Glycaemic Status in Different Stages CKD Patients by CKD EPI Formula due to Diabetic Nephropathy

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Background: *Diabetes is one of the important causes of Chronic Kidney Disease (CKD) in both developed and developing countries. Around one third of diabetic patients develop CKD. Controlling hyperglycaemia may halt the progression of diabetic kidney disease patients to ESRD (End Stage Renal Disease). Worlwide, more than 140 million people suffer from diabetes, making this one of the most common noncommunicablediseases. The aim of the study to find out the glycaemic status of diabetic nephropathy in different stages of CKD.*

Materials and methods: *This is a cross sectional study. This study was done Medicine and Nephrology Department of CMCH over 100 patients during the period June to December 2014. Staging of CKD in this patient will be done by CKD- EPI formula and Glycaemic status was evaluated by fasting and 2HABF and HbA1C. Sociodemographic data was compared. Staging of Diabetic Nephropathy (DN) was evaluated by either urinary Albumin Creatinine Ratio (ACR) or Urinary Total Protein (UTP).*

Results: *Among 100 patients studied regarding sex most of them are male (60%). .Regarding occupational status most of them were engaged in business (33%) and house wife (36%). Average (71%) socioeconomic status commonly foundand most of them were doing moderate works (80%) and most patients were from rural (74%) origin. Dip stick test was found positive among (55%) cases. Fundal examination findings revealed preproliferative retinopathy was commonest (49%). Stage 5 CKD was found in 35% cases rest were at stage 3 and 4. In ultrasonogram study Illdefined corticomedullary differentiation was found in 68% cases. Highest creatinine was found 12.3 and HbA1c was found 13. Relation of CKD stages with Fasting blood sugar (p= 0.473), blood sugar 2 hours after breakfast (p=0.312), HbA1c (p=0.120) were found insignificant and relation with eGFR was found highly significant (p=0.001).*

Conclusions: *This study defined a scenario of Glycaemic status of CKD patients admitted in a tertiary care hospital. No significant relation of Glycaemic status were found with different stages of CKD in our setting.*

Key words: CKD; Fasting blood sugar; HbA1c; Serum creatinine.

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INTRODUCTION

Diabetes Mellitus (DM) is not a single disease entity, but rather a group of metabolic disorders sharing the common underlying feature of hyperglycemia. Hyperglycemia in diabetes result from defects in insulin secretion, insulin action or most commonly, both. Worldwide, more than 140 million people suffer from diabetes, making this one of the most common noncommunicablediseases.[1] The number of affected individuals with diabetes is expected to double by 2025. The countries with the largest number of diabetics are India, China and the united states. Diabetes affects an estimated 16 million people in the United States, as many as half of whom are undiagnosed.[2] Uncontrolled DM or poorly controlled DM may lead to Chronic

Kidney Diseases (CKD). Other than diabetes, hypertension and chronic glomerulonephritis were some important causes of CKD. One of the microvascular complications of DM is nephropathy and the first sign of renal involvement is Microalbuminuria. When patients develop proteinuria, they already enter to the phase of stage lll diabetic nephropathy which has a chance of progression to end stage renal disease. Patients in microalbuminuric and early proteinuric stage, they may not have any clinical signs at this stage so if appropriate steps are taken at this stage it can halt diabetic nephropathy early.[3]

The previous classification schemes of diabetes mellitus were based on the age at onset of the disease or on the mode of therapy, in contrast, the recently revised classification reflects our greater understanding of the pathogenesis of each variant.[4] The vast majority of cases of diabetes fall into one of two broad classes Type 1 and type 2. Individuals with Impaired Glucose Tolerance (IGT) have a significant risk of progressing to overt diabetes over time, with up to 5% to 10% advancing to DM per year.[4] In addition, those with IGT are at risk for cardiovascular disease due to the abnormal carbohydrate metabolism as well as the co-existence of other risk factors such as low HDL, hypertriglyceridemia, and increased plasminogen activator inhibitor.[1,5]

This present study is aimed to evaluate the pattern of Glycaemic status among diabetic kidney disease patients but there is scarcity of study in Asia. Chittagong Medical College Hospital (CMCH) is the 2nd largest hospital in Bangladesh and one of the tertiary care hospitals in south east part of Bangladesh So these study though a cross sectional study may reflect partial scenario of Glycaemic status among the different stages of CKD due to diabetic nephropathy.

MATERIALS AND METHOD

This cross sectional descriptive was conducted at the Department of Medicine and Nephrology, Chittagong Medical College Hospital (CMCH) Chattagram, Bangladesh, from1st June 2014 to 31st December 2014. All patients with CKD due to diabetes nephropathy confirmed by eGFR admitted in CMCH Medicine and Nephrology Department were included in this study. In this study total 100 consecutive cases of CKD were enrolled in this study. It was purposive sampling.

