ORIGINAL ARTICLE

Impact of Age and Ethnic Variability on Cardiovascular Risk in Chronic Kidney Disease Patients

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ABSTRACT

Objective: To investigate the effect of age and ethnicity on cardiovascular disease risk in patients with chronic kidney disease.

Study Design: Descriptive Cross-sectional.

Place and Duration of Study: This study was conducted at the Department of Nephrology, Jinnah Post Graduate Medical Centre and Cantonment board Clifton health care center, Karachi from 21st August 2023 to 21st February 2024.

Materials and Methods: One- forty male and female chronic kidney disease (CKD) patients aged 25–60 with diabetes and hypertension for at least five years were included. Patients on renal replacement therapy with coronary artery disease, liver disease, hormonal or steroidal medicine, pregnancy, or breastfeeding were excluded. Descriptive statistics employed mean for quantitative variables. The demographics and case history of patients were collected on a performa and grouped by ethnicity. BMI, Hb, creatinine, urea, lipid profile, and BNP were measured. Quantitative variables were shown. Data was analyzed using SPSS version 25.0. Statistical analysis included Pearson correlation test and One-way Anova to compare the biochemical parameters across the different groups.

Results: In CKD patients, age was positively linked with Hb% (P = 0.018), serum urea (P = 0.000), serum creatinine (P = 0.000), total cholesterol (P = 0.002), and LDL- Cholesterol (P = 0.024). Pathans had significantly higher total cholesterol levels (171.53± 39.75) with a P-value of 0.019. Sindhi had the highest HDL- cholesterol levels (mean 54.44 ±6.48) with a significant P-value < 0.001. Gilgiti had the highest BNP levels (307.37± 57.71) with a significant P-value< 0.0001.

Conclusion: The study found that age and ethnicity affect CKD-related CVD. Adding these traits to clinical practice should improve high-risk CKD screening and management. By closing demographic gaps and customizing treatments, clinicians can lower CVD risk and CKD consequences.

Key Words: *Chronic Kidney Disease, Cardiovascular Disease, Diabetes Mellitus Hypertension, Pathan.*

Introduction

Chronic kidney disease (CKD) is a major global health issue, with high incidences of cardiovascular disease, particularly among patients with complications like type 2 diabetes, obesity, hypertension, and atherosclerosis.[1] The rising prevalence of CKD, ranging from 11 to 13%, is widely documented globally, with 21 million people in Pakistan suffering from it.[2] Research indicates that older age significantly impacts cardiovascular risk and mortality in individuals with CKD, highlighting the complex interaction of age and cardiovascular events.

Patients with CKD who are older have a higher risk of cardiovascular disease (CVD) and death than those who are younger. Individuals over 75, for example, have a significantly higher risk of dying than individuals under 55 years.[3] In patients with CKD, aging is a major risk factor for cardiovascular disease (CVD). Traditional risk factors and comorbidities associated with CKD contribute to the greater prevalence of both atheromatous and non-atheromatous CVD in older adults.[4] The relationship between pulse pressure (PP) and negative outcomes changes with age; older patients are more impacted by kidney outcomes, whereas younger patients are at increased risk of atherosclerotic cardiovascular

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Received: May 24, 2024; Revised: January 20, 2025
Accepted: January 28, 2025

https://doi.org/10.57234/jiimc.march25.2088

disease (ASCVD) events.[5]

Historically, various social, genetic, and biological factors have influenced the relationship between ethnicity and cardiovascular outcomes in CKD patients, with disparities evolving due to treatment options and healthcare access.

Studies show that Black individuals with CKD have a higher mortality rate than White patients, with a 34% mortality rate compared to 26% for White patients. Higher interleukin-6 (IL-6) levels are linked to a higher risk of death and cardiovascular disease (CVD), with a larger association shown in White patients.[6] cardiovascular disease (CVD) and chronic kidney disease (CKD) have historically been disproportionately prevalent in minority racial and ethnic groups.[7]

Research on the difficulties younger CKD patients encounter is lacking, which restricts our knowledge of age-related differences in cardiovascular outcomes as most existing research focuses on adults.[8] There is little data on the effects of age and ethnicity at every stage of the ESKD pathway, especially when it comes to end-of-life care. There are very few qualitative studies and few cross-country comparisons in the literature.[9]

Research on the effects of age and ethnicity on cardiovascular outcomes in individuals with CKD is crucial since it reveals notable differences in health outcomes. Numerous studies show that cardiovascular risks and death rates among patients with CKD are significantly influenced by both age and ethnicity, underscoring the necessity for focused therapies. According to certain research, these gaps might eventually be lessened by advancements in healthcare management and access, suggesting that future results could improve. By our study we can increase knowledge of the intricate relationships that exist between the risk of cardiovascular events, age, and ethnicity in CKD patients. We can help find ethnicities at high risk so that treatments can be focused on them. We can make informed judgments on healthcare policy and individualized treatment plans.

