


Research Article

Association of Estimated Glomerular Filtration Rate with HbA1c and Microvascular Complications in Type 2 Diabetes

Salman Tariq^{1,*}, Nabeel Yousaf Chaudhary¹, Talha Ibad², Mahrukh Naeem¹, Jawiria Javid¹, Sajeela Riaz¹

Abstract

Introduction: As a leading cause of death and disability worldwide, diabetes directly affects people and increases their risk of cardiovascular and renal illness. Type 2 diabetes has microvascular complications that are linked to hemoglobin A1c and the estimated glomerular filtration rate.

Material-Methods: This cross-sectional study was conducted in Wazirabad Institute of Cardiology, Gujranwala during June 2021 till December 2021. A total of 200 people with diabetes, both men and women, participated in the study. An electronic form was utilized to collect all demographic information, a history of illness, and blood transfusion history, as well as any other relevant information that could be found. A thorough clinical examination was conducted on each of the participants

Results: A total of 200 patients, both male and female, were surveyed. Study participants were found to have a 24.6 % prevalence of diabetes overall, with 200 people diagnosed with the condition after the study (95 % confidence interval: 21.90 - 27.49). 31.5 % who participated in the research reported having a history of illness (P 0.001).

Conclusion: To conclude that HbA1c and renal function decline in type 2 diabetes patients are directly linked, with the connection being greater in those who have microalbuminuria than in those who have normal kidney function.

Introduction

Every country in the globe has a high rate of diabetes-related mortality due to cardiovascular and renal illness, as well as diabetes itself [1]. Over time, diabetic kidney damage is reduced by long-term glycemic control [2, 3]. High blood pressure exacerbates diabetic microvascular complications. There is a risk of developing microvascular complications, such as renal and retinal disease (BP). In diabetics, the progression of renal injury is aided by factors such as high blood pressure and hyperglycemia [5].

Insulin resistance and decreased pancreatic insulin production are both symptoms of type 2 diabetes mellitus, which is an endocrine infection with a long-term course. Milder microangiopathies and macrovascular problems are associated with type 2 diabetes's persistent hyperglycemia [6, 7]. Chronic hyperglycemia is the most prevalent cause of diabetic retinopathy, the most common microangiopathy. It is also known as diabetic glomerulosclerosis (DGS) or diabetic kidney disease (DN). ESRD is primarily caused by it [7]. GFR and microalbuminuria are two clinically relevant markers

Affiliation:

¹Wazirabad Institute of Cardiology, Gujranwala, Pakistan

²Government Rural Dispensary Chak Qazian Shakargarh, Narowal, Pakistan

*Corresponding author:

Salman Tariq, Wazirabad Institute of Cardiology, Gujranwala, Pakistan.

Email: salmantariq24@yahoo.com

Citation: Salman Tariq, Nabeel Yousaf Chaudhary, Talha Ibad, Mahrukh Naeem, Jawiria Javid, Sajeela Riaz. Association of Estimated Glomerular Filtration Rate with HbA1c and Microvascular Complications in Type 2 Diabetes. Archives of Nephrology and Urology. 6 (2023): 75-77.

Received: May 04, 2023

Accepted: May 11, 2023

Published: May 19, 2023

of renal function. Although microalbuminuria is a key clinical indicator of diabetes, it has also been linked to the development of diabetic ketoacidosis [8]. Microalbuminuria, on the other hand, does not occur concurrently with diabetes. The rate at which the kidneys filter fluid is known as GFR, and it may be approximated using formulae (eGFR). The GFR rises early in diabetes due to high blood sugar levels but falls subsequently due to renal function deterioration. In contrast, microalbuminuria is rising. Changes in GFR emerge before changes in microalbuminuria in diabetics. In truth, several factors impact a person's risk of acquiring diabetes-related problems [9, 10].

