The prevalence and risk factors of micro and macroalbuminuria among diabetic patients in Taif

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Abstract

Background: Diabetes mellitus is a global public health concern and an important cause of morbidity and mortality. There has been a marked rise in the prevalence and incidence of end-stage chronic kidney disease in Saudi Arabia over the last 3 decades.

Objectives: This work aimed to measure albumin creatinine ratio, calculate the prevalence of diabetic nephropathy, and assess risk factors of micro and macroalbuminuria.

Methods: This is a cross-sectional study that included records of Type 2 diabetes patients who visited the Diabetic Center of King Abdulaziz pecialist Hospital for laboratory investigations starting from October 2018 to January 2019.

Results: 571 type 2 diabetic patients were studied and the overall prevalence of microalbuminuria and macroalbuminuria was found to be 19% (109 cases) where microalbuminuria accounted for 73.39% of all cases (80 cases) and macroalbuminuria accounted for 26.61% of all cases (29 cases).

Conclusion: The prevalence of albuminuria in Type 2 diabetic patients was found to be high, which calls for the need for increasing awareness among type 2 diabetes patients.

Keywords: prevalence, risk,
micro, macroalbuminuria, diabetic, Taif

Introduction

Diabetes mellitus (DM) is a chronic, metabolic disease characterized by hyperglycemia as a result of insufficient insulin production or action or both as reported by WHO. There are more than 422 million people who have diabetes worldwide, and it is a primary cause of death globally (WHO). Diabetic nephropathy (DN) is a major complication of diabetes mellitus, and it is one of the leading causes of end-stage renal diseases (ESRD) (1).

DN is a major concern because it decreases the life expectancy of diabetic patients (2). Without proper management of Type 2 diabetic patients, 20 to 40% with microalbuminuria (MA) progress to develop nephropathy after 20 years from the onset of diabetes, where 20% develop ESRD (3).

DN is a microvascular complication of DM and is known to be the leading cause of ESRD worldwide (4). Diabetic patients who develop albuminuria, are at risk of developing diabetic nephropathy (DN). In this condition, DN can progress from MA to macroalbuminuria. MA is considered an early marker of DN and a predictor for cardiovascular diseases (5).

The progression of DN from proteinuria to renal failure is irreversible (6). Therefore, the early detection of MA is crucial. The American Diabetes Association (ADA) recommends that all Type 2 diabetic patients should have an annual MA urine test, starting at the time of diagnosis (7).
In Saudi Arabia, the rate of MA among Type 2 diabetic patients attending the outpatient clinic for the internal medicine department at King Fahd University Hospital, Al-Khobar was 36.8% (8). Another study was conducted at the Primary Health Care Clinics at King Fahad Armed Forces Hospital, Jeddah, Saudi Arabia on 1,416 Saudis with type 2 diabetes. Microalbuminuria was present in 33.2% of DM patients (9). A cross-sectional study, where 54,670 Saudi Type 2 diabetic patients were selected from the Saudi National Diabetes Registry found that the prevalence of DN was 10.8%, divided into 1.2% MA, 8.1% macroalbuminuria, and 1.5% ESRD (10).

In the United Kingdom, the Prospective Diabetes Study (UKPDS), for newly diagnosed patients those with type two diabetes who progressed from normal, to microalbuminuria to macroalbuminuria and renal failure were 2 to 3% annually

(11). And after 15 years in median of follow up for four thousand diabetic patients, almost 40% developed albuminuria, and almost 30% developed renal failure (4). In Japan, the number of new patients who started renal replacement therapy due to diabetes has increased 7 fold, accounting for 40% of overall newly diagnosed patients (12). Also, NICE guidelines recommend using the Chronic Kidney Disease Epidemiology Collaboration (CKD-EPI) creatinine equation to estimate GFR creatinine (13).

Another cross-sectional study was done in 33 countries which evaluated more than 32,000 type 2 diabetic patient and 39% of them were found to have microalbuminuria, where the prevalence increased with aging, presence of hypertension and the duration of diabetes itself (14). Also, DN increases the morbidity and mortality universally among diabetic patients, and it is the largest cause of chronic renal diseases (15).

The complication of DN has been a major burden on developing countries and their health care systems. Kingdom of Saudi Arabia (KSA) is one of the highest countries in the prevalence of diabetes and its complications (16). Almost one-third of the patients who were diagnosed with type two diabetes have nephropathy (12). Additionally, in 2011 more than 40% of the ESRD cases in KSA were associated with diabetes (17).

Subjects and Methods

Study design, setting and time: This was a cross-sectional study that included records of 571 Type 2 diabetes patients who visited the Diabetic Center of King Abdulaziz Specialist Hospital for laboratory investigations starting from October 2018 to January 2019. Only patients having micro or macroalbuminuria were included. Exclusion criteria included patients with type 1 diabetes and patients with an uncompleted or inaccessible files during data collection.

