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An Analysis on Prevalence and Risk Factors of Chronic Kidney Disease in Yongzhou Region

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KEYWORDS

Chronic Kidney Disease;
Prevalence;
Risk Factors;
Cross-Sectional Study

ABSTRACT

Objective This study is to investigate the prevalence of chronic kidney disease (CKD) and its major risk factors among the adult population in Yongzhou, Hunan Province, it provides a scientific basis for developing targeted CKD prevention and management strategies in this region.

Methods A cross-sectional study was conducted from January 2024 to July 2025, involving participants from the nephrology outpatient clinic and health check-up center of Yongzhou Central Hospital. All participants underwent questionnaires, physical examinations, and laboratory tests. The collected data were statistically analyzed.

Results A total of 2,571 eligible participants were enrolled in this study. The participants comprised 1,167 patients from the nephrology outpatient clinic and 1,404 individuals from the health examination center, with a mean age of 52.16 ± 14.23 years (50.36 ± 15.82 years for males and 54.09 ± 12.18 years for females). Chi-square tests revealed that the differences in the prevalence of CKD across groups stratified by age, BMI, physical labor level, alcohol consumption, hypertension, diabetes, dyslipidemia, and hyperuricemia were statistically significant in the total population. Logistic regression analysis identified increasing age, lack of physical labor, hypertension, diabetes, dyslipidemia, and hyperuricemia as independent risk factors for CKD.

Conclusion Although the prevalence of CKD among adults in Yongzhou is slightly lower than the national average, the absolute disease burden remains substantial and is closely associated with multiple modifiable metabolic risk factors. Early screening and comprehensive management of risk factors such as hypertension, diabetes, obesity, and hyperuricemia should be strengthened to delay the onset and progression of CKD.

Introduction

Chronic Kidney Disease (CKD) is a major non communicable disease characterized by progressive damage to the structure or function of the kidneys, and has become an increasingly severe public health challenge worldwide. Its course is insidious, and early symptoms are often not obvious, resulting in a large number of patients not receiving timely diagnosis and intervention. Once end-stage renal disease (ESRD) progresses, patients will face a heavy burden of dialysis or kidney transplantation, accompanied by a soaring risk of cardiovascular events and a significant increase in all-cause mortality. This not only seriously damages individual health and quality of life, but also puts enormous pressure on social medical resources. According to data from the Global Burden of Disease (GBD) study, the total number of CKD patients worldwide has exceeded 800 million, with an overall

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prevalence rate close to 10% and showing a continuous upward trend. In China, with the acceleration of the aging process of the population, the sharp increase in the prevalence of metabolic diseases (such as diabetes and hypertension) and profound changes in environmental and lifestyle factors, the prevalence of CKD is particularly severe [3]. Thoroughly analyzing the risk factors of CKD is the cornerstone of developing effective prevention and control strategies. Therefore, this study aims to understand the characteristics and epidemiological factors of CKD in Yongzhou area, and provide certain data support for the prevention and treatment of CKD.

Materials and Methods

Population

The data source for this study is patients and physical examination personnel who visited in Departmentthe Nephrology of Yongzhou Central Hospital from January 2024 to July 2025. The selected individuals had complete personal information and ultimately agreed to participate in this study, age at 18 - 65 years, the effective sample number is 2571. All enrolled individuals had signed informed consent forms, understood all the contents of this study, and voluntarily participated in this study.

Method

This study consists of questionnaire survey and laboratory examination. The content of the questionnaire includes basic personal information such as gender, height, weight, marital status and education level, life habit risk factors such as smoking, drinking, diet type, and sleep duration, and chronic disease risk factors such as hypertension, diabetes, hyperuricemia, and dyslipidemia. The laboratory examination includes the determination of serum biochemical indicators and urine protein, including blood glucose, blood uric acid, blood lipids, urine α1 microglobulin, urine α2 macroglobulin, urine immunoglobulin G and other indicators.

