EPH173

Disease Burden of Diabetic Kidney Disease in China: A Systematic Literature Review

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BACKGROUND & OBJECTIVES

- Diabetic kidney disease (DKD) is the primary cause of chronic kidney disease (CKD) and end-stage renal disease (ESRD) in China (~27% of CKD cases), driven by >140 million diabetic adults.
- Progressive renal failure in DKD causes severe complications. The 5-year mortality rate for dialysis patients exceeds 60%.
- Dialysis impairs quality of life. The economic burden is massive, with annual costs exceeding twice the gross domestic product (GDP) per capita of China.
- We conducted a systematic literature review (SLR) to synthesize the multidimensional clinical, humanistic, and economic burden of DKD in China.

METHODS

Study Design

- SLR following PRISMA 2020 guidelines
- Focused on real-world evidence demonstrating the illness burden of DKD in Chinese patients

Data Sources & Search Strategy

- **Databases**: English (MEDLINE, Embase, Web of Science)

  Chinese (CNKI, WANFANG, VIP)
- **Timeframe**: January 2019 to March 2024
- **Keywords**: Combinations of terms relating to "Diabetic Kidney Disease," "China/Chinese," and "Observational study"

Study Selection

- **Inclusion**: Observational research involving Chinese adults (aged ≥18 years) with DKD.
- **Exclusion**: Clinical trials, non-human studies, case series, case reports, editorials, reviews, commentaries, clinical guidelines, and expert consensus statements.

Data Extraction

- **Captured**: Study attributes, demographics, clinical characteristics, metabolic control, clinical events (ESRD, mortality), Health-Related Quality of Life (HRQoL), and costs (adjusted to 2025 Chinese Yuan).

Evidence Synthesis & Statistical Analysis

- Single-arm meta-analysis (random-effects model) for pooled estimates where feasible.
- Proportions of patients reaching metabolic targets were estimated by reconstructing normal distributions from reported means and standard deviations.
- Heterogeneity assessed via I^2 statistic (I^2 > 50% defined as substantial heterogeneity).

RESULTS

- The literature search process is illustrated in Figure 1. From 7,601 initial references across English and Chinese databases, 929 underwent full-text review. Ultimately, 267 studies were included: 237 observational, 16 HRQoL, and 14 healthcare resource use and cost studies.

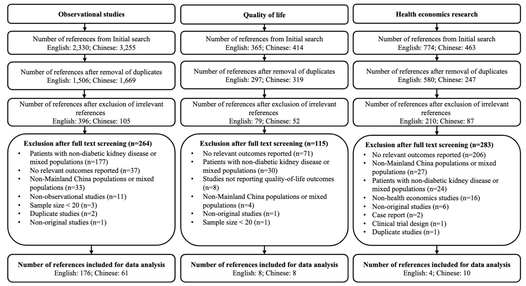

Figure 1. Flowchart of literature search for published real-world studies including Chinese patients with DKD

Patient characteristics

- Across 160 studies (715,259 patients), the pooled mean age was 58.2 years (58.5% male). Notably, 42.8% of patients had an elementary education or lower, as detailed in Table 1.
- Most patients had early-to-moderate CKD (Stage I: 31.7%, II: 20.9%, III: 25.0%) (Figure 2). The pooled eGFR was 77.9 ml/min/1.73m², aligning with early-stage disease.
- Major comorbidities included hypertension (65.0%), dyslipidemia (50.2%), and coronary artery disease (17.7%), alongside microvascular neuropathy (50.8%) and retinopathy (47.8%), as shown in Figures 3 and 4.

Table 1. Pooled patient characteristics of Chinese patients with DKD from the included real-world studies

Variable	Number of studies	Sample size	Point estimation (95%CI)	Heterogeneity test	
				P value	I^2
Age (years)	114	94,642	58.2 (57.1, 59.3)	<0.001	99.9%
Male gender	156	715,259	58.5% (56.9%, 60.6%)	<0.001	95.7%
eGFR (ml/min/1.73 m²)	56	72,191	77.9 (72.3, 83.6)	<0.001	99.8%
Metabolic indicators					
Glycated haemoglobin (%)	79	52,311	8.4 (8.2, 8.6)	<0.001	99.3%
Total cholesterol (mmol/L)	59	42,415	4.9 (4.8, 5.0)	<0.001	98.4%
Triglycerides (mmol/L)	41	24,189	2.2 (2.0, 2.4)	<0.001	99.4%
High-density lipoprotein (mmol/L)	52	34,642	1.2 (1.1, 1.3)	<0.001	99.6%
Low-density lipoprotein (mmol/L)	58	32,861	2.8 (2.7, 2.9)	<0.001	99.8%
Systolic blood pressure (mmHg)	73	51,536	140.2 (138.7, 141.8)	<0.001	99.1%
Diastolic blood pressure (mmHg)	74	51,526	81.5 (80.6, 82.4)	<0.001	98.6%

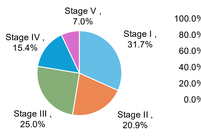

Figure 2. CKD stage* (T= 6, N=8,076)

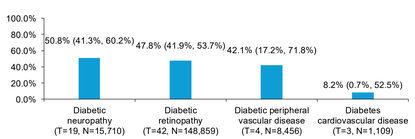

Figure 3. Diabetes-Related Complications in Chinese DKD Patients

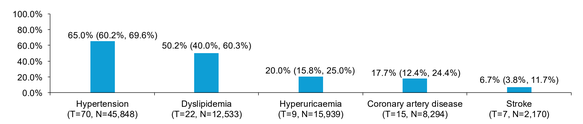

Figure 4. Comorbidities in Chinese DKD Patients

*: eGFR Levels (Based on KDIGO, CKD stage I ≥90 ml/min/1.73m²; CKD stage II 60-89 ml/min/1.73m²; CKD stage III 45-59 ml/min/1.73m²; CKD stage IV 30-44 ml/min/1.73m²; CKD stage V 15-29 ml/min/1.73m²).

