Diabetes Case Reports

Research Article **Open Access**

Association of Microalbuminuria with HbA1c in Patients of Type II Diabetes Mellitus in Different Age Groups and Genders

Muhammad Bilal Habib[1]* and Noreen Sher Akbar[2]

[1]College of Medical Laboratory Technology, National Institute of Health, Islamabad, Pakistan

[2]National University of Sciences and Technology, Islamabad, Pakistan

***Corresponding author:** Muhammad Bilal Habib, College of Medical Laboratory Technology, National Institute of Health, Islamabad, Pakistan, Tel: 923348966276; E-mail: bilalhabib62@gmail.com

Abstract

As a result of defects in insulin secretions, insulin actions or both, the glucose level raised in blood and it can lead to hyperglycaemia, and consistent hyperglycaemia leads to the Diabetes mellitus that is metabolic syndrome. There are two types of Diabetes mellitus, Type I Diabetes mellitus and type I Diabetes mellitus. The most common is Type II Diabetes mellitus and the patients who suffers from type II Diabetes mellitus their renal function will eventually have progressive deterioration. Neuropathy is most common life-threatening complication in Diabetes; it can lead to uraemia and death which is treated by Dialysis and renal transplantation. There are also some other complications like retinopathy, cardiovascular diseases etc. Our aim in this study was to Determine Microalbuminuria and HbA1c level in Diabetic Patients. To find association of hyperglycaemia and HbA1c level on the basis of defined parameters. To compare the urine microalbumin value of the patient having good control of HbA1c with the urine microalbumin value of the patients with uncontrolled HbA1c level. 100 samples were included in study. We have analysed HbA1c level in blood and micro albumin in urine. All the patients that had HbA1c level more than 6.0 and suffering from type II diabetes mellitus were included in study. 80 patients of type 2 diabetes mellitus which have mean HbA1c level of 10.309%, mean urine Albumin 105 mg/dl (normal less than 20 mg/dl). The main objective of study by finding the relationship of diabetes with urine albumin of the body. We can estimate the possible threat of renal failure in patients with type II diabetes. Microalbuminuria showed little or no concern with age and highly concerned with HbA1c level of type II diabetic patients. Overall males were more prone to Microalbuminuria according to our findings.

Keywords: Glycated hemoglobin test; Glycohemoglobin; Diabetes Mellitus (DM); Mobile phase; Ethylene Diamine Triacetic Acid (EDTA)

Introduction

DM is metabolic syndrome having worldwide distribution and it is characterized by hyperglycaemia and impaired insulin metabolism [1]. Due to kidneys damage in type II diabetes mellitus there are proteins present in urine, and urine microalbumin test is a test to detect very small levels of a blood protein (albumin) in your urine, because albumin is one of the first protein that appears in urine when kidneys are damaged. (Mayo clinic Report).

According to King et al., the incidence of diabetes is expected to increase 122% worldwide (from 135 million to 300 million people) between 1998 and 2025. Out of which type 2 Diabetic patients will be 90%. For more than 25 years ago and until now estimation of glycocylated hemoglobin (HbA1c) is the gold standard methods in the diagnosing of chronic hyperglycemia and altered glucose metabolism 6.5% HbA1c levels in diabetes is considered as good control value and 7.5% will be considered at high risk [2-4].

Diabetic nephropathy is characterized by proteinuria. Quantitative estimation of urinary protein is used for the measurement of degree of nephropathy and progression of renal failure. In coronary heart disease proteinuria is associated with diabetes and it also reflects vascular injury [5]. Above the threshold value of (30-300 mg/day or 20-200 µg/min in 24 hours urine collection) microalbuminuria is characterized by secretion of microalbumin in urine [6]. When urine albumin concentration increases above normal this condition is called microalbuminuria and it cannot be detectable by dip-stick method, protein-urea represents high level of albumin which can be detectable. Total urine protein is also used as a diagnostic tool for nephropathy but the estimation of urine microalbumin is considered as gold standard method for the diabetic nephropathy.