Diagnostic Criteria and Related Indicators

Personal basic information, lifestyle habits, and chronic disease status were obtained through face-to-face paper questionnaire surveys. According to the National Occupational Classification Dictionary of the People's Republic of China, this study classifies agricultural, forestry, animal husbandry, and fishery workers and laborers as manual laborers in industry and agriculture, while other occupations are defined as non industry and agriculture.

The investigator recorded the height (M), weight (KG), blood pressure (mmHg) and other indicators of the respondents on site according to the operating procedures. According to the current industry standard "Adult Weight Determination" (WS/T 428-2013), the Body Mass Index (BMI) of adults in China should be maintained at $18.5 \leq BMI < 24.0$. $BMI < 18.5$ indicates underweight, $24.0 \leq BMI < 28.0$ indicates overweight, and $BMI \geq 28.0$ indicates obesity. Blood pressure was measured using the Omron HBP-9021J fully automatic electronic blood pressure monitor. According to the "Chinese Guidelines for the Prevention and Treatment of Hypertension (Revised 2024 Edition)" [4], the upper arm blood pressure of the subjects was recorded after resting quietly for at least 5 minutes in a sitting position. The measurements were repeated twice every minute. If there was a difference of more than 10 mmHg between the two readings of systolic or diastolic blood pressure, the measurements were taken again and the average of the three readings was recorded. Hypertension is defined as having a systolic blood pressure of ≥ 140mmHg and/or a diastolic blood pressure of ≥ 90mmHg, or having been diagnosed with hypertension by a township (community), or higher level hospital and taking medication in the past 2 weeks without the use of antihypertensive drugs. The blood sugar, blood uric acid, blood lipids and other related serum biochemical indicators were measured by Siemens Advia 1800 biochemical analyzer. Among them, diabetes patients refer to those with fasting blood glucose ≥ 7.0 mmol/L and/or blood glucose ≥ 11.1 mmol/L 2 hours after the oral glucose tolerance test (OGTT) or those who have been diagnosed as diabetes by township (community) level hospitals or above. Patients with hyperuricemia, whether male or female, have blood uric acid levels greater than 420 μmol/L; Abnormal blood lipids refer to the "Chinese Blood Lipid Management Guidelines (Primary Edition 2024)" [5], with total cholesterol ≥ 6.2mmol/L or triglycerides ≥ 2.3mmol/L or low-density lipoprotein cholesterol ≥ 4.1mmol/L or high-density lipoprotein cholesterol<1.0mmol/L. The urine protein was detected using the Huasheng H-1000 fully automatic dry chemistry urine analyzer, and the results were expressed as negative (-), weakly positive (±), and positive (1+, 2+, and 3+), respectively. The urine protein was measured using the Doctoral TD240 fully automatic specific protein analyzer. According to the Clinical Practice Guidelines for Evaluation and Management of Chronic Kidney Disease (2024) published by Kidney Disease: Improving Global Outcomes (KDIGO), CKD is defined as the presence of proteinuria or a urinary albumin/creatinine ratio (UACR) greater than 30 mg/g. The relevant information on family history of chronic kidney disease, history of kidney stones, etc. comes from the self-report and past medical history of the respondents.

The inclusion criteria for this study are: (1) Permanent residents who are over 18 years old and have resided in Yongzhou City for no less than 6 months; (2) Complete basic information and able to provide clinical samples required for this study; (3) Clear consciousness, basic communication skills, able to cooperate in completing questionnaire surveys

and physical examinations. The exclusion criteria are: (1) Patients with end-stage renal disease; (2) Patients with acute kidney injury; (3) Severe organ dysfunction, including severe heart failure, severe liver failure, advanced malignant tumors, etc; (4) Pregnant women.

