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Research Article

Frequency of Microalbuminuria in Saudi Adults with Type 2 Diabetes Mellitus

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Received: May 14, 2018; **Published:** June 08, 2018

Abstract

Background: Diabetes is one of the most common chronic diseases. The development of microalbuminuria in type 2 diabetes increases the risk for renal and cardiovascular disease.

Methods: The study was cross section conducted at the Primary Health Care Clinics at King Fahad Armed Forces Hospital, Jeddah, Saudi Arabia. A total of 1416 Saudi with type type 2 diabetes were randomly selected.

Results: Total of 1416 patients with type 2 diabetes included in this study; 570 (40.3%) male and 846 (59.7%) female with mean age 39.5 ± 6.3. Microalbuminuria was present in 470 (33.2%). Microalbuminuria was significantly more prevalent in female (54.7%) with female predominance (sex ratio male: female) 1:1.7. Hypertension with microalbuminuria was more prevalent in 316(37.4%) of microalbuminuria group with odd ratio 1.7 (1.3 - 2.1) $p < 0.0001$. Microalbuminuria have significant higher HbA1c than patients with normoalbuminuria and there was a significant difference between gender and when compared to HbA1c groups.

Conclusion: The frequency of microalbuminuria in patients with type 2 diabetes in this study is high. It is mandatory to have adequate diagnostic, therapeutic and educational resources in addition to competent physicians who can manage microalbuminuria in diabetic patients by using a continuing, comprehensive and coordinated approach.

Keywords: *Type 2 Diabetes Mellitus; Microalbuminuria*

Introduction

Diabetes mellitus is one of the most common disease affecting both developed and developing countries and occur at a higher prevalence in the older age group and result from both genetic and environmental etiological factors [1-3]. Type 2 diabetes (T2DM) accounts for over 90% of diabetes, and yet the natural history of nephropathy from prospective data is less well described for T2DM [4]. The earliest clinical sign of diabetic nephropathy is an elevated urinary albumin excretion, referred to as microalbuminuria (MA). MA is defined as an albumin excretion rate (AER) of 20 - 199 g/min in a timed or a 24-h urine collection (equivalent to 30 - 299 mg/g creatinine in a random spot sample) [5]. The development of MA in T2DM increases the risk for renal and cardiovascular disease [6-8]. End-stage renal disease incidence in T2DM has risen in many regions of the world [9-10]. Diabetes is estimated to increase the risk of end-stage renal disease approximately 12-fold [11]. MA is also one of the predictors for cardiovascular disease [12-17]. MA was found in 17 - 40% of patients with T2DM [18-23]. As a high proportion of patients with T2DM are found to have MA or overt nephropathy shortly after diagnosis of their diabetes, annual screening for microalbuminuria is recommended by the American Diabetes Association [5]. Screening by means of a semi-quantitative dipstick test is accurate, easy and immediate [24]. Although T2DM is more common in Saudi Arabia than in Europeans in the

UK, very little is known about complications and their risk factors in Saudi Arabia. There have been few studies on the prevalence of MA in Saudi populations. In this study we report on the prevalence of MA in patients with T2DM attending a diabetes centre in Saudi Arabia.

Methods

The study was cross section conducted at the Primary Health Care Clinics at King Fahad Armed Forces Hospital. A total of 1416 Saudi with T2DM were randomly selected. The demographic data and medical history were documented. Blood Pressure readings were within a gap of 15 minutes using a mercury sphygmomanometer by palpation and auscultation method in right arm in sitting position. Two readings, 15 min apart, were taken and the average of both the readings was taken for analysis. Hypertension (HTN) was also diagnosed based on anti HTN medications or having a prescription of antihypertensive drugs and were classified as Hypertensive irrespective of their current blood pressure reading or if the blood pressure was greater than 140/90 mmHg i.e. systolic BP more than 140 and diastolic BP more than 90 mm of Hg - Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines [25]. HbA1c was expressed as percentage. High performance liquid chromatography was used. The HbA1c was divided into three groups; < 7.0, 7.0 - 8.9 and ≥ 9.0. MA was assessed by measurement of mean albumin excretion rate (AER) on timed, overnight urine collections. We use a polyclonal radioimmunoassay for albumin measurement. MA was defined as AER 30 g/min in overnight urine collections (equivalent to 30 - 299 mg/g creatinine in a random spot sample).

Statistical Analysis

Univariate analysis of baseline and follow up demography and clinical laboratory endpoints were accomplished using unpaired t-test. Chi square (X^2) test were used for categorical data comparison. All statistical analyses. were performed using SPSS Version 22.0. All P values were based on two-sided tests. $P < 0.05$ was considered to be significant.