Increase micro- and macroalbuminuria, is strong predictive of higher HbA1c levels gives strong evidence that development of nephropathy and albuminuria may results due to the poor control on blood glucose levels. UKPDS data analysis suggested that for a 1% reduction in HbA1c (HbA1c 7.5-6.6%), there is significantly decrease in Microalbuminuria and revert to normal than in those who remained with high HbA1c levels (HbA1c7.7%) and microalbuminuria or developed proteinuria (HbA1c8.9) [7]. In this study we have determined the Correlation between HbA1c and microalbuminuria, which can lead to diabetic neuropathy in Type II DM [8-17].

Materials and Methods

Study design and duration

This study was cross-sectional and last for the duration of 3 months.

Setting

The research study was done in the Haematology and Chemistry Department of Islamabad Diagnostic Center, Islamabad.

Sample size

A total 100 samples were studied.

Sampling technique

Non-probability sampling technique was followed.

Inclusion criteria

All samples with diabetes type II (Insulin Dependent Diabetes Mellitus) patients were included with HbA1c level>6.0%.

Exclusion criteria

All samples from other type of diabetic and non-diabetic patients were excluded.

Sample collection and identification

Blood sample of patients suffering from type II diabetes mellitus were collected in EDTA blood bottle to measure the HbA1c levels. Urine sample of patients suffering from type II diabetes mellitus were collected in sterile container to measure the microalbumin levels.

Urine micro albumin analysis

It was very simple test, we have collected random urine samples, there was not fasting state is required and after collection we have transported the sample in to the laboratory under sterile conditions after physical and chemical examination, Micro Albumin Analysis was done on Architect Ci4100, a state of art Chemistry Analyzer from Abbot Diagnostics.

Principle

Urine Micro Albumin Analysis of the patients was determined by spectrophotometrically on Beer-Lambert's law.

HbA1c analysis

At least 3 ml blood sample were collected in EDTA bottle for the determination of HbA1C level.

Haemolytic sample, lipemic sample, icteric samples were excluded from the study. HbA1c have been measured according to standard protocol by using Architect Ci4100, a state of art Chemistry Analyzer from Abbot Diagnostic.

Data analysis

Data was analysed by using SPSS version 16. SPSS is short for statistical package for the social sciences. It was used for statistical analysis.

Results

Total 100 samples were taken from diabetic type II patients and the values of HbA1c were high and there are high levels of microalbumin in urine samples. Results of HbA1c and Micro albumin in urine were recorded and interpreted. The mean level of HbA1c was 10.309%.

The mean Urine albumin level was 105 mg/dl. Males were more affected than females. There was strong relationship present between HbA1c and microalbuminuria.

One sample T-test

It is applied to determine the mean of the age, HbA1c and microalbuminuria values in selected population by using SPSS software (Table 1).

Variables	Mean Difference	95% Confidence Interval of the Difference	
		Lower	Upper
HbA1c (%)	10.309	9.87	10.75
Age (Y)	52.192	49.93	54.45
Microalbuminuria (mg/dL)	105.156	47.95	162.36

Table 1: Mean of the age, HbA1c and microalbuminuria values using SPSS software.