Statistical Analysis

SPSS 25.0 statistical software was used to perform statistical analysis on the data of this study. The measurement data was represented by $\bar{x}\pm s$, and t-test was used to compare the differences between groups. Count data was represented by frequency or rate, and comparison of differences between groups was performed using the chi square test. Among them, comparison of ordered multi class data was performed using the linear trend chi square test. The risk factors for CKD were analyzed using logistic regression. The test level is all $\alpha=0.05$.

Results

Basic Information Analysis

This study included a total of 2571 individuals, of whom 56.98% individuals were female, 43.02% were male. The average age was 52.16 ± 14.23 years, with 50.36 ± 15.82 years for males and 54.09 ± 12.18 years for females. The cultural level of the respondents was mainly junior high school or below (50.14%), high school (33.06%), and college or above (16.80%). The prevalence rates of hypertension, diabetes, hyperuricemia and dyslipidemia were 27.69%, 20.65%, 18.51%, 16.45% and 12.80% respectively. Men have higher levels of blood uric acid than women; Total cholesterol, triglycerides, and low-density lipoprotein cholesterol were lower in females, and the differences were statistically significant ($P<0.05$) (**Table 1–4**).

Prevalence of Chronic Kidney Disease in Various Populations

In this study, CKD patients accounted for 9.26% (238/2571), with female CKD patients accounting for 9.28% (136/1465) and male patients accounting for 9.22% (102/1106), there is no statistical difference between the male and female groups. Among all the participants included in the study, there was a significant correlation ($P < 0.001$) between the prevalence of CKD and age and BMI, while the relationship between BMI levels in females and CKD was not significant. Meanwhile, there is no significant correlation between educational level and sleep duration and the incidence of CKD. Smoking and alcohol consumption, as unhealthy habits, are not significantly associated with CKD, while the latter shows a higher risk of CKD in the male population. Hypertension, diabetes, dyslipidemia and hyperuricemia, as the influencing factors of CKD related diseases, are all significantly related to the prevalence of CKD (**Table 5**).

Analysis of Various Influencing Factors and the Risk of Chronic Kidney Disease

Based on various lifestyles and chronic disease conditions, including age, educational level BMI, physical labor, smoking, drinking, sleep duration, hypertension, diabetes, dyslipidemia and hyperuricemia were taken as independent variables. Perform binary logistic regression analysis with CKD as the dependent variable and the health level of each influencing factor as a reference. The results showed that the increase of age, non manual workers, hypertension, diabetes, dyslipidemia and hyperuricemia were all associated with the high risk of CKD (**Table 6**).

Discussion

CKD has become an important public health issue in worldwide. Some studies have shown that the incidence of CKD has been gradually increasing in the past 30 years. From 1990 to 2019, the number of CKD cases doubled in worldwide, and the mortality and disability adjusted life years (DALYs) have also been increasing year by year. This indicates that CKD has become a serious public health problem worldwide. The growth of incidence rate and mortality is closely related to the high incidence of primary diseases, such as population aging, diabetes and hypertension, and constitutes a vicious circle of mutual correlation and intensification [8-10]. A survey conducted in developed countries shows that CKD and ESRD impose a heavy medical burden on the healthcare system [11]. In China, with the development of social economy and the transformation of residents' lifestyles, the prevalence of CKD is also severe. Diabetes nephropathy and hypertensive glomerular arteriosclerosis have become the primary cause of disease replacing primary glomerulonephritis, and the transformation of this disease spectrum is similar to that of western countries [12]. In this context, it is of great practical significance to conduct an analysis of the current prevalence and risk factors of CKD in Yongzhou district, a specific region. The aim of this study is to clarify the disease burden and unique risk characteristics of CKD in the region, providing scientific basis for the development of regional early screening and precise prevention and control strategies, in order to address this increasingly severe public health challenge.

