fortune Journals

Research Article

FORTUNE JOURNAL OF HEALTH SCIENCES

ISSN: 2644-2906

Driving Safety Among Patients with End-Stage Renal Disease on Hemodialysis

Fayez AlHejaili[1], Muhammad N. Hashmi[1], Abdulkareem Alsuwaida[*, 2], Ghada A. Ankawi[3], Anas A. Alsuwaida[2], Mohammed T. AlZahrani[4], Ali E. Shehadah[2], Riyadh Al-Sehli[2]

Abstract

Background: Human error is the main cause of car accidents, but it has not yet been clarified whether cognitive impairment related to dialysis sessions and/or comorbid medical conditions increases the risk of car accidents. Our objective was to explore dialysis patients' perceptions of driving and the prevalence and predictors of car accidents among dialysis patients.

Methods: A cross-sectional questionnaire survey was conducted at eight dialysis units in Saudi Arabia. The study included all adult patients on in-center hemodialysis for more than three months.

Results: Data were collected from 711 adults enrolled in the study. Among the participants, 55.1% were diabetic, 86.9% had hypertension, and 24.8% had coronary artery disease. Among the participants who continued to drive, 137 had been involved in road traffic accidents. Many patients complained of post-dialysis fatigue (54.6%), which was associated with a higher risk of car accidents. Similarly, history of diabetes were also associated with more car accidents.

Conclusion: Many of the participants had stopped driving after starting dialysis or felt that continuing driving was unsafe. Health-care providers and institutions need to engage in patient transportation as part of holistic care delivery to dialysis patients.

Keywords: Car accident; Driving; Chronic kidney disease; Hemodialysis

Introduction

Road traffic accidents are major causes of morbidity and mortality [1]. Driving is considered to be a complex task that requires undivided attention to the surroundings. Medical conditions are commonly overlooked as causes of car accidents [2]. Patients with chronic kidney disease commonly suffer from multiple comorbidities that can impair their ability to drive a vehicle safely [3]. Moreover, dialysis treatment commonly causes symptoms of hypotension and fatigue, which can lead to road traffic accidents [4, 5].

Transportation can play a role in missed or shortened dialysis treatment, which is associated with increased hospitalization, contributing to rising health-care costs [6]. Patients with advanced chronic kidney disease on regular hemodialysis (HD) are particularly vulnerable to road traffic accidents because they travel to dialysis units at least three times weekly. For those who require dialysis as a life-sustaining therapy, missing treatment sessions or treatment interruptions can lead to serious health consequences [7, 8].

However, few studies have examined these issues among HD patients. Because of this, it is paramount to investigate the association between road traffic accidents and dialysis therapy. Doing so could help health-care organizations create driving guidelines and provide services for dialysis

Affiliation:

[1]King Saud Bin Abdulaziz University for Health Sciences, Riyadh, Kingdom of Saudi Arabia

[2]King Saud University Medical City, King Saud University, Riyadh, Kingdom of Saudi Arabia

[3]College of Medicine, King Abdulaziz University, Jeddah, Kingdom of Saudi Arabia

[4]King Faisal Specialist Hospital and Research Centre, Riyadh, Kingdom of Saudi Arabia

***Corresponding author:**
Abdulkareem Alsuwaida, Department of Medicine, King Saud University, Riyadh, P.O. Box 2925, Riyadh 11321, Saudi Arabia

Citation: Fayez AlHejaili, Muhammad N. Hashmi, Abdulkareem Alsuwaida, Ghada A. Ankawi, Anas A. Alsuwaida, Mohammed T. AlZahrani, Ali E. Shehadah, Riyadh Al-Sehli. Driving Safety Among Patients with End-Stage Renal Disease on Hemodialysis. Fortune Journal of Health Sciences. 7 (2024): 226-230.

Received: March 27, 2024
Accepted: April 03, 2024
Published: April 16, 2024

patients to prevent avoidable accidents from occurring. Our study examines the prevalence and predictors of car accidents among dialysis patients as well as patients' perceptions of the safety of self-driving to dialysis units. We hope that our study will contribute to the development of safe and effective transportation strategies for dialysis patients.