Materials and Methods

This descriptive cross-sectional study was conducted at Jinnah Post Graduate Medical Centre (JPMC) and, Cantonment board Clifton health care center, Phase 2 South circular avenue, Defense housing authority Karachi from August 21, 2023, to February 21, 2024, with Institutional Review Board approval (CBC/EL/PH-II/No.29). Patients were initially registered at CBC health care center and then followed in the JPMC after routine investigations. Hospitals were chosen using convenience sampling. Software open EPI version 3 determined sample size. Samples were drawn using a single proportion approach with 5% error and 95% confidence. The required sample size was 140. After informed permission, male and female CKD patients with diabetes mellitus and hypertension for more than 5 years and healthy persons aged 25-60 were enrolled in the study. Dialysis or kidney transplant patients with coronary artery disease, hepatopathologies, hormonal or steroidal treatment, pregnancy, or several co-existing illnesses were excluded from the study. The proforma comprising demographics, medical history, family history, and lifestyle issues was disseminated among the participants. Body mass index (BMI), baseline tests and research factors were recorded. Statistical product for services solution (SPSS) version 25.0 was utilized to analyze the data. The continuous variables were expressed as mean±SD. Pearson correlation test was employed to examine the differences between the age and biochemical parameters and one way ANOVA was applied for the comparison between different ethnic groups and biochemical parameters at a predetermined level of statistical significance of $p < 0.05$.

Results

A total of 140 subjects included in this study in which 101 (72.1%) male. Mean age was 56.69±10.53 with range of 38-78 years. Correlation of age (years) and different parameters were assessed. Positive correlation was observed among Hb% with significant P-value=0.018, Total cholesterol with significant P-value=0.002 and LDL with significant P-value=0.024. However negative correlation was observed among serum urea with significant P-value=0.000 and serum creatinine with significant P-value=0.000. (Table I)

Hb% was found with high mean value 11.71 ±2.14 among Pathan followed by Sindhi with mean 10.22± 2.64 with significant P-value 0.001.. Serum creatinine levels found higher value of mean 8.65 ±2.96 among Bengali followed by 5.88 ±3.3 in Sindhi

https://doi.org/10.57234/jiimc.march25.2088

Table I: Comparison of Age (years) with Different Study Parameters

	Variables	r-value (Correlation)	P-value
Age (years)	Hb%	.199*	0.018
	BMI	0.092	0.277
	Serum Urea	-.297**	0.000
	Serum Creatinine	-.518**	0.000
	Total Cholesterol	.257**	0.002
	Triglycerides	-0.002	0.984
	HDL	-0.162	0.055
	LDL	.190*	0.024
	BNP	0.036	0.669

***Pearson's Correlation was applied to see the significance**
***P-value < 0.05 considered statistically significant**
****Highly statistically significant P-value**

with highly significant value P< 0.001. Total cholesterol levels found higher value of mean 171.53± 39.75 among Pathan followed by 155.17± 23.2 in Sindhi with significant P-value= 0.019. HDL levels were observed highest in Sindhi with mean value 54.44 ±6.48 followed by Bengali with mean value 51.2± 2.86. The P-value <0.001 for this association was found significant. BNP levels were observed highest in Gilgiti with mean value 307.37± 57.71 followed by Pathan 277.88± 111.93 with significant P-value <0.0001. (Table II)

