Annals of Clinical and Analytical Medicine

# Prevalence and Gender Difference in Microalbuminuria among Diabetic Patients Attending Primary Healthcare Center at Security Forces Hospital, Riyadh, Saudi Arabia

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Received 8/1/2022; revised 21/1/2022; accepted 25/2/2022

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**Abstract**

**Introduction**: Diabetic nephropathy is a common cause for end stage renal disease, and kidney failure is a main cause of death in type 2 DM patient. An early significant marker for diabetic nephropathy is microalbuminuria which can lead to end stage renal disease. This study focused on the prevalence of microalbuminuria and gender difference among patients with type II diabetes mellitus, in Riyadh, Saudi Arabia.

**Methods**: This is a cross-sectional study based on the electronic medical records. This study included 283 diabetic patients, who attended primary care center at security forces hospital in 2019. Included patients from both genders who had type II diabetes mellites and aged 20-60 years old. Patients with congestive cardiac failure, urinary tract infection, or pregnant patients were excluded from this study. Detection of difference in the mean of microalbuminuria is done by t-test and Mann-Whitney test. Significant associations between demographic and background variables were detected at < 0.05 significance level.

**Results**: A total of 283 diabetic patients were included in this study. Female patients accounted for 4.2% while males constituted 45.8% of the diabetic patients. After exclusion of patients with overt albuminuria, the prevalence of microalbuminuria was 9.8%. Patients with normal albuminuria accounted for 90.2%, while only three patients had overt albuminuria. There was no significant difference between medians of gender groups using Mann-Whitney test (p=0.300).

**Conclusions**: Prevalence of microalbuminuria is low among T2DM patients in Riyadh city which may indicate a high quality of healthcare provided for diabetic patients. Gender was not a significant risk factor for microalbuminuria among the diabetic patients.

**Keywords**: Diabetes mellitus, Nephropathy, Renal diseases, Saudi

## Introduction

Diabetes mellitus DM is a worldwide metabolic disorder characterized by hyperglycemia resulting from resistance to insulin action, inadequate insulin secretion, and excessive or inappropriate glucagon secretion (1). Diabetes mellitus is one of the most common chronic diseases with a global growing prevalence (2). The prevalence of DM is dramatically increasing, globally an estimated 425 million people have diabetes and there were 3.852.000 cases of diabetes in Saudi Arabia more than 18.5 % of the total population (3). Diabetes mellitus is declared by World Health Organization to be a progressive epidemic related to the increase in population aging, obesity, sedentary life style (4). Additionally, about 175 million patients remain undiagnosed, which increase the incidence of diabetes complications and rise the disease burden (5). Diabetes mellitus type II is the most common type of diabetes account for 90 – 95 % of diagnosed cases (1).

The premature deaths due to diabetes complications increase globally with approximately half of diabetes-related deaths occurred among patients < 60 years old (6). It is important to mention that 35 of 219 countries have a prevalence higher than 12% which is considered very high when compared to 4.4% global incidence. Many Arabic countries have high prevalence of diabetes mellitus, particularly gulf countries (7). Previous study in Saudi Arabia found that DM is becoming increasingly because of obesity and sedentary life with lack of physical activity.

In Saudi Arabia, the largest country in Middle East, diabetes mellitus is identified as a common chronic disease with rapidly increasing incidence. Saudi Arabia has the second rank in the prevalence of diabetes among Middle East countries and the seventh rank internationally (8). Recent studies reported a prevalence of 34.1% in men and 27.6% in women (9). The overall prevalence of diabetes was 23.7% in Riyadh region which was significantly higher in the urban areas compared to rural areas (10). Another study reported that more than half of Saudi adults (≥ 30 years old) are either diabetic or in in prediabetic phase (11). The Saudi health system has a large burden of diabetes mellitus with estimation of 0.9 billion dollars spent in 2010 to treat complications of diabetes (12).

Diabetic nephropathy is a common cause for end stage renal disease, and kidney failure is a main cause of death in type 2 DM patient (13) . An early significant marker for diabetic nephropathy is microalbuminuria which can lead to end stage renal disease. There are many studies assessed prevalence of microalbuminuria in different countries. The prevalence varied widely but it was high in Asian countries and Sub-Sahara Africa. The prevalence of microalbuminuria was 57% in Nigeria, and up to 53% in Cameron (14). In UAE, a study showed that the prevalence reaches up to 61 % (15). However, in Saudi Arabia, the majority of studies assessed diabetic nephropathy and end-stage renal disease (16-20), as general, while few studies focused on microalbuminuria as an early indicator for nephropathy (21, 22). This study focused on the prevalence of microalbuminuria and gender difference among patients with type II diabetes mellitus, in Riyadh, Saudi Arabia.

