

# LEVERAGING BIG DATA TO DELIVER PRECISION PUBLIC HEALTH

## A NATIONAL DIABETES REGISTRY ANALYSIS TO DETERMINE THE PREVALENCE OF DIABETIC KIDNEY DISEASE AND THE ASSOCIATED FACTORS AMONG TYPE 2 DIABETES PATIENTS IN MALAYSIA

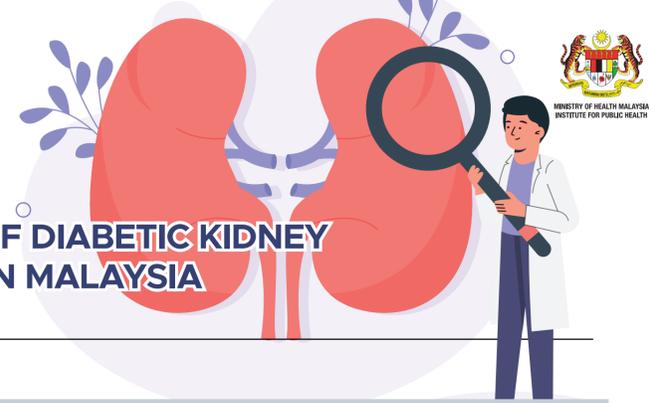
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### PROBLEM STATEMENT AND OBJECTIVE

The prevalence of diabetic kidney disease (DKD) among patients with diabetes in Malaysia is unknown. In precision public health, delivering the right intervention to the right population at the right time is the goal. We aimed to determine the prevalence of DKD and its associated factors in patients with type 2 diabetes in Malaysia.

### METHODOLOGY

An analytical cross-sectional analysis was conducted using the year 2022 clinical audit dataset from the National Diabetes Registry. The target population included patients with type 2 diabetes who received care from public health clinics in Malaysia. DKD was defined as having albuminuria (macroalbuminuria and/or microalbuminuria), a decreased glomerular filtration rate (<60 ml/min/1.73m<sup>2</sup> estimated using the 2009 CKD-Epidemiology Collaboration creatinine equation), or both.<sup>1</sup> Multivariate binary logistic regression was performed to determine the factors associated with DKD.

### POLICY IMPLICATIONS/PROPOSALS

DKD is a common diabetes complication among type 2 diabetes patients in Malaysia with the prevalence falls between the 27.1% to 83.7% range reported worldwide.<sup>2</sup>

The high DKD burden should serve as an alert to health policymakers, program managers, and clinicians about the substantial financial costs and adverse health outcomes associated with the disease, such as frailty, reduced quality of life, end-stage kidney disease, and premature deaths.<sup>3</sup>

Precision public health is a new approach that uses big data science to improve population health and reduce health disparities.<sup>4</sup> Delivering the right intervention to the right population at the right time is the goal.<sup>4</sup> High-risk subpopulations identified in this study can be targeted for better interventions.

DKD screening activities must be intensified urgently, particularly because many patients with early DKD are asymptomatic. Patients should also be treated more aggressively to prevent the disease progression to kidney failure.<sup>1</sup>

### CONCLUSION

Health policymakers, program managers, and clinicians should target high-risk subpopulations and modifiable risk factors to manage the high prevalence of DKD in Malaysia. Granular secondary big data can be leveraged to deliver precision in public health in Malaysia.

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### FINDINGS

Among the 80,360 patients, 62.2% were females and 68.4% were Malays. The mean age was 61.4 years. About 56.7% (95% CI: 56.4–57.1%) of patients had DKD (**Figure 1**). Increasing age, male sex, Malay ethnicity, longer diabetes duration, overweight/obesity, hypertension, diabetic retinopathy, diabetic foot ulcer, nontraumatic lower-extremity amputation, ischaemic heart disease, stroke, insulin, higher numbers of antihypertensive agents, antiplatelet agents, poorer glycaemic control, higher systolic blood pressure, non-achievement of triglyceride target, and non-attainment of HDL-cholesterol goals were independent risk factors associated with DKD (**Table 1**).