The data from this study shows that the prevalence of CKD among adults in Yongzhou City is 9.26%, which is lower than the global estimated prevalence of 13.4% (11.7-15.1%) [13], and compared with data from other regions around the world, it is lower than 22.48% in Bangladesh [14] and 13.24% in India [15]. Another survey on CKD prevalence based on 16 Asian countries showed significant differences in the overall CKD prevalence rate among countries, ranging from 7.0% to 34.3% [16]. Compared with the domestic research, it is lower than 12.72% in Liaoning Province [17] and 9.97% in Henan Province [18]. This indicates

Table 1 | Age, BMI, blood pressure, glucose and cholesterol of participants

Groups	N	Age	BMI	Systolic blood pressure	Diastolic blood pressure	Fasting blood glucose	Total cholesterol
	(year)	(kg/m^2)	(mmHg)	(mmHg)	(mmol/L)	(mmol/L)	(year)
Male	1106	45.36±15.82	25.35±6.28	135.21±20.12	81.45±12.56	5.67±1.41	4.53±0.81
Female	1465	48.09±12.18	23.54±7.68	135.08±18.54	78.14±11.49	5.65±1.32	4.77±0.93
Total	2571	46.16±14.23	24.41±6.98	135.15±19.33	79.80±12.03	5.66±1.36	4.65±0.87

Table 2 | Triglycerides, high- and low-density lipoprotein, blood uric acid, α1 and α2, microglobulin, immunoglobulin G, retinol binding protein and transferrin of participants

Groups	Triglycerides	High-density lipoprotein	Low-density lipoprotein	Blood uric acid	Urine α1 microglobulin	Urine α2 macroglobulin	Immunoglobulin G	Retinol binding protein	Transferrin
	(mmol/L)	(mmol/L)	(mmol/L)	(μmol/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
Male	1.61±1.12	1.36±0.42	2.58±0.72	325.32±85.15	31.26±53.54	2.24±7.56	5.37±35.41	1.55±2.83	490.21±1049.53
Female	1.69±1.15	1.39±0.48	2.76±0.82	260.21±77.41	24.27±58.54	1.35±2.49	4.25±29.32	1.72±2.92	674.21±1328.75
Total	1.64±1.14	1.37±0.45	2.68±0.77	292.765±81.28	27.43±55.12	1.79±5.03	4.66±33.36	1.65±2.87	544.21±1128.14

Table 3 | Educational level, smoke, drinking, and manual labor of participant

Group	Educational level			Smoking	Drinking	Manual labor
	Junior high school and below	High school	College or above			
Male	701 (27.27%)	312 (12.14%)	93 (3.62%)	426 (16.57%)	153 (5.95%)	356 (13.85%)
Female	879 (34.19%)	395 (15.36%)	191 (7.43%)	217 (8.44%)	78 (3.03%)	339 (13.19%)
Total	1289 (50.14%)	850 (33.06%)	432 (16.80%)	643 (25.01%)	231 (8.9%)	695 (27.03%)

Table 4 | Sleep, CDK family, kidney stone history, hypertension, diabetes, hyperuricemia and dyslipidemia of participant

Group	Sleep duration			CDK Family history	History of kidney stones	Hypertension	Diabetes	Hyperuricemia	Dyslipidemia
	< 6h	6~8	>8						
Male	271 (10.54%)	714 (27.77%)	121 (4.71%)	75 (2.92%)	186 (7.23%)	328 (12.76%)	241 (9.37%)	228 (8.87%)	201 (7.82%)
Female	428 (16.65%)	802 (31.19%)	235 (9.14%)	79 (3.07%)	234 (9.10%)	384 (14.94%)	290 (11.28%)	248 (9.65%)	222 (8.63%)
Total	699 (27.19%)	1516 (58.97%)	356 (13.85%)	154 (5.99%)	420 (16.34%)	712 (27.69%)	531 (20.65%)	476 (18.51%)	423 (16.45%)

Note: The data in the table are mean ± standard deviation; The data in parentheses is the rate (%), and the data outside parentheses is the number of examples

that there are significant regional differences in the prevalence of CKD, which may be closely related to factors such as public awareness of CKD, aging population, socio-economic factors, dietary and cultural habits, occupational and environmental exposure [19-21]. In addition, the prevalence of CKD in women was slightly higher than that in men in this study, which is consistent with the results of other similar studies. The reasons for this are related to physiological differences between genders and the effects of sex hormones on kidney function [22, 23].

