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Assessing cardiac threat in Chronic Renal Impairment with not acclaimed Cardiovascular Disease

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Abstract: Chronic renal impairment commonly called Chronic Kidney Disease (CKD) is among the self-regulating threat directing to cardiovascular diseases (CVD). The threat to heart advances with the elevated intensity of kidney abnormality. Various insults like hypertension, hyperglycemia, hypercholesterolemia, and obesity accompanying the CKD causes premature and brisk development of CVD. But a timely preventive measure may deaccelerate pathogenic development from silent to established disease. Therefore, the research was aimed to assess the Cardiac risk ratio in these patients prior to onset. The cross- sectional plan was executed in the period of 2023-2024. 100 CKD patients meeting inclusion requirement were inquired for demographics, through systematized questionnaire and blood samples were collected for kidney function tests & lipid profile assays following consent. Subjects were divided in three groups and cardiac risk ratio was estimated. Data was statistically analyzed at $p<0.05$ level of significance. Results showed that the risk of cardiac disease was reported the most (approx. 60%) in diabetes, 43% in hypertensive, 34% in CKD counterparts without comorbidities. The findings concluded that company of comorbidities precipitates cardiovascular disease likelihood and timely precautions may defer its onset refining overall health status and plummeting hospital visits.

Keywords: Cardiovascular Risk, Chronic Kidney Disease, Hypertension, Diabetes Mellitus, Chronic Renal Impairment

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Introduction

Chronic renal impairment generally referred as chronic kidney disease (CKD) is one of utmost prevailed and progressive global illness with significant contribution in overall death burden [1] involving other core organs and compromising quality of life. Its presence alone communicates a disproportionately elevated threat for cardiovascular diseases. The patients with CKD possess high frequency of conventional and non-conventional cardiovascular (CV) threats that in turn leads to an exponential escalation of CVD in this sub-population. Distinguishing of the connotation is imperious if CV consequences in this patients group are to be progressed [2].

Though, it is stated that CVD is the core etiological factor of indisposition and transience in CKD, happening still at primary phases of CKD in absence of evident vasculopathy [2]. Cardiovascular (CV) impermanence chance is substantially more in dialysis patients as compare to age-matched disease controls3. According to the revised guidelines CKD is not only identified as a sovereign CV threat equivalent, but it is believed that CKD be taken as the most significant menace cluster for subsequent progression of CVD [3]. U.S. Renal Data System published that, 43% of CKD

developed heart illnesses had heart collapse, and 15% were carrying record of acute myocardial infarction; the corresponding percentage in non-chronic renal impairment with CVD were reported 18.5% and 6.4% respectively. Amongst predominant CKD patients, 31% experienced Cardiac arrest, 11% faced AMI, and 24% underwent atrial fibrillation. Though, uremic toxins consequential to abnormal kidney performance contribute significantly in the pathogenesis of CVD [4].

Chronic kidney disease is autonomous bio-hazard for CVD and all cause-death tolls and is referred as a coronary heart disease threat comparable. In CKD stage 2 or advance, there is a undeviating connection between the scale of renal dysfunction and cardiovascular threat, unconstrained of other reported contributors (age, hypertension, diabetes, and smoking), CVD history, and proteinuria. Even imperceptible compromises in kidney performance, in otherwise healthy being, uplift the chance of CV morbidity and mortality.

The leading contributors liable for this high risk encompass volumic overload and anemia resulting in hypertrophy of left ventricular, bone minerallopathies leading to valvular and calcification of blood vessels, chronic inflammation, free radical injury, vascular endothelial cell damage, and hyperactive sympathetic nervous system.

The available literature is depictive that CKD linked cardiovascular changes initiate too early as compromised kidney function advances prior to its clinical manifestation. But the pathogenic processes can be slowed down by introducing precautionary instruments well in time like life style adjustments and remedies. But to mark the critical point and time CKD patient require such intervention is the key to positive outcomes. Owing to absentminded affordable medical facilities and in state with low socio-economic status, the need becomes more desirable. Assaying cardiac risk ratio incorporate just LDL-C and HDL-C but the calculated ratio foretell the likelihood of CVD before onset and enables timely preemptive approach [2, 3]

The study was aimed to calculate cardiac risk ratio in CKD patients that are still clinically asymptomatic along with effect of hypertension and diabetes mellitus on CVD threat.

