MICROALBUMINURIA AMONG PATIENTS WITH DIABETES TYPE 1 AND TYPE 2 AT THE ARMED FORCES HOSPITAL IN JUBAIL

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Nephropathy is one of the common complications of diabetes, and can lead to end-stage renal failure. The number of diabetic subjects accepted for renal dialysis treatment is increasing yearly.[1] Nephropathy takes several years to develop after the diagnosis of diabetes, but if it is diagnosed early, the process can be aborted or even reversed by strict metabolic control.[2]

Nephropathy presents first as intermittent microalbuminuria (incipient), progressing to persistent microalbuminuria, and then to macroalbuminuria. A useful method of early detection of albumin in urine is by quantifying microalbuminuria. The usual way to do this is by measuring albumin in a 24-hour urine sample. But the patient's compliance is a limiting factor. An easier method is to measure the concentration of albumin in urine at the patient's regular visit, especially the concentrated morning sample.

Several investigators used this method and reported comparable results.[3,4] In fact it has been recommended as a screening test for early detection of nephropathy.[5] In this study, the investigator tried to identify the extent of microalbuminuria among the regular diabetic patients attending the primary health care clinic.

Patients and Methods

More than 300 diabetic patients are seen regularly at the diabetic clinic in the Primary Care Department of the Armed Forces Hospital in Jubail, Saudi Arabia. A full history, physical examination and the necessary investigations were done for most of the patients attending this clinic.

One random sample of urine was obtained (from 104 patients with diabetes, randomly selected from the Primary Care Clinic) for quantifying albumin concentration in urine. This method is superior to the excretion rate[6] and an accurate method for screening of micro- and macroalbuminuria.[7] The method used was the urinary protein (UP) method developed for aca™ discrete clinical analyzer. In this method, the turbidimetric method of Iwata and Nishikaze,[8] as well as the benzethonium chloride method for precipitating urinary protein in a basic medium, were used for quantifying microalbuminuria. The specimens were analyzed within one hour in the same hospital laboratory. The urine samples were random single-sample (i.e., not a 24-hour sample) collected from the patients as they were seen at the clinic. The single-sample method was also used before by several authors.[3,9,10]

Patients who had exercised heavily prior to the clinic encounter were excluded. As well, to reduce the confounding effect of hypertension, 31 subjects were excluded from the study because they had elevated blood pressure. Hypertension was considered if the reading was equal to or more than 140/90. All the data were fed into a personal computer and were analyzed using Epi-Info statistical package.

TABLE 1. *The different characteristics of the study population.*

Item	Number	Percentage
Gender		
Male	54	74
Female	19	26
Total	73	100
Type of diabetes		
Type 1	08	11
Type 2	65	89
Total	73	100
Duration of diabetes		
<1 year	26	35.6
1-5	34	46.6
6-10	08	11.0
>10	05	6.8
Total	73	100
Blood pressure		
<140/90	73	70.2
≥140/90	31	29.8
Total	104	100

TABLE 2. *Distribution of albumin level in urine among the patients with diabetes.*

Level of microalbuminuria	Number	Percentage
<15 mg/L	33	45.2
15-200 mg/L	36	49.3
>200 mg/L	4	5.5
Total	73	100

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TABLE 3. *Regression analysis of the different variables that may affect albumin level in urine.*

Variable	Mean	Coefficient β	95% confidence Lower	Upper	S.E.	F
Weight	75.12	1.40	-0.189	2.99	0.81	2.98
Systolic	129.72	0.13	-1.13	1.38	0.64	0.038*
Dystolic	72.67	-0.14	-2.2	1.9	1.05	0.02*
Type of DM	1.92	22.41	-30.68	75.5	27.09	0.68
Fasting blood sugar	201.66	0.026	-0.199	0.25	0.11	0.051*
HBA_{lc}	9.91	1.566	-4.57	7.71	3.13	0.25
Body mass index	28.34	-0.77	-4.25	2.69	1.77	0.19
Duration	4.35	0.199	-3.33	3.73	1.80	0.012*
Family history	0.83	8.025	-7.88	23.94	8.11	0.97

*There is a significant relationship.

Results

Of the 104 subjects, 31 were excluded to control for the confounding effect of high blood pressure. The rest of the subjects (73) had an age range of 15-74 years, with a mean of 44.08 years. Table 1 shows the characteristics of the study population.