Methods

This was a cross-sectional study, and we included adult patients at eight HD units between March 1, 2022, and December 1, 2022. We selected all patients on maintenance dialysis diagnosed with end-stage renal disease and on renal replacement therapy for more than 3 months. The study included patients aged 18 years or older. We collected demographic, clinical, and laboratory results from direct interviews with the clinical team, chart reviews, and patient surveys about driving perception and car accidents. We defined a car accident as "a sudden, unexpected occurrence leading to injury or trauma during driving." Injury or trauma was defined as "tissue damage resulting from a transfer of different forms of energy either intentionally or unintentionally" [9]. Accidents were classified into three groups. The first group included fatal accidents, defined as occurring when at least one person (driver, passenger, or pedestrian) dies within 30 days of injuries received as a result of a road traffic accident [9]. The second group included major injuries, defined as occurring when at least one person is injured and admitted to a hospital but no deaths occur [9]. The third group included minor injuries from any type of accident. Detailed dialysis-related parameters and their association with car accidents were collected. These included the frequency of dialysis sessions per week, the timing of dialysis sessions, and the duration of dialysis treatment. The correlation between car accidents and clinical parameters, laboratory results, and medications was described. This study, approved by the Research Ethics Board of King Saud University Medical City, was conducted using privacy safeguards at the Institute for Clinical Evaluative Sciences (E-21-6484), and data were collected by direct patient interviews. The study was conducted in accordance with the Declaration of Helsinki, and all participants provided informed consent.

Analysis

The research was conducted with the aim of uncovering the relationship between car accidents and predictors related to clinical or biochemical parameters. The overall number of patients was 711; however, due to missing data, there was variation in the total number of patients for each variable. This study describes frequencies for all means with standard deviation (SD) for continuous variables and frequencies for categorical variables. The categorical variables included sociodemographic data, dialysis and lifestyle impact, transportation and residency, scheduling, driving and dialysis, and medications. This study also investigated driving behaviors and experiences and how such factors were affected by dialysis. The participants were divided into groups encompassing patients who had experienced major or minor car accidents and those who had not experienced such accidents. After grouping, a comparison of the characteristics of the two groups and their relationships to any diseases observed in this study was carried out. The differences in clinical variables, such as general lab and dialysis lab session results between the two groups of patients, were also revealed. Finally, this study describes the reasons why patients—specifically, those who have driven before but decide to stop several years after starting HD—choose to cease driving.

Results

The sociodemographic and clinical characteristics of the 711 participants are shown in Table 1. Hypertension was prevalent in 86.9% of participants, and 24.8% had coronary artery disease. Type 2 diabetes was common (55.1%), with diabetic retinopathy reported in 21.2% of cases. Many patients had mobility issues, and 19.32% used canes.

The results revealed that 329 of the patients had driven a car and that 87.5% had done so for more than 10 years, with 226 (68.7%) patients still actively driving (Table 2). Among the 329 participants who could drive, 30.1% no longer did so. Most of the patients (74.8%) who had stopped driving had done so more than three years previously, and a large number ceased driving due to either the inability to concentrate (40.1%) or frailty (28.3%). Among the 226 patients who were still driving, 7.5% lacked confidence behind the wheel, mostly due to dizziness (58.8%). Table 2 shows the descriptive statistics of the car accidents, with 100 (30.4%) of the dialysis patients having experienced a minor car accident and 37 having sustained a major car accident. It was also revealed that among the patients who had had accidents, only one was involved in a fatal accident. Most drivers who had been involved in minor or major car accidents (67.0%) experienced collisions on non-dialysis days. However, among the car accidents on a dialysis day, the majority occurred after treatment. Among those who continued to drive, 14 patients (10.2%) had sustained three or more car accidents since they started dialysis. Similarly, many patients (41.6%) felt that dialysis sessions impacted their driving capacity, and one-fifth would feel sleepy during driving after a dialysis session.

A majority of patients who took the survey had occasional post-dialysis dizziness (56.1%), and another 82 (11.7%) had frequent dizziness. 581 patients (83.7%) complained of post-dialysis fatigue in various frequencies. The proportion of patients with hypertension involved in an accident (40.5%) was greater than that of patients without hypertension (22.9%, $p = 0.05$). The proportion of patients who had experienced both fatigue after dialysis and car accidents

was 85%, compared with 70% among those who had not experienced car accidents (p = 0.01) (Table 4). There was no relationship between the dialysis schedule (both the dialysis day and the dialysis session timing) and the car accidents they experienced. Neither was there a relationship between a history of coronary artery disease, hypertension, heart failure, hyperlipidemia, or cerebrovascular accidents and car accidents.

