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Frequency of Ischemic Heart Disease in End Stage Kidney Disease

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ABSTRACT

Introduction: Ischemic heart disease commonly coexists with end-stage renal disease (ESKD), presenting significant challenges in patient management. This comorbidity elevates the risk of cardiovascular complications and mortality in individuals with ESKD. The complex interplay between these conditions highlights the need for comprehensive care and tailored interventions to reduce associated risks and improve patient outcomes.

Materials and Methods: Eligible individuals at Indus Hospital, Karachi, were recruited based on inclusion/exclusion criteria. Informed consent was obtained, ensuring awareness of the study's methods, risks, and benefits. Demographic data, medical history, physical examination, and ECG were recorded to assess ischemic heart disease.

Results: The mean ± SD age of the participants was 49.84 ± 11.86 years. Among them, 73 (57.5%) were male, while 54 (42.5%) were female. Ischemic heart disease was identified in 88 (69.3%) of the patients.

Conclusion: Ischemic heart disease is highly prevalent in end-stage renal disease patients, emphasizing the need to manage their elevated cardiovascular risk. Further research and targeted interventions are crucial for improving outcomes in this population.

Keywords: End Stage Kidney Disease, Ischemic Heart Disease, Frequency, atherosclerosis, disability adjusted life years.

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Introduction:

End-stage kidney disease (ESKD) represents the final stage of chronic kidney disease (CKD), necessitating renal replacement therapy such as peritoneal dialysis, hemodialysis, or kidney transplantation.[1] The global prevalence and incidence of CKD is steadily rising. The leading causes of CKD are diabetes mellitus, hypertension, glomerular and interstitial diseases, and idiopathic factors.[2] In Pakistan, CKD is highly prevalent due to the significant burden of hypertension and diabetes. Data from 120 countries with dialysis services indicate that approximately 1.9 million individuals undergo renal replacement therapy, with 1,297,000 (68%) receiving hemodialysis.[3] In Pakistan, the annual incidence of new ESKD cases exceeds 100 per million, with an overall prevalence of 14.6%.[4]

Ischemic heart disease (IHD) is recognized as a significant challenge to sustainable development in the 21st century. Also known as coronary artery disease (CAD) and atherosclerotic cardiovascular disease

(ACD), IHD clinically presents as myocardial infarction and ischemic cardiomyopathy. A growing number of individuals with non-fatal IHD experience chronic disabilities and a reduced quality of life.[5] The primary pathological process that leads to IHD is atherosclerosis, an inflammatory disease of the arteries associated with lipid deposition and metabolic alterations due to multiple risk factors. More than 70% of at-risk individuals have multiple risk factors for IHD, and only 2%-7% of the general population have no risk factors.[6] Of all cardiovascular diseases (CVDs), ischemic heart disease (IHD) is one of the leading causes of mortality and disease burden worldwide, resulting in approximately 8.9 million deaths and 164.0 million disability-adjusted life years (DALYs) -globally in 2015.[7]

The number of ESKD patients undergoing hemodialysis is rising over time, while the prevalence of IHD in this population remains to be assessed. Studies from various regions of Pakistan report differing frequencies of IHD among hemodialysis patients, ranging from 56.8% in Lahore to 70% in Karachi.[9] However, available data is limited, and at our center, it is nearly nonexistent. Therefore, this study aims to determine the frequency of IHD among ESKD patients on hemodialysis. If the findings reveal a significant burden of IHD in this population, routine screening and necessary interventions would be considered to reduce morbidity and mortality.

Methods:

Study design and Setting: Cross Sectional Study at the Indus Hospital and the Health Network

Inclusion Criteria:

1. Patients of both genders having age above 20 years and below 70 years.
2. Patients on maintenance dialysis since at least 3 months. .
3. Patients who signed written informed consent to participate in the study.

Exclusion Criteria:

1. Patients with deranged LFTs (ALT>40IU, AST/40IU), anemia (<Hb 10 mg/dl) or deranged PTH level before initiation of dialysis.
2. Critically ill, unconscious or non-cooperative patients.
3. Hemodynamically unstable patients.

