Outcome of hemodialysis in elderly diabetic patients: a single-center experience

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Background

The optimal renal replacement therapy for elderly patients is unclear, and literature is evolving in this regard. For elderly individuals who progress to CKD5, hemodialysis is often a valuable treatment option. Although hemodialysis is a life-sustaining therapy and extends life, it may also create, increase, or prolong suffering in selected subgroups of geriatric patients. In our current study we focused on elderly diabetic patients above 65 years, as they constitute the more vulnerable subgroup, having multiple comorbid conditions. The primary objective was to study the patient's survival and the association with different comorbidities.

Patients and methods

We conducted a retrospective analysis of 48 type 2 diabetic patients aged above 65 years. We reviewed their survival data and comorbid conditions – namely, vascular, cognitive, and autonomy.

Results and conclusion

The mortality rate was 7.5% per year with significant association with prior cerebrovascular accident, cognitive impairment, and lost autonomy.

Keywords:

CKD5, diabetic, elderly, survival

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Introduction

Nephrologists have recognized that the number of elderly patients with chronic kidney disease stage 5 (CKD5) has been increasing over the past 5 years [1]. The European registry shows that 48% of new dialysis patients are above the age of 65 and have a 2-year survival rate of 51% [2,3].

The optimal renal replacement therapy for elderly patients is unclear, and literature is evolving in this regard. The concept of maximal conservative management or even withdrawal of dialysis is under active discussion among nephrologists. The rationale behind this is that elderly patients not only suffer from CKD but also from varying degrees of frailty and additional comorbidities. In such situations, initiation of renal replacement treatment might not be the best option as it might not improve the quality of life, nor improve survival [4,5].

In our current study we tried to focus on elderly diabetic patients above 65 years, as they constitute the more vulnerable subgroup, having multiple comorbid conditions. The primary objective was to study the patient's survival and the association with different comorbidities.

Patients and methods

As per hospital ethical and research committee and also as per international research ethics code no consent is required for retrospective archived file research.

We conducted a retrospective study reviewing the patients admitted to the Dialysis Unit at Dr. Erfan and Bagedo Hospital over 2007–2013 after obtaining approval from the ethical committee of the hospital.

Selection criteria

(1) Presence of type 2 diabetes.
(2) Age 65 years or more.
(3) CKD5 on dialysis.

We excluded patients with a history of malignancy, patients with diseases requiring immunosuppressive treatment, and those who died within three months of initiation of treatment.

A total of 48 patients were identified with a mean age of 70.8 ± 4.7 years and a mean duration of dialysis and follow up of 32 ± 18 months.

Patient files were reviewed for:

(1) Vascular access.
(2) Comorbid conditions such as coronary artery disease (CAD), peripheral vascular disease (PVD), and cerebrovascular disease. Documenting of comorbidities depended on diagnoses established

by the corresponding specialty and appropriate imaging studies.
(3) Autonomy, whether independent, wheel chair dependent, or completely bedridden.
(4) Cognitive functions and depression as documented by psychiatric evaluation and medications.

Statistical analysis

Data were analyzed using an IBM computer with statistical package for the social sciences (SPSS, version 12; SPSS Inc., Chicago, Illinois, USA) as follows [6]:

(1) Description of quantitative variables as mean, SD, and range.
(2) Use of the unpaired *t*-test to compare quantitative variables in parametric data (SD<50% mean).
(3) Use of the Mann–Whitney test instead of the unpaired *t*-test when SD was greater than 50% of the mean.
(4) Use of the χ^2-test to compare qualitative variables between the two groups.
(5) Use of the Fisher exact test instead of the χ^2-test when one expected cell was less than 5.

P values greater than 0.0 5 were considered insignificant.

P values less than 0.05 were considered significant.

P values less than 0.01 were considered highly significant.

Results

Tables 1–3 show the demographic and comorbid conditions of the studied cohort.

Tables 4–7 show the association of depression, cognitive stat, autonomy, and mortality. Our results showed significant association between previous cerebrovascular accident (CVA) and lost autonomy and mortality (Tables 6 and 7), and no association of sex, vascular access, PVD, or mortality.

