

Epidemiology of Patients at Initial Treatment with Hemodialysis

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Abstract:

Introduction: The incidence and prevalence of chronic kidney disease (CKD) and end-stage kidney disease (ESKD), requiring renal replacement therapy (RRT) mainly in the form of hemodialysis (HD), is increasing in developing countries.

Method: Data were obtained from computerized system and included all patients that were registered in renal dialysis unit (RDU) and underwent HD as first time (initiation of hemodialysis) in the period from 2014 to 2015.

Results: A total of 201 patients were analyzed in this study. The mean (SD) age of the patients was 53 (16.8) years old with those over 40 comprised 144 (72 %) of total number and males comprised 125 (62%) of the sample.

Total of 153 (76 %) patients were known to have CKD before starting HD whereas while remaining 48 (24 %) were initiated on HD without being labeled as having CKD before. The leading risk factor for ESKD was hypertension (n= 151;75%) followed by diabetes mellitus (n= 120; 59%). Biopsy proven glomerulonephritis seen in 28 (3.9%) patients. ESKD was due to renal causes in 195 (97%) patients whereas 6 (3%) of the patients had post renal causes.

Conclusion: This study has also revealed an extremely high prevalence of emergent and uraemia-related cardiovascular risk factors and medical comorbidities at initiation of hemodialysis in our population, that is young and with high prevalent of diabetes and hypertension. Timely referral to a nephrologist is recommended in patients with CKD, because late referral is linked with increased mortality and morbidity and greater healthcare burden.

1. INTRODUCTION

The incidence and prevalence of end-stage kidney disease (ESKD), requiring renal replacement therapy (RRT), is increasing in developing countries. There are several contributing causes and risk factors that led to increasing number of ESKD patients. Diabetes mellitus and hypertension are among the leading causes (1). The aetiology of chronic kidney disease (CKD) in European incident hemodialysis populations is different from the aetiology among the incident population in the USA, where diabetes and hypertension account for >70% of cases, compared with <50% in Europe (2-4).

The incidence of renal replacement therapy (RRT) varies from around 100–120 per million of the population (pmp) in the Oman, UK, Australia, New Zealand and the Netherlands to 350–450 pmp in Jalisco (Mexico), Taiwan and the United States of America (1, 3, 5, 6). Variation in rates of progression of CKD to ESKD may explain some of these differences, but other factors such as referral to renal services, the decision to initiate dialysis

and availability of resources are also likely to have played a part (1). Also, it seems to be associated with national wealth, spending on health care and health care system organization.

Dialysis outcomes and practice patterns study (DOPPS) though is restricted to in-center hemodialysis but it provided important insights into the characteristics and likely prognosis of hemodialysis (HD) patients (7). DOPPS study investigates many potential explanatory variables at the individual level including patient case mix and processes of care (8-10). At a broader level, however, the characteristics of the general population or of the health care system and inequalities in access to renal services may also explain some of the variations in RRT survival (11).

Several prospective epidemiological studies from several European countries have also described the incident hemodialysis population, which can help to assess the influence of a multitude of risk factors on the increased mortality among these patients (4, 5, 12-14).

This study seeks to provide new data about the characteristics of first time initiated hemodialysis patients and lay down international comparisons. Also, it seeks to confirm any important differences in demographic features, clinical presentations, causative risk factors and outcome of such patients including the prevalence of cardiovascular events in the main tertiary hospital, Royal hospital (R.H), in Sultanate of Oman.

2. MATERIAL AND METHODS

This is a retrospective descriptive study that was conducted at R.H. Data were obtained from computerized system and included all patients that were registered in renal dialysis unit (RDU) and underwent HD as first time (initiation of hemodialysis) in the period from 2014 to 2015. The data collection sheet using Microsoft excel included patient demographics, mode of referrals, co-morbid conditions, the indication of starting hemodialysis and the outcome. Patient less than 12 years and those who started hemodialysis elsewhere in the peripheral hospitals were excluded from the study. Statistical analysis was completed using Stata software, Chicago, Ill. USA.

3. RESULTS

A total of 201 patients were analyzed in this study. The mean (SD) age of the patients was 53 (16.8) years old with those over 40 comprised 144 (72 %) of total number and males comprised 125 (62%) of the sample. Overall, total of 133 (66 %) patients were referred from emergency department, 28 (14 %) patients from outpatient department (OPD) and 40 (20 %) patients from local health centers.

Total of 153 (76 %) patients were known to have CKD before starting HD whereas while remaining 48 (24 %) were initiated on HD without being labeled as having CKD before. The leading risk factor for ESKD was hypertension (n= 151:75%) followed by diabetes mellitus (n= 120; 59%). Biopsy proven glomerulonephritis seen in 28 (3.9%) patients. ESKD was due to renal causes in 195 (97%) patients whereas 6 (3%) of the patients had post renal causes. The leading indication to start HD was low estimated glomerular filtration rate (eGFR) (eGFR<10) in 195 (97%) patients, followed by refractory acidosis in 89 (44%), uremia 87(43%), hyperkalemia in 59 (29%) and fluid overload in 52 (25.9%).