Data collection methods:

After approval from the ethical review committee of the hospital, 127 patients with end stage renal disease who were present in the department of Nephrology, The Indus Hospital Karachi and who fulfilled the above criteria were counseled and explained the details of the study. Written informed consent and detailed history were taken from each patient.

Demographic information (name, age, gender, BMI, duration of disease) was recorded. Then history, examination followed by the electrocardiogram (ECG) was performed on each patient and labeled as ischemic heart disease present or not. Ischemic heart disease was judged as documented history of myocardial infarction, angina, evidence of ST elevation or depression >1 mm on electrocardiogram, or chest pain > 3 hours along with dyspnea on exertion.

All the data was collected using the proforma. All laboratory tests were conducted at the same hospital laboratory to minimize bias. Confounding variables were controlled through exclusion criteria

Statistical Analysis Method:

All the collected data was entered and analyzed into SPSS version 22.0 (IBM, NY, USA). Numerical variables i.e. age, height, weight, BMI, and duration of disease were presented by Mean±SD. The Shapiro-Wilk test was applied to check the normal distribution of data taking p value of < 5% in any cell, then Fisher Exact test was applied taking p value of <0.05 as statistical significant.

Result:

In this study, a cohort of 127 patients, Ischemic heart disease (IHD) was identified in 88 (69.3%) of the patients. Regarding gender distribution, 73 (57.5%) were male, while 54 (42.5%) were female. IHD is more prevalent in patients younger than 50 years (38.6%) compared to those aged 50 and above (30.7%), with a significant p-value of 0.020, Table 1.

No significant association was found between gender and IHD (p = 0.347), with IHD diagnosed in 41.7% of males and 27.6% of females. Higher BMI (>24 kg/m²) was associated with a greater prevalence of IHD (55.1%), whereas a BMI below 24 kg/m² had a lower prevalence (14.2%), with a p-value of 0.064.

No significant relationship was observed (p = 0.418), with IHD present in 50.4% of patients with disease duration <9 months and 18.9% in those with over 9 months, Table 2.

The mean ± standard deviation (SD) values along with confidence intervals (C.I.) were as follows:
Age: 49.84±11.86 years (C.I. 47.76 – 51.93); Weight: 73.53±10.52 kg (C.I. 71.68 – 75.38)
Height: 168.35±8.28 cm (C.I. 166.89 – 169.80); BMI: 25.98±3.58 kg/m² (C.I. 25.35 – 26.60)
Disease duration: 9.50±5.66 months (C.I. 8.51 – 10.50)

Table 1: Demographic and laboratory parameters of 127 patients on maintenance hemodialysis.

Demographic and Laboratory parameters of patients				
Laboratory parameters	**Mean ± STD**	**Median , IQR**	**Minimum**	**Maximum**
Age in Years	49.84± 11.86	51 , 12	20	70
Weight	73.53± 10.52	70, 15	55	101
Height	168.35± 8.28	167, 15	155	182
Body Mass Index	25.98± 3.58	25, 4.3	20.3	33.7
Duration of Disease	9.50 ± 5.66	8, 4	3	30

Discussion:

Ischemic heart disease (IHD) is a significant global health issue, leading to high morbidity and mortality rates. Its impact is even more pronounced in the context of end-stage renal disease (ESKD), where the intricate interplay between renal dysfunction and cardiovascular complications poses a distinct clinical

challenge.[9] ESKD, the advanced stage of chronic kidney disease (CKD), necessitates renal replacement therapy, such as dialysis or transplantation, for survival. Cardiovascular diseases, particularly IHD, are the leading cause of mortality in this population.[10] The relationship between IHD and ESKD is bidirectional. CKD is a recognized risk factor for IHD development and progression, while IHD can worsen renal function, accelerating CKD progression to ESKD.[11,12] A thorough understanding of these interrelated mechanisms is essential for improving patient management and outcomes. This includes evaluating both traditional cardiovascular risk factors—such as hypertension, dyslipidemia, and diabetes mellitus—and non-traditional risk factors specific to ESKD patients, including uremia, mineral and bone disorders, and volume overload. In patients with end-stage renal disease (ESKD), IHD presents a unique challenge due to the complex interaction between renal dysfunction and cardiovascular complications.[9] Cardiovascular diseases, particularly IHD, are the leading cause of mortality in this population. [10] The relationship between IHD and ESKD is bidirectional. CKD is a recognized risk factor for IHD development and progression, while IHD can worsen renal function, accelerating CKD progression to ESKD. [11] A thorough understanding of these interrelated mechanisms is essential for improving patient management and outcomes.

