

Prevalence of Diabetic Nephropathy among Type 2 Diabetes Mellitus, and Glycaemic Control Evaluated by Glycated Haemoglobin in Diabetic Patients with and without Diabetic Nephropathy

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Abstract

Background: Diabetic Nephropathy (DN) is by far the most common cause of End-Stage Renal Disease (ESRD). Approximately one-third of individuals with diabetes develop DN, with a high likelihood of progression to ESRD. In addition, DN is associated with considerably increased cardiovascular disease risk and mortality.

Aim of Study: The purpose of this study is to determine the prevalence of diabetic nephropathy between T2DM, and glycaemic control evaluated by a glycated haemoglobin in diabetic patients with and without diabetic nephropathy.

Material and Methods: This study was carried out on 100 diabetic patients who attended a private clinic in Aden-Yemen. Over a period from 1st June 2018 to 1st January 2019. All the participants studied were subjected to assessment of sex, age and duration of diabetes with laboratory investigations including determination of urinary albumin to creatinine ratio, and glycated haemoglobin (HbA_{1c}).

Results: The results showed that 14% of all patients have been studied had diabetic nephropathy, there were statistically significant relationships between diabetic nephropathy and duration of diabetes ($p=0.040$), there were no statistically significant relationships between diabetic nephropathy and age, sex and glycated haemoglobin level (HbA_{1c}) of the patients.

Conclusion: Screening for microalbuminuria will enable early identification of patients with DN. Duration of DM and was strong predictor associated with the development of DN in the patients studied.

This also raises a red flag against the common medical practice of only using Serum Creatinine as a test to determine renal function.

Key Words: Diabetic nephropathy – T2DM – HBA_{1c}

Introduction

DIABETES Mellitus (DM) is a metabolic disorder characterized by persistence hyperglycaemia resulting from the defects in insulin secretion, action or both. Diabetes mellitus is not a single disease but a group of several metabolic disorders, which shares a common feature of hyperglycaemia [1].

DM is the leading cause of End Stage Renal Disease (ESRD). Although both type 1 and type 2 DM can lead to ESRD, the majority of patients are those with type 2 DM [2].

In the Middle East, diabetes is also prevalent, mirroring the current global epidemic of diabetes [3]. The high prevalence of obesity and lack of exercise, along with the possibility of region-specific genetic mutation associated with diabetes, may be the explanation, thereby further confirming the genetic peculiarity of some populations [4,5].

Type 2 diabetes mellitus is one of the major chronic disease burdens with a prevalence of 422 million patients worldwide [6]. Type 2 diabetes is expected to be the seventh most common cause of death in the world by 2030, primarily due to its rapid rise in middle-income and low-income countries [7].

Complications of diabetes contribute greatly to the increased mortality and morbidity associated with this disease. Diabetic complications are customarily divided into two main categories: Macrovascular complications, including heart disease and stroke, and microvascular complications, which include retinopathy, nephropathy, and neuropathy,

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microvascular complications accounted for about half the total number of complications [8].

Diabetic Nephropathy (DN), which is characterized by proteinuria, is one of the most serious long-term microvascular complications of DM. The proportion of DN is increasing worldwide. DN is the leading cause of chronic kidney diseases and end-stage renal disease, which constitutes the major workload of dialysis centres worldwide. Microalbuminuria (MA) is the earliest sign of DN, so the early detection of MA and early control of diabetes retards the progression of DN [9].

Diabetic nephropathy and microalbuminuria are also strong predictors of cardiovascular and overall morbidity and mortality in patients of diabetes, and hence vital indicators in the patients [10].

Diabetic nephropathy is a progressive kidney disease involving damage to the capillaries in the kidneys' glomeruli because of longstanding DM, characterized by diffuse scarring of the glomeruli. While final diagnosis may need a biopsy, diagnosis is usually done with measurement of urinary albumin/GFR/creatinine clearance/serum creatinine levels [11].

Material and Methods

This was a prospective study carried out in a private clinic in Aden-Yemen, included 100 patients with type 2 diabetes mellitus and age of 30 years old or more, over a period from 1st June 2018 to 1st January 2019.

The participants divided into those with diabetic nephropathy, and those without.

Inclusion criteria: Local Yemeni patient with age 30 years or more and type 2 diabetes mellitus.