Inclusion criteria
● Patients diagnosed as CKD due to diabetes mellitus on the basis of clinical (Anemia, weakness, weight loss, polyuria, polydipsiaand polyphagia) sonological (Loss of corticomedullary differentiation and change in kidney size) and biochemical criteria (Abnormal renal function and diabetic range of FBS and 2HABF level in diabetic range).
● Age above 18 years.

Exclusion criteria
● Diabetic kidney disease on steroid therapy.
● Diabetic kidney disease patients on dialysis.
● Transplanted diabetic kidney diseases.
● Subjects who do not provide written consent to participate in the study.

Data was processed and analyzed by using computer bases software SPSS-15 (Statistical Package for Social Science). Qualitative variables like sex, occupation, stages of CKD will be analyzed by percent and proportion and quantitative variables like age, creatitine levels, eGFR, FBS, 2HABF and HbA1c levels were analyzed by mean and standard deviation. Clinical history, questionnaire, through physical examination and relevant investigation like Hb1c, UTP, eGFR were recorded in details in all cases.

RESULTS

Among 100 patients studied regarding sex most of them are male (60%) gender age of respndents (Table I). Regarding occupational status most of them were engaged in business (33%) and house wife (36%). Average (71%) socioeconomic status commonly found and most of them were doing moderate works (80%) and most patients were fromrural (74%) origin. Dip stick test was found positive among (55%) cases. Fundal examination findings revealed preproliferative retinopathy was commonest (49%). Stage 5 CKD was found in 35% cases rest were at stage 3 and 4 CKD status ofrespondents (Table II). In ultrasonogram study Ill defined corticomedullary differentiation was found in 68% cases USG findings of respondents (Table III). Highest creatinine 12.3 and HbA1c was found 13 (Table IV). Relation of CKD stages with Fasting blood sugar (p=0.473) blood sugar 2 hours after breakfast (p=0.312), HbA1c (p=0.120) were found insignificant and relation with eGFR was found highly significant (p=0.001) (Table V).

Table I Gender status of respondent

	Frequency	Percent
Male	60	60.0
Female	40	40.0
Total	100	100.0

Table II CKD stage of respondent

CKD Stage	Frequency	Percent
Stage 3	32	32.0
Stage 4	33	33.0
Stage 5	35	35.0
Total	100	100.0

Table III USG findings of Kidney

USG finding	Frequency	Percent
Well defined	4	4.0
Ill defined	68	68.0
Lost	28	28.0
Total	100	100.0

Table IV Quantitative variables

Variable	Descriptive Statistics				
	n	Minimum	Maximum	Mean	Std. Deviation
Age	100	34	75	55.94	9.806
Pulse	100	68	100	83.58	6.711
Systolic blood pressure	100	90	230	146.80	23.651
Diastolic blood pressure	100	50	140	86.05	13.206
Height	100	5.0	5.8	5.346	.2307
Weight	100	44	87	59.96	8.934
Fasting blood sugar	100	3	19	8.22	3.301
Blood sugar 2 hours after breakfast	100	3.6	24.8	11.222	4.0634
Serum creatinine	100	1.3	12.3	4.020	2.4511
Blood Urea	100	26	297	81.43	54.323
HbA1c	100	5	13	7.39	1.266
24 hrs UTP	100	.0	9.6	2.036	2.3713
eGFR	100	2.8	59.5	21.980	13.8101
Valid N (Listwise)	100				

Table V Analysis of different Glycaemic status with CKD stages

Variable		n	Mean	Std. Deviation	Std. Error	p value*
Fasting blood sugar	Stage 3	32	8.77	3.312	.586	0.473
	Stage 4	33	7.77	2.755	.480	
	Stage 5	35	8.15	3.755	.635	
	Total	100	8.22	3.301	.330	
Blood sugar 2 hours after breakfast	Stage 3	32	12.105	3.8843	.6867	0.312
	Stage 4	33	10.985	3.2884	.5724	
	Stage 5	35	10.639	4.7961	.8107	
	Total	100	11.222	4.0634	.4063	
HbA1c	Stage 3	32	7.70	1.149	.203	0.120
	Stage 4	33	7.43	.993	.173	
	Stage 5	35	7.06	1.530	.259	
	Total	100	7.39	1.266	.127	
eGFR	Stage 3	32	39.194	7.2443	1.2806	0.001
	Stage 4	33	19.970	4.5009	.7835	
	Stage 5	35	8.137	2.8890	.4883	
	Total	100	21.980	13.8101	1.3810	

*p value calculated by ANOVA.

