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COMPARATIVE EVALUATION OF BLOOD SUGAR VARIATIONS IN DIABETIC AND NON-DIABETIC CHRONIC KIDNEY FAILURE PATIENTS UNDERGOING MAINTENANCE HEMODIALYSIS

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ABSTRACT

Background: Hemodialysis influences glucose metabolism and may cause significant fluctuations in blood sugar levels, particularly among diabetic patients with chronic kidney disease. Monitoring glycemic changes during dialysis is important for preventing metabolic complications and improving patient outcomes. **Objectives:** To evaluate and compare pre- and post-dialytic blood sugar levels among diabetic and non-diabetic patients undergoing maintenance hemodialysis. **Methods:** A hospital-based observational study was conducted on 50 patients undergoing maintenance hemodialysis. Patients were categorized into diabetic (n=35) and non-diabetic (n=15) groups. Demographic variables including gender, age, dialysis vintage, and diabetic status were recorded. Blood sugar levels were assessed before and after hemodialysis sessions. Data were analyzed using appropriate statistical methods, and significance was considered at $p<0.05$. **Results:** Among the 50 participants, 54.00% were females and 46.00% were males. The majority of patients belonged to the 51–60 years age group (28.00%). Most patients (56.00%) had a dialysis vintage of 1–5 years, while 70.00% were diabetic. In diabetic patients, mean blood sugar levels significantly decreased from 201.68 ± 25.27 mg/dL pre-dialysis to 155.50 ± 19.88 mg/dL post-dialysis. In non-diabetic patients, blood sugar levels decreased from 99.80 ± 3.00 mg/dL to 89.53 ± 2.33 mg/dL following dialysis. The difference was statistically significant (F=168.366; p=0.001). **Conclusion:** Hemodialysis significantly reduces blood sugar levels in both diabetic and non-diabetic patients, with a greater reduction observed among diabetic individuals. Regular monitoring of blood glucose during dialysis is essential to prevent glycemic complications and ensure safe clinical management of patients undergoing maintenance hemodialysis.

KEYWORDS: Hemodialysis, Blood sugar level, Diabetes mellitus, Chronic kidney disease, Dialysis patients.

INTRODUCTION

Chronic Kidney Failure (CKF), also known as Chronic Kidney Disease (CKD), is a progressive condition characterized by irreversible loss of renal function, ultimately leading to End-Stage Renal Disease (ESRD) requiring renal replacement therapy such as hemodialysis.[1,2] CKD has emerged as a major global public health problem, affecting nearly 10–13% of the world's population and contributing significantly to morbidity, mortality, and healthcare burden.[3,4] Hemodialysis is the most commonly used treatment modality for ESRD and plays a crucial role in maintaining fluid, electrolyte, and metabolic balance in affected patients.[5] Diabetes Mellitus (DM), particularly type 2 diabetes mellitus, is the leading cause of CKF worldwide.[6,7] Persistent hyperglycemia contributes to progressive renal damage through mechanisms such as oxidative stress, endothelial dysfunction, inflammation, and diabetic nephropathy.[8-10] Studies have shown that approximately 40-50% of patients undergoing renal replacement therapy are diabetic, emphasizing the strong association between diabetes and kidney failure.[11,12]

Maintenance hemodialysis produces significant metabolic and physiological alterations that may affect blood glucose regulation.[13,14] In diabetic patients, ESRD alters insulin metabolism because of reduced renal insulin clearance and changes in insulin sensitivity.[15,16] Hemodialysis may further influence glucose homeostasis by improving insulin sensitivity during dialysis sessions, increasing the risk of glycemic fluctuations and hypoglycemia[17-20] Poor glycemic control in dialysis patients has also been associated with protein catabolism, muscle wasting, cardiovascular complications, and increased mortality.[21,22] Non-diabetic patients undergoing maintenance hemodialysis may also experience disturbances in glucose metabolism due to uremia, altered hepatic glucose production, malnutrition, and dialysis-related metabolic changes.[23,24] Episodes of hypoglycemia may occur even in the absence of diabetes, particularly during or after dialysis sessions.[25,26] However, the magnitude and pattern of blood sugar variations may differ considerably between diabetic and non-diabetic CKF patients.