Data collection: The data was gathered from patients' laboratory records. Data comprised Lab results, which were collected from the lab database of the Diabetic Center, while risk factors assessment was taken from patients' files according to doctors' history taking and notes.

Collected data included last reading of measured Albumin creatinine ratio, Fasting Blood Glucose, Hemoglobin A1C and Lipid Profile (HDL, LDL, Triglyceride, Cholesterol), Risk Factors of Micro and Macro albuminuria (Age, Smoking, Weight, Height, BMI, duration of DM) complications of long-standing T2DM (nephropathy, neuropathy, vasculopathy, retinopathy) and associated diseases with T2DM (HTN, Hyperlipidemia, IHD).

Microalbuminuria was considered if the patient had an albumin creatinine ratio (ACR) >30 and <300, while macroalbuminuria was considered from 300 and above ACR.

Statistical analyses: Data were represented in terms of frequencies (number of patients/ cases) and valid percentages for categorical variables. Mean, standard deviations (SD), minimum and maximum values were used to describe a numerical variable. IBM SPSS (Statistical Package for the Social Science; IBM Corp, Armonk, NY, USA) was used to perform all statistical calculations, version 22 for Microsoft Windows.

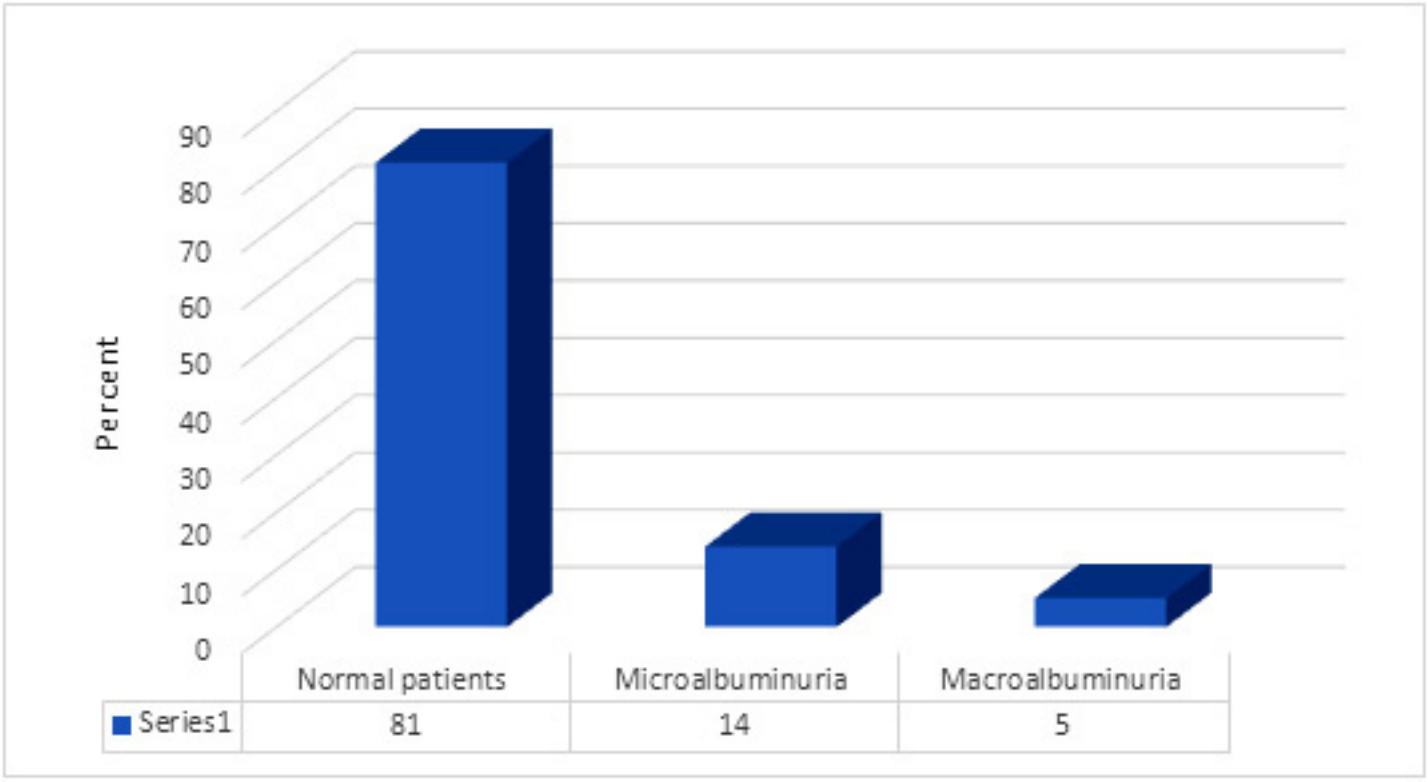
Ethical considerations: Institutional research ethics board approval was acquired before conducting any study procedure. The study was approved by the Ethical Committees at Taif University and KAASH.