Results

Total of 1416 patients with T2DM included in this study; 570 (40.3%) male and 846 (59.7%) female with mean age 39.5 ± 6.3 (Table 1). MA was present in 470 (33.2%). MA was significantly more prevalent in female (54.7%) with female predominance (sex ratio male: female) 1:1.7. HTN with MA was more prevalent in 316(37.4%) of MA group with odd ratio 1.7 (1.3 - 2.1) $p < 0.0001$ with significant difference between both gender (Figure 1). MA have significant higher HbA1c than patients with normoalbuminuric and there was a significant difference between gender and when compared to HbA1c groups (Figure 2 and 3).

Parameters		Normoalbuminuria 946 (66.8)	Microalbuminuria 470 (33.2)	P value
Gender	Male	357 (45.3)	213 (37.7)	0.006
	Female	589 (54.7)	257 (62.3)	
Age (years)		39.4 ± 6.1	39.8±6.6	0.2
Body mass index		31.6 ± 6.2	31.2±5.8	0.2
Hypertension		530 (62.6)	316 (37.4)	< 0.0001
HbA1c		8.0 ± 2.3	8.5±2.3	< 0.0001
Serum creatinine		69.7 ± 18.3	76.7±30.2	< 0.0001
Urine microalbumin (g/min)		10.7 ± 7.4	192.5±375.3	< 0.0001

Table 1: *Demographic patients parameters and Comparison of features between microalbumin groups.*

