DOI: https://doi.org/10.54393/pbmj.v5i12.828

PAKISTAN BIOMEDICAL JOURNAL

https://www.pakistanbmj.com/journal/index.php/pbmj/index

Volume 5, Issue 12 (Decemeber 2022)

Original Article

Evaluation of Levels of Urea and Creatinine, Comorbidity and Socioeconomic Status in Diabetic Patients

Hina Asif[1*], Tehreem Anwar[2] and Sadia Sarwar[3]

[1]Shaukat Khanum Memorial Cancer Hospital, Lahore, Pakistan
[2]Department of Biotechnology, Lahore College for Women University, Lahore, Pakistan
[3]Department of Zoology, Lahore College for Women University, Lahore, Pakistan

ARTICLE INFO

Key Words:

Nephropathy, Diabetes, Renal diseases, Hyperglycaemia, Frequency, Comorbidity

How to Cite:

Asif, H., Anwar, T. ., & Sarwar, S. . (2022). Evaluation of Levels of Urea and Creatinine, Comorbidity and Socioeconomic Status in Diabetic Patients: Urea/Creatinine, Comorbidity & Socioeconomic Status in Diabetic Patients. Pakistan BioMedical Journal, 5(12). https://doi.org/10.54393/pbmj.v5i12.828

***Corresponding Author:**

Hina Asif
Shaukat Khanum Memorial Cancer Hospital, Lahore, Pakistan
hinaasif657@gmail.com

Received Date: 16th October, 2022
Acceptance Date: 8th December, 2022
Published Date: 31st December, 2022

ABSTRACT

Nephropathy occurs in 10±40% of patients who have Type I (insulin-dependent) diabetes mellitus [1±3]. The development of diabetic nephropathy cannot be explained by poor glycaemic control alone. **Objectives:** To determine the frequency, association of diabetes with gender, correlation of diabetes duration with urea and creatinine, co morbidity, socioeconomic status renal disease in diabetic patients. **Methods:** The study was carried out in Mayo Hospital. A total of 100 patients were included in this study from 1st November 2019 to 31st January 2020. Blood samples were collected from diabetic people for chemical analysis to determine the protein and Urea Creatinine Ratio (UCR). RFTs was done to calculate the urea/creatinine values and their ratios. Statistical analysis was performed by using SPSS software version 13. **Results:** The ratio of male and female diabetic patients was 60:40. Mean age of male diabetic patients was 53.67 years and of female diabetic patients was 50.42 years. Frequency of renal diseases in diabetic patients was 55%. A significant p-value was obtained from the correlation of duration of diabetes (yrs) with urea and creatinine (mg%). Frequency of co-morbidity in all diabetic patients was measured and the highest frequency was of heart diseases. **Conclusions:** We conclude that diabetes is the single main and leading cause of renal diseases. It is clear that diabetic kidney disease is becoming a problem in Pakistan. As long as the duration of diabetes increases there will be more chances of renal disease so the proper diagnose at time and management is very necessary.

INTRODUCTION

Proteinuria is a characteristic of diabetic nephropathy, which is well recognised as the main cause of end-stage renal disease (ESRD). The term Diabetic kidney disease (DKD) should be used instead of "diabetic nephropathy." Kidney illness brought on by diabetes that has been confirmed by biopsy should be referred to as diabetic glomerulopathy. It is thought that abnormalities in both insulin secretion and function are the cause of type II (non-insulin-dependent) diabetes [1]. While Type I diabetes is believed to be a more uniform disease marked by an initial lack of insulin brought on by the autoimmune death of pancreatic beta cells. Due to the global rise in type 2 diabetes and obesity, diabetes is the primary cause of kidney disease in developed nations and is quickly overtaking it as the top cause in developing countries [2]. In the US, 43% of people with a history of diabetes have microalbuminuria, and 8% have macroalbuminuria [3]. Furthermore, diabetes now causes 45% of renal failure that is common, up from 18% in 1980 [4]. In urbanised nations [5] as well as in Africa [6, 7], India [8,] the Pacific Islands [9], and Asia [10, 11], where infectious disease traditionally posed the greatest concern [12], reports of a markedly rising burden of DKD are emerging. Numerous vascular and nonvascular consequences of diabetes include CVD, peripheral vascular disease, stroke, retinopathy, neuropathy, and DKD. These vascular disorders account for

DOI: https://doi.org/10.54393/pbmj.v5i12.828

the majority of the morbidity and death related to diabetes. Obesity, inactivity, race, extreme ages, and pregnancy are among the factors contributing to the rising prevalence of diabetes. Persons with diabetes die at a rate that is twice as high as people without diabetes in the United States [13]. According to the WHO Multinational Study of Vascular Disease in Diabetes [14], proteinuria is particularly linked to a higher risk of death from renal failure, cardiovascular disease (CVD), and all other causes of death. Costly treatment for chronic kidney disease (CKD) is required. An increasing number of research shows that early detection, treatment, and preventative interventions might postpone or avoid some of the negative effects of CKD [15–17].

