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EVALUATING COMPLICATIONS AND QUALITY OF LIFE OF DIALYSIS IN DIABETES MELLITUS

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ABSTRACT

Background: Diabetes is a metabolic disease that affects many organ systems and is one of the most common ones affecting people worldwide. One of the leading causes of end-stage renal disease (ESRD) worldwide is diabetes.

Aim: The purpose of this study was to evaluate the results of managing diabetes with dialysis in comparison to people without the disease.

Methods: During a 14-month period, 266 hemodialysis maintenance participants were prospectively examined for the study. Hospitalization, cause of death, and hemodialysis departure were evaluated in each of the included participants and compared to non-diabetic subjects.

Results: Of 266 patients, 40.97% (n=109) had a history of diabetes. Compared to non-diabetic participants, diabetic subjects had significantly worse SF36 scores, high serum triglycerides and LDL cholesterol, lower iPTH, low serum albumin, high CRP, greater cardiovascular morbidities, shorter dialysis durations, and older ages. Diabetics had a 1.9-fold increased risk of death from disease than non-diabetics. Infection and other causes of cardiovascular disease accounted for 54% of deaths in non-diabetics and 80% of deaths in diabetics. Diabetics also had a much higher annual admission rate.

Conclusions: The current study finds that, in comparison to non-diabetic participants receiving hemodialysis, diabetic people had significantly worse clinical outcomes and HRQOL (health-related quality of life). This difference is mostly attributable to the increased frequency of cardiovascular illnesses.

Keywords: hemodialysis, diabetes mellitus, cardiovascular illnesses, results, and quality of life

INTRODUCTION

A metabolic ailment that affects many organ systems, diabetes is one of the most common conditions affecting people worldwide. One of the leading causes of end-stage renal disease (ESRD) worldwide, even in emerging nations like India, is diabetes. Diabetes is the etiology of almost 45% of end-stage renal diseases in the United States alone mellitus.1

Proteinuria, which is more frequently observed in individuals with type 1 diabetes mellitus, is the hallmark of diabetic nephropathy. Nonetheless, as side effects of diabetes, individuals with type 2 diabetes mellitus also exhibit proteinuria and diabetic nephropathy. When diabetes mellitus has a longer duration and a glycemia level high enough to progress to diabetic complications, patients presenting with secondary manifestations of the disease, such as those after pancreatectomy and pancreatitis, are also at risk for developing diabetic nephropathy.2

After a mean of 15 years with diabetes, around 25–30% of patients with diabetes mellitus develop micro microalbuminuria; fewer than half of these subjects go on to develop macroalbuminuria, also referred to as overt nephropathy. After overt nephropathy manifests, a significant proportion of patients develop end-stage renal disease (ESRD) at a rate of 4% to 17% at 20 years of age and approximately 17–30% after the first diagnosis of diabetes mellitus. These patients require hemodialysis in order to survive and maintain renal function.3

Recently, the prevalence of patients with diabetic nephropathy in need of hemodialysis has decreased as diabetes is better managed medically, especially in wealthy nations. It can also be linked to the application of reno-protective strategies in diabetic subjects and the general dissemination of education.4

By comparing diabetic patients receiving maintenance dialysis to non-diabetic patients with end-stage renal diseases caused by glomerular disorders and hypertension; the results show a moderate improvement in response to recent literature findings. Young diabetic people without cardiovascular problems as concomitant variables have superior hemodialysis outcomes.5

Assessing the death rate, comorbidities, quality of life, and features of diabetic people receiving maintenance hemodialysis at the institute was the goal of the current clinical investigation. Additionally, the study contrasted the features and results of diabetes hemodialysis patients with those of non-diabetic participants.

MATERIALS AND METHODS

The goal of the current prospective clinical trial was to evaluate the results of managing diabetes with dialysis in comparison to people without diabetes. The individuals on hemodialysis who were admitted to the institute made up the study population. Before participating in the study, all subjects gave their written and verbal informed consent after being fully informed about the study plan to the participants.