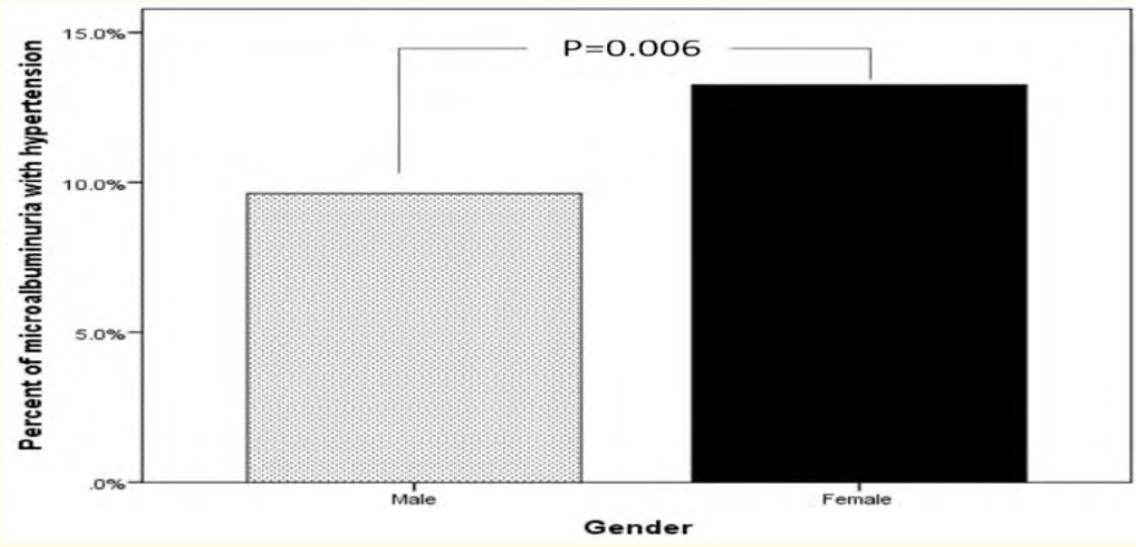

Figure 1: *Frequency of microalbuminuria and hypertension according to gender.*

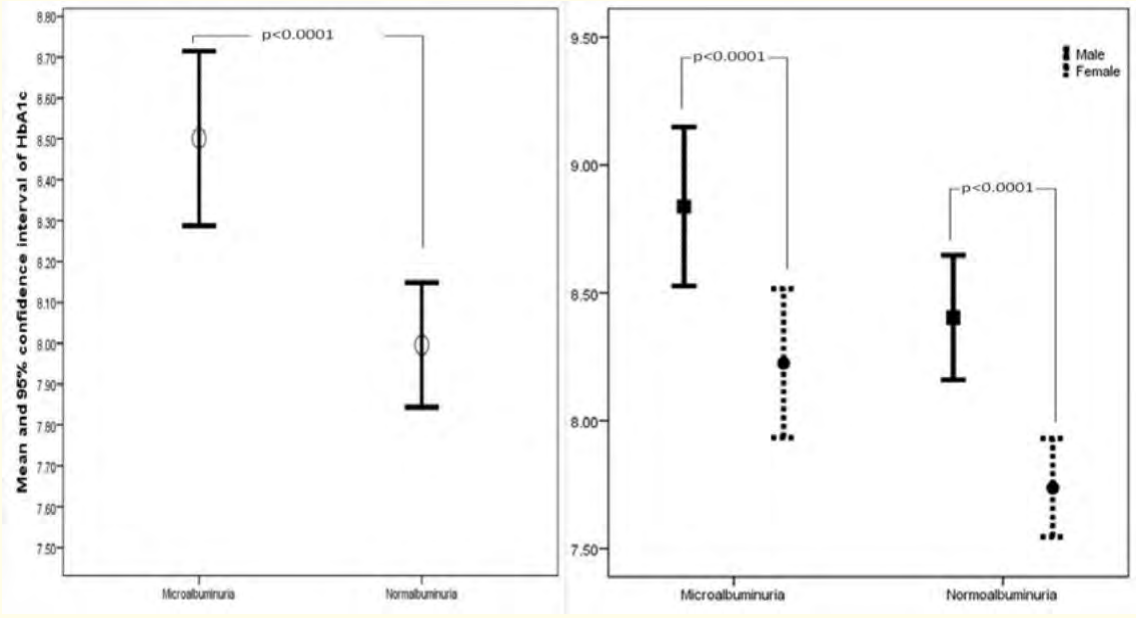

Figure 2: *Mean HbA1c of microalbuminuria group and gender.*

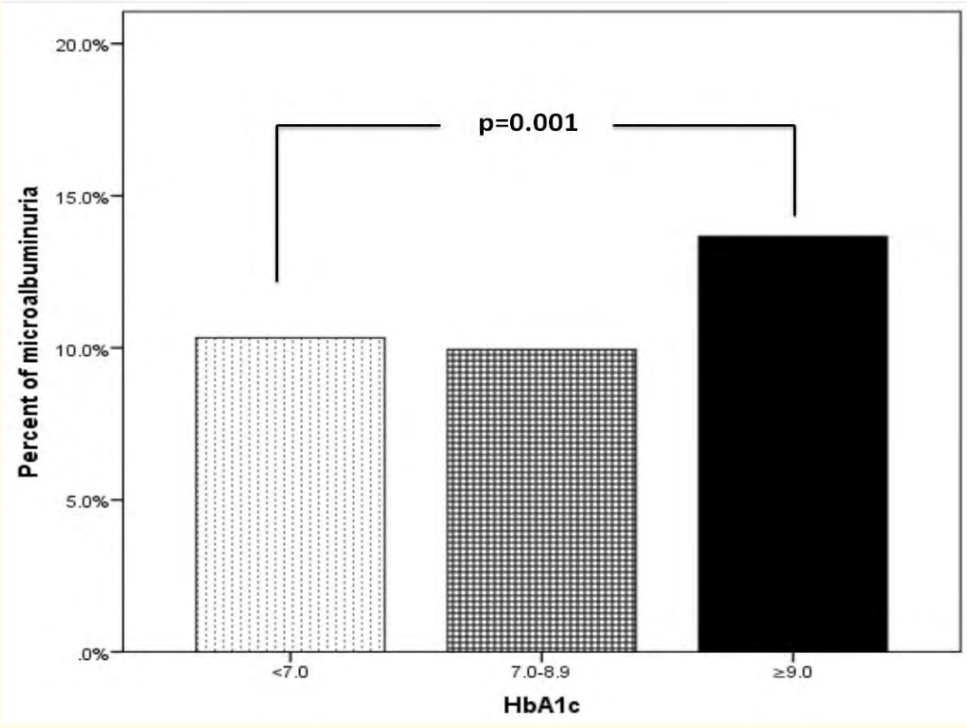

Figure 3: *Frequency of microalbuminuria group according to HbA1c groups.*

Discussion and Conclusion

The chronic noncommunicable diseases represent one of the most difficult challenges for all health care systems, in both developed and developing countries, due to their continuous and relentless growth. T2DM represented the most paradigmatic example. In the past decade, end-stage renal failure in patients with T2DM has emerged as a serious public health problem and as a major medical challenge. Diabetic nephropathy (DN) is the leading cause of end-stage renal disease and the care of patients with T2DM and DN contributes significantly to health care costs. DN patients are a problem at the interface between general medicine, primary care physician, diabetology and nephrology. Of patients with T2DM, about 10% - 20% will eventually develop DN [26]. The earliest clinical evidence of DN is the appearance of low but abnormal levels of albumin in the urine, referred to as MA, and patients with MA are referred to as having incipient DN. A higher proportion of individuals with T2DM are found to have overt nephropathy and MA shortly after diabetes diagnosis, because diabetes is actually present for many years before the diagnosis is made and as shown by biopsy studies, the presence of albuminuria may be less specific for the presence of diabetic nephropathy. Albuminuria is a marker of increased cardiovascular morbidity and mortality for patients with T2DM. Thus, possible vascular disease could be indicated by the finding of MA and it is an indication for aggressive intervention to reduce all cardiovascular risk factors.