Method

The cross sectional study plan was executed in a general hospital located in Karachi during 2023-2024. Hundred (100) CKD patients were included, between 40-60 years. Patients with liver disease, heart disease, AIDS, hepatitis, pregnant women, using statin, established dyslipidemia, renal failure, on dialysis, nominee for kidney transplant were debarred.

The cardiac risk ratio was calculated through risk calculator (ACC/AHA ASCVD Risk Calculator) involving TC, HDL-C, Systolic and Diastolic Blood Pressure. Demographical information and blood sample was collected following consent. Plasma was isolated and stored at -86 OC biochemical assay. The lipid profile was measured through spectrophotometric Partakers were classified in three groups as diabetic CKD, hypertensive CKD and without two comorbidities as disease control group.

Collected information was presented as Mean ± Std.Dev. processed through SPSS at 95% CI at $p<0.05$ as chosen level of significance.

Results

100 CKD patients contributed with 45:55 male to female ratio, BMI ranged 23±4.8, DM in 35%, hypertension in 45%, Hb<10g% in 72% were found. Stages of CKD patients was shown in figure 1

It was recorded that cholesterol was non-significantly different amongst the groups, on the other hand, LDL-C level was significantly increased in hyperglycemia ($p<0.05$), and hypertensive ($p<0.05$) compromised kidneys when means compared to impaired kidney function with no such illnesses. HDL-C was lesser in diabetics ($p<0.05$) whereas lower but did not calculated as

significant in hypertensive CKD, similar observations in case of TG and VLDL ($p<0.05$) as illustrated in Table 1.

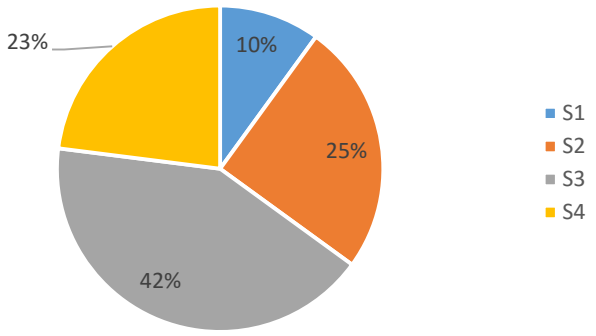

Figure1: CKD stages in the Partakers

Table 1: Comparison of lipid profile among various CKD groups

Lipid Profile	Disease control (n=20)	Diabetic CKD (n=35)	Hypertensive CKD (n=45)
TC (mg/dl)	225±22	240±13NS	242±16NS
LDL (mg/dl)	112±12	148±08*	140±13*
HDL (mg/dl)	21±05	14±06*	18±03NS
TG (mg/dl)	155±12	195±16*	170±10NS
VLDL (mg/dl)	33±12	39±16*	34±10NS

*p-value<0.05

There was variation in the kidney function amongst the groups but it did not touch the level of significance as displayed in table 2

Table 2: Comparison between kidney performance of disease control and comorbidity carrying CKD groups

Renal Function Tests	Disease control (n=20)	Diabetic CKD (n=35)	Hypertensive CKD (n=45)
GFR (ml/min.)	70±07	65 ± 08	75 ±13
Sr Creatinine (mg/dl)	3.2±0.4	3.9 ±0.9	3.8±0.5
Sr Urea (mg/dl)	110±12	116 ±8	103±5
BUN (mg/dl)	51.40±12	54.20±8	48.13±5
Sr Albumin (g/dl)	3.5±0.3	3.2±0.5	3.8±0.9

No presented statistically significant difference

CRR in CKD with diabetes mellitus found highest (56.9%), in hypertension (42.8%) and least in patients without these two illnesses (33%) depicting that DM advances highest threat of CVD this sub-population.

Discussion

As per CDC, the death toll owing to cardiovascular diseases upsurges annually and is one of the leading sources of bereavement globally. Roughly seventy five percent casualties rooted to CVD are recorded from low to middle income countries spanning from Africa to south Asian states. One

of the primary justifications might be poor health care system and non-availability in the remote rural areas of country.

