

The Association of Multiple Modifiable Lifestyle Factors and Diabetic Kidney Disease (DKD) in the DKD-Onset and Progression RISk Factors (DORIS) Cohort



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BACKGROUND

- Diabetic kidney disease (DKD) is the main cause of end-stage renal disease (ESRD) in Singapore.
- Importantly, several modifiable lifestyle factors (i.e. obesity, smoking, diet, physical activity) can influence kidney function among people with type 2 diabetes mellitus (T2DM).

OBJECTIVES

To understand the association between lifestyle factors and DKD in the DKD-Onset and Progression RISk Factors (DORIS) cohort, a local, multi-ethnic population with T2DM.

METHODS

Study Population

- DORIS: An ongoing cross-sectional study of T2DM patients (≥ 21 years old) who attended the Khoo Teck Puat Hospital and Admiralty Medical Centre from Nov 2017 to May 2019.

DKD and Non-DKD

- DKD: ACR > 300 mg/g OR eGFR < 60 ml/min/1.73m²
- Non-DKD: ACR ≤ 300 mg/g AND eGFR ≥ 60 ml/min/1.73m²

Assessment of Physical Activity (PA) and Diet

- We used a 16-question Global Physical Activity Questionnaire (GPAQ) developed by World Health Organization to estimate the level of PA.
- We used Food Frequency Questionnaire (FFQ), developed for Singaporeans, to assess dietary habit and consumption of various food items in a subset of DORIS cohort.

Statistical analysis

- Differences between groups were compared by t test or χ^2 test.





RESULTS

Table 1. The basic characteristics in all patients stratified by DKD (N=285)

Variables	DKD (n=187)	Non-DKD (n=98)	All (n=285)	P-value
Entry age (yrs)	59.5 \pm 11.3	55.7 \pm 11.7	58.2 \pm 10.6	0.01
Male gender (%)	105 (56.2%)	46 (46.9%)	151 (53.0%)	0.14
Ethnicity (%)				
Chinese	84 (44.9%)	47 (48.0%)	131 (46.0%)	
Malays	77 (41.2%)	24 (24.5%)	101 (35.4%)	
Indians	24 (12.8%)	26 (26.5%)	50 (17.5%)	
Others	2 (1.1%)	1 (1.0%)	3 (1.1%)	0.01
Duration of T2DM (yrs)	16.4 \pm 10.0	13.0 \pm 9.3	15.2 \pm 9.8	0.006
HbA1c (%)	8.9 \pm 1.6	7.7 \pm 1.4	8.5 \pm 1.7	<0.001
SBP (mmHg)	140.0 \pm 17.1	130.1 \pm 15.3	136.6 \pm 17.2	<0.001
DBP (mmHg)	80.0 \pm 11.0	79.3 \pm 10.5	79.7 \pm 10.8	0.59
RAS medication, n (%)	138 (74.6%)	44 (45.4%)	182 (64.5%)	<0.001
Insulin, n (%)	101 (55.5%)	30 (31.3%)	131 (47.1%)	<0.001
ACR (mg/g)	182.5 (64-686)	10 (5-17)	56 (14-344)	<0.001
eGFR (ml/min/1.73 m ²)	72.4 \pm 29.9	95.4 \pm 15.9	80.6 \pm 28.0	<0.001

HbA1c, hemoglobin A1c; SBP, systolic blood pressure; DBP, diastolic blood pressure; RAS (renin-angiotensin system), angiotensin-converting-enzyme or angiotensin receptor blockers; ACR, albumin/creatinine ratio; eGFR, estimated glomerulus filtration rate

Table 2. Comparison of modifiable lifestyle factors between DKD and non-DKD patients

Obesity, Smoking and PA	DKD (n=183)	Non-DKD (n=95)	All (n=285)	P-value
Obesity (BMI ≥ 27.5 kg/m ²) 	104 (55.6%)	44 (44.9%)	148 (51.9%)	0.085
Former/current smokers 	46 (24.9%)	16 (16.8%)	62 (22.1%)	0.13
Moderate-to-vigorous PA (min/week) 	60 (0-180)	112.5 (20-210)	85 (0-180)	0.02
Healthy Dietary Factors	DKD (n=64)	Non-DKD (n=41)	All (n=105)	P-value
Consumption of whole meal bread 	31 (48.4%)	25 (61.0%)	56 (53.3%)	0.26
Consumption of brown rice	22 (34.4%)	18 (43.9%)	40 (38.1%)	0.33
Use of unsaturated oil	30 (46.9%)	26 (63.4%)	56 (53.3%)	0.04
Trim skin from poultry	43 (67.2%)	34 (79.1%)	77 (72.0%)	0.18
Do not add salt/soya sauce to food at the table	30 (46.9%)	32 (74.4%)	62 (57.9%)	0.005

CONCLUSIONS

- Readily modifiable unhealthy lifestyle factors (smoking, obesity, lower PA and unfavourable diet) are associated with DKD.
- Our pilot results suggest that clinical management of these lifestyle factors should be considered as a non-pharmacological adjunct in the management of DKD in T2DM patients.



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