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The Association Between Lifestyle-Related Risk Factors and Renal Progression

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Objectives : Unhealthy lifestyles such as smoking, alcohol consumption, obesity, and inadequate physical activity adversely impact renal function. Research also demonstrates the relationship between leisure activities and the short- and long-term health of people with chronic diseases. However, many studies on the health effects of lifestyle often omit considerations of leisure participation habits. This study combined several unhealthy lifestyle factors to examine their impact on renal progression.

Methods : This study recruited 8387 patients with chronic kidney disease (CKD), diabetes, and hypertension from 14 medical centers and communities in Taiwan between October 2008 and February 2016. Demographic characteristics and lifestyle were collected through a structured questionnaire. Obtain clinical examination through medical chart review. Renal progression was defined as a decrease in eGFR of more than 25% based on baseline eGFR. Lifestyle factors include leisure participation, physical activity, smoking, alcohol consumption, and body mass index.

Results : We observed 2078 renal progression events. The mean age of the cohort was 60.89 ± 14.12 years, and 52.88% were male. After adjusting for covariates, patients with low levels of physical activity showed a significantly higher risk of renal progression (adjusted odds ratio (aOR), 1.403; 95% confidence interval (CI), 1.081–1.821), as did those with moderate levels of physical activity (aOR, 1.368; 95% CI, 1.030–1.817), compared to patients with high levels of physical activity. Additionally, renal progression was notably elevated among patients without leisure participation (aOR, 2.532; 95% CI, 2.121–3.021) in comparison to those with leisure participation. Furthermore, individuals with unhealthy lifestyle behavior scores of 2-3 and 4-5 exhibited a significantly higher risk of renal progression compared to those in the 0-1 score group [aOR, 2.405 (95% CI, 1.719-3.365) and 1.71 (3.207-4.700)].

Conclusions : Participation in leisure activities, regular physical activity, and adherence to a healthy lifestyle were associated with a reduced risk of renal progression among patients with CKD, diabetes, and hypertension.

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Table 1. The baseline characteristics subjects (n=8387)

| Characteristic | n/mean | %/SD |
|---|--------|-------|
| Age (years) | 60.89 | 14.12 |
| Sex, % | | |
| Female | 3952 | 47.12 |
| Male | 4435 | 52.88 |
| Years of education | | |
| 6 < | 2641 | 33.98 |
| 6-12 | 2906 | 37.39 |
| ≥13 | 2225 | 28.63 |
| Family income, NT dollars, % | | |
| <40000 | 5759 | 69.19 |
| ≥40000 | 2565 | 30.81 |
| Lifestyle, % | | |
| Leisure Participation | | |
| No | 6395 | 76.84 |
| Yes | 1928 | 23.16 |
| Levels of Physical Activity | | |
| Low | 3325 | 62.69 |
| Moderate | 1376 | 25.94 |
| High | 603 | 11.37 |
| Cigarette smoking | | |
| No | 6389 | 77.23 |
| Yes | 1884 | 22.77 |
| Alcohol consumption | | |
| No | 7364 | 89.17 |
| Yes | 894 | 10.83 |
| BMI (kg/m ²) | 25.23 | 4.14 |
| Underweight | 2727 | 38.69 |
| Normal weight | 180 | 2.55 |
| Overweight | 2113 | 29.98 |
| Obese | 2029 | 28.78 |
| Unhealthy Lifestyle Behavior Score | | |
| 0-1 | 431 | 8.51 |
| 2-3 | 3908 | 77.16 |
| 4-5 | 726 | 14.33 |
| Physical examination | | |
| Serum creatinine (mg/dl) | 1.57 | 1.47 |
| Baseline eGFR (ml/min per 1.73 m ²) | 57.44 | 27.23 |
| SBP (mmHg) | 131.03 | 17.52 |
| DBP (mmHg) | 76.47 | 11.53 |
| Fasting glucose (mg/dl) | 113.63 | 36.58 |
| Total cholesterol (mg/dL) | 184.96 | 40.88 |
| Comorbidities, % | | |
| CKD | 5723 | 68.24 |
| Hypertension | 5447 | 64.99 |
| Diabetes mellitus | 3296 | 39.33 |
| Dyslipidemia | 2644 | 31.55 |
| Gout | 1737 | 20.74 |
| Stroke | 570 | 6.8 |

Abbreviations: CKD, chronic kidney disease; BMI, body mass index; SBP, systolic blood pressure; DBP, diastolic blood pressure.

Defined as sum of each unhealthy lifestyle behavior criterion met: leisure participation (no [1 point] versus yes [0 points]), physical activity (any weekly moderate to vigorous physical activity [0 point] versus no moderate to vigorous physical activity [1 points]), cigarette smoking (no [0 point] versus yes [1 points]), alcohol consumption (no [0 point] versus yes [1 points]), and BMI (normal weight [0 point] versus underweight, overweight, or obese [1 points]).

Table 2. Logistic regression model analysis for risk of renal progression

| Variable | Crude | | | Adjusted ^a | | |
|---|------------|---------|-------|-----------------------|---------|-------|
| | Odds ratio | (95%CI) | | Odds ratio | (95%CI) | |
| Lifestyle | | | | | | |
| Leisure Participation | | | | | | |
| Yes | | ref | | | ref | |
| No | 2.048 | 1.762 | 2.380 | 2.532 | 2.121 | 3.021 |
| Levels of Physical Activity | | | | | | |
| Low | 1.618 | 1.292 | 2.025 | 1.403 | 1.081 | 1.821 |
| Moderate | 1.451 | 1.136 | 1.854 | 1.368 | 1.030 | 1.817 |
| High | | ref | | | ref | |
| Cigarette smoking | | | | | | |
| No | | ref | | | ref | |
| Yes | 1.283 | 1.108 | 1.485 | 1.136 | 0.934 | 1.383 |
| Alcohol consumption | | | | | | |
| No | | ref | | | ref | |
| Yes | 0.842 | 0.688 | 1.031 | 1.047 | 0.818 | 1.340 |
| BMI (kg/m²) | | | | | | |
| Underweight | 1.219 | 0.808 | 1.840 | 1.038 | 0.624 | 1.73 |
| Normal weight | | ref | | | ref | |
| Overweight | 1.155 | 0.987 | 1.351 | 1.014 | 0.841 | 1.222 |
| Obese | 1.208 | 1.031 | 1.416 | 0.985 | 0.811 | 1.197 |
| Unhealthy Lifestyle Behavior Score | | | | | | |
| 0-1 | | ref | | | ref | |
| 2-3 | 2.306 | 1.714 | 3.103 | 2.405 | 1.719 | 3.365 |
| 4-5 | 3.086 | 2.222 | 4.286 | 3.207 | 2.188 | 4.700 |

^a Adjusted for age, sex, years of education, family income, baseline eGFR, chronic kidney disease, hypertension, diabetes mellitus, dyslipidemia, gout, stroke.