

Frequency of Albuminuria in Diabetic Patients Presenting with Macrovascular Complications

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ABSTRACT

Objective: The purpose of this research paper is to determine the frequency of albuminuria in diabetic patients presenting with macrovascular complications.

Study Design: Descriptive study

Place and Duration: The study was conducted at the Medicine department of Fauji Foundation Hospital, Rawalpindi for duration of six months from December 2020 to May 2021.

Methods: Total hundred patients of both genders had diabetic mellitus with macrovascular complications were presented in this study. Patients were aged between 18-60 years. Patients' detailed demographics including age, sex, body mass index and blood pressure were recorded after taking informed written consent. Two tests were performed for albuminuria, one was heating method of albumin detection in a test tube and second was dipstick method. An albumin level more than 30mg was judged significant in a hospital laboratory study using 24-hour urine protein samples. SPSS 25.0 version was used to analyze the complete data.

Results: Mean age of the patients was 45.19±9.88 years with mean BMI 29.18±6.71 kg/m². Majority of the patients 58 (58%) were males and 42 (42%) were females. Mean duration of diabetes was 4.3±4.8 years. 17 (17%) had diabetes type 1 and 83 (83%) cases had diabetes type-2. Mean systolic and diastolic blood pressure of patients were 148.6±29.8 and 95.4±14.52 mmHg. Prevalence of albumin was found among 89 (89%) patients by using heating method of urine in test tube and 45 (45%) was found by using dipstick method. We found that most of the patients had troponin-T positive myocardial infarction 56 (56%), followed by ischaemic cerebrovascular accident (CVA) 27 (27%) and 17 (17%) patients had haemorrhagic cerebrovascular accident (CVA).

Conclusion: In this research we concluded that frequency of albumin in diabetic patients with macrovascular complications were significantly high. Diabetes mellitus is one of the key risk factor predicting macrovascular consequences such as myocardial infarction and cardiovascular illnesses.

Keywords: Diabetes, Albuminuria, Macrovascular Complications, CVA, Myocardial Infarction

INTRODUCTION

By 2030, diabetes mellitus is anticipated to reach pandemic proportions over the world, with the majority of the increase occurring in low- and middle-income nations. There is a global increase in both type 1 and type 2 diabetes mellitus prevalence, but in nations becoming more industrialized, type 2 diabetes is increasing at a much quicker rate due to increased obesity and lower levels of physical activity. Diabetic complications would impact an estimated 380 million people worldwide by 2025, according to recent estimates. As previously said, diabetics are more likely to suffer from a wide range of serious health problems such heart and blood vessel diseases that can lead to premature death and blindness as well as kidney difficulties that can lead to amputation and fractures. [4] The microalbuminuria that's been discovered recently is one of these new vascular dangers. Men with urine albumin release rates or albumin:creatinine ratios between 30 and 299 mg/day and between 25 mg/mmol and between 3.5 and 25 mg/mmol in males have been shown to have micro albuminuria. Microalbuminuria is an independent marker of endothelial dysfunction and is occasionally utilized as a warning sign for kidney disease in the early stages. Several prevalent

vascular risk factors interact with it. People believe that examining kidney structure with this easy test can provide a window into the systemic vasculature, as leaky renal vessels indicate a person's overall vulnerability to harm to organs due to increased vascular permeability and/or vascular permeability. [7] Diabetics have a 7 percent prevalence of cerebrovascular disease, 2-3 times that of the general population, with a deadly stroke as a possible outcome. In diabetes mellitus, malfunction and inflammation of endothelial cells are critical factors in the development of a stroke. [9] Albuminuria is a key stroke indicator since it is an endothelial dysfunction and subclinical atherosclerosis symptom. Albuminuria (around 34% of total protein excretion) is common in diabetics, which indicates an elevated risk of stroke development¹⁰. Between 10 and 44 percent of African diabetes patients [10] had microalbuminuria, but in the UAE the number rose to 61 percent. When it came to diabetic patients in Cameroon's tertiary care hospital in 1999, researchers found that 53.1% had microalbuminuria, which was linked to diabetic retinopathy. [11] Despite these findings, the cost of routine microalbuminuria testing in Sub-Saharan Africa (SSA) prevents many patients with diabetes from testing

their own urine for protein levels using dipsticks instead of a blood test.