Table 1 Distribution of the studied cases as regards general data and comorbid conditions

Variables	*N* (%)
Sex	
Male	25 (52.1)
Female	23 (47.9)
CAD	33 (68.8)
CVA	24 (50)
Age	70.8 ± 4.7
Duration	32 ± 18

Male patients constituted more than 52% of the studied patients, with average age of 70.8 years. CAD, coronary artery disease; CVA, cerebrovascular accident.

Table 2 Distribution of the studied cases as regards access and hospital stay

Vascular access	*N* (%)
Fistula	25 (52.1)
Graft	19 (39.6)
Catheter	4 (8.3)
Number of admissions [median (IQR)]	6 ± 3 [4.5 (2–9)]
Hospital stay (days) [median (IQR)]	48.9 ± 41 [26 (9–29)]

The majority of patients had either fistula or graft, whereas 8.3% of them were using a catheter. IQR, interquartile range.

Table 3 Distribution of the studied cases as regards outcome

Variables	***N* (%)**
Depression	
No	39 (81.3)
Yes	9 (18.7)
Cognitive effect	
Conscious	42 (87.5)
Dementia	6 (12.5)
Mortality	
Alive	38 (79.2)
Expired	10 (20.8)
Autonomy	
Independent	35 (72.9)
Bedridden	10 (20.8)
Wheelchair	3 (6.3)

18.7% of the studied patients had depression, 12.5% had dementia, 20.8% died, and 20.8% of the studied cases were bedridden.

Discussion

In our studied cohort, the cutoff age for being considered elderly was 65 years. This cutoff point, which defines elderly, is debatable and inconsistent in different authorities. The common use of a calendar age to mark the threshold of old age assumes equivalence with biological age; yet at the same time it is generally accepted that these two are not necessarily synonymous. While the WHO considers 60+ as the cutoff point, most developed countries have accepted the chronological age of 65 years as a definition of 'elderly' or older person [7–9]. Taking into consideration the economic and cultural status of the Kingdom of Saudi Arabia, it was more appropriate to apply the age of 65+ to define elderly.

Our study showed a mortality of 20.8% (10/48 patients) with a mean duration of 32.4 months for hemodialysis (7.55% per year). The mortality was significantly correlated with prior CVA, lost autonomy, and cognitive impairment.

Survival data for elderly diabetic patients are seldom reported separately [10].

In elderly persons, mortality rates worsen with kidney disease more than in other groups. In the general US

Table 4 Relation between psychiatric disorder and different variables

Variables	Psychiatric [*N* (%)]		χ^2	*P*
	Normal	Depression		
Sex				
Male	21 (53.8)	4 (44.4)	0.2	>0.05 (NS)
Female	18 (46.2)	5 (55.6)		
CAD	24 (61.5)	9 (100)	Fisher	<0.05 (S)
CVA	15 (38.5)	9 (100)	Fisher	<0.001 (HS)
PVD	5 (12.8)	2 (22.2)	Fisher	>0.05 (NS)
Expiry				
Alive	31 (79.5)	7 (77.8)	Fisher	>0.05 (NS)
Expired	8 (20.5)	2 (22.2)		
Access				
Fistula	19 (48.7)	6 (66.7)	2.4	>0.05 (NS)
Graft	17 (43.6)	2 (22.2)		
Catheter	3 (7.7)	1 (11.1)		
Age	70.6 ± 4	71.8 ± 5.7	0.9[a]	>0.05 (NS)
Duration	31.9 ± 16	32.8 ± 18.9	0.8[b]	>0.05 (NS)

The higher frequency of CVA and CAD in the depressed group compared with the normal group, with statistically significant difference, using the Fisher exact test. CAD, coronary artery disease; CVA, cerebrovascular accident; HS, highly significant; PVD, peripheral vascular disease; S, significant. [a]Unpaired *t*-test. [b]Mann–Whitney test.