Results

In this study, data from 571 patients' records was collected retrospectively. Data included patients' symptoms and laboratory findings.

Among 571 patients, 109 patients had positive ACR, where 80 of them had microalbuminuria and 29 had macroalbuminuria as shown in Figure 1.

Figure 1.:Prevalence of ACR among studied patients



Descriptive Analysis

Among 80 patients with microalbuminuria, 66 (82.5%) were above 50-years-old. Also, out of 70 of microalbuminuria patients, 44 (62.85%) had diabetes for less than 16 years. The mean HbA1c for microalbuminuria patients was 8.61% but only 71.25% of them were on insulin therapy. 67 of the microalbuminuria patients had comorbidities, 47 (70%) had hypertension, 15 (22.4%) had hyperlipidemia, 5 (7.5%) had nephropathy, 3 (4.5%) had ischemic heart disease, and 2 (3%) had benign prostate hypertrophy.

The other 29 patients with macroalbuminuria had a mean level of HbA1c 9.2. Out of the 29 macroalbuminuria patients, 27 patients had diabetes for less than 18 years. 82% of them were on insulin therapy. Regarding macroalbuminuria complications, 6 (28.6%) had nephropathy, while 5 (23.8%) had neuropathy, 6 (28.6%) had vasculopathy, 5 (23.8%) had retinopathy and only 1 (4.8%) had combined nephropathy, neuropathy, vasculopathy, and retinopathy. A full description is detailed in Table 1.

Table 1. Differences between microalbuminuria and macroalbuminuria according to quantitative data (Age, creatinine, HbA1c, LDL, HDL, Triglyceride, cholesterol, duration of diabetes)

Variable	Microalbuminuria	N (%)	Missing data	Macroalbuminuria	N (%)	Missing data
Age	59.2	80	0	61.4	29	0
Creatinine	1.195	63	17	1.750	23	6
HbA1c	8.61	80	0	9.20	29	0
LDL	99.67	75	5	97.45	26	3
HDL	40.38	69	11	36.76	25	4
Triglyceride	155.18	72	8	204.25	24	5
Cholesterol	166	71	9	172	24	5
Duration of diabetes	13.2	70	10	15.5	27	2

Discussion

In the present study, 571 type 2 diabetic patients were studied and the overall prevalence of microalbuminuria and macroalbuminuria was found to be 19% (109 cases). where microalbuminuria accounted for 73.39% of all cases (80 cases) and macroalbuminuria accounted for 26.61% of all cases (29 cases).

Comparing means of results, age, levels of creatinine, fasting blood glucose, HbA1c, triglyceride, cholesterol, duration of diabetes and systolic blood pressure are higher in patients with macroalbuminuria than microalbuminuria, however, diastolic blood pressure did not show a significant difference in patients with and without microalbuminuria, with a mean of 77.

In a prior study, it was discovered that microalbuminuria was substantially correlated with aberrant HbA1c levels, hypertension, and excessive serum creatinine. There was no difference between patients with and without microalbuminuria in terms of mean age, BMI, or cholesterol levels (18).

Age-related differences in albuminuria incidence have been the subject of some research (19, 20). Even after adjusting for the length of the illness, Bruno et al. observed that growing older was independently linked with microalbumiuria in an Italian population (19). In contrast, even in univariate analysis, our study design in the Iranian population was unable to confirm a connection between age and albuminuria. Additionally, in an Afro-American sample, there was no correlation between age and albumin excretion rate (20).

The study showed a strong correlation between the prevalence of albuminuria in general and hypertension where hypertension was diagnosed in 70% of all patients who have micro or macroalbuminuria. This finding is consistent with past research in which albuminuria has been linked to essential hypertension, dyslipidemia, obesity, poor glucose tolerance, insulin resistance, and other characteristics of the metabolic syndrome (21,22,23).

The study also showed a strong correlation between the prevalence of albuminuria and the duration of diabetes where 71% of all patients who have micro or macroalbuminuria had diabetes for more than 10 years. The same result was revealed from previous studies (24,25).

Yet, there was a non-significant correlation between the prevalence of albuminuria and gender, fasting blood glucose or HbA1c. The risk of diabetic microvascular problems is strongly predicted by the HbA1c level, and glycosylated haemoglobin level has been the focus of diabetes care. There is some evidence that intensive glycemic management can postpone the progression of DKD and albuminuria (26).

Limitations

The present study has some limitations. First, the cross-sectional design and poor history taking and documentation of risk factors of diabetes patients by doctors could affect the internal validity of the study. Also, the limited access for the data and some missing files affected the reliability of the produced outcomes.

Conclusion

The prevalence of albuminuria in Type 2 diabetic patients was found to be high, which calls for the need of increasing awareness among type 2 diabetes patients and developing strategies among physicians for prevention, detection and treatment of diabetic nephropathy.

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