The goal of this study was to find out how often albuminuria is in diabetics who have developed macrovascular problems.

MATERIAL AND METHODS

This descriptive study was conducted at the Medicine department of Fauji Foundation Hospital, Rawalpindi for duration of six months from December 2020 to May 2021. The study was comprised of hundred patients of both genders. Detailed demographics of enrolled cases including age, sex, body mass index and blood pressure were calculated after taking informed written consent. Hypertensive, smoker, atrial fibrillation, chronic renal failure and cirrhosis patients with a past history were eliminated from the study.

Patients were aged between 18-60 years. Two tests were performed for albuminuria, one was heating method of albumin detection in a test tube and second was dipstick method. In first method test tube filled with urine was heated at top with little inclination till boiling. Then few drops of full strength nitric acid were added and any visible coagulum left at surface was regarded as albumin in urine sample. An albumin level more than 30mg was judged significant in a hospital laboratory study using 24-hour urine protein samples. SPSS 25.0 version was used to analyze the complete data. Chi-square test was used to compare frequency of albumin among male and female. Frequencies and percentages were used for categorical variables.

RESULTS

Mean age of the patients was 45.19±9.88 years with mean BMI 29.18±6.71 kg/m². Majority of the patients 58 (58%) were males and 42 (42%) were females. Mean duration of diabetes was 4.3±4.8 years. 17 (17%) had diabetes type 1 and 83 (83%) cases had diabetes type-2. Mean systolic and diastolic blood pressure of patients were 148.6±29.8 and 95.4±14.52 mmHg.(Table 1)

Table 1: Detailed demographics of enrolled patients

Variables	Frequency (n=100)	%age
Mean age (years)	45.19±9.88	
Mean BMI (kg/m ²)	29.18±6.71	
Gender		
Male	58	58
Female	42	42
Blood Pressure		
Systolic (mmHg)	148.6±29.8	
Diastolic (mmHg)	95.4±14.52	
Type of Diabetes		
I	17	17
II	83	83

Table 2: Frequency of albumin among diabetic patients by using 2-methods

Albuminuria	Frequency (n=100)	%age
Heating Method		
Yes	89	89
No	11	11
Dipstick Method		
Yes	45	45
No	55	55

Prevalence of albumin was found among 89 (89%) patients by using heating method of urine in test tube and 45 (45%) was found by using dipstick method.(Table 2)

We found that most of the patients had troponin-T positive myocardial infarction 56 (56%), followed by ischaemic cerebrovascular accident (CVA) 27 (27%) and 17 (17%) patients had haemorrhagic cerebrovascular accident (CVA). (Table 3)

Table 3: Association of macrovascular complications among diabetic patients

Variables	Albumin	Non-Albumin
Macrovascular Complications		
Myocardial infarction	50 (50%)	6 (6%)
Ischaemic cerebrovascular accident	24 (24%)	3 (3%)
Haemorrhagic cerebrovascular accident	15 (15%)	2 (2%)
Total	89 (89%)	11 (11%)

By using chi-square test frequency of albuminuria was compared among males and females. (Table 4)

Variables	Albumin (n=89)	Non-Albumin (n=11)
Gender		
Male	50 (56.2%)	8 (72.7%)
Female	39 (43.2%)	3 (27.3%)
Total	89 (100)	11 (100%)

DISCUSSION

Diabetes mellitus is a prevalent disease that affects people all over the world, and it has a high fatality rate. [12] Atherogenesis, ischemic heart disease, and other diabetic vascular illnesses have all been linked to albuminuria in various investigations. [13] Several studies have shown a relationship between diabetic nephropathy and diabetic retinopathy, as well as coronary artery disease and neuropathy, as well as peripheral vascular disease. [14]

In this descriptive study 100 diabetic patients with macrovascular complications were presented. Mean age of the patients was 45.19±9.88 years with mean BMI 29.18±6.71 kg/m². Majority of the patients 58 (58%) were males and 42 (42%) were females. These findings were comparable to the previous studies.[15,16] Mean duration of diabetes was 4.3±4.8 years. 17 (17%) had diabetes type 1 and 83 (83%) cases had diabetes type-2. Mean systolic and diastolic blood pressure of patients were 148.6±29.8 and 95.4±14.52 mmHg. [17] Prevalence of albumin was found among 89 (89%) patients by using heating method of urine in test tube and 45 (45%) was found by using dipstick method. According to research, albuminuria is closely linked to various macrovascular problems in Indian subcontinent patients as well. [18] Among diabetics, albuminuria is common (affecting 35 percent of them) 13 and indicates a higher risk of developing serious macrovascular problems. [19]