Previous studies have investigated glycemic control and metabolic changes in dialysis patients, but comparative studies specifically evaluating blood sugar fluctuations between diabetic and non-diabetic patients undergoing maintenance hemodialysis remain limited.[27-30] Understanding these variations is important for optimizing dialysis care, preventing acute metabolic complications, and improving overall patient outcomes.[31-34]

Therefore, the present study aims to compare variations in blood sugar levels between diabetic and non-diabetic patients with CKF undergoing maintenance hemodialysis. The study also seeks to evaluate the impact of diabetic status on glycemic control during dialysis and provide insights for better clinical management of these patients.[35]

MATERIALS AND METHODS

Study Design

This study employed an observational, comparative, and descriptive study design to evaluate variations in blood sugar levels among diabetic and non-diabetic patients with CKF undergoing maintenance hemodialysis. The study observed glucose fluctuations during routine dialysis sessions without any therapeutic intervention.

Study Duration

The study was conducted over a period of 6 months (from December 6, 2025 to May 6, 2026) to allow adequate observation across multiple hemodialysis sessions and ensure sufficient data collection for analysis.

Study Setting

The study was carried out at Civil Hospital Shillong, Meghalaya selected dialysis centers and nephrology units providing maintenance hemodialysis services.

Study Population

The study population consisted of patients diagnosed with CKF and undergoing regular maintenance hemodialysis. Both diabetic and non-diabetic patients were included.

Sample Size

A total of 50 participants were recruited for the study following G-power software, including both diabetic and non-diabetic CKF patients undergoing maintenance hemodialysis.

Participant Selection

Inclusion Criteria: patients aged 18 years and above, diagnosed cases of CKF/ESRD, patients undergoing regular maintenance hemodialysis for at least 3 months, both diabetic and non-diabetic patients, and patients willing to provide informed consent.

Exclusion Criteria: patients with acute kidney injury, patients with severe cardiovascular instability or active infection, patients with cognitive impairment or inability to provide informed consent, patients with contraindications to hemodialysis, and critically ill or hospitalized patients.

Data Collection Procedure

Blood glucose levels were assessed at three different stages of the hemodialysis session: before initiation of hemodialysis (pre-dialysis), during hemodialysis (mid-session), and immediately after completion of hemodialysis (post-dialysis). Standardized glucometers were used for blood sugar measurements, and regular calibration of devices was ensured to maintain accuracy.

Clinical Variables

The clinical parameters were also recorded as: age and gender, duration of CKF and hemodialysis, presence of diabetes mellitus, use of insulin or oral hypoglycemic agents, and associated comorbidities such as hypertension and cardiovascular disease.

Outcome Measures

The primary outcome measure were: variation in blood glucose levels during hemodialysis sessions, secondary outcome measures included: comparison of glucose fluctuations between diabetic and non-diabetic patients, and frequency of hypoglycemic or hyperglycemic episodes during dialysis.

Statistical Analysis

Data was analyzed using SPSS, verson 24 statistical software. Descriptive statistics including mean, standard deviation and percentage were calculated. Comparative analysis between diabetic and non-diabetic groups in preand post-dialysis conditions were performed using repeated measures ANOVA. A *p*-value of <0.05 was considered statistically significant.

Ethical Considerations

Ethical approval was obtained from the Institutional Ethics Committee prior to commencement of the study. Written informed consent was obtained from all participants. Confidentiality and privacy of participant data was strictly maintained throughout the study.

RESULTS

Table 1 presents the distribution of demographic and clinical characteristics of the patients included in the study. A total of 50 patients undergoing maintenance hemodialysis were enrolled. Gender-wise distribution showed that 23 patients (46.00%) were males and 27 patients (54.00%) were females, indicating a slightly higher proportion of female participants.