METHODS

The study was carried out in Mayo Hospital. A total of 100 patients were included in this study. Study duration was 3 months from 1st November 2019 to 31st January 2020. Inclusion criteria: 1. Diabetic patients were included in this study. 2. Patients of both sexes and all age groups were included. Exclusion criteria: 1. Patients who were not diabetic. 2. Patients who had renal problem first and then diabetes. Blood samples were collected from diabetic people for chemical analysis to determine the protein and Urea Creatinine Ratio (UCR) which diagnosed the kidney problems. RFTs was done to calculate the urea/creatinine values and their ratios. Blood samples were centrifuge on 300rpm for 3min to separate the serum. Took three tubes labelled as blank, standard and test in rack. 1ml of urea reagent 1 was added in all three tubes. Then 10ul of urea standard solution was added in standard tube and 10ul of serum in test tube. Incubated them at 37℃. Then 1ml of urea reagent 2 was added in all three tubes and again incubated on 37℃ for 5min. The instrument was set on 578nm wavelengths against standard and required test was selected. The absorbance of blank solution was noted first then factor of standard solution was noted that should be 190 and in last take the reading of urea in test solution. Normal value is 15-45 mg%. For creatinine measurement blood samples were centrifuged on 300rpm for 3min to separate the serum. Then three tubes were taken labelled as blank, standard and test in rack. 500µl of creatinine reagent 1 was added in all three test tubes. Then 500µl of creatinine reagent 2 was added in all three tubes. Then 100µl of creatinine standard solution was added in standard tube and 100µl of serum in test tube. Incubated them at 37℃ for 10secconds. Then absorbance was taken at 490nm wavelength. First absorbance of blank solution was measured then factor of standard solution was noted that should be 32 and in last take the reading of creatinine. Normal value is 0.5-1.4 mg%. Statistical analysis was performed by using SPSS software version 13.

RESULTS

Out of them, 60 were diabetic males and 40 were diabetic females with/without renal disease. The pie chart below shows male and female distribution of diabetic patients either with or without renal diseases (Figure 1).

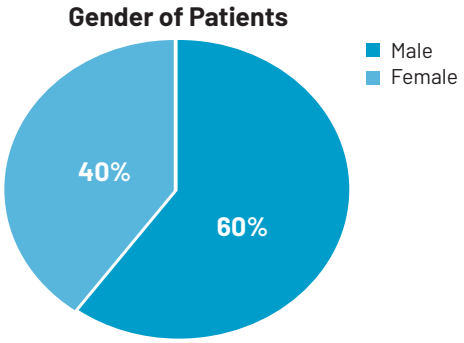


Figure 1: Graph showing gender-wise distribution of diabetic patients

The ages of the male diabetic patients ranged from 21-85 years, with a mean of 53.67 years and the ages of the female diabetic patients ranged from 28-82 years with a mean of 50.43 years (Table 1).

Male	N	Valid	60
		Missing	0
	Mean ± SD		53.67±11.567
	Minimum		21
	Maximum		85
Female	N	Valid	40
		Missing	0
	Mean ± SD		50.43±11.697
	Minimum		28
	Maximum		82

Table 1: Age-wise distribution of diabetic patients

55% diabetic patients (male/female) had renal disease while 45% had not (Figure 2).