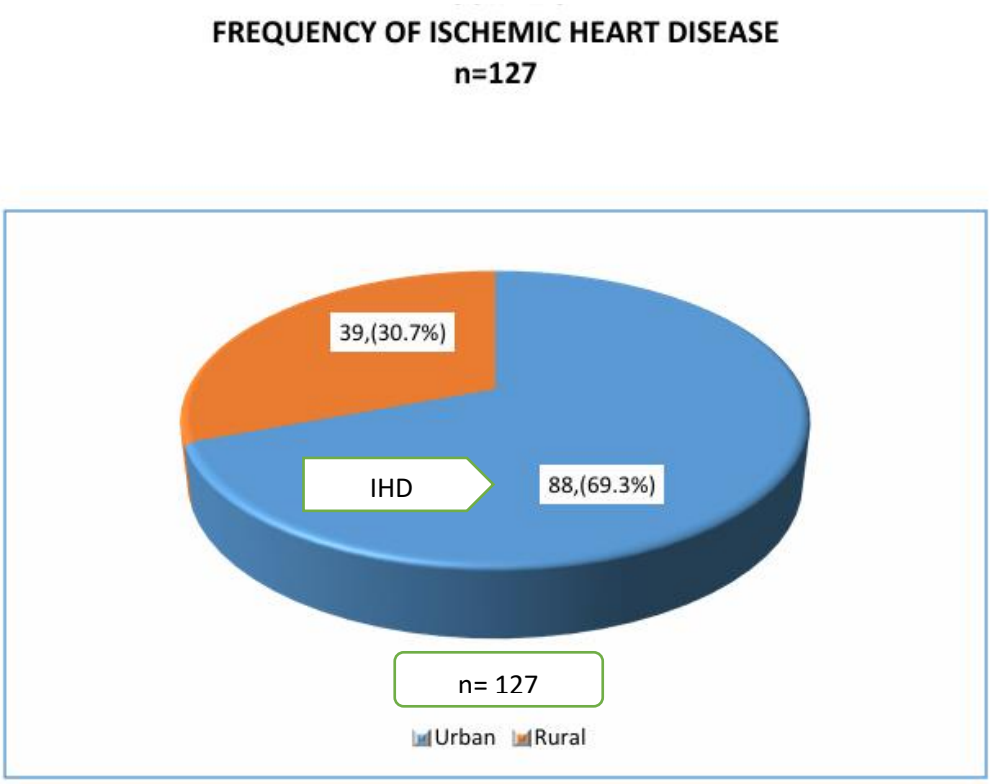
Table 2: Comparative analysis of 127 end stage kidney disease patients with and without presence of ischemic heart disease.

Parameters	Ischemic Heart Disease (Yes) (n=88)	Ischemic Heart Disease (No) (n=75)	Total (n=127)	p-Value
Age (Years)				
< 50	49 (55.7%)	13 (65.3%)	62 (61.1%)	0.020
> 50	39 (44.3%)	26 (34.7%)	65 (39.9%)	
Gender				
Male	53 (60.2%)	20 (26.7%)	73 (44.8%)	0.347
Female	35 (93.8%)	19 (73.3%)	54 (33.1%)	
BMI				
< 24	18 (20.5%)	14 (18.7%)	32 (19.6%)	0.064
> 24	70 (79.5%)	25 (81.3%)	95 (80.4%)	
Duration of Disease (Months)				
< 9	64 (50.4%)	31 (24.4%)	95 (58.3%)	0.418
> 9	24 (18.9%)	8 (6.3%)	32 (41.7%)	

In a cohort of 127 patients of our study, IHD was identified in 69.3% of cases, which is suggestive of significant among ESKD patients. Akhtar et al. conducted a study on the frequency of ischemic heart disease in patients of end stage renal disease and observed its frequency to be 56.8% (46/81 cases).[12] Another study done by Ahmed et al. who found (IHD) in 70% (112/160) cases.[13] If we compare the mean age of both of these studies (45.35±14.16 and 55.97±7.27 years) with ours 49.84±11.86 then it is quite comparable. In our study males constituted 57.5% and females 42.5% of the study population,

with no significant gender-based difference in IHD prevalence (p = 0.347). While the male to female ratio of above two mentioned studies came out as 56.8% /43.2% and 63.75%/36.25% respectively.