Diabetes-related illnesses such as diabetic neuropathy, retinal degeneration, and renal function impairment have been linked to decreased estimated glomerular filtration rate (eGFR). eGFR should be assessed in diabetics. Currently, there is limited information on the relationship between renal disease and microvascular issues [10].

Objectives

As a key goal of the study, researchers will investigate the relationship between glomerular filtration rate and hemoglobin A1c and the development of microvascular problems in type 2 diabetes.

Materials and Methods

This cross-sectional study was conducted in Wazirabad Institute of Cardiology, Gujranwala during June 2021 till December 2021. A total of 200 people with diabetes, both men and women, participated in the study. An electronic form was utilized to collect all demographic information, a history of illness, and blood transfusion history, as well as any other relevant information that could be found. A thorough clinical examination was conducted on each of the participants. When assessing diabetics, researchers carefully looked at their microvascular problems. An RX Imola semi-robotized analyzer from Randox Biosciences used a colorimetric technique to assess glucose levels after at least 8 hours of fasting and 2 hours after dinner.

Biochemical analysis

Microalbumin excretion in the urine, the HbA1c level, and the serum creatinine level were also performed as additional assays. The estimated glomerular filtration rate was calculated using the MDRD method, which was implemented in Matlab (eGFR). MDRD computed the estimated GFR for all type II diabetic patients to assess their stage of renal disease.

Statistical analysis

Collection and analysis of data were carried out with the help of SPSS version 19. The average and standard deviation of each number were provided.

Results

A total of 200 patients, both male and female, were surveyed. Study participants were found to have a 24.6 percent prevalence of diabetes overall, with 200 people diagnosed with the condition after the study (95 percent confidence interval: 21.90 - 27.49). 31.5 percent of participants who participated in the research reported having a history of illness (P 0.001).

95 (83%) patients of the 115 patients without microvascular confusions of had HbA1c < 7.0 (Table 5). 80 (70%) patients of the 115 patients without microvascular entanglements had term < 5 years (table 03).

(Table 2) HbA1c 7.0 was found in 95 of the 115 individuals who did not have microvascular confusions. Among the 115 patients without microvascular entanglements, 80 (%) had a duration of fewer than five years (table 03).

Discussion

Like endothelial cell mischief, microvascular irritants are produced [7]. Our investigation demonstrated a link between high blood pressure, poor glycemic management, and microvascular diseases. Several free risk factors for the microvascular disease have been found. Age, glycated hemoglobin, length of diabetes, and the presence of serum oily

Table 1: Distribution of participants according to disease

Status	Total (%)	P-value
Diabetic	24.6	<0.001
Type-2	32	<0.001
Non diabetic	68.5	<0.001

Table 2: Characterizes the microvascular complications in Diabetes.

Duration of Diabetes	No. of Patients	Percentage
< 5 years	80	70
> 5 years	35	30
Total	115	100

Table 3: Differentiates patients based on HbA1c. Patients without microvascular complications.

Duration of Diabetes	No. of Patients	Percentage
< 5 years	80	70
> 5 years	35	30
Total	115	100

Table 4: Comparison of Platelet indices in two study groups

Platelet index	Normal range	Std. deviation	t	P
MPV (fL)	8.6-15.5 fL	1.63	12.47	0.0001
PDW (fL)	9.0-14 fL	3.15	9.82	0.0001
PCT (%)	0.22-0.24%	0.056	3.21	0.0001

oils are all indications that one is at more risk of developing diabetes than another [11].

Individuals with type 2 diabetes who have a GFR of less than 60 ml/min/1.73 m² have chronic renal impairment when their HbA1c levels change over time [4, 5]. No previous studies have looked at the link between HbA1c fluctuation and an annual decrease in eGFR in people with type 2 and type 1 diabetes. [9] HbA1c CV is an independent predictor of eGFR deterioration in diabetics for the first time. In nephropathy (ACR30 mg/g), the researchers reported a stronger connection between HbA1c fluctuations and impairment of renal function [12] than in normoalbuminuria.