Age-group-wise distribution revealed that the majority of patients belonged to the 51–60 years age group (28.00%), followed by 41–50 years (24.00%) and 31–40 years (20.00%). Patients aged 21–30 years constituted 16.00% of the sample, while only 6.00% each were below 20 years and above 61 years of age. This indicates that middle-aged and older adults formed the major proportion of the study population.

With regard to the vintage of dialysis, most patients (56.00%) had been on dialysis for 1–5 years, whereas 26.00% had a dialysis duration of less than 1 year and 18.00% had undergone dialysis for 6–10 years.

Diabetic status-wise distribution demonstrated that 35 patients (70.00%) were diabetic, while 15 patients (30.00%) were non-diabetic, indicating a predominance of diabetic patients among the study participants.

Table 2 compares the blood sugar levels of diabetic and non-diabetic patients in pre-dialytic and post-dialytic conditions. Among diabetic patients, the mean pre-dialytic blood sugar level was 201.68 ± 25.27 mg/dL, which significantly decreased to 155.50 ± 19.88 mg/dL after dialysis. Similarly, in non-diabetic patients, the mean pre-dialytic blood sugar level decreased from 99.80 ± 3.00 mg/dL to 89.53 ± 2.33 mg/dL in the post-dialytic condition.

The statistical analysis showed a highly significant difference between pre- and post-dialytic blood sugar levels, with an F-value of 168.366 and a p-value of 0.001. These findings indicate that hemodialysis resulted in a significant reduction in blood sugar levels in both diabetic and non-diabetic patients, with a more pronounced reduction observed among diabetic individuals.

Table 1: Distribution of characteristics of the patients.

Gender-wise distribution		
Gender	Abs. No.	%age
Male	23	46.00
Female	27	54.00
Total	50	100.00
Age-group-wise distribution (years)		
>20	3	6.00
21-30	8	16.00
31-40	10	20.00
41-50	12	24.00
51-60	14	28.00
<61	3	6.00
Total	50	100.00
Vintage of Dialysis-wise distribution (years)		
>1	13	26.00
1-5	28	56.00
6-10	9	18.00
Total	50	100.00
Diabetic status-wise distribution		
Diabrtic	35	70.00
Non-diabetic	15	30.00
Total	50	100.00

Table 2: Comparison of blood sugar level in pre- and post-dialytic conditions in diabetic and non-diabetic patients (Repeated Measures ANOVA).

Population	**Pre-dialytic patients**		**Post-dialytic patients**		**F-value**	**p-value**
	Mean	**S.D.**	**Mean**	**S.D.**		
Diabetic patients	201.68	25.27	155.50	19.88	168.366	0.001
Non-diabetic patients	99.80	3.00	89.53	2.33		

DISCUSSION

The present study was conducted to compare the variations in blood sugar levels between diabetic and non-diabetic patients with CKF undergoing maintenance hemodialysis. The findings demonstrated a significant reduction in blood glucose levels following hemodialysis in both groups, with a more pronounced decline observed among diabetic patients. These findings support the concept that hemodialysis substantially influences glucose metabolism and insulin dynamics in CKF patients.[14,15] In the present study, the majority of participants belonged to the age group of 51-60 years, and females slightly outnumbered males. Similar demographic patterns have been reported in previous epidemiological studies of CKF and dialysis populations, where advancing age has been recognized as a major risk factor for chronic kidney disease and diabetic nephropathy.[2-4] The predominance of diabetic patients (70.00%) in the present study further supports earlier evidence identifying diabetes mellitus as the leading cause of ESRD worldwide.[6,7,9]

A significant reduction in blood glucose levels was observed after dialysis among diabetic patients, where the mean blood sugar decreased from 201.68 ± 25.27 mg/dL to 155.50 ± 19.88 mg/dL (232.15%). Similarly, non-diabetic patients also exhibited a reduction from 99.80 ± 3.00 mg/dL to 89.53 ± 2.33 mg/dL (10.29%) following dialysis. The repeated measures ANOVA demonstrated a highly significant difference ($F=168.366$; $p<0.001$), indicating that hemodialysis exerts a marked effect on glycemic status. These findings are consistent with the observations of Abe and Kalantar-Zadeh,[14] who reported that hemodialysis may induce glycemic disarrays and hypoglycemic episodes due to glucose loss through dialysate and altered insulin metabolism. Similarly, Abe et al.[22] demonstrated that plasma insulin is partially removed during hemodialysis, thereby contributing to fluctuations in blood glucose levels.