Discussion

Chronic kidney disease (CKD) constitutes a significant global health issue, substantially contributing to the burden and mortality associated with cardiovascular disease (CVD). This study examines the impact of age and ethnicity on cardiovascular outcomes in Pakistani patients with chronic kidney disease, highlighting demographic and clinical differences. The results indicate a favorable correlation between age and hemoglobin percentage (Hb%), total cholesterol (TC), and low-density lipoprotein (LDL). Hemoglobin levels seem to rise with age, perhaps as a result of erythropoiesis-stimulating agents (ESAs) or iron supplementation. This tendency corresponds with previous research that noted steady or elevated hemoglobin levels in older patients with chronic kidney disease (CKD).[10] A further study indicated that age had no impact on the factors across CKD stages.[11] A multicenter prospective study in China shown that age independently predicted the frequency of

Table II: Comparison of Ethnicity with Different Study Parameters

Parameters	Response	Bengali	Gilgiti	Pathan	Punjabi	Sindhi	Urdu
Hb%	Mean ±SD	8.92 ±2.01	9.7 ±1.27	11.71 ±2.14	10.68 ±1.74	10.22± 2.64	10.09± 1.86
	P-value	0.001*					
BMI	Mean ±SD	25.52 ±2.41	26.62± 2.08	25.17± 5.87	24.26 ±5.36	22.46± 4.89	23.37± 5.58
	P-value	0.398					
Serum Urea	Mean ±SD	121 ±20.08	146.62± 137.72	111.8 ±47.44	94.59 ±43.87	123.11 ±39.49	113.24 ±59.18
	P-value	0.406					
Serum Creatinine	Mean ±SD	8.65 ±2.96	3.66 ±3.09	4.84 ±2.54	3.73± 2.5	5.88 ±3.3	5.51 ±3.47
	P-value	0.001*					
Total Cholesterol (TC)	Mean ±SD	141.4 ±23.51	152.5± 2.12	171.53± 39.75	148.6 ±37.19	155.17± 23.2	148.84± 27.58
	P-value	0.019*					
Triglycerides (TG)	Mean ±SD	116 ±18.65	96.5 ±27.58	173.33± 72.49	152.12± 68.92	157.06 ±76.5	163.49± 51.1
	P-value	0.111					
HDL	Mean ±SD	51.2± 2.86	42± 0	47.03 ±6.61	42.72 ±8.72	54.44 ±6.48	42 ±8.68
	P-value	0.0000*					
LDL	Mean ±SD	111.8± 3.79	89± 4.24	119.78± 23.34	111.24 ±27.34	120.5± 23.33	111.84 ±25.62
	P-value	0.289					
BNP	Mean ±SD	135.81± 29.03	307.37± 57.71	277.88± 111.93	210.12± 123.54	122.18 ±47.48	290.86 ±116.92
	P-value	0.0000*					

***One way ANOVA test was applied to see the significance**
***P-value < 0.05 considered statistically significant**

cardiovascular disease in individuals with chronic kidney disease.[12] These data indicate that aging populations may preserve superior hematological profiles in the context of chronic kidney disease, maybe owing to specific therapeutic approaches. Additional research is required to comprehensively understand this link, especially in groups with varied genetic and environmental contexts. Renal parameters, including blood urea and creatinine, exhibit a substantial negative correlation with age, indicating an age-related loss in kidney function and an elevated risk of chronic kidney disease progression. This highlights the necessity of monitoring kidney parameters in elderly populations to customize therapies.[13] Elevated blood urea levels inversely correlate with the decrease of renal function associated with aging, indicating that age influences renal parameter dysregulation.[14]

In older CKD patients, increased TC and LDL levels signify substantial abnormalities in lipid metabolism linked to aging. Dyslipidemia, an established risk factor for atherosclerosis and cardiovascular disease, likely facilitates the relationship between chronic kidney disease and cardiovascular disease through processes including oxidative stress, inflammation, and endothelial dysfunction. In chronic kidney disease, elevated cholesterol and LDL levels correlate positively with age due to diminished lipid metabolism and heightened atherosclerotic risk in older individuals.[13] A separate study revealed that elevated total cholesterol levels significantly correlate with renal impairment, with aging serving as an exacerbating factor in these connections.[15] LDL-C levels significantly correspond with the decline in glomerular filtration rate (GFR) in elderly chronic kidney disease (CKD) populations, establishing LDL-C as a therapeutic target.[16] Consistent with our study findings, research identified a positive correlation between age and total blood cholesterol levels.[17] The oxidative alteration of LDL and its role in vascular injury offer a credible rationale for these observations. Elevated reactive oxygen species and compromised endothelial function are prevalent in chronic kidney disease and may contribute to the noted lipid abnormalities. This underscores the necessity for age-specific approaches in the management of dyslipidemia, especially for older patients with chronic kidney disease at increased cardiovascular risk.