## Methods

This is a cross-sectional study based on the electronic medical records. This study included 283 diabetic patients, who attended primary care center at security forces hospital in 2019. Included patients from both genders who had type II diabetes mellites and aged 20-60 years old. Patients with congestive cardiac failure, urinary tract infection, or pregnant patients were excluded from this study. Sample size calculated based on the equation of proportion assessment. The overall prevalence of diabetes in Saudi Arabia was 24% as estimated from previous studies (10). Thus, at the confidence level of 95% and estimation error of 0.05, the minimum sample size is calculated to be 280 participants, based on the expected proportion of 24%.

Data collected from electronic records into an Excel sheet containing variables such as level of albuminuria and gender of patients. Data were introduced anonymously to computer and analyzed using Statistical Package of Social Silences (SPSS,

version 26). The data were analyzed to present the findings in the descriptive and inferential statistics. The descriptive statistics include frequencies and percentages for categorical variables, while means, median and standard deviations were used to summarize numerical data. A sample of urine was considered positive if the albumin/creatinine ratio (ACR) is 30-299 based on measurement unit of mg for albumin/ and gram for creatinine. Detection of difference in the mean of microalbuminuria is done by t-test and Mann-Whitney test. Significant associations between demographic and background variables were detected at < 0.05 significance level. Informed consent was obtained from the patients before collection of data. The protocol was approved by the ethical committee in security forces hospital, Riyadh, Saudi Arabia.

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## Results

A total of 283 diabetic patients were included in this study. Female patients accounted for 4.2% while males constituted 45.8% of the diabetic patients. After exclusion of patients with overt albuminuria, the prevalence of microalbuminuria was 9.8%. Patients with normal albuminuria accounted for 90.2%, while only three patients had overt albuminuria.

Although mean of albuminuria was higher among males that that among females (12.2 versus 10.6 mg/day), association between gender and occurrence of microalbuminuria was not statistically significant using independent samples t-test (p=0.711). Because of data were not normally distributed, non-parametric test was used to detect any significant difference between median of gender groups (Figure 1). There was no significant difference between medians of gender groups using Mann-Whitney test (p=0.300).

**Table (1): Demographic and clinical characteristics of the diabetic patients**

| Characteristics | Frequency | Percent (%) |
|---|---|---|
| **Gender** | | |
| Male | 107 | 45.5 |
| Female | 128 | 54.5 |
| **Level of albuminuria after exclusion of overt patients** | | |
| <30 mg/day | 212 | 90.2 |
| 30-300 mg/day | 23 | 9.8 |
| **Heart failure** | | |
| Yes | 3 | 1.3 |
| No | 232 | 98.7 |
| **Level of albuminuria among all patients** | | |
| <30 mg\day | 212 | 89.1 |
| 30-300 mg\day | 23 | 9.7 |
| >300 mg\day | 3 | 1.3 |

## Discussion

Chronic disease such as diabetic mellitus is challenging for health systems in developing as well as developed countries because of highly increasing burden (23). Diabetic nephropathy could affect 20-30% of patients which is a major cause of end-stage renal disease (24). Microalbuminuria could be considered as an early sign of nephropathy which could help in early detection and management of diabetic patients. This study focused on the prevalence of microalbuminuria and gender difference among patients with type II diabetes mellitus, in Riyadh, Saudi Arabia.

The present study found 9.8% and 1.3% prevalence of microalbuminuria and macroalbuminuria among diabetic patients in Riyadh city. A slightly higher prevalence of microalbuminuria (13.9%) was found among 1,416 patients with type II DM in Jeddah city. However, the prevalence was much higher (29.6%) among type I DM included in the same study (22). However, different findings reported by a large-scale registry-based study that included 67,075 patients with T2DM in Saudi Arabia (17). The prevalence of microalbuminuria and macroalbuminuria was 1.2% and 8.1%, respectively (17), which is totally different