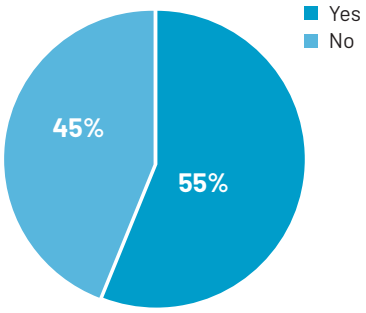


Figure 2: Frequency of renal disease in diabetic patients

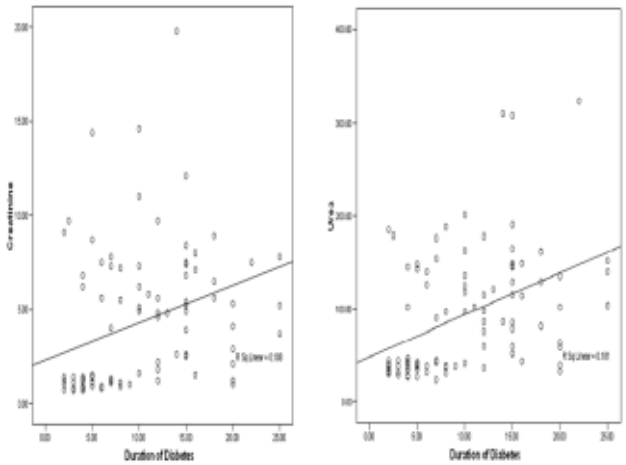
There were different ranges of duration of diabetes in 100 patients, mean of duration of diabetes in male patients was 10.34±6.163 years and in female patients was 8.95±6.238 years. (Table 2).

DOI: https://doi.org/10.54393/pbmj.v5i12.828

Group Statistics	Gender of Patients	N	Mean ± SD (Yrs.)	p-value
Duration (yrs.) of Diabetes	Male	60	10.3417±6.16338	0.274
	Female	40	8.9500±6.23863	

Table 2: Association of duration (yrs.) of diabetes with gender

With the increasing duration of diabetes, there was increased in urea and creatinine (mg%) values of all diabetic patients that lead to renal diseases (Figure 3).



Correlation Co efficient=0.329, 0.426, p-value=0.001, 0.000 respectively

Figure 3: Correlation of duration (yrs.) of diabetes with creatinine and urea (mg%)

A mean value of urea and creatinine (mg%) is high in diabetic patients (male/female) who had renal disease than that of who had not (Table 3).

	Renal Disease	N	Mean ± SD (Yrs.)	p-value
Urea (mg%)	Yes	55	136.29±57.92	0.000
	No	45	39.51±17.61	
Creatinine (mg%)	Yes	55	6.71±3.33	0.000
	No	45	1.22±0.98	

Table 3: Association of urea and creatinine (mg%) values with all diabetic patients either had renal disease or not

Among 100 diabetic patients there were 37 patients who had also some other diseases than renal disease. Among these diseases there was highest frequency of heart diseases (Table 4).

Co-morbidity		Frequency (%)	Valid Percent	Cumulative Percent
Valid	Heart Disease	20 (20.0%)	20.0	20.0
	Multiple Myeloma	2 (2.0%)	2.0	22.0
	Hepatic encephalitis	1 (1.0%)	1.0	23.0
	Gout	1 (1.0%)	1.0	24.0
	Respiratory disorder	4 (4.0%)	4.0	28.0
	Hepatitis C	9 (9.0%)	9.0	37.0
	None	63 (63.0%)	63.0	100.0
	Total	100 (100%)	100.0	

Table 4: Co-morbidity in diabetic patients

Socio-economic status of all diabetic patients was observed. There were only 2% diabetic patients belonged to upper class, 25% diabetic patients belonged to middle class and 73% diabetic patients belonged to lower class family. But further studies are required to confirm this because the limitation in our study was small population size and majority of the patients coming to mayo hospital (government) belong to lower class because of not able to afford a private treatment. So, this information was not reliable (Figure 4).

