Determination of Microalbuminuria in Sudanese Patients with Type 2 Diabetic Mellitus

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Abstract:
Background: Diabetes mellitus causes progressive changes to the kidneys and ultimately results in diabetic renal nephropathy. This complication progresses can be delayed with intensive therapy to normalize blood glucose. In the early stage there are no obvious signs of renal dysfunction. Microalbuminuria is a beginning to the renal complications of diabetes mellitus; it is a significant index for early detection as well as monitoring the progression of diabetic nephropathy. Urine microalbumin measurement is important in the management of patients with diabetes mellitus who are at serious risk of developing nephropathy over their lifetime.

Aims: To determine the effect of diabetes mellitus on renal function in Sudanese type 2 diabetic patients (non-insulin-dependent) by measuring microalbuminuria which express by Albumin creatinine ratio.

Materials and methods: The study involved a control group of apparently healthy non-diabetic (N=50) matched for age with a test group of diabetic (N=50). The range of both groups was 30-65 years old. Then microalbumin was measured by a fluorescence immunoassay and urine creatinine was measured by Jaffe kinetic method. Appropriate statistical tests were used to assess significant difference in the means of the studied concentrations between cases and control group.

Results: The diabetic patient showed high levels of microalbumin/creatinine ratio [M±SD = 52.4±80.9 mg/g] compared with control group [M±SD = 8.7±3.8 mg/g], this difference was considered statistically significant [P = 0.000 which is less than 0.05]. There is a significant difference in microalbumin levels in diabetic patient [M±SD = 69.6±93 mg/l] compared with control group [12.7±7.3 mg/l] [P = 0.000 which is less than 0.05]. While there is no significant difference in Creatinine levels in diabetic [M±SD = 135.8± 60.6 mg/dl] compared with control group [M±SD = 137± 46.6 mg/dl] [P = 0.909 which is higher than 0.05].

Conclusion: This study shows that high level of microalbumin creatinine ratio is significantly more common into Type 2 diabetes mellitus. It may be useful to do early screening of diabetic nephropathy.

Key Words: Diabetes mellitus Type2, Microalbuminuria, Albumin creatinine ratio (ACR)

Introduction
Diabetes mellitus (DM) is a group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action or both. It is associated with long-term damage to various organs especially the eye, kidneys, nerves, heart, and blood vessels (1). Patients with type 2 diabetes often have long asymptomatic period of hyperglycaemia and many have complication at the time of diagnosis (2). Diabetic nephropathy is a condition or clinical syndrome, where the kidney is damaged due to long-term complications of diabetes (3). It starts as a minor damage with poor filtration by the kidneys. As the condition advances and left untreated, it leads to chronic kidney failure and requires dialysis or kidney transplant. Kidney failure will finally lead to death (4). Diabetic nephropathy is the leading cause of end stage renal disease (ESRD) in US and a leading cause of diabetes mellitus related morbidity and mortality (5). Albumin is type of protein found in large amount in the blood because it is one of the first proteins able to pass through the kidneys into the urine when there are kidney problems. This presence of small amount of albumin in urine is condition called microalbuminuria. As the kidney damage progresses and the amount of albumin in the urine increase the name of condition change from microalbumin to albuminuria or proteinuria (6). Microalbuminuria is defined as a urinary albumin excretion rate of 30 to 300 mg in 24 hour urine collection or as a urinary albumin excretion rate of 20 to 200 mg/min in a timed overnight urine collection (7). The laboratory test for early detection of diabetic nephropathy is the measurement of microalbumin in urine (8). The American Diabetes Association (ADA) recommended that people with diabetes should do an annual microalbuminuria urine test and measurement blood creatinine at least once a year (9).
are many conditions causing microalbuminuria but hypertension and diabetes are the two biggest risk factors besides old age and weight gain (10). Microalbuminuria (MAU) has been reported as an important risk factor for the progression of renal and cardiovascular diseases in diabetes mellitus (DM) patients since 1974 (11-12).

