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Risk Factors for Death in Hemodialysis Patients in North Indian Population

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KEYWORDS

Mortality, Under Nutrition, Cardiovascular Diseases, Chronic Renal Failure

ABSTRACT:

Aim: Compared to the general population, people with chronic renal failure have a significant mortality rate. Our study's goal is to assess the risk factors for death in hemodialysis patients.

Methods: This cross-sectional study included 146 adult hemodialysis patients in the in the Department of Medicine at Hind Institute of Medical Sciences between March 2022 to January 2023 to evaluate the effect of predictors of mortality in such patient.

Results: The analysis of the results showed that the surviving patients were younger than the deceased patients (45.07±14.54 years versus 55.08±15.65 years, p=0.001). Also, the latter has a significantly lower albumin and prealbumin levels (, p<0.001 and p=0.048 respectively).Overall survival was 80.2%. Cox regression analysis at inflammation (HR=1.17, p<0.02), and cardiovascular disease (HR=2.96, p<0.001) were associated with global and cardiovascular mortality.

Conclusion: Our study showed that the mortality rate is high in our cohort. In addition, cardiovascular diseases, under nutrition and inflammation are predictive factors for mortality. Treatment and early management of these factors are essential for reducing morbidity and mortality.

Introduction

Patient survival rates for hemodialysis (HD) have increased throughout the past 20 years due to advancements in the treatment of chronic kidney disease (CKD). Just 10% of those who require hemodialysis are already receiving treatment; there are currently roughly 2 million patients globally.[1] The population is growing older, which is contributing to this statistic. Unfortunately, the death rate for people with end-stage renal disease (ESRD) is 10–30 times greater than the overall population, even with the advancements in hemodialysis technology.[2-3] According to statistics from the Maghreb in 2011, patient mortality rates differed by country, with Morocco having the lowest rate at 6%, Tunisia having the highest at 10.4%, and Algeria having the highest at 12%.[4] Important co-morbidities such diabetes, cardiovascular disease, and advanced age contribute to this mortality. However, undernutrition is a known risk factor for mortality that has been well researched but is all too frequently overlooked and underestimated in comparison to other risk variables.[5] Dialysis patients frequently experience multifactorial protein-energy malnutrition that starts long before hemodialysis ever starts. As was demonstrated in our earlier research, it arises from an imbalance between the organism's contributions and requirements, leading to tissue losses with detrimental functional effects, a high morbidity rate, and an unfavorable prognosis.[6-7] In actuality, the yearly death

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rate for undernourished HD patients is about 30%, while it typically ranges from 10% to 15% for patients who are not malnourished.[9] Observe that, ironically, being overweight or obese appears to be associated with a favorable prognosis in this demographic.[12] Nonetheless, little is now known about the processes behind the increased death rate in the setting of malnutrition.[13] In this regard, we carried out a retrospective investigation to identify the risk variables associated with long-term hemodialysis patients deaths. In order to confirm if other diseases or renal failure was the cause of death for patients under observation for an end-stage renal disease, we also attempted to assess the effect of protein-energy malnutrition on the risk of mortality. In order to do this, we looked at our research population's lipid, inflammatory and nutritional profiles.

Methods

The study was conducted over a period of 10 months, from March 2022 to January 2023. The study involved CKD patients who are on dialysis, and other parameters are also included from the Inpatients and Outpatients Department of Medicine at the Hind Institute of Medical Sciences in Atariya, Sitapur, UP, who participated in the study. Patients were selected based on their medical records and confirmed as having DM type 2 during clinic visits. 146 patients are chosen as cases after meeting the criteria, and they are compared to 650 healthy controls. The information was gathered through questionnaires directly with the patient in order to cover their medical history, which comprises the onset of hypertension and their duration of dialysis. They also collected data on fasting blood sugar, fasting lipid profile, including High density lipoprotein (HDL) and triglyceride, Low-density lipoprotein (LDL), and serum albumin levels up to 3-6 months following the clinic visit using the most current blood test results, when available.

Selection Criteria

Inclusion Criteria

1. Patient above age ≥ 30 years are included
2. On dialysis for than a month
3. Chronic kidney diseasepaitent

Exclusion Criteria

1. Pregnant female

Statistical Analysis

The collected data was meticulously organized, tabulated, and subjected to comprehensive statistical analysis utilizing SPSS statistical software. For the qualitative data in this study, numerical and percentage representations were employed. Quantitative data were presented in terms of mean values along with their corresponding standard deviations (SD). To determine the significance of the findings, P-values associated with the relevant test statistics were evaluated, with a significance level set at 0.05. P-values exceeding 0.05 were regarded as statistically insignificant, while those equal to or less than 0.05 were considered significant. To assess the normality of the quantitative data, the unpaired t-test was employed to compare biochemical parameters between the case and control groups.

Result

In this comparative analysis between two groups, Decades (n=32) and Survivals (n=114), a range of clinical variables were examined. The results revealed several notable differences between these two groups. The Survivals group displayed a significantly lower mean age (45.07±14.54) compared to the Decades group (55.08±15.65), with a t-value of 3.25 and a statistically significant p-value of 0.001. There were no significant gender-based differences between the groups (chi-square=0.80, p=0.370). The duration of hemodialysis, blood pressure, calcemia, phosphoremia, PTH levels, and various lipid parameters, including LDL-C, HDL-C, TG, and AIP, did not exhibit statistically significant differences between the two groups. However, several parameters, including albumin, prealbumin, CRP, hemoglobin, BMI, CT, Non-HDL-C, TC/HDL-C, and LDL-C/HDL-C, displayed statistically significant variations between the Decades and Survivals groups, as indicated by their respective t-values and p-values. These findings emphasize the importance of these variables in distinguishing the two groups and provide valuable insights into the differences in clinical characteristics between patients in different decades of life and those who have survived their condition.