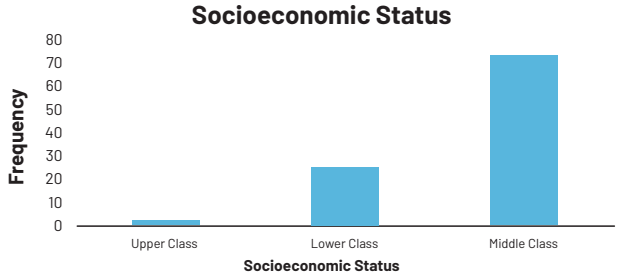


Figure 4: Socio-economic status of diabetic patients

DISCUSSION

In this study, 100 diabetic patients were taken, in which 60 were males and 40 were females as shown in. The ages of male diabetic patients ranged from 21-85 years and a mean age of male diabetic patients was 53.67 years and the ages of female diabetic patients ranged from 28-82 years and a mean of female diabetic patients was 50.43. There were different ranges of duration of diabetes in all patients and a mean of duration of diabetes in male patients was 10.34 years and in female patients was 8.95 years. A significant p-value of this association was calculated is 0.274. Diabetes was the main cause of renal diseases in our patients as also shown in a study by Thomas *et al.*, [18]. Renal disease followed by diabetes also called as Diabetic kidney disease, chronic kidney disease or end-stage renal disease. Diabetic nephropathy is characterized by proteinuria and it is extensively known as the leading cause of end-stage renal disease (ESRD) or Diabetic kidney disease. It is also considered the earliest evidence of the renal damage in diabetic patients. In this study, frequency of renal disease in diabetic patients was 55%, means that 55 out of 100 diabetic patients (male/females) diagnosed renal disease in different duration. Similar results were found by another study by Pham *et al.*, which found 64(27.5%) participants with non-diabetic renal disease [19]. Diabetic nephropathy occurs in both Diabetes mellitus type 1 and type 2, including diabetes due to genetic defects of cell function. Pathologic abnormalities are prominent in patients with long-standing Diabetes mellitus before the onset of microalbuminuria. Diabetes is the single cause of kidney failure. Damage to kidney can initiate within a year or so of type 1 diabetes and can be present at diagnosis of type 2 diabetes but it may take 5 to 10 years to become noticeable problem. The values of urea and creatinine (mg%) were measured to

DOI: https://doi.org/10.54393/pbmj.v5i12.828

evaluate the renal function. The value of urea and creatinine (mg%) were slightly raised as the long duration (yrs.) of diabetes that led to renal failure and their value of correlation coefficient was 0.426 and 0.329 respectively. The raised values of urea and creatinine (mg%) than normal in diabetic patients who had renal disease lead to the kidney failure and decreased glomerular functional rate (GFR). Similar results were also found by Bamanikar *et al.*, out of 100 patients, 18 had high urea levels while 15 had high creatinine values [20]. T-test was applied to find mean differences and associate the urea and creatinine (mg%) values with all diabetic patients either had renal disease or not. A mean value of urea (mg%) in 55% diabetic patients (male/female) who had renal disease was 136.29 mg% and in the 45% diabetic patients who had not renal disease was 39.51 (mg%), p-value of this association was 0.000. Like this, the mean value of creatinine (mg%) in 55% diabetic patients (male/female) who had renal disease was 6.71 mg% and in the 45% diabetic patients (male/female) who had not renal disease was 1.22 mg%, p-value of this association was 0.000. There are so many risk factors of diabetic nephropathy discussed here that include genetic factors, lifestyle factors, blood sugar control, blood pressure, with a resultant high body mass index, ethnicity, extremes of age, inactivity and pregnancy. 37% diabetic patients (male/female) were diagnosed few other diseases than renal diseases. Among them 20% diabetic patients had heart diseases, 2% had multiple myeloma, 1% had hepatic encephalitis, 1% had gout, 4% had respiratory disorders and 9% had hepatitis C. Socio-economic status of all diabetic patients were observed. There were only 2% diabetic patients belonged to upper class, 25% diabetic patients belonged to middle class and 73% diabetic patients belonged to lower class family. But further studies are required to confirm this because the limitation in our study was small population size and majority of the patients coming to mayo hospital (government) belong to lower class because of not able to afford a private treatment. So, this information was not reliable.

CONCLUSIONS

In this study, we determined the frequency of occurrence of renal diseases in diabetic patients by analysing or searching on 100 diabetic patients, by correlating the diabetes with age, sex and renal disease. This study showed that frequency of renal diseases in diabetic patients was greater, and it also varied based on the age and sex. Diabetes is multifactorial disease it effects all the vital organs, but this study throw light on renal diseases.

Conflicts of Interest

The authors declare no conflict of interest.

Source of Funding

The authors received no financial support for the research, authorship and/or publication of this article.

REFERENCES

[1] DeFronzo RA. The triumvirate: β-cell, muscle, liver: a collusion responsible for NIDDM. Diabetes. 1988 Jun; 37(6): 667-87. doi: 10.2337/diab.37.6.667.

[2] McKenna MT, Michaud CM, Murray CJ, Marks JS. Assessing the burden of disease in the United States using disability-adjusted life years. American Journal of Preventive Medicine. 2005 Jun; 28(5): 415-23. doi: 10.1016/j.amepre.2005.02.009.

[3] Bojestig M, Arnqvist HJ, Hermansson G, Karlberg BE, Ludvigsson J. Declining incidence of nephropathy in insulin-dependent diabetes mellitus. New England Journal of Medicine. 1994 Jan; 330(1): 15-8. doi: 10.1056/NEJM199401063300103.

[4] Bethesda M. US Renal Data System: USRDS 2004 Annual Data Report: The National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases. 2004.

[5] Bethesda M. US Renal Data System: USRDS 2005 Annual Data Report.: The National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases. 2005.