The substantial data endorse variable risk factors contribute in the raising CVD susceptibility in compromised kidney patients encompassing advancing age, low birth weight, family history, obesity, HTN, smoking [5, 6].

We found that CKD stage 3 has most prevalent CVD risk most specifically in middle- aged men and women as shown in figure 1 while the hypertension encounters for [7] that is greater than that for diabetes mellitus [8]. The CKD patients also experience nephrotic syndrome, hypercholesterolemia and elevated LDL-D [9, 10, 11, 12]

A convincing connotation amongst age and CKD is also a matter of concern that persons with lengthiest life probability have the maximum risk. Furthermore, advancing age also favors the chances of CVD, this cardiovascular risk is non-amendable, incessant and progressive [13], subjects suffering with CKD age ranged between 40 to 70 years showed increased chance of emerging cardiovascular diseases.

The Framingham heart study recommends that dyslipidemia with elevated TC, LDL, TG, and less than normal HDL are the most prevailed culprits making a person extra vulnerable to cardiac insults14. Recommended concentration for TC is 130-230 mg/100ml though we found 240 mg/100ml in diabetics while 242mg/100ml in hypertensive (table 1). The raised cholesterol in hypertensive favors disorder predisposition and uplift the vulnerability to cardiac arrest and consequent death.

Reported data is evident that circulatory LDL is marginally raised in CKD in comparison to healthy being and is a foremost CVD hazard [15], as we also reported that LDL ranges 100-129 mg/dl in healthy individual, while table 1 illustrates that LDL raised in diabetics 148mg/100ml and in hypertension found 140 mg%, in addition, diabetic patients had bit high.

CKD patients showed low HDL as equated to healthy being with normal working kidneys [16]. Usually HDL is favorable between 20-100 mg/dl, whereas findings depicted decline in the HDL level with progressing CKD, lowered up to 14 mg% in diabetics while 18mg % in hypertensives (Table 1).

Below 150 mg/dl TG is referred standard whereas we found bit greater (table 1). As per published literature, CKD patients commonly possess hypertriglyceridemia because of elevated biosynthesis and tardy catabolism of triglyceride enriches lipoproteins [17].

Conclusion

The study concludes that cardiac risk diseases elevated among CKD patients with comorbidities particularly diabetes mellitus and hypertension. The intervention essentially addresses chronic kidney disease, while the cardiac risks remained unnoticed. Therefore, it is vital to keep record of comorbidities to prevent cardiovascular deaths.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Not applicable.

HUMAN AND ANIMAL RIGHTS

No animals were used in this study. The study on humans was conducted in accordance with the ethical rules of the Helsinki Declaration and Good Clinical Practice.

CONSENT FOR PUBLICATION

Not applicable.

AVAILABILITY OF DATA AND MATERIALS

The datasets used and analyzed during the current study are available from the corresponding author upon reasonable request.

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CONFLICT OF INTEREST
The authors declare no conflict of interest, financial or otherwise.