The study included 266 patients, male and female, undergoing continuous hemodialysis. The study's inclusion criteria were met by subjects, with or without diabetes, who gave informed consent to participate in the research, were at least eighteen years old, and had been undergoing continuous hemodialysis for at least two weeks. The exclusion criteria of the study were subjects who refused to participate. Following final inclusion, each participant had a thorough history taken, and then they underwent a clinical examination. Additionally, the aseptic and sterile procedure for sample collection was followed in order to get the samples for laboratory analysis. For every subject, a pre-made, structured questionnaire was created in order to gather laboratory, clinical, and demographic information. After that, the individuals were monitored for a period of 14 months, with intervals between 15 days and 14 months. Exit from the hemodialysis unit, including cause of death and hospitalization, was recorded for each study participant. The final reassurance was recorded as the final visit or the moment the patient departed the hemodialysis unit due to renal recovery, transplantation, and switching to peritoneal dialysis.

The participants moved to different wards and were observed there. Every individual had their cardiovascular disease status evaluated, and congestive heart failure was diagnosed based on echocardiographic criteria. Patients were receiving medication for coronary artery disease (CAD) and were diagnosed with stress myocardial undergone coronary angiography, perfusion imaging, dobutamine stress echocardiography, PCI (percutaneous coronary intervention), or CABG (coronary artery bypass graft).

Using the SF 36 (36-item short-form health survey), which evaluated SF 36 scores as well as two dimensions and eight scales of MCS (mental component summary) and PCS (physical component summary) in accordance with the scoring methodology, HRQOL (health-related quality of life) was also evaluated in each subject.6

The collected data were statistically evaluated using IBM Corp.'s SPSS software version 21.0. Armonk, NY, USA) by comparing the categorical variables with the chi-square test and the Fisher exact test. The t-test, ANOVA (analysis of variance), and Mann-Whitney U test were used to evaluate continuous variables. Furthermore evaluated was the hazard ratio. The information was provided in terms of frequency, percentage, mean, and standard deviation. A significance threshold of $p<0.05$ was used.

RESULTS

The current prospective clinical study sought to evaluate the results between non-diabetic and diabetic participants who were receiving dialysis. 266 patients of both genders receiving continuous hemodialysis were included in the study. Of the 266 participants, 109 had diabetes and 157 did not. With p<0.001, the mean age of diabetics was found to be significantly higher at 62.4±11.4 years, as opposed to 53.3±16.5 years for non-diabetics. There is a gender p=0.08 indicates a non-significant difference between the two groups. With p=0.01, the vintage of hemodialysis was substantially higher in non-diabetics. AVG was used in 5.50% (n=6) diabetics and 7.64% (n=12) non-diabetics, and AVF in 69.72% (n=76) diabetics and 73.88% (n=116) non-diabetics, respectively. The vascular access type was tunneled CVC in 22.01% (n=24) subjects with diabetes and 15.92% (n=25) non-diabetics. AVF showed non-significant difference with p=0.17. Table 1 indicates that there was a significant difference (p<0.001) in BMI of >25–30 and >30 between diabetes and non-diabetics. With regards to the laboratory data, it was observed that the single pool Kt/V in non-diabetics was 1.31±0.19, which was substantially higher than in diabetics (1.25±0.17, p=0.001). Additionally, non-diabetics had considerably higher creatinine levels (9.1±2.5) than Diabetics with p<0.001 had 7.4±2.2. With p=0.001, CRP levels were substantially greater in diabetics than in non-diabetics. On the other hand, albumin levels in non-diabetics were 3.91±0.33 g/L, which was substantially higher than 3.84±0.33 g/L (p<0.001). While LDL was substantially greater in diabetics (p=0.03), HDL was significantly higher in non-diabetics. Additionally, there was a significant increase in serum triglycerides (p<0.001) in diabetics. iPTH was notably greater in non-diabetics (372 pg/mL) than in diabetics (270 pg/mL; p<0.001). Table 2 summarizes the considerably higher phosphorus levels (p=0.004) in non-diabetics. Prior to dialysis There were statistically insignificant variations between the serum levels of BUN, hemoglobin, calcium, potassium, cholesterol, ferritin, transferrin, iron, and alkaline phosphate in diabetics and non-diabetics (Table 2). Regarding the study subjects' quality of life metrics, it was observed that the role-emotional component was considerably higher in non-diabetics (59.9±35.6) than in diabetics (50.3±34.9; p=0.007). Significant differences were observed between non-diabetic and diabetic subjects in terms of vitality, general health, role physical, physical functioning, SF 36 scores, mental component summary, physical component summary, and mental health (p=0.01, 0.02, 0.002, <0.001, 0.004, 0.003, and 0.04, respectively). As seen in Table 3, there was a non-significant difference between diabetics and non-diabetics in terms of social functioning and physical discomfort, with non-diabetics showing better outcomes with p=0.12 and 0.71, respectively. In comparison to non-diabetics, diabetics had a considerably greater prevalence of cardiovascular disorders; 56.88% (n=62) of diabetic patients and 0.63% (n=1) of non-diabetic subjects had clinical peripheral vascular disease, with a p-value of less than 0.001. 16.51% (n=18) of diabetics and 7.64% (n=12) of non-diabetics reported having a cerebrovascular accident; this difference was not statistically significant (p=0.002). A substantial increase in congestive heart failure was observed in 36.69% (n=40) of the diabetes participants and 16.56% (n=26) of the non-diabetic subjects (p<0.001). With p<0.001, diabetics had a considerably higher risk of coronary artery disease (CAD) than non-diabetics (Table 4).