The larger reduction in glucose levels observed among diabetic patients may be explained by impaired insulin sensitivity and altered renal insulin clearance associated with ESRD.[15,16] In patients with kidney failure, reduced degradation of insulin by the kidneys prolongs circulating insulin activity, while dialysis simultaneously improves insulin sensitivity by removing uremic toxins.[18,19] This combined effect may predispose diabetic patients to rapid reductions in blood glucose during dialysis sessions. Morioka et al.[15,27] also reported that glycemic control in diabetic dialysis patients is often unstable because of altered insulin kinetics and dialysis-related metabolic changes.

The present findings also highlight that non-diabetic patients undergoing maintenance hemodialysis are susceptible to reductions in blood glucose levels, although the magnitude of decline was less severe than in diabetic patients. Similar observations were reported by Cryer et al.,[24] who emphasized that hypoglycemic episodes may occur even in non-diabetic individuals under conditions of metabolic stress or altered glucose homeostasis. Hemodialysis-associated metabolic changes, reduced nutritional intake, and impaired hepatic glucose production may contribute to these glucose fluctuations in non-diabetic CKF patients.[23,29] Another important clinical implication of the study is the potential risk of intradialytic hypoglycemia, particularly among diabetic patients. Previous studies have demonstrated that recurrent hypoglycemic episodes during dialysis are associated with increased cardiovascular morbidity, protein catabolism, muscle wasting, and mortality.[20,21] Inaba et al.[31] also identified significant glycemic variability during hemodialysis sessions, suggesting that routine monitoring of blood glucose before, during, and after dialysis is essential for safe clinical management. Furthermore, KDOQI guidelines recommend close glycemic assessment in dialysis patients to prevent metabolic complications and improve patient outcomes.[32]

The findings of the present study are also supported by Riveline et al.,[34] who used continuous glucose monitoring systems and reported significant glycemic variability among diabetic patients undergoing chronic hemodialysis. Williams et al. [28] similarly concluded that fluctuations in glucose control during dialysis may influence long-term morbidity and survival in diabetic ESRD patients. These studies collectively reinforce the importance of individualized glycemic management strategies in maintenance hemodialysis populations.

Despite its significant findings, the present study has several limitations. The sample size was relatively small and confined to selected dialysis centers, which may limit the generalizability of the results. Blood glucose levels were measured only during pre- and post-dialytic periods, whereas continuous intradialytic monitoring could have provided more detailed information regarding glucose fluctuations. Additionally, variables such as dietary intake, dialysate glucose concentration, insulin dosage, duration of diabetes, and coexisting comorbidities were not analyzed separately. Future multicentric studies with larger sample sizes and continuous glucose monitoring systems are recommended to better understand glycemic variations during hemodialysis and their long-term clinical implications.[33,35]

CONCLUSION

The present study concludes that hemodialysis significantly reduces blood sugar levels in both diabetic and non-diabetic patients, with a more pronounced decline observed among diabetic individuals. The findings highlight the substantial impact of dialysis on glucose metabolism and emphasize the importance of regular monitoring of blood sugar levels before and after dialysis sessions. Proper glycemic assessment and individualized management strategies are essential to prevent complications such as hypoglycemia and to improve the overall safety and clinical outcomes of patients undergoing maintenance hemodialysis.

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Competing Interests: The authors declare no competing interests.