Exclusion criteria: Included subjects less than 30 years of age, subjects diagnosed with type I diabetes, hypertensive patients, users of medications affecting kidney and those with gestational diabetes.

All participants were subjected to laboratory investigations including:

- 1- Random urine samples were collected for determination of creatinine and microalbumin in urine to calculate the albumin/creatinine ratio.
- 2- A blood sample was placed in an EDTA tube for quantitative colorimetric determination of HbA_{1c}.

Diabetes was diagnosed based on ADA criteria: Fasting blood sugar of 126mg/dl or more and random blood sugar of 200mg/dl or more or Glycated haemoglobin 6.5% or more [12].

Nephropathy was defined as 30-299mcg of albumin/mg of creatinine, for microalbuminuria and >300mcg of albumin/mg of creatinine for macroalbuminuria in two of the three tests within 3-6 months [9].

Degree of glycaemic control was determined by Glycated haemoglobin (HbA_{1c}).

It was divided into good control: HbA_{1c} <7% and poor control: HbA_{1c} >9%.

Ethical consideration: Verbal informed consent was obtained from all participating subjects. The research and ethics committee in the Faculty of Medicine University of Aden approved the study design.

Data analysis was done using statistical package for social science software for windows (SPSS) Version 20. Results were presented as percentages and tables as appropriate.

p-value <0.05 considered to indicate the level of significance in the study.

Results

This study included 100 patients with type 2 diabetes mellitus, managed in a private clinic during the study period from 1st June 2018 to 1st January 2019.

The mean age of the patients recruited in this study was 54.09 (±8.4), it ranges from 30 to 67 years, the mean of diabetes duration among the study population was 8.28 (±6.59), HbA_{1c} mean value among recruited patients was 8.69 (±1.61).

14 patients had diabetic nephropathy, number of males and females diabetic nephropathy patients was equal (50%) with (*p*-value 1.00) not statistically significant.

The peak prevalence of type 2 diabetic patients with nephropathy attending the private clinic during the study period was in the age group of 46-60 years (64.2%), followed by the age group >60 years (35.7%), it was statistically not significant (*p*-value 0.285).

The majority of diabetic nephropathy patients were having T2DM in duration between 11-20 years (57%) followed by (21.4%) for those who

have T2DM in duration of 5-10 years, which was statistically significant (p -value 0.04).

Diabetic patients with nephropathy and poor controlled HBA_{1C} was (92.9%), while those with good control (7.1%), it was not statistically significant (p -value 0.330).

Diabetic patients without nephropathy constitute (82.6%), and (17.4%) for those with poor controlled diabetes and good controlled diabetes respectively.

Table (1): Prevalence of Diabetic Nephropathy (DN) among type 2 DM.

	No of patients	%
Type 2 DM with DN	14	100
Type 2 DM without DN	86	86
Total	100	100

Table (2): Sex distribution among type 2 DM with Diabetic Nephropathy (DN).

Sex	No of patients	%
Female	7	50
Male	7	50
Total	14	100

p -value (1.00)

Table (3): Age distribution among type 2 DM with Diabetic Nephropathy (DN).

Age group	No of patients	%
30-45	0	0
46-60	9	64.2
>60	5	35.7
Total	14	100

p -value (0.285)

Table (4): Duration of DM among type 2 DM with Diabetic Nephropathy (DN).

Duration of DM	No of patients	%
<5 years	2	14.2
5-10 years	3	21.4
11-20 years	8	57
>20 years	1	7.1
Total	14	100

p -value (0.040)

Table (5): HBA_{1C} among diabetics with diabetic nephropathy and without diabetic nephropathy.

Glycaemic control HBA _{1C}	DM with albuminuria	DM without albuminuria	p - value
Good control	1 7.1%	15 17.4%	0.330
Poor control	13 92.9%	71 82.6%	

Discussion

Among 100 patients have been recruited in the study, diabetic patients with nephropathy was (14%). Near to (15.3%) mentioned in the the study of Sohaila Cheema et al. [13].

Less than the results presented in the study made by Rahim MA et al., in Bangladesh, where diabetics with Nephropathy constitute (54.5%) [14].

In addition, less than the results mentioned by Patel V et al., in their study, where total of 43 patients out of 100 patients were detected to have Diabetic Nephropathy [10].