Renal function recovery was the reason for departure from hemodialysis in 0.91% (n=1) of diabetic participants and 0.63% (n=1) of non-diabetic subjects. In 0.91% of diabetics (n = 1) and 1.27% of non-diabetics (n = 2), peritoneal dialysis was the cause of their departure from hemodialysis. 17.19% (n=27) of non-diabetics and 6.42% (n=7) of diabetics required a renal transplant. For 41.28% (n = 45) of the diabetics and 22.29% (n = 35) of the non-diabetics, the reason for leaving hemodialysis was death. In 50.45% of the diabetics (n = 55) and 58.59% of the non-diabetics (n = 92), continued hemodialysis was the cause. Table 5 shows that the difference between diabetics and non-diabetics was statistically significant (p<0.001). Cachexia combined with cardiovascular disease (CVD) or infection was the cause of mortality in 45 deaths involving diabetes and 35 deaths involving non-diabetics (42.22% of diabetics, n = 19), and 42.85% of non-diabetics, n = 15. In 2.85% (n=1) of the non-diabetic participants and 13.33% (n=6) of the diabetic ones, cancer was the cause of death. For 26.66% (n=12) of the diabetics and 8.57% (n=3) of the non-diabetics, infection was the cause of death. Deaths from CVD infections were recorded in 4.44% (n = 2) of diabetics and 8.57% (n = 3) of non-diabetics. For 6.66% (n=3) of diabetics and 8.57% (n=3) of non-diabetics, another cause of death was cardiovascular disease (CVD). 2.22% (n=1) of diabetics and 8.57% (n=3) of non-diabetics died from CVD. There were more unreported causes of death mentioned Table 6 summarizes the percentages in 4.44% (n = 2) diabetes and 20% (n = 7) non-diabetics.

DISCUSSION

109 of the 266 research participants had diabetes, whereas the remaining 157 did not. With p<0.001, the mean age of diabetics was found to be significantly higher at 62.4±11.4 years, as opposed to 53.3±16.5 years for non-diabetics. With p=0.08, there is no discernible difference between the genders in the two groups. With p=0.01, the vintage of hemodialysis was substantially higher in non-diabetics. AVG was used in 5.50% (n=6) diabetics and 7.64% (n=12)

non-diabetics, and AVF in 69.72% (n=76) diabetics and 73.88% (n=116) non-diabetics, respectively, illustrating non-diabetic vascular access. Tunneled CVC was the vascular access type used in 22.01% (n=24) patients with diabetes and 15.92% (n=25) non-diabeticsp=0.17 indicates a significant difference. Diabetics had a considerably higher BMI (p<0.001) than non-diabetics for both >25–30 and >30. These statistics were comparable to those from studies conducted in 2006 by Sorensen V et al. and in 2004 by Kaysen GA et al., where the authors evaluated subjects using demographic information similar to those of the current study.