We found that most of the patients had troponin-T positive myocardial infarction 56 (56%), followed by ischaemic cerebrovascular accident (CVA) 27 (27%) and 17 (17%) patients had haemorrhagic cerebrovascular accident (CVA). [17,20] Subjects with type 2 diabetes and microalbuminuria died at higher rates, according to Mogensen et al. [21]. It is hypothesized that hypertension

raises glomerular filtration pressure and, in doing so, alters the amount of glomerular permeability necessary for albumin ultrafiltration [21]. Microalbuminuria has been found to be associated with elevated aortic and pulmonary artery pressures in most studies [22-24]. This study confirms the importance of maintaining optimal blood pressure control [25] and emphasizes the potential importance of routine MA screening, particularly in diabetic patients with concomitant hypertension.

Despite the fact that diabetes is more common in the elderly, it is on the rise across all races and age categories, especially in young adults, where macro-vascular disease is the leading cause of mortality (>75 percent).[26] As compared to the general population, diabetics have a 7 percent prevalence of cerebro-vascular disease, which increases the risk of death by 2–3 times, while 18 percent of those with coronary artery involvement have a 3–5 times higher risk of dying from heart disease, and 4.5 percent of those who suffer from intermittent claudication have a 15-fold higher risk of having an amputation as compared to the general population.

Diabetic individuals with macro-vascular problems had significantly higher levels of albuminuria. As a result, albuminuria in diabetic individuals can be viewed as a harbinger of imminent diabetes-related macrovascular problems. In contrast to the heating method of albumin detection, which detected albumin in the urine of 89% of diabetic patients with macro-vascular complications, routine dipstick examination is not an effective test for detecting albuminuria in diabetic patients. Only 45% of patients had a positive result for albumin in their urine on dipstick. [17]

CONCLUSION

In this research we concluded that frequency of albumin in diabetic patients with macrovascular complications were significantly high. Diabetes mellitus is one of the key risk factor predicting macrovascular consequences such as myocardial infarction and cardiovascular illnesses.