Table 5 Relation between cognitive outcome and different variables

Variables	Cognitive [*N* (%)]		χ^2	*P*
	Normal	Dementia		
Sex				
Male	21 (50)	4 (66.7)	0.2	>0.05 (NS)
Female	21 (50)	2 (33.3)		
CAD	27 (64.3)	6 (100)	Fisher	<0.05 (S)
CVA	18 (42.9)	6 (100)	Fisher	<0.05 (S)
PVD	6 (14.3)	1 (16.7)	Fisher	>0.05 (NS)
Survival				
Alive	35 (83.3)	3 (50)	Fisher	<0.05 (S)
Expired	7 (16.7)	2 (50)		
Access				
Fistula	20 (47.6)	5 (83.3)	1.8	>0.05 (NS)
Graft	19 (45.2)	0		
Catheter	3 (7.1)	1 (16.7)		
Age	70.6 ± 4	71.8 ± 5.7	0.9[a]	>0.05 (NS)
Duration	31.9 ± 16	32.8 ± 18.9	0.8[b]	>0.05 (NS)

The higher frequency of CVA, mortality, and CAD in the dementia group compared with the normal group, with statistically significant difference, assessed using the χ^2-test. CAD, coronary artery disease; CVA, cerebrovascular accident; PVD, peripheral vascular disease; S, significant. [a]Unpaired *t*-test. [b]Mann–Whitney test.

population, individuals 75–79 years of age have an expected remaining life duration of 10.4 years; for the elderly patient with CKD5, it is 2.6 years, and in the presence of diabetes it is at least 25% less [11].

Studies reported by Dialysis Outcome and Practice Patterns Study (DOPPS) consistently show a marked difference in crude mortality between different countries, with mortality in the USA being one of the highest. For example, in 2003, DOPPS reported the crude 1-year mortality rate to be 6.6% in Japan, 15.6% in Europe, and 21.7% in the USA [12]. In DOPPS III, 8161 in-center hemodialysis patients participated; the median follow-up was 18 months. During the study period, 1337 participants died (crude mortality rate for all study participants was 12.2/100 patient-years, with mortality rates of 3.7, 10.4, and 21.4 deaths per 100 patient-years for patients <45, 45–74, and ^{3}75 years of age, respectively) [13].

The incidence of stroke is much higher in CKD patients than in the general population. The United States Renal Data System (USRDS) and National

Table 6 Relation between autonomy and different variables

Variables	Autonomy [*N* (%)]		χ^2	*P*
	Independent	Need assistance		
Sex				
Male	19 (54.3)	6 (46.2)	Fisher	>0.05 (NS)
Female	16 (45.7)	7 (53.8)		
CAD	22 (62.9)	11 (84.6)	Fisher	>0.05 (NS)
CVA	12 (34.3)	12 (92.3)	Fisher	<0.001 (HS)
PVD	5 (14.3)	2 (15.4)	Fisher	>0.05 (NS)
Survival				
Alive	30 (85.7)	8 (61.5)	Fisher	<0.05 (S)
Expired	5 (14.3)	5 (38.5)		
Access				
Fistula	17 (48.6)	8 (61.5)	0.8	>0.05 (NS)
Graft	15 (42.9)	4 (30.8)		
Catheter	3 (8.6)	1 (7.7)		
Age	70 ± 4	72 ± 5	1.2[a]	>0.05 (NS)
Duration	30 ± 18	32 ± 22	0.4[b]	>0.05 (NS)

The higher frequency of CVA and mortality in the assisted group compared with the normal group, with statistically significant difference, as assessed with the Fisher exact test. CAD, coronary artery disease; CVA, cerebrovascular accident; HS, highly significant; PVD, peripheral vascular disease; S, significant. [a]Unpaired *t*-test. [b]Mann–Whitney test.