The proportion of patients diagnosed with diabetes mellitus who had experienced an accident (29.5%) was lower than the proportion of patients without a diabetes mellitus diagnosis (44.5%) (see Table 4). However, among participants with diabetes mellitus, self-reported hypoglycemia was substantially related to patients' involvement in automobile accidents. This was also substantiated by the higher rate of car accidents when assessing average glycosylated hemoglobin (HbA1c). Patients who had never been in a car accident had higher HbA1c levels (6.1 +/- 3.1) than those who had been in a car accident (5.1 +/- 3.1). There was no relationship between changes in systolic or diastolic blood pressure or ultrafiltration volume and car accidents. No medications—specifically, ESA, anti-hypertensive, or cinacalcet—were shown to be significantly related to patient car accidents.

Discussion

In-center HD is usually done three or four times weekly and is a source of stress and anxiety for many patients and their families [10]. The majority of patients on RRT have significant comorbidities that make driving challenging [3]. The international Dialysis Outcomes and Practice Patterns Study associated longer travel times with reduced health-related quality of life and greater mortality risk [11]. We found that many patients reported feeling unsafe to self-drive to and from dialysis sessions, which led them to stop driving, while those who continued to drive reported a higher rate of major and/or minor road traffic accidents. One-third of the patients stopped driving after initiating dialysis, and the majority were not able to maintain their attention while driving. A distressing finding of our study was that, among those who continued to drive, some were not confident about their capacity to do so.

Many participants sustained either minor and/or major car accidents. Those who experienced car accidents on dialysis days mostly did so after HD sessions. One-third of the patients indicated that dialysis negatively impacted their capacity to drive. Post-dialysis fatigue is prevalent among HD patients [4] and has a significant relationship with automobile accidents. Two previous studies found an association between road traffic accidents and the post-dialysis period. In the first, in Australia, 21.9% of respondents reported having been involved in road traffic accidents, with 72.4% being labeled as high risk for collisions [12]. In the second study, conducted in the United States, 22.1% of participants reported having had vehicle collisions since commencing dialysis, and a further 78.3% were deemed high risk for road traffic accidents [13]. The participants in both studies reported dizziness, weakness, impaired vision, and falling asleep at the wheel. A systematic review published by the Canadian Society of Nephrology noted that the current evidence, although scarce, showed an association between the post-dialysis period and road traffic accidents [14]. The prevalence of car accidents among participants is alarming, indicating the need for a creative approach to safely transport these patients to and from HD sessions.

Diabetes is prevalent in dialysis patients, and we noticed that those with self-reported hypoglycemia or lower glycosylated hemoglobin had a higher rate of car accidents. Similar observations were noted in other studies showing an increased risk of injuries among drivers with type 2 diabetes [15]. Motor vehicle accidents in a population-based study reported that among diabetics, tighter glycemic control (measured by HbA1c) is associated with an increased risk of motor vehicle collision [16]. These findings suggest that tight glycemic control does not necessarily mean "optimal" in dialysis patients. The well-being of dialysis patients, reflected by our study as normal serum albumin and serum creatinine, is associated with a higher likelihood of a road traffic accident. Similarly, those who continue to work are likely to continue driving and are therefore more prone to automobile accidents. We have not found any similar observations in the literature. Many health-care systems are deploying strategies to facilitate transportation to dialysis centers [10]. The inclusion and bundling of the cost of travel to dialysis treatment paid for by the health-care system is probably the best approach for all parties.