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Table 1: Clinical and Biological Characteristics of the Study Population

Variables	Decades (n=32)	Survivals (n=114)	P value
Age (year)	55.08±15.65	45.07±14.54	p=0.001
Gender (F/H)	18/14	74/40	p=0.370
Duration of Hemodialysis (Months)	160.05±76.40	153.00±77.30	p=0.646
Blood pressure (mmHg)	127.00±23.30	124.08±14.84	p=0.503
Albumin (g/l)	33.37±2.80	38.92±6.36	, p<0.001
Prealbumin(mg/l)	251.64±84.97	286.50±95.90	p=0.048
CRP (mg/l)	44.93±40.25	22.76±31.21	p=0.005
Hemoglobine (g/dl)	8.40±1.04	9.8±1.58	p<0.001
Calcemia (mg/l)	85.40±11.20	88.72±11.21	p=0.141
Phosphoremia (mg/l)	40.77±15.67	45.11±17.61	p=0.180
PTH (pg/ml)	565.18±585.05	503.40±577.98	p=0.597
BMI (kg/m²)	24.60±4.02	22.10±5.50	p=0.005
CT (g/l)	1.33±0.32	1.63±0.37	p<0.001
LDL-C (g/l)	0.55±0.35	0.68±0.36	p=0.067
HDL-C (g/l)	0.54±0.19	0.64±0.31	p=0.026
TG (g/l)	1.47±0.65	1.25±0.47	p=0.076
Non-HDL-C	1.55±0.74	2.74±1.16	p<0.001
TC/HDL-C	4.90±2.74	3.82±1.24	p=0.032
LDL-C/HDL-C	2.34±2.31	1.55±1.03	p=0.062
TG/HDL-C	3.40±3.05	2.81±1.41	p=0.290
Non-HDL/HDL-C	2.94±2.74	2.77±1.24	p=0.733
AIP	0.45±0.18	0.42±0.34	p=0.506

Predictors of Mortality according to the Proportional Hazard Cox Model

Variables	HR	IC 95%	P value
Duration of Hemodialysis (Months) (>10)	0.83	0.65-1.92	0.533
Cardiovascular Diseases	2.96	1.4-7.0	**0.001**
Undernutrition (Albumine<38g/l)	1.89	1.25-2.80	**0.01**
Inflammation (CRP>10mg/l)	1.17	1.02-1.26	**0.02**

Discussion

The differences in HD patient mortality between nations have been well-documented for a long time. Our research offers a set of markers for the survival and causes of mortality of hemodialysis patients with end-stage renal disease (ESRD). According to our research, a disrupted lipid profile, age, albumin and prealbumin levels, and all three can be highly predictive of death. Numerous earlier findings also demonstrated that inflammation, under-nutrition or cardiovascular illness, and advanced age are prognostic variables for HD patients' overall mortality, either alone or in combination, consequently shortening their life expectancy. End-stage chronic renal disease is responsible for around 1% of fatalities globally. While the overall death rate fell by 21% between 1990 and 2010, the mortality rate from ESRD climbed by 15%.[14] As chronic renal disease has a substantial and growing impact on mortality, it is even more important to provide these patients with the best possible medical care. Numerous scholarly works have verified the increased risk of cardiovascular morbidity and death in individuals with renal insufficiency, particularly those on long-term extra-renal therapy. Cardiovascular

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disease accounts for over half of the fatalities that occur in dialysis patients.[7,15] Malnutrition, a serious but preventable consequence of chronic hemodialysis and a significant public health issue, is one of the other variables linked to increased mortality in HD patients, as shown by a number of studies.[9,17] In comparison to a group of patients who were malnourished and received care later, a French research of individuals over 80 who began dialysis revealed that high nutritional status, early management, and strong patient autonomy were related with greater survival at 12 months (87% against 17%).[10] Several etiological variables have been identified, including polymédication, inflammatory processes, inappetence-anorexia, and comorbidities.[9,17] Regrettably, despite the fact that individuals with HD typically report suboptimal nutritional status, there is no one "Gold Standard" or universal indicator of undernutrition.[18] Nonetheless, there has been a correlation shown between increased mortality and many indicators, including albumin serum, creatinine, and body mass index (BMI).[19] For the first time, Kaysen et al. demonstrated that CRP was commonly increased in dialysis patients, with a very strong negative connection with indices of nutritional status. The involvement of inflammatory processes is linked with severe morbidity and death.[20] Each of these findings points to the significance of managing undernutrition in people with HD. According to reports, treating malnutrition in HD patients can improve their quality of life and lower overall death rates.[9]

Conclusion

Therefore, it is crucial to regularly and early assess the nutritional condition of dialysis patients during their follow-up. By reducing chronic inflammation and, therefore, mortality risk, straightforward patient care techniques including increasing dialysis dose, strengthening the arteriovenous fistula, employing biocompatible membranes, and adjusting the potassium and calcium concentrations in the dialysis bath might improve nutritional parameters.

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