The male to female ratio was 7.4:2.6. Type 1 diabetes was seen in 11% of the study population and the remaining 89% were type 2. Duration of diabetes ranged from less than one year to 18 years, with a mean of 4.1 years.

Microalbuminuria concentration upper limit of normal used in this study was 15 mg/L. Eshoj and colleagues[11] used 15 µg/min for the overnight specimen because of the reduced level of overnight excretion. Macroalbuminuria (>200 mg/L) was seen in 5.5% of the study population, and 49.3% of the patients had albuminuria in the range of 15-200 mg/L.

Table 3 shows that the systolic and diastolic blood pressure, fasting blood sugar and duration of diabetes had a significant correlation with albumin concentration level in urea.

Other variables, such as the weight of the subject, type of diabetes mellitus, HbA_{lc}, body mass index and family history of diabetes, did not have a significant correlation with albuminuria.

Discussion

Microalbuminuria is a useful predictor of renal failure in patients with diabetes, and even an independent predictor of mortality in Type 2.[12] The Centers for Disease Control and Prevention (CDC) recommend early detection of microalbuminuria in patients with diabetes.[13] In this study, the author attempted to estimate the extent of the problem, i.e., the prevalence of microalbuminuria among patients with diabetes at the Naval Base Hospital.

Fortunately, the early detection of microalbuminuria and early control of diabetes retards the development of structural changes in early diabetic nephropathy.[14] This study showed the prevalence of microalbuminuria to be 49.3% among all diabetes patients, which is a high prevalence rate. Jerums and associates[15] found a 20% prevalence rate of microalbuminuria in diabetic subjects, however, they used the clearance rate rather than the concentration. Schwab et al.[4] reported a rate of 23.4% of microalbuminuria, but the cut-off point used was from 20-150 µg/mL for microalbuminuria, and they found 34% albuminuria (i.e., >150 µg) using the radioimmunoassay method. Both albuminuria and microalbuminuria added up to 57% in Schwab's study, which is not far from the result obtained in this study (54.8%).

Olivarius and colleagues[16] found microalbuminuria using the albumin/creatinine ratio (ACR) of 33.6% among male and 28.8% among female newly diagnosed diabetics. They used an ACR of 2-<20 mg/mmol level as microalbuminuria.

It is clear, in this study and others, that microalbuminuria is quite prevalent among patients with diabetes. This obviates the necessity for early detection and treatment. The American Diabetes Association also recommended annual testing for microalbuminuria for persons who have had diabetes for five years or more.[17] Strict control of diabetes can retard the progression of albuminuria, as reported by the Diabetes Control and Complications Trial.[18] Others[19] have said that strict metabolic control can provide complete protection over 7.5 years, against a fall in glomerular filtration rate to subnormal value.

Systolic blood pressure was found to be significantly correlated with albuminuria in this study (P=0.038). Other investigators[16] agree with this finding.

Diastolic blood pressure was also found to be significantly correlated with albuminuria among diabetics (P=0.02). This is in agreement with the study of Viberti et al.[14] There are studies that document the reduction of serious morbidity or mortality by the use of angiotensin-converting enzyme (ACE) inhibitor[20] in diabetics. From this study it is clear that high blood pressure correlates significantly with microalbuminuria. Therefore it is important to take the matter seriously when managing a patient with hypertension in addition to diabetes. Another variable which correlates significantly with albuminuria is fasting blood glucose (P=0.05). Controlling FBS is important in the follow-up and control of diabetes patients. HbA_{lc} was not correlated statistically with albumin concentration in urine, which is consistent with a similar finding in the study conducted by Huraib et al.[21]

The Diabetes Control and Complications Trial[22] study found that for every 1% reduction in HbA_{1c}, there was a 28% reduction in nephropathic complications in type 1 diabetes, as compared to 34% in type 2 diabetes at 12 years' follow-up. The duration of diabetes was another variable that correlated with albuminuria (P=0.012). Viberti et al.[14] found the same correlation. The duration of diabetes was shown in previous studies[6,14] to play an important role in the development of microalbuminuria.

Microalbuminuria among patients with diabetes is quite prevalent. Therefore screening with a random urine sample at least for the early detection of microalbuminuria is highly recommended, to prevent later development of renal failure. A number of patients with diabetes excreted albumin early in the course of the disease. This emphasizes the need for early detection and prevention.

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