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References

1. Michel Jadoul, Mabel Aoun, Mannix Masimango Imani, The major global burden of chronic kidney disease, The Lancet Global Health, Volume 12, Issue 3, 2024, Pages e342-e343, ISSN 2214-109X, https://doi.org/10.1016/S2214-109X(24)00050-0.
2. Zoccali, C., Mark, P.B., Sarafidis, P. et al. Diagnosis of cardiovascular disease in patients with chronic kidney disease. Nat Rev Nephrol 19, 733–746, 2023 https://doi.org/10.1038/s41581-023-00747-4
3. Cozzolino M, Mangano M, Stucchi A, Ciceri P, Conte F, Galassi A. Cardiovascular disease in dialysis patients. Nephrol Dial Transplant. 2018; 33(suppl_3):iii28-iii34. doi:10.1093/ndt/gfy174
4. US Renal Data System 2024 Annual Data Report: Epidemiology of Kidney Disease in the United States Johansen, Kirsten L. et al. American Journal of Kidney Diseases, Volume 85, Issue 6, A8 - A11
5. Harold E. Bays, Pam R. Taub, Elizabeth Epstein, Erin D. Michos, Richard A. Ferraro, Alison L. Bailey, Heval M. Kelli, Keith C. Ferdinand, Melvin R. Echols, Howard Weintraub, John Bostrom, Heather M. Johnson, Kara K. Hoppe, Michael D. Shapiro, Charles A. German, Salim S. Virani, Aliza Hussain, Christie M. Ballantyne, Ali M. Agha, Peter P. Toth, Ten things to know about ten cardiovascular disease risk factors, American Journal of Preventive Cardiology, Volume 5, 2021, 100149, ISSN 2666-6677, https://doi.org/10.1016/j.ajpc.2021.100149.
6. Flora GD, Nayak MK. A Brief Review of Cardiovascular Diseases, Associated Risk Factors and Current Treatment Regimes. Curr Pharm Des. 2019; 25(38):4063-4084. doi:10.2174/1381612825666190925163827
7. Antonio De Pascalis, Alessandro Tomassetti, Daniele Vetrano, Edoardo Tringali, Luca Di Lullo, Marcello Napoli, Gaetano La Manna, Giuseppe Cianciolo; Hypertension in Cardiovascular and Kidney Disease: Recent Trends – Treating Two Diseases as One. Cardiorenal Med 14 May 2024; 14 (1): 581–587. https://doi.org/10.1159/000541876
8. Wissam Ahmed, Sharareh Vahabi, Azfar G. Zaman, Reducing cardiovascular risk in patients with type 2 diabetes mellitus, Medicine, Volume 50, Issue 11, 2022, Pages 691-695, ISSN 1357-3039, https://doi.org/10.1016/j.mpmed.2022.08.001.
9. Afshinnia, Farsad1; Pennathur, Subramaniam1,2. Lipids and Cardiovascular Risk with CKD. CJASN 15(1):p 5-7, January 2020. | DOI: 10.2215/CJN.13531119
10. Ceja-Galicia ZA, Aranda-Rivera AK, Amador-Martínez I, Aparicio-Trejo OE, Tapia E, Trujillo J, Ramírez V, Pedraza-Chaverri J. The Development of Dyslipidemia in Chronic Kidney Disease and Associated Cardiovascular Damage, and the Protective Effects of Curcuminoids. Foods. 2023; 12(5):921. https://doi.org/10.3390/foods12050921

11. Go AS, Tan TC, Chertow GM, et al. Primary Nephrotic Syndrome and Risks of ESKD, Cardiovascular Events, and Death: The Kaiser Permanente Nephrotic Syndrome Study. J Am Soc Nephrol. 2021;32 (9):2303-2314. doi:10.1681/ASN.2020111583
12. Stacey C. Regis, Daniel Del Castillo-Rix, Rosario Colombo, Patterns of coronary artery disease trends in patients with nephrotic syndrome: A national inpatient study, International Journal of Cardiology, Volume 410, 2024, 132200, ISSN 0167-5273, https://doi.org/10.1016/j.ijcard.2024.132200.
13. Heerspink, H, Neuen, B, Inker, L. Chronic Kidney Disease Progression in Heart Failure: What We Know, Don't Know, and Where to Next ?∗ . J Am Coll Cardiol HF. 2024 May, 12 (5) 860–863.https://doi.org/10.1016/j.jchf.
14. Charlotte Andersson, Matthew Nayor, Connie W. Tsao, Daniel Levy, Ramachandran S. Vasan, Framingham Heart Study: JACC Focus Seminar, 1/8, Journal of the American College of Cardiology, Volume 77, Issue 21, 2021, Pages 2680-2692, ISSN 0735-1097,
15. Ziad A. Massy, Dick de Zeeuw, LDL cholesterol in CKD—to treat or not to treat?, Kidney International, Volume 84, Issue 3, 2013, Pages 451-456, ISSN 0085-2538, https://doi.org/10.1038/ki.2013.181.
16. Bodaghi AB, Ebadi E, Gholami MJ, Azizi R, Shariati A. A decreased level of high-density lipoprotein is a possible risk factor for type 2 diabetes mellitus: a review. Health Sci Rep. 2023; 6:e1779. doi:10.1002/hsr2.1779
17. Prima Wulandari, Associations Between Triglyceride-Glucose Index And Cardiovascular Diseases: An Insight From Three-Years Nationwide Datasets, American Journal of Preventive Cardiology, Volume 19, Supplement, 2024, 100842, ISSN 2666-6677, https://doi.org/10.1016/j.ajpc.2024.100842.