T = number of studies; N = sample size.

Metabolic control indicators

- Pooled data revealed suboptimal glycemic and blood pressure control. The mean HbA1c was 8.4%, while the mean systolic blood pressure (SBP) and diastolic pressure were 140.2 and 81.5 mmHg, respectively, reflecting poorly managed hypertension.
- Lipid profiles indicated suboptimal management. Pooled mean levels were 4.9 mmol/L for total cholesterol (TC), 2.2 mmol/L for triglycerides (TG), 1.2 mmol/L for high-density lipoprotein cholesterol (HDL-C), and 2.8 mmol/L for low-density lipoprotein cholesterol (LDL-C).
- Estimated clinical target achievements were strikingly low: 23.1% for HbA1c, 28.1% for SBP, and 41.8% for LDL-C. These findings highlight significant gaps in the comprehensive management of Chinese DKD patients (Figure 5).

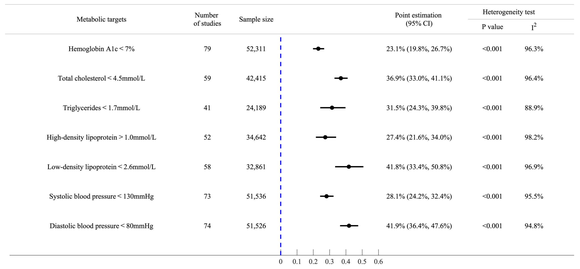

Figure 5. Pooled attainment proportions of metabolic targets in Chinese patients with DKD

Disease progression and survival prognosis

- The 3-year incidence of ESRD demonstrated a clear escalating trend as CKD progressed. The incidence was 46.2% for patients in stages I–III, which sharply increased to 62.8% for those in advanced stages III–IV.
- The 3-year all-cause mortality rate significantly worsened with advancing disease stages. Mortality grew from 4.8% in patients with CKD stages I–III to 12.7% among patients with more advanced disease in stages III–IV.
- The highest 3-year mortality was observed in stage V CKD patients undergoing dialysis, reaching 40.9%. Overall, these results underscore the progressive nature of CKD and the escalating burden of renal and mortality outcomes (Figure 6).

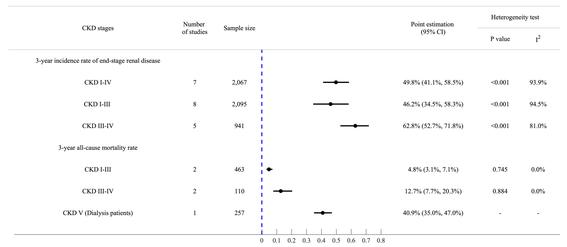

Figure 6. Pooled prognosis outcomes of Chinese patients with DKD from the included real-world studies

HRQoL and economic outcomes

- The pooled EuroQol 5-Dimension (EQ-5D) utility score across seven studies was 0.738 for unstratified DKD patients, reflecting a moderate impairment in HRQoL compared to the general population.
- Annual direct medical costs escalated steeply with advancing CKD stages, as shown in a large-scale study of 11,409 patients. Costs rose from ¥1,362 in stages I–II, to ¥4,775 in stages III–IV, and peaked at ¥11,765 for stage V disease.
- Healthcare utilization increased significantly in advanced CKD. Annual hospital days rose from 4.0 (stages III–IV) to 9.1 (stage V), with first dialysis stays averaging 13.0 days. Patients also required frequent care (8.2 outpatient and 2.0 inpatient visits yearly), as detailed in Table 2.

Table 2. Pooled outcomes for quality of life, health resource utilization, and direct medical costs from the included real-world studies for Chinese patients with DKD

Variable	Number of studies	Sample size	Point estimation (95%CI)	Heterogeneity test	
				P value	I^2
Quality of life					
EQ-5D index score	7	2,210	0.738	-	-
Health resource utilization					
Annual outpatient visits*	1	601	8.2	-	-
Annual hospital admissions*	1	601	2.0	-	-
Annual length of hospital stays (days)					
CKD stages III-IV	1	-	4.0†	-	-
CKD stage V	1	-	9.1†	-	-
Length of hospital stay per visit*	2	303	11.7 (0.4, 23.0)	<0.001	99.5%
Length of hospital stay during the first dialysis	2	285	13.0 (6.3, 19.6)	<0.001	99.0%
Annual direct medical costs					
CKD stages I-V	1	-	¥4,807.7	-	-
CKD stages I-II	1	-	¥1,362.2	-	-
CKD stages III-IV	1	-	¥4,774.6	-	-
CKD stage V	1	-	¥11,765.0	-	-
Annual productivity loss costs attributable to hospitalization					
CKD stages III-IV	1	-	¥1,156.3	-	-
CKD stage V	1	-	¥2,640.0	-	-

*: Patients across CKD stages I–V.

†: The annual hospitalization days were calculated for the entire cohort, including non-hospitalized participants (assigned a value of 0).

CONCLUSIONS

- The SLR highlights a high prevalence of early-stage CKD with suboptimal metabolic control, alongside escalating risks of ESRD, mortality, and severe quality of life impairment, particularly for patients on dialysis.
- The economic burden rises sharply with disease progression, characterized by steeply increasing direct medical costs, frequent hospitalizations, and intensive healthcare resource utilization across advancing CKD stages.
- These findings underscore the urgent need for improved early detection and optimized management. Future real-world studies and health economic evaluations are crucial to inform reimbursement policies and alleviate the multidimensional burden of DKD in China.