Materials and methods
The study involved two groups: control group of apparently healthy (N=50) matched for age with test group of diabetic mellitus type 2 patients the range age of both groups was 30- 65 years. All volunteers were recruited from Alanfal specialized hospital  Khartoum – Sudan. Early morning urine sample from all patients and healthy control were collected in sterile urine containers (For creatinine urine sample diluted with distilled water 1/50). Then microalbuminuria were measured by using IChroma TM Reader, is a fluorescence immunoassay method. Urine creatinine levels were measured using standard spectrophotometer method. Statistical evaluation was performed using the Microsoft Office Excel for windows; (2007) and SPSS for windows version 19. Normal distribution of the studied variables was examined using kolmogrov-smirnova and Shapiro-wilk tests were used to assess significant difference in the means of the studied variables in diabetic and non-diabetic. Correlation between urine microalbumin level and duration of diabetic were assessed using bivariate correlation. P <0.05 was considered statistically significant.

Results
This study was carried out on 50 type 2 diabetic patients (cases) and 50 apparently healthy individual (control). To determine the effect of diabetes mellitus on renal function in Sudanese type2 diabetic patients. The age of the patients [M±SD = 47.8±8.9 years] was comparable with control group [M±SD = 44.7±10.3years, p=0.106). The M±SD of the duration of diabetic = [6.8±3.9] years. After conducting the appropriate tests the following results were obtained: microalbumin creatinine ratio was higher in the patients [M±SD =52.4±80.9mg/g] compared with control group [M±SD =8.6±3.8mg/g], this difference was considered statistically significant [P = 0.000 which is less than 0.05]. There is significant differences in microalbumin levels in diabetic patient [M+SD=69.6+93mg/l] compare with control group [12.7+7.3mg/l] P=0.000 which is less than 0.05, table (1)

<table>
<thead>
<tr>
<th>Parameter</th>
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<tr>
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<td>Patients (n =50)</td>
<td>Control (n =50)</td>
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<td>Mean±SD</td>
<td>Mean±SD</td>
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<tr>
<td>Microalbumin creatinine ratio (mg/g)</td>
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<td>8.6±3.8</td>
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<tr>
<td>Microalbumin (mg/l)</td>
<td>69.5±93</td>
<td>12.7±7.4</td>
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<tr>
<td>Creatinine (mg/dl)</td>
<td>135.8±60.7</td>
<td>137±46.6</td>
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There is statistical significant correlation between microalbumin creatinine ratio and duration of disease (P =0.00), and statistical significant correlation also observed between microalbumin and duration of disease (P =0.00). But there is no statistical significant correlation between creatinine and duration of disease (P ≈0.909).

Discussion
The results obtained that there is no statistically significant difference in levels of urine creatinine in the diabetic patients (cases) compared with apparently healthy individuals (control), also the results showed significant increase the levels of microalbumin and microalbumin/creatinine ratio. Microalbuminuria was diagnosed in 11(22%) patients. Various epidemiological and cross sectional studies have reported marked variation in the prevalence of microalbuminuria (13–15). Earlier studies on Asian immigrant Indians and native Indians have suggested a high prevalence of microalbuminuria (14-15) Gupta et al reported a prevalence of 26.6% in 65 type 2 north Indian non-protein uric patients, (14). while John et al reported a prevalence of 19.7% from a tertiary hospital in Vellore, south India (16) and Vijay et al reported that 15.7% had proteinuria among 600 type 2 diabetic patients studied at a diabetic centre in Chennai city (17). Diabetic nephropathy accounts for a significant reduction in life expectancy of diabetic patients. It is the leading cause of end-stage renal disease in the western world (18,19).
Without any intervention, approximately 80% Type 1 patients with persistent microalbuminuria develop overt nephropathy after 10–15 years. Eventually 50% of these develop end stage renal failure within 10 years and 75% by 20 years (20). In Type 2 diabetic patients, 20–40% with microalbuminuria progress to overt nephropathy and 20 years later, approximately 20% develop end stage renal failure (21).

Conclusion
Microalbuminuria in diabetic patients in this study was found to be as high as 22%, which needs of therapeutic and preventive measures. Being a developing country, there is a need of microalbuminuria testing in both newly diagnosed as well as already diagnosed type 2 diabetic patients as an early marker of renal risk factor. The present study emphasizes education about strict glycaemic control and testing for microalbuminuria which is an early indicator of diabetic nephropathy, mandatory for all type 2 diabetic patients.

References