Gender, HbA1c and microalbuminuria

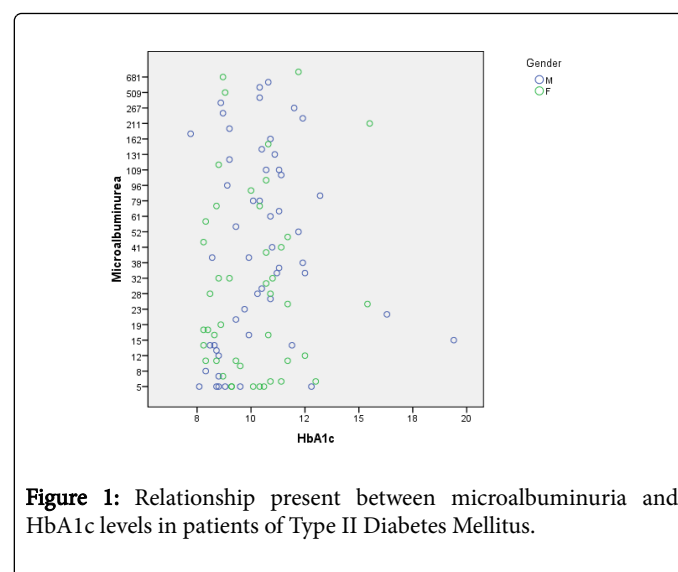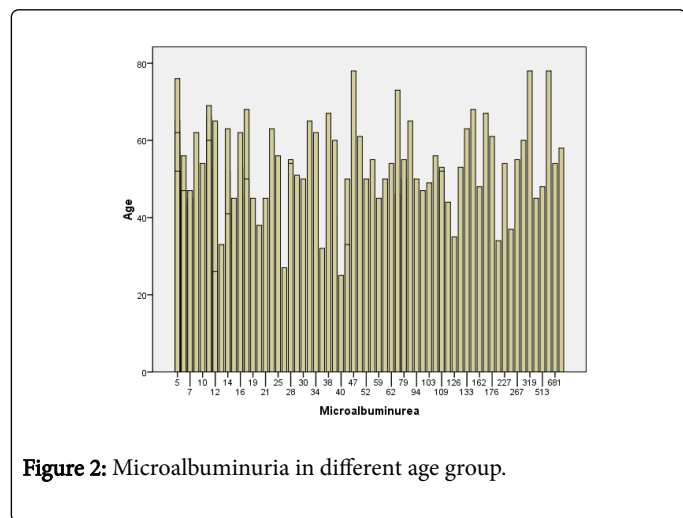The blue circle showing male population of the study and green circle showing female population.

Figure 1: Relationship present between microalbuminuria and HbA1c levels in patients of Type II Diabetes Mellitus.

Mostly males had micro albuminemia above 40 mg/dl and HbA1c level more than 8%, it is the indication that patients have poor diabetic control and this is the indication that the strong relationship present between microalbuminuria and HbA1c levels in patients of Type II Diabetes Mellitus (Figure 1).

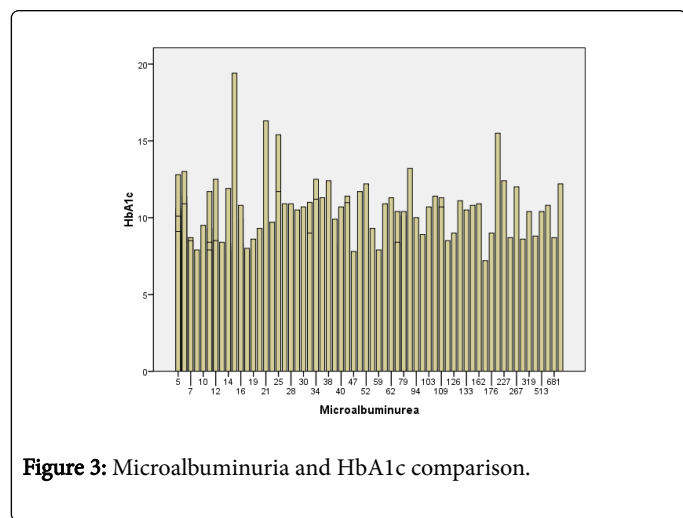## Microalbuminuria in different age group

This chart showing that patients of any age group can be affected by microalbuminuria either they belong to young and old age. So, conclusion is that microalbuminuria occurs in any stage of life due to

kidneys damage especially in diabetic patients who have poor diabetic control and high HbA1c levels (Figure 2).

Figure 2: Microalbuminuria in different age group.

Microalbuminuria and HbA1c comparison

This graph bars showing the relationship between HbA1c and microalbuminuria, in which many patients have HbA1c levels mean value is 10% and most values are >8% with high levels of microalbuminuria (Figure 3).

Figure 3: Microalbuminuria and HbA1c comparison.

Discussion

Patients that have hyperglycaemia they are more prone to the risk of Diabetes mellitus because of poor control on glucose levels in blood. This study shows that patients who have poor control on diabetes they have high HbA1c levels >8% and mean value is >10%. There is one more finding of the study is that there are high levels of microalbuminuria in patients that have high HbA1c levels. The mean value of microalbuminuria is 105 mg/dl, so there is strong relationship between the HbA1c levels and microalbuminuria in Type II Diabetes Patients. There should be control on sugar levels in blood that can lead to hyperglycaemia and then Diabetes mellitus also. Microalbuminuria occurs in any age group of the patients because of kidneys damage due to Type II Diabetes Mellitus.