[6] Motala AA, Pirie FJ, Gouws E, Amod A, Omar MA. Microvascular complications in South African patients with long duration diabetes mellitus. South African Medical Journal. 2001 Nov; 91(11): 987-92.

[7] Wanjohi FW, Otieno FC, Ogola EN, Amayo EO. Nephropathy in patients with recently diagonised type 2 diabetes mellitus in black Africans. East African Medical Journal. 2002 Aug; 79(8): 399-404. doi: 10.4314/eamj.v79i8.8824.

[8] Ramachandran A, Snehalatha C, Latha E, Vijay V, Viswanathan M. Rising prevalence of NIDDM in an urban population in India. Diabetologia. 1997 Jan; 40(2): 232-7. doi: 10.1007/s001250050668.

[9] Simmons D, Schaumkel J, Cecil A, Scott DJ, Kenealy T. High impact of nephropathy on five-year mortality rates among patients with Type 2 diabetes mellitus from a multi-ethnic population in New Zealand. Diabetic Medicine. 1999 Nov; 16(11): 926-31. doi: 10.1046/j.1464-5491.1999.00187.x.

[10] Park JY, Kim HK, Chung YE, Kim SW, Hong SK, Lee KU. Incidence and determinants of microalbuminuria in Koreans with type 2 diabetes. Diabetes Care. 1998 Apr; 21(4): 530-4. doi: 10.2337/diacare.21.4.530.

[11] Wu AY, Kong NC, De Leon FA, Pan CY, Tai TY, Yeung VT, *et al*. An alarmingly high prevalence of diabetic nephropathy in Asian type 2 diabetic patients: the

DOI: https://doi.org/10.54393/pbmj.v5i12.828

Microalbuminuria Prevalence (MAP) Study. Diabetologia. 2005 Jan; 48(1): 17-26. doi: 10.1007/s00125-004-1599-9.

[12] Sobngwi E, Mauvais-Jarvis F, Vexiau P, Mbanya JC, Gautier JF. Diabetes in Africans. Part 1: epidemiology and clinical specificities. Diabetes & Metabolism. 2001 Dec; 27(6): 628-34.

[13] Kleinman JC, Donahue RP, Harris MI, Finucane FF, Madans JH, Brock DB. Mortality among diabetics in a national sample. American Journal of Epidemiology. 1988 Aug; 128(2): 389-401. doi: 10.1093/ oxford journals.aje.a114979.

[14] Stephenson JM, Kenny S, Stevens LK, Fuller JH, Lee E, WHO Multinational Study Group. Proteinuria and mortality in diabetes: the WHO Multinational Study of Vascular Disease in Diabetes. Diabetic Medicine. 1995 Feb; 12(2): 149-55. doi: 10.1111/j.1464-5491.1995.tb00446.x.

[15] Fioretto P, Steffes MW, Brown DM, Mauer SM. An overview of renal pathology in insulin-dependent diabetes mellitus in relationship to altered glomerular hemodynamics. American Journal of Kidney Diseases. 1992 Dec; 20(6): 549-58. doi: 10.1016/S0272-6386(12)70217-2.

[16] Adler S. Diabetic nephropathy: Linking histology, cell biology, and genetics. Kidney International. 2004 Nov; 66(5): 2095-106. doi: 10.1111/j.1523-1755.2004.00988.x.

[17] Tarnow L, Rossing P, Nielsen FS, Fagerudd JA, Poirier O, Parving HH. Cardiovascular morbidity and early mortality cluster in parents of type 1 diabetic patients with diabetic nephropathy. Diabetes Care. 2000 Jan; 23(1): 30-3. doi: 10.2337/diacare.23.1.30.

[18] Thomas MC, Brownlee M, Susztak K, Sharma K, Jandeleit-Dahm KA, Zoungas S, *et al.* Diabetic kidney disease. Nature Reviews Disease Primers. 2015 Jul; 1(1): 1-20. doi: 10.1038/nrdp.2015.70.

[19] Pham TT, Sim JJ, Kujubu DA, Liu IL, Kumar VA. Prevalence of nondiabetic renal disease in diabetic patients. American Journal of Nephrology. 2007 May; 27(3): 322-8. doi: 10.1159/000102598.

[20] Bamanikar SA, Bamanikar AA, Arora A. Study of Serum urea and Creatinine in Diabetic and nondiabetic patients in a tertiary teaching hospital. The Journal of Medical Research. 2016 Jan; 2(1): 12-5. doi: 10.31254/jmr.2016.2104.