Ethnicity is a significant factor influencing outcomes related to cardiovascular disease in chronic kidney disease. Differences in Hb%, serum creatinine, TC, HDL, and BNP across various ethnic groups illustrate the impact of genetic, environmental, and lifestyle influences. South Asians typically exhibit lower HDL levels and elevated triglycerides, which contribute to increased cardiovascular risks. In contrast, African Americans may present with favorable HDL levels but increased LDL cholesterol, thereby elevating their ASCVD risks. These patterns indicate variations in eating patterns, hereditary traits, and metabolic syndromes among different ethnic groups.[18] Research on Asian populations has shown a significant correlation between low estimated glomerular filtration rate (eGFR), albuminuria, and heightened cardiovascular disease (CVD) risk. The current study's findings align with existing research, emphasizing the influence of ethnicity on health outcomes in chronic kidney disease (CKD).[19] However, contrasting results from Hispanic CKD cohorts, where no significant racial or ethnic disparities in atherosclerotic or heart failure outcomes were observed, underscore the complex and context-dependent nature of these relationships.[20] BNP levels, indicative of cardiac strain, exhibit considerable variation among CKD patients of diverse ethnic backgrounds. Elevated BNP levels in specific ethnic groups, such as the Gilgiti in our study, may suggest variations in cardiac remodeling or stress responses. Ethnic disparities in BNP are associated with differences in blood pressure management and the occurrence of cardiovascular complications.[21]

The interaction of age and ethnicity in affecting CKD-related CVD outcomes highlights the importance of integrating these factors into standard risk evaluations. Identifying high-risk individuals using demographic variables can provide personalized therapies to reduce cardiovascular risks and enhance overall health outcomes. This method is especially pertinent for patients with chronic kidney disease, who are inherently susceptible to unfavorable cardiovascular outcomes.

This study, although having useful insights, has numerous drawbacks. The limited sample size for each ethnic group may constrain the generalizability

https://doi.org/10.57234/jiimc.march25.2088

of the findings, as results from communities may not be relevant to larger populations. Furthermore, socioeconomic position and healthcare access, which are known to significantly affect health outcomes, were not included in this study. The aforementioned issues may have led to the observed differences in biomarkers. Moreover, as a cross-sectional study, the research design prevents the establishment of causation, rendering it hard to ascertain whether the observed relationships are directly attributable to age or ethnicity. Longitudinal studies are essential to corroborate these findings and investigate the enduring impacts of age and ethnicity on CKD and CVD outcomes.

Subsequent study ought to rectify these limitations by incorporating larger, more heterogeneous cohorts and considering socioeconomic and healthcare access characteristics. Longitudinal studies are crucial for determining causality and revealing the reasons behind observed demographic differences. Moreover, research examining customized therapies according to age and ethnicity may yield significant insights for enhancing CKD management and mitigating cardiovascular risks. A deeper comprehension of these linkages might improve risk classification and guide tailored healthcare measures for CKD patients.

Conclusion

This study underscores the interconnected influence of age and ethnicity on CKD-related cardiovascular events. Incorporating these characteristics into clinical practice could markedly enhance early diagnosis and management options for high-risk CKD patients. By addressing demographic differences and customizing therapies, healthcare practitioners can improve outcomes and alleviate the burden of CKD and its related comorbidities predominantly cardiovascular risk.

Acknowledgement

The authors express their gratitude to Dr. Ghazala Yasmeen, Supervisor (M.Phil. Physiology) at the University of Karachi and Dr. Abdul Manan Junejo, Head of the Department of Nephrology at Jinnah Postgraduate Medical Center, for her invaluable role as a clinical collaborator. They also extend their appreciation to the Multidisciplinary Research Lab (MDRL) and Bahria University Health Sciences for their technical support.

Conflict of Interest

There is no conflict of interest among the study authors.

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CONFLICT OF INTEREST

Authors declared no conflicts of Interest.

GRANT SUPPORT AND FINANCIAL DISCLOSURE

Authors have declared no specific grant for this research from any funding agency in public, commercial or nonprofit sector.

DATA SHARING STATEMENT

The data that support the findings of this study are available from the corresponding author upon request.