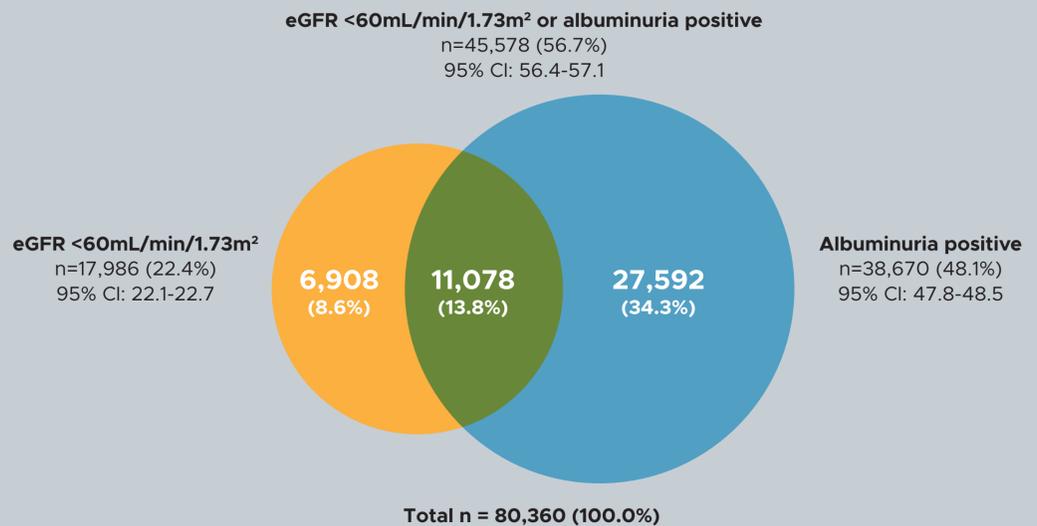


Figure 1: Prevalence of diabetic kidney disease

Table 1: Factors associated with diabetic kidney disease

Characteristics	Adjusted OR	95% CI for adjusted OR	P values
<b>Age groups, years</b>			
18 to 59	1.00		
60 to 69	1.20	1.16 – 1.25	<0.001
70 to 79	1.91	1.82 – 2.01	<0.001
≥80	3.15	2.84 – 3.50	<0.001
<b>Sex</b>			
Male	1.00		
Female	0.75	0.73 – 0.78	<0.001
<b>Ethnic groups</b>			
Malay	1.00		
Chinese	0.84	0.80 – 0.88	<0.001
Indian	0.66	0.62 – 0.71	<0.001
Bumiputera Sabah	1.05	0.98 – 1.12	0.160
Bumiputera Sarawak	0.65	0.58 – 0.74	<0.001
Other ethnic groups	0.80	0.71 – 0.90	<0.001
<b>Duration of diabetes</b>			
<5 years	1.00		
5–10 years	1.04	1.00 – 1.08	0.041
>10 years	1.27	1.21 – 1.33	<0.001
<b>Body mass index categories, kg/m<sup>2</sup></b>			
Underweight (<18.5)	1.30	1.13 – 1.48	0.001
Normal (18.5 to 22.9)	1.00		
Overweight (23.0 to 27.4)	1.06	1.01 – 1.12	0.018
Obese (≥27.5)	1.21	1.15 – 1.27	<0.001
<b>Hypertension</b>	1.28	1.14 – 1.43	<0.001
<b>Diabetic retinopathy</b>	1.19	1.13 – 1.26	<0.001
<b>Diabetic foot ulcer</b>	1.80	1.45 – 2.24	<0.001
<b>Nontraumatic lower-extremity amputation</b>	1.57	1.14 – 2.15	0.005
<b>Ischaemic heart disease</b>	1.10	1.02 – 1.20	0.014
<b>Stroke</b>	1.15	1.01 – 1.31	0.041
<b>Diabetes treatment modality</b>			
Lifestyle management only	1.00		
Oral glucose-lowering drug (OGLD) only	1.09	0.99 – 1.20	0.089
Insulin only	2.78	2.44 – 3.17	<0.001
Both OGLD and insulin	1.46	1.31 – 1.62	<0.001
<b>Number of antihypertensive agents</b>			
None	1.00		
One	1.22	1.09 – 1.35	<0.001
Two	1.56	1.41 – 1.73	<0.001
Three or more	2.03	1.82 – 2.25	<0.001
<b>Use of antiplatelet agents</b>	1.14	1.09 – 1.19	<0.001
<b>HbA1c, %</b>			
<7	1.00		
7 to 8	1.10	1.05 – 1.15	<0.001
>8	1.29	1.24 – 1.34	<0.001
<b>Systolic blood pressure, mmHg</b>			
<130	1.00		
130 to 139	1.00	0.96 – 1.04	0.978
140 to 159	1.10	1.06 – 1.15	<0.001
160 to 179	1.40	1.29 – 1.51	<0.001
≥180	1.93	1.56 – 2.40	<0.001
<b>Triglycerides, &lt;1.7 mmol/L</b>	0.73	0.71 – 0.76	<0.001
<b>HDL-C, &gt;1.0 for males and &gt;1.3 for females</b>	0.84	0.81 – 0.87	<0.001