Disclaimer (Artificial intelligence)

Authors hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript

REFERENCES

1. KDIGO. Clinical Practice Guideline for the Evaluation and Management of Chronic Kidney Disease. *Kidney Int Suppl.*, 2013; 3(1): 1-150.
2. Levey, A.S. and Coresh, J. Chronic kidney disease. *Lancet.*, 2012; 379(9811): 165-180.
3. Hill, N.R., Fatoba, S.T., Oke, J.L., Hirst, J.A., O'Callaghan, C.A., Lasserson, D.S. and Hobbs, F.D.R. *Global prevalence of chronic kidney disease. PLoS One*, 2016; 11(7): e0158765.
4. Jha, V., Garcia-Garcia, G., Iseki, K., Li, Z., Naicker, S., Plattner, B., Saran, R., Wang, A.Y.M. and Yang, C.W. Chronic kidney disease: global dimension and perspectives. *Lancet.*, 2013; 382(9888): 260-272.
5. Webster, A.C., Nagler, E.V., Morton, R.L. and Masson, P. Chronic kidney disease. *Lancet.*, 2017; 389(10075): 1238-1252.
6. Bell, S., Farran, B., McGurnaghan, S., McCrimmon, R.J., Leese, G.P., Petrie, J.R., McKeigue, P.M., Sattar, N., Wild, S., McKnight, J., Lindsay, R.S., Colhoun, H.M. and Looker, H.C. Risk of progression to dialysis or death in CKD patients with diabetes. *Diabetologia*, 2015; 58(8): 1767-1776.
7. Lok, C.E., Oliver, M.J., Rothwell, D.M. and Hux JE. The growing volume of diabetes-related dialysis. *Kidney Int.*, 2004; 66(4): 1484-1490.
8. Forbes, J.M. and Cooper, M.E. Mechanisms of diabetic complications. *Physiol Rev.*, 2013; 93(1): 137-188.
9. Alicic, R.Z., Rooney, M.T. and Tuttle, K.R. Diabetic kidney disease. *Clin J Am Soc Nephrol.*, 2017; 12(12): 2032-2045.
10. Gross, J.L., de-Azevedo, M.J., Silveiro, S.P., Canani, L.H., Caramori, M.L. and Zelmanovitz, T. Diabetic nephropathy: diagnosis, prevention, and treatment. *Diabetes Care*, 2005; 28(1): 164-176.
11. Rigobon, R., Silveira, M.F., Oliveira, P.D., Ribeiro, R.C.L. and Bastos, M.G. Obesity and chronic kidney disease. *J Bras Nefrol.*, 2015; 37(1): 108-115.
12. Gerrits, E.G., Landman, G.W.D. and Bilo, H.J.G. Improved survival in patients with type 2 diabetes mellitus. *Diabetes Care*, 2015; 38(12): 2197-2203.
13. Daugirdas, J.T., Blake, P.G. and Ing, T.S. Handbook of Dialysis. 5th ed. Philadelphia: Wolters Kluwer, 2015.
14. Abe, M. and Kalantar-Zadeh, K. Haemodialysis-induced hypoglycaemia and glycaemic disarrays. *Nat Rev Nephrol.*, 2015; 11(5): 302-313.
15. Morioka, T., Emoto, M., Tabata, T., Shoji, T., Tahara, H., Kishimoto, H., Ishimura, E. and Nishizawa, Y. Glycemic control in diabetic dialysis patients. *Hemodial Int.*, 2012; 16(Suppl 1): S37-S45.
16. Mak, R.H. Impact of end-stage renal disease and dialysis on glycemic control. *Semin Dial*, 2000; 13(1): 4-8.
17. Shurraw, S., Majumdar, S.R., Klarenbach, S., Manns, B., Bello, A., James, M., Turin, T.C., Hemmelgarn, B., Lin, M. and Tonelli, M. Glycemic control and outcomes in dialysis patients with diabetes. *Clin J Am Soc Nephrol.*, 2011; 6(5): 1041-1048.
18. Sobngwi, E., Ashuntantang, G., Ndounia, E., Dehayem, M., Azabji-Kenfack, M., Kaze, F., Balti, E. and Mbanya, J.C. Effects of hemodialysis on insulin sensitivity and glycemic control. *Diabetes Metab.*, 2010; 36(5): 386-392.
19. Rhee, C.M., Leung, A.M., Kovesdy, C.P., Lynch, K.E., Brent, G.A. and Kalantar-Zadeh, K. Updates on the management of diabetes in dialysis patients. *Semin Dial.*, 2014; 27(2): 135-145.
20. Seaquist, E.R., Anderson, J., Childs, B., Cryer, P., Dagogo-Jack, S., Fish, L., Heller, S.R., Rodriguez, H., Rosenzweig, J. and Vigersky, R. Hypoglycemia and diabetes. *Diabetes Care*, 2013; 36(5): 1384-1395.
21. Pupim, L.B., Heimbürger, O., Qureshi, A.R., Ikizler, T.A. and Stenvinkel, P. Accelerated lean body mass loss in poorly controlled diabetic dialysis patients. *Kidney Int.*, 2005; 68(5): 2368-2374.
22. Abe, M., Kaizu, K. and Matsumoto, K. Plasma insulin is removed by hemodialysis. *Ther Apher Dial.*, 2007; 11(4): 280-287.
23. Kalantar-Zadeh, K. and Fouque, D. Nutritional management of chronic kidney disease. *N Engl J Med.*, 2017; 377(18): 1765-1776.
24. Cryer, P.E., Axelrod, L., Grossman, A.B., Heller, S.R., Montori, V.M., Seaquist, E.R and Service, F.J. Evaluation and management of adult hypoglycemic disorders. *J Clin Endocrinol Metab.*, 2009; 94(3): 709-728.
25. Abe, M., Okada, K. and Soma, M. Dialysate glucose concentration and glycemic control in hemodialysis patients. *Clin Exp Nephrol.*, 2011; 15(3): 392-399.
26. Chang, Y.H. Insulin resistance and whole-body protein catabolism in obesity. *Metabolism*, 2023; 141: 155401.
27. Morioka, T., Emoto, M. and Shoji, T. Glycemic control in diabetic patients on hemodialysis. *Curr Diab Rep.*, 2012; 12(3): 195-202.
28. Williams, M.E., Lacson, E., Teng, M., Lazarus, J.M. and Hakim, R.M. Hemodialysis and glycemic