REFERENCE

- Wild S, Roglic G, Green A, Sicree R, King H. Global Prevalance of Diabetes: Estimates for the year 2000 and projection for 2030. *Diabetes Care* 2004; 27:1047–53.
- Cali AMG, Caprio S. Prediabetes and type 2 diabetes in youth: an emerging epidemic disease? *Curr Opin Endocrinol Diabetes Obesity* 2008;15:123–7.
- Ramachandran A, Snehalatha C. Current scenario of diabetes in India. *J Diabetes* 2009;1:18–28.
- Iqbal F, Naz R. Pattern of diabetes mellitus in Pakistan; An overview of the problem. *Pak J Med Res* 2005;44:59–64.
- Stefanie Keymel, Yvonne Heinen, Jan Balzer, Tienush Rassaf, Malte Kelm, Thomas Lauer, and Christian Heiss. Characterization of macro-and microvascular function and structure in patients with type 2 diabetes mellitus. *Am J Cardiovasc Dis* 2011;1: 68–75.
- Stefanie Keymel, Yvonne Heinen, Jan Balzer, Tienush Rassaf, Malte Kelm, Thomas Lauer, and Christian Heiss. Characterization of macro-and microvascular function and structure in patients with type 2 diabetes mellitus. *Am J Cardiovasc Dis* 2011;1: 68–75.
- Ovbiagele B. Microalbuminuria: risk factor and potential therapeutic target for stroke? *J Neurol Sci.* 2008;271:21–28.
- Eghan BA, Frempong MT, Adjei-Poku M. Prevalence and predictors of microalbuminuria in patients with diabetes mellitus: a cross-sectional observational study in Kumasi, Ghana. *Ethn Dis.* 2007;17:726.
- Lutale JJK, Thordarson H, Abbas ZG, Vetvik K. Microalbuminuria among type 1 and type 2 diabetic patients of African origin in Dar Es Salaam, Tanzania. *BMC Nephrol.* 2007;8:2
- Al-Maskari F, El-Sadig M, Obineche E. Prevalence and determinants of microalbuminuria among diabetic patients in the United Arab Emirates. *BMC Nephrol.* 2008;9:1
- Sobngwi E, Mbanya JC, Moukouri EN, Ngu KB. Microalbuminuria and retinopathy in a diabetic population of Cameroon. *Diabetes Res Clin Pract.* 1999;44:191–6.
- Lee M, Saver JL, Chang KH, Ovbiagele B. Level of albuminuria and risk of stroke. *Cerebrovasc Dis* 2010;30:464-9.
- J Chowdhur, N Sultana, S Ahmed, et al. Microalbuminuria as a Predictor of Short-Term Mortality in Acute Ischemic Stroke. *Bangladesh J Med Biochem* 2012; 5(1): 16-19
- Beamer NB, Coull BM, Clark WM, Wynn M. Microalbuminuria in ischemic stroke. *Arch Neurol* 1999; 56:699-702.
- MASOOD UZ ZAMAN BABAR1 , SUNIL DAT MAHESHWARI2 , MUJTABA SHAH3 , GHULAM FAREED. Frequency of Albuminuria in Diabetic Patients Presenting with Stroke. *P J M H S Vol. 14, NO. 4, OCT – DEC 2020*
- Umamura T, Senda J, Fukami Y, Mashita S, Kawamura T, Sakakibara T, et al. Impact of albuminuria on early neurological deterioration and lesion volume expansion in lenticulostriate small infarcts. *Stroke.* 2014;45(2):587–90
- Muhammad Sohail, Fozia Fatima, Sadia Fatima, Shahbaz Ali Khan, Syed Abbas Anwar, Muhammad Adeel Alam, Munir Ahmad Abbasi. FREQUENCY OF ALBUMINURIA IN DIABETIC PATIENTS PRESENTING WITH MACROVASCULAR COMPLICATIONS. *J Ayub Med Coll Abbottabad* 2014;26(2)
- Chandy A, Pawar B, John M, Isaac R. Association between diabetic nephropathy and other diabetic microvascular and macrovascular complications. *Saudi J Kidney Dis Transpl* 2008;19:924–8
- Satchell SC, Tooke JE. What is the mechanism of microalbuminuria in diabetes: a role for the glomerular endothelium? *Diabetologia* 2008;51:714–25.
- Efundem, N.T., Assob, J.C.N., Feteih, V.F. et al. Prevalence and associations of microalbuminuria in proteinuria-negative patients with type 2 diabetes in two regional hospitals in Cameroon: a cross-sectional study. *BMC Res Notes* 10, 477 (2017).
- Mogensen CE. Microalbuminuria and hypertension with focus on type 1 and type 2 diabetes. *J Intern Med.* 2003;254:45–66
- Eghan BA, Frempong MT, Adjei-Poku M. Prevalence and predictors of microalbuminuria in patients with diabetes mellitus: a cross-sectional observational study in Kumasi, Ghana. *Ethn Dis.* 2007;17:726
- Lutale JJK, Thordarson H, Abbas ZG, Vetvik K. Microalbuminuria among type 1 and type 2 diabetic patients of African origin in Dar Es Salaam, Tanzania. *BMC Nephrol.* 2007;8:2.
- Afkhami-Ardekani M, Modarresi M, Amirchaghmaghi E. Prevalence of microalbuminuria and its risk factors in type 2 diabetic patients. *Indian J Nephrol.* 2008;18:112–7.
- Choukem S-P, Dzudie A, Dehayem M, Halle M-P, Doualla M-S, Luma H, et al. Comparison of different blood pressure indices for the prediction of prevalent diabetic nephropathy in a sub-Saharan African population with type 2 diabetes. *Pan Afr Med J.* 2012;11:67.
- Begley D, Cullen S, Davies C, Dhinoja M, Earley M, Graham J, et al. Drugs for heart: Ranoxoline. In: Ramrakha PS, Hill J. editors. *Oxford handbook of cardiology.* New York: Oxford university press Inc; 2006.p. 140–1