Ten (5 %) patients become dialysis independent and 182 (90.5 %) patients remained dialysis dependent. There were 9 (4.5 %) patients who died during their admission.

For those patients who were ESKD, 26 (13 %) patients were worked up for renal transplant as their RRT future plan whereas the rest continued with dialysis during their initial admission.

4. DISCUSSION

The study prospectively included all consecutive incident hemodialysis patients at the Royal Hospital for one-year period. The mean age of the patients was 53 years with patient > 40 yrs comprises 72 % of total patients and males comprises 2/3 (62%) of the sample. Overall, 60% patients were referred from emergency department, 13.9% patients were referred from OPD and 19% patients were referred from local health centers without prior information of CKD status. Among this population, about 60% were diabetic and 75% were hypertensive. There were many medical comorbidities including cardiac, sepsis and obstructive uropathy. The majority presented with anuria and or very low eGFR. The death rate was 5.5% among this population and 7% became eventually dialysis independent.

We found that our study population age is younger than that found in UK (15), with mean age (SD) 53 (16.8) years old, and yet have significant prevalence of comorbidities. This goes in concordance, with DOPPS study in our population (7). Also, women, older patients, Hispanics and Asians, and uninsured patients (vs. private insurance) have been found to be more likely to be started on dialysis later (8, 9, 15, 16). The distribution of gender in both the UK and US samples was like ours, where over 50% were male at time of initiation of hemodialysis (3, 10, 17-19).

About a two third of studied population were diabetic. This figure is slightly higher than that reported in our DOPPS studies (20, 21) but even much higher than being reported in European studies (2, 3, 13). Similarly, the prevalence of hypertension in the present study concurs to that reported in DOPPS, but it is higher than that reported in Western countries (5, 6, 12, 22, 23). Our percentages of patients of various etiologies of chronic kidney disease, among the incident population, are like that in the USA (24-27), but different to that of European populations where diabetes and hypertension account for lesser percentages.

A study from Saudi Arabia found that obstructive uropathy was present in 3.7% of patients with ESKD on dialysis (28). A study done in United Arab Emirates found that obstructive uropathy was found in 4.37% among

all causes of hemodialysis population (29). A Sudanese study found that 9.6% of patients on hemodialysis had obstructive uropathy as the aetiology (30). An Iraqi study found that obstructive uropathy contribute to 17.3% of hemodialysis patients (31), whereas a Yemeni study found that obstructive nephropathy is responsible for 13.7% of patients on hemodialysis (28, 32). These rates are similar to our study where obstructive uropathy was present in 12.9% of all patients.

Our study found that contrast induced nephropathy (CIN) represent 2.5% of the studied patients CIN is reported to be the third cause of in hospital acute kidney injury (AKI). The incidence of CIN varies between 0 and 24%, depending on patient's risk factors (33-35), representing about 12% of the cases (35-38). CIN is responsible for a longer hospital stay, an increased morbidity and mortality, in addition to a higher cost (33, 35, 37). Furthermore, an incidence as high as 50% was reported in patients with diabetic nephropathy undergoing coronary angiography despite the use of low-osmolar contrast and adequate hydration (39, 40). Also, up to 15% of them required dialysis (39, 40).

The present study showed that sepsis was seen in almost in 17% of all patient initiating hemodialysis(41-44). Patients with preexisting CKD have increased risk of morbidity and mortality from sepsis (41, 42). Sepsis is the leading cause of AKI in critical care and intensive units (41, 44). Reportedly, 45–70 % of all AKI is associated with sepsis (41, 43, 45). Patients with both sepsis and AKI are widely recognized as having an unacceptably high mortality rate (43-45). A research group found that in-hospital and ICU mortalities of septic AKI were increased, to 30 and 20 % respectively and that higher mortality was observed across all the AKI severity categories (41-45). Dialysis-requiring AKI shows excessively high mortality of 40–50 %, with mortality increasing to 60–80 % when associated with distant organ dysfunction such as cardiac and respiratory failure (44-47).