Conclusion

Results show that in 80 patients of type 2 diabetes mellitus which have mean HbA1c level of 10.309%, mean urine Albumin 105 mg/dl (normal less than 20 mg/dl). This shows the association between High levels of microalbuminuria associated with HbA1c in patients suffering from Type II Diabetes mellitus. This study provides evidence in numbers to justify the likelihood of enrolment of diabetic patients in kidney disorder leading to renal failure. By finding the relationship of diabetes with urine albumin with HbA1c we can estimates the possible threat of renal failure in patients with type II diabetes.

However, results show that Microalbuminuria show little or no concern with age but there is strong relationship with HbA1c level of type II diabetic patients as showed in above graphs that when there is High HbA1c levels than its effects on their microalbumin levels in urine. Overall males are more prone to Microalbuminuria according to our findings.

References

1. Defronzo RA (2004) Pathogenesis of type 2 diabetes mellitus. Med Clin North Am 88: 787-835.
2. King H, Aubert RE, Herman WH (1998) Global burden of diabetes, 1995-2025: Prevalence, numerical estimates, and projections. Diabetes Care 21: 1414-1431.
3. Nathan DM, Turgeon H, Regan S (2007) Relationship between glycated haemoglobin levels and mean glucose levels over time. Diabetologia; 50: 2239-2244.
4. De-Cosmo S, Bacci S, Piras GP, Cignarelli M, Placentino G, et al. (2000) High prevalence of risk factors for cardiovascular disease in parents of IDDM patients with albuminuria. Diabetologia 40: 1191-1196.
5. BMJ (1993) Risk factors for development of microalbuminuria in insulin dependent diabetic patients: A cohort study. Microalbuminuria Collaborative Study Group, UK 306: 1235-1239.
6. Stratton IM, Adler AI, Neil HA, Matthews DR, Manley SE, et al. Association of glycaemia with macrovascular and microvascular complications of type 2 diabetes (UKPDS 35): Prospective observational study. BMJ 321: 405-12.
7. Vijay V, Snehalatha C, Ramachandran A, Viswanathan M (1994) Prevalence of proteinuria in non-insulin dependent diabetes. J Assoc Physicians India 42: 792–794.
8. Huraib S, Abu-Aisha H, Sulimani RA, Famuyiwa FO, Al-Wakeel J, et al. (1995) The pattern of diabetic nephropathy among Saudi patients with noninsulin-dependent diabetes mellitus. Ann Saudi Med 15: 120–124.
9. Varghese A, Deepa R, Rema M, Mohan V (2001) Prevalence of microalbuminuria in type 2 diabetes mellitus at a diabetes centre in southern India. Postgrad Med J 77: 399–402.
10. Adler AI, Stevens RJ, Manley SE, Bilous RW, Cull CA (2003) Development and progression of nephropathy in type 2 diabetes: The United Kingdom Prospective Diabetes Study (UKPDS 64). Kidney Int.63: 225-232.
11. Thorp ML (2005) Diabetic nephropathy: Common questions. Am Fam Physician 72: 96-99.
12. Laupacis AP, Keownand PN, Pus N (1996) A study of the quality of life and cost-utility of renal transplantation. Kidney Int 50: 235-242.
13. Susman JL, Helseth LD (1997) Reducing the complications of type II diabetes a patient centered approach. J. Am Fam Physician 2: 1.
14. Remuzzi GA, Schieppati A, Ruggenenti P (2002) Clinical practice: Nephropathy in patients with type II diabetes. N Engl J Med 346: 1145-1151.
15. Vargheese A, Deepa R, Reema M, Vohan V (2001) Prevalence of microalbuminuria in type 2 diabetes mellitus at a diabetes centre in southern India. Postgrad Med J 77: 399–402.

16. Toto RD (2004) Microalbuminuria definition, detection and clinical significance. J ClinHypertens 6: 2-7.

17. Hernandez D, Espejo-Gil A, RosaBernal-Lopez M, Mancera-Romero J (2013) Association of HbA1c and cardiovascular. BMC nephrology 14: 151.