Table 7 Relation between mortality and different variables

Variables	Survival [*N* (%)]		χ^2	*P*
	Alive	Expired		
Sex				
Male	18 (47.4)	7 (70)	Fisher	>0.05 (NS)
Female	20 (52.6)	3 (30)		
CAD	25 (65.8)	8 (80)	Fisher	>0.05 (NS)
CVA	15 (42.1)	8 (80)	Fisher	<0.05 (S)
PVD	6 (15.8)	1 (10)	Fisher	>0.05 (NS)
Access				
Fistula	18 (47.4)	7 (70)	2	>0.05 (NS)
Graft	17 (44.4)	2 (20)		
Catheter	3 (7.9)	1 (10)		
Age	71 ± 6	70 ± 5	1.1[a]	>0.05 (NS)
Duration	32 ± 17	30 ± 22	0.84[b]	>0.05 (NS)

The higher frequency of CVA and mortality in the assisted group compared with the normal group, with statistically significant difference, as assessed with the Fisher exact test. CAD, coronary artery disease; CVA, cerebrovascular accident; PVD, peripheral vascular disease; S, significant. [a]Unpaired *t*-test. [b]Mann–Whitney test.

Hospital Discharge Survey (NHDS) data sets show that the incident dialysis population suffers from a 5–10-fold higher risk of hospitalized stroke in comparison with the non-CKD population [14]. The short-term and long-term mortality associated with stroke appears to be higher in CKD patients than in the general population. In the Okinawa Dialysis Study (OKIDS), the 30-day stroke mortality rate was higher in CKD patients compared with the rate observed in the general population in Okinawa, Japan [15]. In a recent study from Taiwan, among 5672 maintenance hemodialysis patients, 650 (11.5%) patients had prior stroke and were found to have a 36% increased risk for mortality compared with those without prior stroke (HR 1.36, 95% CI 1.22–1.52) [16].

Cognitive disorders have long been recognized as a complication of CKD5 and its treatment. The prevalence of cognitive impairment, as assessed using neuropsychological tests among patients with CKD5, ranges from 16 to 38% depending on the sample and the definition of impairment [17]. Dementia increases the risk for poor outcomes, including disability, hospitalization, withdrawal from dialysis, and death [18–20].

To emphasize the importance of mobility and autonomy in dialysis patients, McAdams-DeMarco *et al*. [21] enrolled 146 incident hemodialysis patients and followed them up for around 30 months. They found that adults of all ages undergoing hemodialysis have a high prevalence of frailty, more than five times as high as community-dwelling older adults. In this population, regardless of age, frailty is a strong, independent predictor of mortality and number of hospitalizations [21].

In a French study, Couchoud *et al.* [22] established and validated a bedside scoring system for predicting 6-month mortality in elderly hemodialysis patients. Dependency for transfer was given the highest score of 3 points, compared with diabetes, which was given only 1 point [22].

Vascular access is an important predictor of death in hemodialysis patients. The relative risk for death is increased 2–3-fold in incident patients using catheters compared with those using an arteriovenous access (fistula or graft) [23].

In our study, vascular access had no significant survival outcome. This may be explained by the small number of patients with a catheter (4/48 patients, 8.3%).

For elderly individuals who progress to CKD5, hemodialysis is often a valuable treatment option. Although hemodialysis is a life-sustaining therapy and extends life, it may also create, increase, or prolong suffering in selected subgroups of geriatric patients. In fact, hemodialysis has the attributes of a serious and progressive chronic illness; it may correct uremia, but the disease pathway of the elderly continues [24,25]. In our studied cohort of patients, there was significant association between both CAD and PVD and cognitive function impairment. This may be because both stem from a common pathological pathway, atherosclerosis, which is well established and has its unique traditional and nontraditional risk factors in CKD patients, especially when diabetes is the etiology of CKD. Moreover, dialysis itself is associated with a significantly increased risk for worsening vascular disease. Registry data and data from observational cohort studies suggest that coexisting vascular disease, whether CAD, PVD, or cerebrovascular disease, is associated with increased mortality risk for patients on dialysis [26,27].

In conclusion, our study showed a mortality rate of 7.5% in elderly diabetic patients above 65 years. The mortality in such a high-risk group was significantly associated with CVA, cognitive impairment, and lost autonomy.

The limitations of our study include its retrospective nature and the limited number of patients. Nephrologists require more data on renal replacement options in the elderly, as well as on outcome from different options. From this point of view our study might be useful but definitely we are awaiting large-scale studies better characterizing this heterogeneous risky group as well as guidelines for treatment options and outcome.

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Conflicts of interest

There are no conflicts of interest.

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