Simultaneously, the results of this study also showed that the growth of age, lack of physical labor, hypertension, diabetes, dyslipidemia, and hyperuricemia accelerated the occurrence and development of CKD to a certain extent through logistic regression. Hypertension, diabetes, dyslipidemia and hyperuricemia are closely related to CKD in different regions, and they are risk factors for each other, which is consistent with the results of relevant studies in the same period [24]. However, the negative correlation between physical labor and CKD disease is not commonly seen in related studies, which contradicts the conclusion obtained from a similar study [25]. China has a large population, and the problem of population aging is becoming increasingly serious, so the above disease groups are growing day by day. It is necessary

Table 5 | CKD prevalence among populations with different baseline characteristics

Baseline characteristics	total（n=2571）	Male（n=1106）	Female（n=1465）
Age（Year）			
＜30	46（1.79）	19（0.74）	27（1.05）
-30	63（2.45）	27（1.05）	36（1.40）
-50	129（5.02）	56（2.18）	73（2.84）
χ^2	93.23	49.72	44.62
P	＜0.001	＜0.001	＜0.001
Educational level			
Junior high school and below	109（4.24）	56（2.18）	87（3.38）
High school	85（3.31）	34（1.32）	27（1.05）
College degree or above	44（1.71）	12（0.47）	22（0.86）
χ^2	1.70	3.78	0.02
P	0.192	0.052	0.887
BMI			
Underweight	21（0.82）	9（0.35）	12（0.47）
Normal weight	97（3.77）	39（1.52）	58（2.26）
Overweight	89（3.46）	35（1.36）	54（2.1）
Obesity	31（1.21）	19（0.74）	12（0.47）
χ^2	30.32	41.46	3.63
P	＜0.001	＜0.001	0.057
Manual labor			
No	96（3.73）	46（1.79）	50（1.94）
Yes	142（5.52）	56（2.18）	86（3.35）
χ^2	23.54	8.58	15.65
P	＜0.001	0.003	＜0.001
Smoking			
No	62（2.41）	49（1.91）	13（0.51）
Yes	176（6.85）	53（2.06）	123（4.78）
χ^2	0.15	4.30	3.28
P	0.697	0.038	0.070
Drinking Wine			
No	193（7.51）	66（2.57）	127（4.94）
Yes	45（1.75）	36（1.4）	9（0.35）
χ^2	31.58	43.41	0.50
P	＜0.001	＜0.001	0.48
Sleep duration			
＜6	65（2.53）	26（1.01）	39（1.52）
-6	129（5.02）	63（2.45）	66（2.57）
-8	44（1.71）	13（0.51）	31（1.21）
χ^2	1.363	0.022	1.830
P	0.243	0.881	0.176
Hypertension			
No	145（5.64）	57（2.22）	88（3.42）
Yes	93（3.62）	45（1.75）	48（1.87）
χ^2	144.64	37.05	114.86
P	＜0.001	＜0.001	＜0.001
Diabetes			
No	162（6.30）	71（2.76）	91（3.54）
Yes	76（2.96）	31（1.21）	45（1.75）
χ^2	20.36	7.25	31.37
P	＜0.001	＜0.001	＜0.001
Dyslipidemia			
No	145（5.64）	65（2.53）	80（3.11）
Yes	93（3.62）	37（1.44）	56（2.18）
χ^2	97.65	24.76	78.96
P	＜0.001	＜0.001	＜0.001
Hyperuricemia			
No	174（6.77）	67（2.61）	107（4.16）
Yes	64（2.49）	35（1.36）	29（1.13）
χ^2	12.20	12.89	2.06
P	＜0.001	＜0.001	0.151