Regarding the laboratory data, it was shown that the single pool Kt/V in non-diabetics was 1.31±0.19, significantly higher than in diabetics (1.25±0.17, p=0.001). Additionally, non-diabetics had considerably higher creatinine levels (9.1±2.5) than diabetics (7.4±2.2; p<0.001).

With p=0.001, CRP levels were substantially greater in diabetics than in non-diabetics. On the other hand, non-diabetics had considerably greater albumin levels (3.91±0.33 g/L) than p=0.03 for both showed that LDL was considerably greater in diabetics than in non-diabetics. Additionally, there was a significant increase in serum triglycerides (p<0.001) in diabetics. iPTH was notably greater in non-diabetics (372 pg/mL) than in diabetics (270 pg/mL; p<0.001). With p=0.004, non-diabetics had considerably higher phosphorus levels. In the serum of diabetics and non-diabetics, pre-dialysis BUN, hemoglobin, calcium, potassium, cholesterol, ferritin, transferrin, iron, and alkaline phosphate levels revealed statistically non-significant differences.

These findings aligned with earlier research by Hayashino Y et al. (2009) and Ravuelta KL et al. (2004), whose authors found similar laboratory data in their hemodialysis and diabetic study participants.

The study's findings demonstrated that, with regard to the measures of life quality in found the role-emotional component in non-diabetics was 59.9±35.6, substantially higher than in diabetics (50.3±34.9, p=0.007). Significant differences were observed between non-diabetic and diabetic subjects in terms of vitality, general health, role physical, physical functioning, SF 36 scores, mental component summary, physical component summary, and mental health (p=0.01, 0.02, 0.002, <0.001, 0.004, 0.003, and 0.04, respectively). However, there was no statistically significant difference between diabetics and non-diabetics in terms of social functioning or body discomfort; the former group performed better, with p=0.12 and 0.71, respectively. These results corroborated those of Gumprecht J et al. (2012) and Osthus TB et al. (2013), who hypothesized that diabetics and non-diabetics receiving hemodialysis would have comparable quality of life. According to study findings, renal function recovery was the reason for hemodialysis subject leave in 0.91% (n=1) diabetic and 0.63% (n=1) non-diabetic participants. In 0.91% of diabetics (n = 1) and 1.27% of non-diabetics (n = 2), peritoneal dialysis was the cause of their departure from hemodialysis. 17.19% (n=27) of non-diabetics and 6.42% (n=7) of diabetics required a renal transplant. For 41.28% (n = 45) of the diabetics and 22.29% (n = 35) of the non-diabetics, the reason for leaving hemodialysis was death. In 50.45% of the diabetics (n = 55) and 58.59% of the non-diabetics (n = 92), continued hemodialysis was the cause. With p<0.001, the difference between those with diabetes and those without it was statistically significant. These results were in agreement with those of Dukkipati R et al. (2010) and Ferreira A et al. (2008), whose publications offered comparable explanations for stopping hemodialysis ..The current study, taking into account its limitations, finds that the increased prevalence of cardiovascular diseases is the primary reason why diabetes participants' clinical outcomes and HRQOL (health-related quality of life) were significantly worse than those of non-diabetic subjects receiving hemodialysis.

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TABLES

Characteristics	**Diabetes (n=109)**	**Non-diabetes (n=157)**	**p-value**
Mean age (years)	62.4±11.4	53.3±16.5	<0.001
Gender			
Males	58 (53.21)	94 (59.87)	0.08
Females	51 (46.78)	63 (40.12)	
Hemodialysis vintage[2]	21 (10-540	28 (11-72)	0.01
Vascular access type			
Tunneled CVC	24 (22.01)	25 (15.92)	0.17
AVG	6 (5.50)	12 (7.64)	
AVF	76 (69.72)	116 (73.88)	
BMI			
≤18.5	3 (2.75)	9 (5.73)	<0.001
>18.5-25	50 (45.87)	96 (61.14)	
>25-30	39 (35.77)	42 (26.75)	
>30	17 (15.59)	10 (6.36)	

