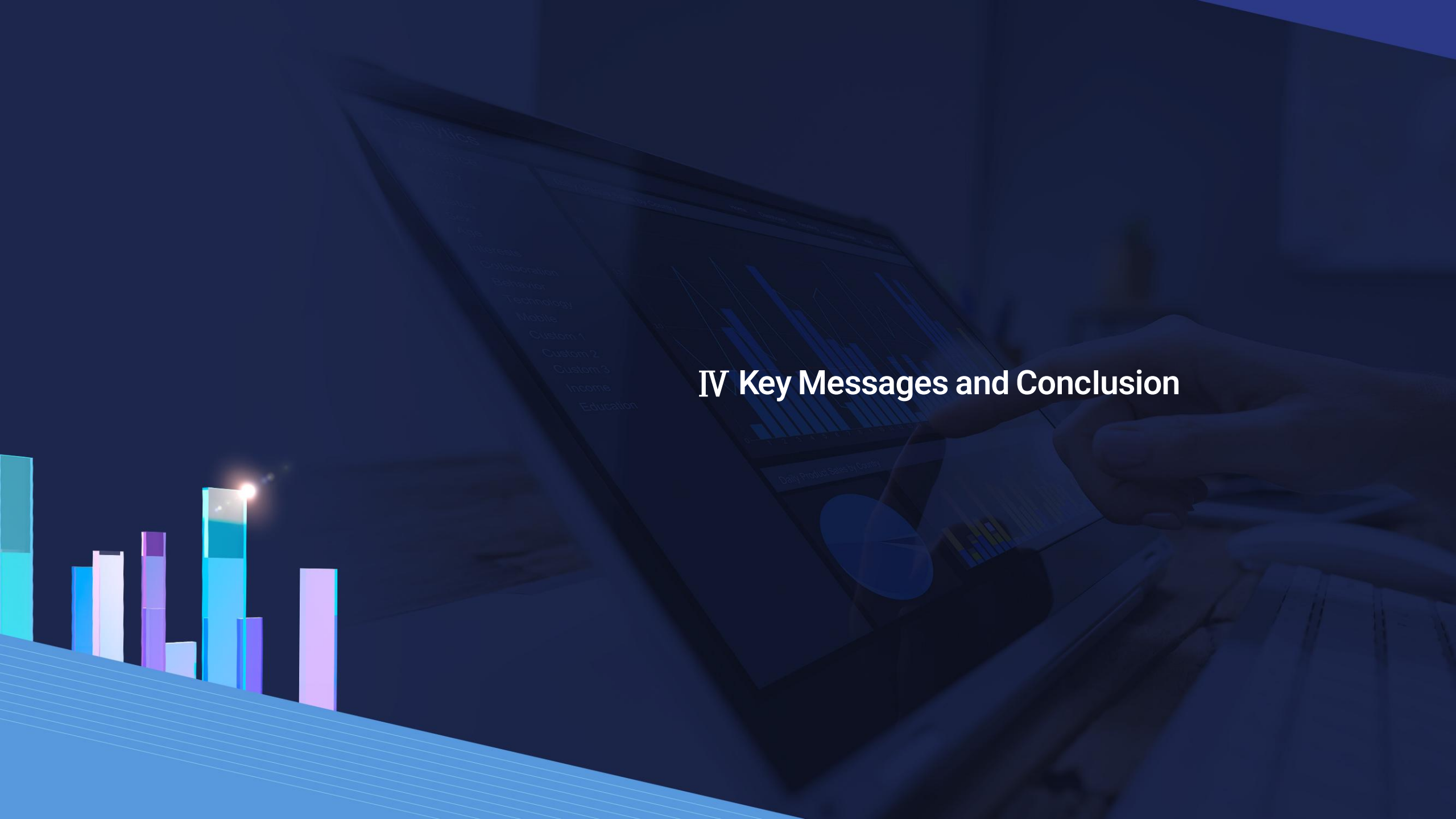
Mental Component Summary(MCS) Scores



Rapid decline in kidney function is significantly associated with reduced physical and mental quality of life in non-dialysis CKD patients.