In the United States and Europe, approximately 90% of heart failure hospitalizations are due to symptoms and signs of sodium and fluid excess (26, 48). As known, there is a tight interaction between the cardiovascular and renal systems in acute or chronic disease settings. Heart failure patients remain refractory to conventional therapies and require frequent hospitalization (48, 49). Studies of ultra filtration have shown that removal of isotonic fluid may relieve symptoms of congestion and restore diuretic

responsiveness in patients with diuretic resistance. These studies have also shown a favorable effect on neurohormonal activation (50). When compared with intravenous diuretics, ultra filtration reduced re-hospitalizations (32% versus 18%, $P < 0.037$) in a randomized controlled trial of patients with decompensated heart failure (49, 51). Extra- and/or intracorporeal ultra filtrations have generated clinical improvement and represent potential therapeutic options for heart failure (51). Our results showed that almost 22% of patients undergoing initiation of hemodialysis were having heart failure. Study in USA found that 80% of men and 70% of women under age 65 years diagnosed with congestive heart failure die within 8 years from the diagnosis (52).

There is also a high incidence of cardiovascular morbidity and mortality in our population with diabetes and hypertension (1, 7). With regard to the prevalence of classic cardiovascular risk factors, the majority of patients had high blood pressure, despite all patients receiving anti hypertensive treatment (21). Diabetes affected more than 60% of our patients, and this is by far higher than other studies including European studies (1, 7, 20, 21).

Our results showed that malignancy exist at a rate of 5.5% of patient initiating first hemodialysis. Nowadays, cancer is the third leading cause of death, after cardiovascular disease and infection (11, 53-55). Butler et al reported that the 5-year cumulative incidence estimate of cancer is 9.48% and demonstrated that overall risk of cancer among dialysis patients is higher than that among the general population (53). European studies found that about 10% of the population underwent initiation hemodialysis had history of neoplasia (56-58). Although the exact mechanism underlying this increased risk of ESKD-related cancer is not clear, however possible effects of dialysis-related factors, including: uremia-induced immune dysfunction; altered DNA repair and methylation; and elevated serum levels of the specific carcinogen, have been proposed as potential risk factors. Majority of our patients are diabetic (53, 56-58). It has been demonstrated that diabetic nephropathy is associated with increased incidence of cancers of colorectum, liver, and larynx but decreased incidence of prostate cancer (53, 58).

Although a minimum nephrological follow-up of 6 months prior to hemodialysis onset is recommended, late referral and or refusal of patients to have a preemptive AVF is the trend among our population in contrast to findings from European countries (1, 7). Poor follow up

with nephrologist has been associated with higher mortality in hemodialysis patient (8, 15-17, 59). The worse clinical status at the onset of hemodialysis in the late referral subgroup may contribute to this high mortality. In our population, femoral catheter was the initial first vascular access as almost all patients were admitted via emergency department with overwhelming poor status. Fewer (<10%) of our patients have pre-emptive AVF than reported in the DOPPS study for all countries. A study from USA, found that black patients and Hispanic patients tend to initiate hemodialysis with an AVF less frequently than white patients despite being younger and having fewer comorbidities (8). In our population initiating hemodialysis, few days later, patients get tunneled dialysis catheter and then depending on logistics and theatre time, AVF is created which may take up to one year. The high proportion of catheter use in the late referral group, also described in DOPPS, highlights the need for early referral as far as possible and focused and concentrated education (5, 7-9, 20, 21). In Europe, 40% of incident hemodialysis patients were found not to have permanent AVF access and this proportion has remained stable during the past few years (9, 60). This suggests that despite possible preferences of physicians to start at relatively lower or higher eGFR, (14, 60, 61), the decision to initiate dialysis is largely determined by patient-related factors (8, 62-65). Canadian data, showed that the disparity in mean eGFR across facilities and regions was small (63). It indicates that special efforts are needed to collect patient-level factors among chronic kidney disease patients approaching the need for dialysis, in order to gain real understanding about determinants of timing of dialysis initiation (41, 63, 64). The United States Renal Data System (USRDS) registry of end-stage renal disease has often been used to study the timing of dialysis initiation, measured by estimated glomerular filtration rate (eGFR) at dialysis initiation (66). With respect to kidney function at hemodialysis onset in our patients, the low GFR (97%) was the most common cause for starting hemodialysis compared with reports from studies USA and European countries (67-69), and all were below the limit of 10 ml/min recommended by the K/DOQI guidelines (70, 71).

This study has also revealed an extremely high prevalence of emergent and uremia-related cardiovascular risk factors and medical comorbidities at initiation of hemodialysis in our population, that is young and with high prevalent of diabetes and hypertension. Timely

referral to a nephrologist is recommended in patients with CKD, because late referral is linked with increased mortality and morbidity and greater healthcare burden. Late nephrology referral of patients with CKD has been suggested as increasing mortality after the initiation of dialysis. As medical care moves toward patient-centered care, identifying demographic factors, such as gender, age, and race/ethnicity (often as a surrogate for sociocultural differences and economic status), which can have a significant influence on the relationship of timing of dialysis initiation and subsequent clinical outcomes has become essential. Also, not enough effort was made to place a permanent AVF before hemodialysis onset.

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