Table 1: Demographic data of study participants

Laboratory parameters	Diabetes (n=109)	Non-diabetes (n=157)	p-value
Single pool Kt/V	1.25±0.17	1.31±0.19	0.001
Pre-dialysis BUN (mg/dl)	56.0±12.9	56.3±13.5	0.84
Creatinine (mg/dl)	7.4±2.2	9.1±2.5	<0.001
Hemoglobin (g/dL)	10.4±1.2	10.4±1.4	0.07
CRP (mg/L)	3.82 (1.52-8.32)	2.27 (0.92-5.15)	0.001
Albumin (g/L)	3.84±0.33	3.91±0.33	<0.001
Calcium (mg/dl)	8.6±0.4	8.6±0.5	0.95
Potassium (meq/L)	5.0±0.4	4.9±0.4	0.08
HDL (mg/dl)	35.7±7.3	37.5±8.9	0.03
LDL (mg/dl)	82.3±24.3	77.3±23.6	0.03
Cholesterol (mg/dL)	151±33	145±36	0.14`
Triglycerides (mg/dL)	165±89	137±65	<0.001
Ferritin (ng/mL)	405±245	444±293	0.13
Transferrin (μg/dL)	251±56	246±57	0.43
Iron (μg/dL)	66±37	69±33	0.51
iPTH (pg/mL)	270 (148-418)	372 (171-705)	<0.001
Alkaline phosphatase (IU/L)	281 (211-363)	322 (197-447)	0.09
Phosphorus (mg/dL)	5.0±0.9	5.4±1,0	0.004

Table 2: Laboratory data in the study participants

Quality of life parameters	Diabetes (n=109)	Non-diabetes (n=157)	p-value
Role-emotional	50.3±34.9	59.9±35.6	0.007
Social functioning	47.7±29.0	52.5±30.2	0.12
Vitality	44.5±25.7	50.4±26.4	0.01
General Health	46.7±21.0	51.5±23.9	0.02
Body pain	60.2±31.7	61.3±31.0	0.71
Role-physical	43.0±30.5	52.2±30.5	0.002
Physical functioning	40.0±31.1	52.6±29.3	<0.001
SF 36 score	45.5±20.7	52.5±20.3	<0.001
Mental component summary	49.1±20.9	55.1±22.0	0.004
Physical component summary	46.9±21.6	53.6±21.4	0.003
Mental health	55.9±27.5	61.1±25.3	0.04

Table 3: Quality of life components in diabetic and non-diabetic study subjects

Cardiovascular comorbidities	Diabetes n=109 (%)	Non-diabetes n=157 (%)	p-value
Clinical peripheral vascular disease	62 (56.88)	1 (0.63)	<0.001
Cerebrovascular accident	18 (16.51)	12 (7.64)	0.002
Congestive heart failure	40 (36.69)	26 (16.56)	<0.001
CAD			
Stent	8 (7.33)	6 (3.82)	<0.001
Medical therapy	43 (39.44)	27 (17.19)	
None	39 (35.77)	112 (71.33)	
CABG	19 (17.43)	12 (7.64)	

Table 4: Cardiovascular diseases in diabetic and non-diabetic study subjects

Causes of hemodialysis exit	Diabetes (n=109)	Non-diabetes (n=157)	p-value
Renal function recovery	1 (0.91)	1 (0.63)	**<0.001**
Peritoneal dialysis	1 (0.91)	2 (1.27)	
Renal transplantation	7 (6.42)	27 (17.19)	
Death	45 (41.28)	35 (22.29)	
Continued hemodialysis	55 (50.45)	92 (58.59)	

Table 5: Cause of exit from hemodialysis unit in diabetic and non-diabetic study subjects

Causes of Death	Diabetes (n=45)	Non-diabetes (n=35)
Cachexia with CVD or infection	19 (42.22)	15 (42.85)
Malignancy	6 (13.33)	1 (2.85)
Infection	12 (26.66)	3 (8.57)
Infections with CVD	2 (4.44)	3 (8.57)
Others with CVD	3 (6.66)	3 (8.57)
CVD	1 (2.22)	3 (8.57)
Others	2 (4.44)	7 (20)

Table 6: Cause of death in diabetic and non-diabetic study subjects