Table 1: Descriptive Statistics of 711 Patients' Sociodemographic Characteristics

Disease	***n***	**%**
Gender (female)	319	44.9
Hypertension	618	86.9
Diabetes	392	55.1
Coronary heart disease/Coronary disease	176	24.8
Hyperlipidemia	263	37
Congestive heart failure	46	6.5
Arrhythmias	76	10.7
Cerebrovascular accident	54	7.6
Peripheral vascular disease	82	11.5
Never smoked	521	73.3
Primary cause of end-stage renal disease		
Diabetes mellitus	290	40.8
Hypertension	177	24.9

Table 2: Descriptive Statistics of 329 Patient Driving Behavior

Driving behavior	Category	*n*	%
Ever drive a car		329	46.3
Years driving	<10 years	41	12.5
	≥10 ψεαρσ	288	87.5
Currently driving		226	68.7
Years since stopping driving	<1 year	9	9.1
	1–3 years	16	16.1
	>3 Years	74	74.8
Reason for stopping driving	Amputation	3	3
	Delayed response	2	2.1
	Dizziness	5	5.1
	Lack of focus	40	40
	Presence of those who can serve me	2	2.1
	Previous bad experience	4	4.1
	Weakness	28	28.3
	Other	15	15.2
If you are currently driving, are you confident in your driving abilities?	Not confident	17	7.5
If you are not confident, specify the reason.	Dizziness	10	58.8
	Poor vision	3	17.7
	Other	4	23.5
Dialysis affects driving.	Yes	94	41.6
Ever felt sleepy or somnolent while driving.	Yes	46	20.4

Table 3: Descriptive Statistics of Patients' Experiences of Car Accidents

Accident	Category	*n*	%
When was your last minor accident?	Haven't had any accident	192	65.8
	<1 year	36	12.3
	1–2 years	16	5.5
	3–5 years	17	5.8
	>5 years	31	10.6
If you had a minor accident, when did it occur?	Non dialysis day	67	67
	Dialysis day, before dialysis	7	7
	Dialysis day, after dialysis	23	23
	Cannot remember	3	3
When was your last major accident?	Less than a year ago	15	40.5
	3–5 Years	3	8.1
	>5 years	19	51.4
	Cannot remember	3	3
If you have had a major accident, when did it occur?	Non-dialysis day	26	70.2
	Dialysis day, before dialysis	2	5.4
	Dialysis day, after dialysis	9	24.4

Table 4: Relationship between Patient's Medical History and Car Accidents

Disease	Category	No Accident	Accident	*p*-value
Fatigue post-dialysis	No	49 (76.6%)	15 (23.4%)	0.01
	Occasionally, rarely	78 (54.2%)	66 (45.8%)	
	Always, often	39 (67.2%)	19 (32.8%)	
Diagnosed with diabetes mellitus	No	81 (55.5%)	65 (44.5%)	0.01
	Yes	86 (70.5%)	36 (29.5%)	
Self-reported hypoglycemia	No	109 (59.6%)	74 (40.4%)	0.03
	Occasionally, rarely	48 (72.7%)	18 (27.3%)	
	Always, often	4 (36.4%)	7 (63.6%)	

Chi-square analysis was used in the analysis.

This study has several limitations. First, the cross-sectional design is not without limitations since causality cannot be established. Second, car accidents were self-reported, which carries a risk of recall and response bias. Third, the number of female participants who would drive was small, which will impact the generalizability of the study. Our study shows that many patients on HD are more vulnerable and face significant challenges when it comes to driving safely. Forty-two percent of patients on in-center HD had sustained road traffic accidents, while one-third of patients stopped driving after starting dialysis. The diabetic patients on dialysis who sustained car accidents were associated with self-reported hypoglycemia and lower HbA1c. Therefore, future research should include the use of measures of predictors of car accidents among patients on HD that correlate with car accidents. In addition, research should focus on optimal strategies to expand health care to include safe and reliable transportation services for dialysis patients.

Availability of data and materials

Data are available subject to reasonable request from the corresponding author, A. Alsuwaida (suwaida@ksu.edu.sa), and further ethical approvals.

Citation: Fayez AlHejaili, Muhammad N. Hashmi, Abdulkareem Alsuwaida, Ghada A. Ankawi, Anas A. Alsuwaida, Mohammed T. AlZahrani, Ali E. Shehadah, Riyadh Al-Sehli. Driving Safety Among Patients with End-Stage Renal Disease on Hemodialysis. Fortune Journal of Health Sciences. 7 (2024): 226-230

Funding

This research was not funded.

Contributions

FA, MNH, AA, MTA, GAA, AAA, MA, AES, and AR initiated the study. FA, GAA, and AA led the development of the protocol and supervised the study. MTA, AAA, MA, and AES undertook recruitment, data collection, and analysis, supported by AA and AR. All authors wrote the initial draft of the paper and contributed to the final manuscript.