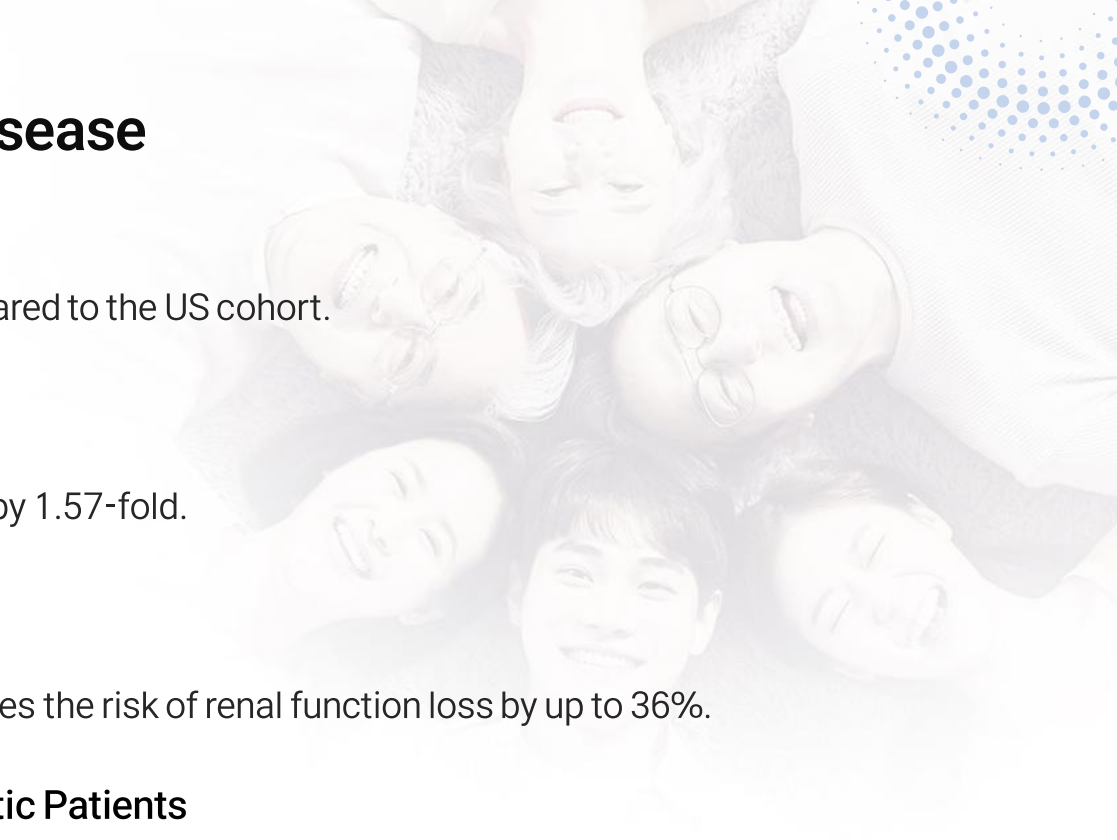
※ Reference: Kim HJ *et al. Sci Rep.* (2023)

* QoL: quality of life



Ⅳ Key Messages and Conclusion

Recommendations for Overcoming Chronic Kidney Disease



1 Raising Awareness of Rapid Progression in Korean CKD Patients

Korean CKD patients face a 1.66-fold higher risk of kidney function decline compared to the US cohort.
Early, systematic management is critical.

2 Long-Term Monitoring of Blood Pressure Trajectories

Persistent blood pressure elevation increases the risk of kidney function decline by 1.57-fold.
Management must focus on long-term trends rather than single measurements.

3 Dual Target Attainment for Systolic Blood Pressure and LDL-Cholesterol

Simultaneous control of systolic BP (<120mmHg) and LDL-C (<70mg/dL) reduces the risk of renal function loss by up to 36%.

4 Universal SGLT2 Inhibitor Use in CKD and Strict Glycemic Control in Diabetic Patients

Early introduction of SGLT2 inhibitors is recommended for all patients, whereas strict glycemic control (HbA1c <7.0%) is specifically targeted at diabetic patients.

5 Comprehensive Lipid Management Including Non-HDL-C and Triglycerides

Elevated non-HDL-C (2.16-fold risk) and triglycerides (43.3% higher risk) directly predict poor outcomes, requiring multi-target lipid management.

6 Rigorous Control of Abdominal Obesity and Body Composition Even in Normal-Weight Patients

Abdominal obesity raises the risk of coronary artery calcification to 56.4% in normal-BMI patients, requiring focus on body composition over weight loss.

Recommendations for Overcoming Chronic Kidney Disease



7 Early Correction of Iron Deficiency to Lower Mortality Risk

Iron deficiency (TSAT <25%) increases mortality by 44%. Regular evaluation and timely iron replacement therapy are essential.

8 Prevention of Osteoporosis & Early Intervention for Bone Mineral Disorders

Osteoporosis increases mortality risk by 2.96-fold. Bone mineral density and vitamin D levels should be routinely monitored to enable early osteoporosis treatment.

9 Regular Moderate-to-Vigorous Physical Activity

Regular exercise reduces cardiovascular complication risk by 53% and mortality risk by 58%. Patients with eGFR <60mL/min/1.73m² particularly benefit from delayed progression to end-stage kidney disease.

10 Optimal Sleep Duration to Preserve Quality of Life (QoL)

Sleep duration <5hours or ≥9hours increases the risk of impaired physical and mental QoL by 2- to 3-fold. Maintaining ~7hours of nightly sleep is recommended.

11 Tailored Nutrition to Prevent Sarcopenia and Malnutrition

As kidney function declines, multidisciplinary, tailored dietary planning is essential to prevent restriction-induced malnutrition.

12 Multidisciplinary Mental Health Support for Depression and Mild Cognitive Impairment (MCI)

High prevalence of depression and MCI in CKD, particularly with diabetes, warrants routine mental health screening and support.

13 Delaying eGFR Decline to Maintain QoL

Rapid kidney function decline accelerates QoL loss, requiring multidisciplinary cohort management to delay dialysis or transplantation.

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