control in diabetic ESRD patients. *Kidney Int.*, 2006; 70(8): 1503-1509.

29. Hung, A.M. and Ikizler, T.A. Factors affecting glucose metabolism in ESRD. *Semin Dial*, 2011; 24(2): 188-191.
30. Stenvinkel, P., Carrero, J.J., Axelsson, J., Lindholm, B., Heimbürger, O. and Massy, Z. Emerging biomarkers for evaluating cardiovascular risk in CKD patients. *Clin J Am Soc Nephrol.*, 2008; 3(4): 1218-1226.
31. Inaba, M., Okuno, S., Kumeda, Y., Yamada, S., Imanishi, Y., Tabata, T., Okamura, M., Okada, S., Yamakawa, T., Ishimura, E. and Nishizawa, Y. Glycemic variability during hemodialysis. *Kidney Int.*, 2007; 71(7): 715-721.
32. KDOQI. Clinical Practice Guidelines for Diabetes and CKD. *Am J Kidney Dis.*, 2012; 60(5): 850-886.
33. Thomas, M.C. Glycemic exposure, glycemic control, and metabolic outcomes in diabetic dialysis patients. *Semin Dial.*, 2010; 23(3): 243-248.
34. Riveline, J.P., Teynie, J., Belmouaz, M., Franc, S., Dardari, D., Varroud-Vial, M., Vanhille, P., Fouque, D., Laville, M. and Charpentier, G. Glycaemic control in type 2 diabetic patients on chronic haemodialysis. *Diabetes Metab.*, 2009; 35(2): 98-103.
35. Morioka, T., Emoto, M. and Shoji, T. Glycemic control in diabetic patients on hemodialysis. *Curr Diab Rep*, 2012; 12(3): 195-202.