Ethics approval and consent to participate

This study was approved by the Research Ethics Board of King Khaled University Medical City and was conducted using the privacy safeguards of the Institute for Clinical Evaluative Sciences (E-21-6484). All participants were able to read and sign the consent form and provided informed consent. All methods were carried out in accordance with relevant guidelines and regulations.

Consent for Publication

Not applicable.

Competing Interests

The authors have no conflicts to declare.

References

1. Rosen HE, Bari I, Paichadze N, Peden M, Khayesi M, Monclús J, et al. Global road safety 2010-18: An analysis of Global Status Reports. Injury 22 (2022): 20:S0020-1383 (22) 00504-6.
2. Shu CC, Dinh M, Mitchell R, Balogh ZJ, Curtis K, Sarrami P, et al. Impact of comorbidities on survival following major injury across different types of road users. Injury 53 (2022): 3178–3185.
3. Bello AK, Okpechi IG, Osman MA, Cho Y, Htay H, Jha V, et al. Epidemiology of Haemodialysis Outcomes. Nature Reviews Nephrology 18 (2022): 378–95.
4. Dou J, Liu H, Ma Y, Wu YY, Tao XB. Prevalence of post-dialysis fatigue: a systematic review and meta-analysis. BMJ Open 13 (2023): e064174.
5. Hattori K, Sakaguchi Y, Kajimoto S, Asahina Y, Doi Y, Oka T, et al. Intradialytic hypotension and objectively measured physical activity among patients on hemodialysis. J Nephrol 35 (2022): 1409–1418.
6. Saran R, Bragg-Gresham JL, Rayner HC, Goodkin DA, Keen ML, Van Dijk PC, et al. Nonadherence in hemodialysis: associations with mortality, hospitalization, and practice patterns in the DOPPS. Kidney Int 64 (2003): 254-62.
7. Obialo CI, Hunt WC, Bashir K, Zager PG. Relationship of missed and shortened hemodialysis treatments to hospitalization and mortality: observations from a US dialysis network. Clin Kidney J 5 (2012): 315-9.
8. Chan KE, Thadhani RI, Maddux FW. Adherence barriers to chronic dialysis in the United States. J Am Soc Nephrol 25 (2014): 2642–2648.
9. Davies C, Hollinshead J, Holmes M, Kirkby K, Medcalf J, Matthews B. Kidney Patient Transport Audit 2012. (2013).
10. Lewis RA, Bohm C, Fraser F, Fraser R, Woytkiw L, Jurgutis S, et al. Transportation burden associated with hemodialysis in Canada: A qualitative study of stakeholders. Kidney Med 5 (2022): 100571.
11. Moist LM, Bragg-Gresham JL, Pisoni RL, Saran R, Akiba T, Jacobson SH, et al. Travel time to dialysis as a predictor of health-related quality of life, adherence, and mortality: The Dialysis Outcomes and Practice Patterns Study (DOPPS). Am J Kidney Dis 51 (2008): 641–650.
12. Graver A, Odell M, Churilov L, Power DA, Mount PF, Davies MRP, et al. Dialysis and driving: an anonymous survey of patients receiving dialysis for end-stage kidney disease. Intern Med J 51 (2021): 1691-1699.
13. Vats HS, Duffy DP. Assessment of self-perceived risk and driving safety in chronic dialysis patients. Dialysis & Transplantation 39 (2010): 63–8.
14. Kepecs DM, Glick L, Silver SA, Yuen DA. Does Chronic Kidney Disease-Induced Cognitive Impairment Affect Driving Safety? Can J Kidney Health Dis 5 (2018): 2054358118777133.
15. Hsu IL, Hou WH, Chang YH, Li CY. Type 2 diabetes mellitus increases the severity of non-fatal injuries, but not the risk of fatal injuries, among driver victims of motor vehicle crashes in Taiwan. Epidemiol Health 44 (2022): e2022076.
16. Redelmeier DA, Kenshole AB, Ray JG. Motor vehicle crashes in diabetic patients with tight glycemic control: A population-based case control analysis. PLoS Med 6 (2009): e1000192.