Figure 1: Frequency of ischemic heart disease among 127 end stage kidney disease patients on maintenance hemodialysis, comparison regarding rural and urban population.



The coexistence of ischemic heart disease (IHD) and end-stage renal disease (ESKD) creates a complex clinical challenge with significant implications for patient management and outcomes.[14,15] The pathophysiology linking these conditions is multifactorial, involving both traditional cardiovascular risk factors—such as hypertension, dyslipidemia, and diabetes mellitus—and non-traditional risk factors unique to renal dysfunction, including uremia, inflammation, oxidative stress, and mineral and bone disorders..[16]

Diagnosing IHD in ESKD patients is complicated due to atypical presentations like silent ischemia and altered symptomatology. Conventional diagnostic tools, including stress testing and cardiac imaging, often have reduced accuracy in this population, requiring a more tailored approach to risk assessment and diagnosis.[17] Optimal medical therapy for IHD in ESKD patients may include antiplatelet agents, statins, beta-blockers, and renin-angiotensin-aldosterone system inhibitors, with dosing adjustments guided by renal function and clinical response. While percutaneous coronary intervention (PCI) and

coronary artery bypass grafting (CABG) remain cornerstone interventions for IHD, their utility in ESKD patients is limited by higher rates of procedural complications and poorer long-term outcomes.[18]

An interesting fact observed in our study as IHD as more common in patients under 50 years (38.6%) compared to those 50 and older (30.7%), (p = 0.020). But the fact of less total number of patients in group of >50 years of age and second this needs to be seen with confidence interval or odds ratio before concluding. Moreover, recent studies have highlighted shifts in the burden of IHD among different age groups. For example, a study published in BMC Public Health in January 2025 noted an increase in IHD burden among individuals younger than 50 and those older than 75 years, while observing reductions in the 50 – 74-year age group. This suggests a rising prevalence of IHD in younger populations.[18] A higher BMI (>24 kg/m²) was linked to increased IHD prevalence (55.1%) versus lower BMI (14.2%) (p = 0.064) seen in our study. This observation aligns with several studies indicating that elevated BMI is a known risk factor for cardiovascular disease, including IHD, due to its association with metabolic syndrome, hypertension, and dyslipidemia. However, the p-value close to 0.05 suggests a possible association that might reach significance with a larger sample size or when adjusted for confounders. Higher BMI or obesity has been associated with a protective effect on mortality among dialysis patients, as shown in previous research.[19] Disease duration showed no significant association with IHD (p = 0.418), though cases were more frequent in those with a duration under 9 months (50.4%) than in those with longer durations (18.9%).

Further research is needed to elucidate the underlying mechanisms driving the development and progression of IHD in patients with ESKD, as well as to evaluate the efficacy and safety of emerging therapeutic interventions tailored to this high-risk population. Prospective studies exploring novel biomarkers, imaging modalities, and treatment strategies hold promise for improving risk stratification, early detection, and outcomes in this vulnerable patient cohort. By addressing modifiable risk factors, optimizing medical therapy, and implementing timely interventions, healthcare providers can strive to improve cardiovascular outcomes and enhance the quality of life for patients living with this challenging comorbidity.[20,21]

Study Weakness: The sample size of 127 is relatively small and from a single-center, which limits generalizability. A logistic regression model controlling for confounders such as age, gender, BMI, and disease duration would provide more robust insights.

Conclusion:

Ischemic heart disease is highly prevalent in end-stage renal disease patients. The results highlight the crucial need to address the heightened cardiovascular risk in this patient group. Further research and targeted interventions are essential for improving management and outcomes in those with both end-stage renal disease and ischemic heart disease in clinical settings.

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