HbA1c variability is more easily linked to microvascular problems than short-term glucose fluctuations. Chronic renal damage in persons with type 2 diabetes has been associated with variations in HbA1c [1–2]. In contrast to other recognized predictors of diabetic nephropathies, such as the mean HbA1c, Penno et al. found SD-HbA1c to be related to albuminuria. In the absence of established GFR predictors, albuminuria and CV-HbA1c were shown to be directly related to GFR decline [14].

Conclusion

Compared to type 2 diabetes patients with normal kidney function, those who had microalbuminuria had a higher hemoglobin A1c. Type 2 diabetics with low eGFR had lower HbA1c levels, but they were more likely to have microvascular complications.

References

1. Buch A, Kaur S, Nair R, et al. Platelet volume indices as predictive biomarkers for diabetic complications in type 2 diabetic patients. *J Lab Physicians* 9 (2017):84–88.
2. Elsherbiny IA, Shoukry A, Tahlawi MAE. Mean platelet volume and its relation to insulin resistance in non-diabetic patients with the slow coronary flow. *J Cardiol* 59 (2012): 176–181.
3. Agrawal A, Kumar S, Bhagwati J. Correlation of platelet indices with a clinical profile in elderly patients: A study in a rural teaching hospital. *Ann Med Health Sci Res* 8 (2018): 163–169.
4. Zuberi BF, Akhtar N, Afsar S. Comparison of mean platelet volume in patients with diabetes mellitus, impaired fasting glucose, and non-diabetic subjects. *Singapore Med J* 49 (2008): 114–116.
5. Jindal S, Gupta S, Gupta R, et al. Platelet indices in diabetes mellitus: Indicators of diabetic microvascular complications. *Hematology* 16 (2011): 86–89.
6. Nazish Waris, Ambreen Shiraz, Muhammad Azfar Tanveer, et al. Association of Estimated Glomerular Filtration Rate with HbA1c and Microvascular Complications in Type 2 Diabetes. *Pakistan Journal of Medical Research* 59 (2020): 8-14.
7. Babaliche P, Nadpara RA, Maldar A. Association Between Estimated Glomerular Filtration Rate and Microvascular Complications in Type II Diabetes Mellitus Patients: A 1-Year Cross-Sectional Study. *J Natl Med Assoc* 111 (2019): 83-87.
8. Mifune M, Togane M. High frequencies of diabetic micro- and macroangiopathies in patients with type 2 diabetes mellitus with decreased estimated glomerular filtration rate and normoalbuminuria. *Nephrol Dial Transplant* 25 (2010):1161-1167.
9. Takenouchi, A., Tsuboi, A., Terazawa-Watanabe, et al. Direct association of visit-to-visit HbA1c variation with annual decline in estimated glomerular filtration rate in patients with type 2 diabetes. *Journal of diabetes and metabolic disorders*, 69 (2015).
10. Moon J, Lee CJ, Lee SH, et al. The Impact of Diabetes Mellitus on Vascular Biomarkers in Patients With End-Stage Renal Disease. *Yonsei Med J* 58 (2017): 75–81.
11. American Diabetes Association. Microvascular Complications and Foot Care: Standards of Medical Care in Diabetes 2021. *Diabetes Care* 44 (2021): S151–167.
12. Skupien J, Warram JH, Smiles AM, et al. The Early Decline in Renal Function in Patients With Type 1 Diabetes and Proteinuria Predicts the Risk of End-Stage Renal Disease. *Kidney Int* 82 (2012): 589–597.
13. B. Satirapoj, K. Aramsaowapak, T. Tangwonglert, et al. “Novel tubular biomarkers predict renal progression in type 2 diabetes mellitus: a prospective cohort study,” *Journal Diabetes Research* 1(2016): 1–9
14. G. Tramonti and Y. S. Kanwar. “Review and discussion of tubular biomarkers in the diagnosis and management of diabetic nephropathy,” *Endocrine* 43(2013): 494–503