Our study showed no statistically significant relationships between diabetic nephropathy and sex (p -value 1.00), sex difference among diabetic nephropathy patients was equal (50%).

While in the study made by Jiji Inassi1, Vijayalakshmy R among 120 diabetics with nephropathy, female patients with diabetic nephropathy was (41.6%), while male (58.3%) [15].

Also in the study made in El-Mahalla General Hospital, there were no statistically significant relationships between diabetic nephropathy and sex of the patient [16].

(64.2%) of diabetics with diabetic nephropathy were (46-60) and (35.7%) of patients were more than 60 years, there were no statistically significant relationships between diabetic nephropathy and age of the patient, similar to the study done in El-Mahalla General Hospital [16].

The present study confirmed occurrence of albuminuria with increasing duration of diabetes; there was statistically significant relationship between duration of diabetes and nephrogenic diabetes.

Nine patients out of fourteen patients with nephrogenic diabetes had diabetes more than 10 years.

It was significantly higher among the group of patients with diabetes between 11-20 years (p =0.04).

Baig et al., studied 60 patients to compare duration of T2DM with micro albumin, concluded that in patients with T2DM and long duration of diabetes, significantly correlated with high level of microalbumin [17].

Duration of diabetes is an independent risk factor for DN and this is in agreement with other related studies [18,19].

In the present study, there were relationship between nephrogenic diabetes and poor glycaemic control. HbA_{1c} was higher among the patients in the group with DN than the patients in the group without DN but it was not statistically significant. (p -value 0.33).

This relationship also presented in a study made in Oman by Alrawahi et al., [20].

In the previously mentioned Baig et al., study, concluded that in patients with T2DM, and poor glycaemic control (depicted by high HbA_{1c} level) significantly correlated with high level of microalbumin [17].

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انتشار إعتلال الكلى السكرى وسط مرضى السكرى النوع الثانى، ومستوى خضاب الدم الجلوكوزى عند مرضى السكرى الذين يعانون من إعتلال الكلى السكرى والذين لا يعانون منه

يعتبر إعتلال الكلى السكرى أهم الأسباب شيوعاً للمرحلة النهائية للفشل الكلوى، وثالث المرضى المصابين بالسكرى يصابوا بإعتلال الكلى السكرى مع احتمالية عالية أن يتطور المرض إلى المرحلة النهائية للفشل الكلوى.

ويرتبط إعتلال الكلى السكرى ارتباط وثيق بمخاطر أمراض القلب والأوعية الدموية والوفيات.

الأهداف: دراسة إنتشار إعتلال الكلى السكرى وسط مرضى السكرى النوع الثانى، ومستوى خضاب الدم الجلوكوزى عند مرضى السكرى الذين يعانون من إعتلال الكلى السكرى والذين لا يعانون منه.

الأساليب: شملت الدراسة ١٠٠ مريض من مرضى السكرى النوع الثانى، الذين حضروا لإحدى العيادات الخاصة فى عدن-اليمن من الأول من يناير إلى الأول من يونيو ٢٠١٩.

تم تحديد جنس وعمر المرضى، ومدة الإصابة بمرض السكرى، وعمل فحوصات لتقييم نسبة الزلال إلى الكرياتينين فى البول، ومستوى خضاب الدم الجلوكوزى.

النتائج: أظهرت النتائج أن ١٤٪ من المرضى عانوا من إعتلال الكلى السكرى، وهناك علاقة ذات أهمية إحصائية بين الإصابة بإعتلال الكلى السكرى ومدة الإصابة بالسكرى ($p=0.040$)، بينما جنس المريض، عمر المريض، ومستوى خضاب الدم الجلوكوزى، لم يشكلوا علاقة ذات أهمية إحصائية مع الإعتلال الكلوى السكرى.

الخلاصة: تحرى بيبة الألبومين سيساعد فى الكشف المبكر لمرض الإعتلال الكلوى السكرى، وتعتبر مدة الإصابة بالسكرى مؤشر قوى لظهور الإعتلال الكلوى السكرى عند المرضى المشملين بالدراسة، ويعتبر ذلك جرس إنذار ضد إستخدام فحص (الكرياتينين) فقط لتقييم وظيفة الكلى.