Note: The data outside parentheses represents the number of CKD cases, while the data inside parentheses represents the composition ratio (%)

Table 6 | Logistic regression analysis of various influencing factors and CKD risk

Lifestyle	β value	SE	χ^2 value	OR（95%）	P
Age	0.021	0.006	12.250	1.021（1.009~1.033）	＜0.001
Educational level					
Junior high school and below				1.000	
High school	0.154	0.092	2.802	1.25（0.818~1.909）	0.094
College degree or above	0.217	0.156	1.935	1.25（0.818~1.909）	0.164
BMI					
Underweight				1.000	
Normal weight	-0.217	0.285	0.580	0.805（0.46~1.407）	0.446
Overweight	-0.316	0.257	1.512	0.729（0.441~1.206）	0.219
Obesity	-0.364	0.247	2.172	0.695（0.428~1.128）	0.141
Manual labor					
No				1.000	
Yes	-0.528	0.248	4.533	0.590（0.363~0.959）	0.033
Smoking					
No				1.000	
Yes	0.033	0.214	0.024	1.034（0.679~1.572）	0.877
Drinking Wine					
No				1.000	
Yes	0.047	0.138	0.116	1.048（0.8~1.374）	0.733
Sleep duration					
＜6				1.000	
-6	0.167	0.318	0.276	1.182（0.634~2.204）	0.599
-8	0.223	0.216	1.066	1.25（0.818~1.909）	0.302
Hypertension					
No				1.000	
Yes	0.685	0.096	50.914	1.984（1.644~2.394）	＜0.001
Diabetes					
No				1.000	
Yes	0.746	0.174	18.381	2.109（1.499~2.965）	＜0.001
Dyslipidemia					
No				1.000	
Yes	0.513	0.096	28.556	1.67（1.384~2.016）	＜0.001
Hyperuricemia					
No				1.000	
Yes	0.261	0.085	9.429	1.298（1.099~1.534）	0.002

to prevent hypertension, diabetes and other risk factors at the source while preventing chronic kidney disease. Correct cognition, healthy lifestyle, and early intervention measures are of great significance in reducing the risk of CKD.

In summary, although the prevalence of CKD among adults in Yongzhou City is relatively lower than in other regions, it is still necessary to pay attention to the prevention and control of this disease. It is recommended to develop and promote multi-level and forward-looking comprehensive prevention. The control strategies should come from the following aspects: **1)** Strengthen early screening and diagnosis. Focusing on high-risk groups of CKD such as hypertension, diabetes and hyperuricemia, regular UACR and serum creatinine detection will be carried out to improve the early detection rate. **2)** Carry out systematic health education. Enhance public awareness of CKD risk factors and prevention measures through various channels, advocate for low salt, low-fat, low purine diets and healthy lifestyles, and improve

group health literacy. **3)** Enhance the capacity of primary healthcare services. Strengthen the capacity building of grassroots medical institutions in CKD screening, diagnosis, treatment, and long-term management, and promote the realization of "early detection, early diagnosis, and early treatment". Implement standardized follow-up and management for confirmed patients, delay the progression of ESRD, and reduce the medical burden on families and society. **4)** Promote interdisciplinary collaboration management. Establish a diagnosis and treatment model led by nephrology, with collaboration from nutrition, cardiovascular, endocrinology, and other departments, to provide comprehensive interventions for patient comorbidities and optimize treatment plans. **5)** Improve the construction of regional chronic disease information platforms, achieve dynamic monitoring and sharing of CKD patient data, and support precise prevention and control as well as policy formulation. 6. Encourage high-risk populations to undergo regular physical examinations, improve disease screening coverage, effectively move the checkpoint forward, combine prevention and treatment, and effectively curb the growth trend of CKD.

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