DISCUSSION

Present study was done on 100 chronic kidney disease patients with diabetes mellitus. It was done in the Department of Medicine and nephrology in a period of one year from January 2014- December 2014. Glycaemic status was examined by testing Fasting Blood Sugar (FBS) two hours post prandial blood sugar and HbA1c. Among 100 patients studied regarding sex most of them are male (60%). Regarding occupational status most of them were engaged in business (33%) and house wife (36%). Average (71%) socioeconomic status commonly found and most of them were doing moderate works (80%) and most patients were from rural (74%) origin.

A population-based, cross-sectional survey (Ref – 16) was performed in Yemen on 10242 subjects aged 15–69 years, stratified by age, gender and urban/rural residency. Proteinuria and hypertension were more prevalent among rural dwellers (Adjusted ORs 1.56, 95% Confidence Limit (CL) 1.31–1.86 and 1.23, 1.08–1.41 respectively) diabetes being less prevalent in rural areas (0.70, 0.58–0.85). They done the study with a very big sample (10,242) so found the significant association with proteinuria, Glycaemic changes and age change, gender and locality but the present study was a cross sectional with small sample size which might be the cause of insignificant findings of the present study.

A study done by Iwasaki et al. 17 assessed diabetic complications in a total of 130 Japanese patients with type 2 diabetes mellitus.[6] In relation to retinopathy, they found a significant difference in the serum albumin level between the "absent" group and the other two groups. The results of logistic regression analysis with adjustment for three variables (Age, gender, serum CRP) revealed that serum albumin was independently related to proliferative retinopathy and proteinuria.They followed the patients prospectively, but present study was cross sectional so long term follow up result could not be evaluated.

In my study inultrasonogram Ill defined corticomedullary differentiation was found in 68% cases.

In my study stage 5 CKD was found in 35% cases rest were at stage 3 and 4. Relation of CKD stages with Fasting blood sugar (p= 0.473) blood sugar 2 hours after breakfast (p=0.312), HbA1c (p=0.120) were found insignificant and relation with eGFR was found highly significant (p=0.001).

A study done by Harada et al. foundglycated hemoglobin (A1C) was positively correlated with random PG.[7] Whereas Glycated Albumin (GA) was correlated with random PG. But the present study did not measure the GA but so far other measures of Glycaemic status like FBS, 2HABF and HbA1c was found also insignificantly related with CKD stage and Glycaemic control.

In another study done by Papademetriou et al. found patients with CKD, compared with standard therapy, intensive glucose lowering was significantly associated with both 31% higher all-cause mortality (1.306: 1.065–1.600) and 41% higher cardiovascular mortality (1.412: 1.052–1.892).[8] Present study did not evaluated the risk of CV diseases but gives an insight to need of control of glucose with CKD.

A study by Siddappa among 60 CKD patient which shows a statistically significant positive correlation was observed between serum creatinine and cortical echogenicity grading.[9] They found renal echogenicity and its grading correlates better with serum creatinine in CKD than other sonographic parameters like longitudinal size, parenchymal thickness and cortical thickness which is consistent with my study.

A cross sectional study by Vijatha among 120 diabetic subjects with CKD who were not on maintenance hemodialysis.[10] The study showing that change in Hb is not associated with change in HbA1c. Our study is limited because of small sample size. Further studies will be necessary with large sample size. Therefore, HbA1c should not be used alone for diagnosis of severity of diabetes in patients with ESRD.

Study by O'callaghan among 175 patients aged at least 18 years.[11] The study demonstrates that introduction of the CKD-EPI formula would reduce the number of patients in the UK who are classified as having of a reduced eGFR. The introduction of the CKD-EPI formula would generate substantial relabeling of individuals but could ultimately reduce the workload attributable to CKD, principally around stage 3 and allow more effective targeting of evidence-based therapies to patients who will benefit from them.

Study by Cummuings among 791 people, mean eGFR in African Americans declined to a greater extent and more rapidly than in whites, Age, mean systolic blood pressure, initial HbA1c, initial eGFR and number of HbA1c values were significant predictors of change in eGFR.[12] Study done by Secrest AM et al. the available evidence clearly points to the fact that socio-economic inequalities in diabetes care do exist.[13]

Low individual SES and regional deprivation are often associated with worse process indicators of care and worse intermediate outcomes (e.g. Poor Glycaemic, lipid and BP control) resulting in higher risks of microvascular (e.g. Retinopathy) and macrovascular complications (e.g. Myocardial infarction, stroke).

LIMITATIONS
- Small sample size.
- Single center study.
- Absence of long-term evaluation of Glycaemic condition in relation with change of eGFR.

CONCLUSION
Present study concluding that different Glycaemic status has non-significant relation with different levels.

DISCLOSURE
All the authors declared no competing interest.

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