We have shown MA frequency in T2DM to be 33.2%. Reports from various epidemiological and cross-sectional studies have shown marked variation in the prevalence of MA [27-32]. In Saudi Arabia, the rate of MA among Type 2 diabetic patients attending the diabetic clinic of King Abdulaziz University Hospital during the period of September 2004 to April 2005 was 45.6% [33]. About 54.3% of patients with Type 2 DM attending a primary care center in Southern Saudi Arabia, had proteinuria [34]. A cross-sectional study, where 54.670

Saudi Type 2 diabetic patients were selected from Saudi National Diabetes Registry found that the prevalence of MA was 1.2%. [35]. Microalbuminuria Prevalence Study is a large multicentre epidemiological study in Asia to determine the prevalence of MA in T2DM patients with hypertension [36]. In a population of 5,549 patients, 39.8% have MA. This is higher than the prevalence rates, reported by us (33.2%) and in population-based studies for Western diabetic patients (17% to 21%) [23]. In another Asian study, in southern India, MA was detected in 36.3% of T2DM [22]. These variations in the prevalence rate of proteinuria can be attributed to differences in several factors such as; study design, source of study population, sample selection, race, age, sex structure of the study population, diagnostic criteria, as well as the methods of measurement of proteinuria and urine collection, diabetic duration, diabetic treatment, and presence of hypertension [37].

In the present study the prevalence of MA across the genders were statistically different. In discordance with our study, earlier studies have reported an increased prevalence of MA in male compared with female. Because women have a lower creatinine excretion than men there is a problem when comparing prevalence across genders using the albumin creatinine ratio. Some studies have revealed male sex, duration of diabetes, and pre-existing retinopathy as major risk factors for MA [30]. In our study, Ma was more frequent in females and non-significantly correlated with younger age ($r = -0.04$, $p = 0.1$) in discordance with other studies [38,39]. We have also found nonsignificant association of MA with obesity ($r = 0.02$, $p = 0.6$) in discordance with other studies. In our study, multiple logistic regression analysis revealed hypertension and HbA1c as the risk factors for MA.

The causal risk factors for MA are poor glycaemic control and uncontrolled hypertension. A number of observational studies have shown that poorer glycemic control is associated with the development of MA [30,40-42]. Glycaemic control has been shown to reverse established pathology and to prevent development of nephropathy. Several prospective, interventional studies showed that improved glycemic control caused a decrease in the development and progression of albuminuria but in most cases, statistical significance finding was precluded by the small sizes of the cohorts [41,42]. Intensive therapy significantly reduced the risk of nephropathy progression (Odd Ratio = 0.3) was concluded by a meta-analysis of these studies [43]. However, as evidenced by available mean HbA1c values above 7.0%, the majority of our patients in the MA group did not achieve adequate glycaemic control [44-46].

We have found the frequency of HTN in patients with MA is 37.4%. In adults, HTN frequently coexists with T2DM. The prevalence of HTN is > 50% in patients with T2DM [47]. HTN which is often accompanied is itself a risk factor for MA Parving., *et al.* in 1974 was the first to report MA in hypertensive patients without diabetes [23]. Since then, several studies have shown that MA occurs in about 30% of patients with mild or moderate hypertension, ranging from 7% to 40% depending on age and ethnic group [47-49].

A clinic based study introduces referral bias, is one of the limitations of this study. This could have introduced some degree of referral bias. However, the prevalence of MA is similar to that reported in other studies. A single urine spot collection with semiquantitative dipstick determinations was used to detect MA. The ADA guidelines stated that this technique has acceptable sensitivity and specificity but recommend that several collections should be done in a 3 to 6-month period before diagnosing a patient as having MA [5].

We conclude that the frequency of MA in patients with T2DM in this study is high. It is mandatory to have adequate diagnostic, therapeutic and educational resources in addition to competent physicians who can manage MA in diabetic patients by using a continuing, comprehensive and coordinated approach.

Acknowledgement

The author would like to thank all colleagues from the Department of Endocrinology for helping in data collection.

Conflict of Interests

The authors declare no conflict of interests.

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Volume 3 Issue 1 June 2018