**Table (2): Association between gender and albuminuria among diabetic patients**

| Gender | Microalbuminuria | Statistical test | P value |
|---|---|---|---|
| **Difference between means (using independent sample t-test)** | | | |
| Male | 12.2±33.6 | 0.371 | 0.711 |
| Female | 10.6±31.6 | | |
| **Difference between medians of gender groups using Mann-Whitney test** | | | |
| Male | 1.3 | 1.36 | 0.300 |
| Female | 1.6 | | |

from the findings of the present study. This difference might be a result of prevalent cases effect, as national registry contains old DM cases with a mean duration of 13.6 years. The old cases of DM are more likely to have macroalbuminuria than newly diagnosed cases. Unlike, studies depended on data from primary healthcare setting where cases are more likely to be newly diagnosed than cases in the national registry.

In a multicentral study conducted among Asian patients, a high prevalence of microalbuminuria (39.7%) was reported. This might be partially explained by inclusion of diabetic Asian patients who had hypertension (25). However, a similar high prevalence (39.8%) was reported among 5,549 patients with T2DM in 10 Asian countries. Reporting of high prevalence was common in Asian populations which may highlight a role of ethnic and genetic factors in the development of microalbuminuria. To estimate ethnic differences related to the prevalence of albuminuria, a study conducted among 4467 diabetic patients in the United States (26). After adjusting of other factors, minorities such as Asians, had twofold higher risk to have microalbuminuria in comparison to Whites among patients without hypertension, while in hypertensive patients, threefold increase of risk was reported among Hispanics compared to Whites (26). In the other hand, some Caucasian populations reported a high prevalence of microalbuminuria such that assessed in Albania (40.8%), which heighted that other factors may be involved including accessibility and quality of health care (27). Differently, in Scandinavian country such as Norway, prevalence of microalbuminuria was 27.8% and 22.4% in male and female diabetic patients (28).

A high prevalence of microalbuminuria is common in non-Caucasian populations such as India. A study, carried out in South India, found a prevalence of 36.3% in patients with type II diabetes mellitus (29). In Pakistan, a prevalence of 34% from a multicentral study in Karachi (30). A very high prevalence was reported in United Arab Emirates (UAE), as 61% of diabetic patients attending primary healthcare setting had microalbuminuria (15). However, the assessment of microalbuminuria was done by measurement of urine albumin excretion (>20 µg/min) which include more false positive cases than albumin/creatinine ratio. The use of albumin/creatinine ratio is superior to albumin excretion rate as confirmed by the literature (31).

Gender was not significantly associated with level of microalbuminuria among diabetic patients included in the current study. Similarly, the prevalence of microalbuminuria was not statistically significant across gender groups among patients with T2DM in South India (29).

Regarding association between gender and microalbuminuria, the findings in the literature are contradicting. Findings among a sample of 583 European and 889 South Asian revealed that the prevalence of microalbuminuria is higher among men than women (32). The prevalence of microalbuminuria was significantly higher among males than females as reported in United Arab Emirates (53% versus 47%, respectively) (15). Furthermore, in Pakistan, a prevalence of microalbuminuria was significantly related to male gender (30).

In the other hand, a study of Aljabri et al. found a significantly higher female: male ratio (2.3 versus 1) among those affected by microalbuminuria in Jeddah city, Saudi Arabia (22).

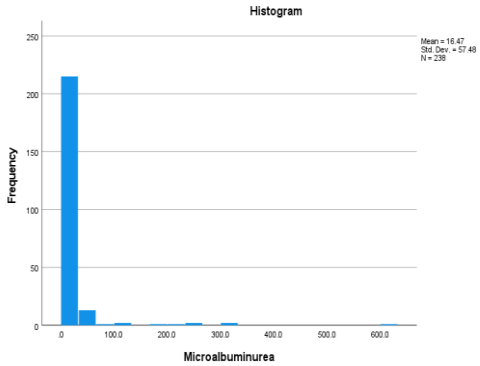


**Figure (1): The distribution of microalbuminuria measurements among type II diabetic patients**

The reason behind these controversial results might be attributed to the physiological factors. As women have a lower creatinine excretion than men, there may be a problem in using albumin-creatinine ratio for assessment of gender difference regarding level of albuminuria. In this case, some investigators suggested use of a lower threshold for males than females (33).

## Conclusions

Prevalence of microalbuminuria is low among T2DM patients in Riyadh city which may indicate a high quality of healthcare provided for diabetic patients. Gender was not a significant risk factor for microalbuminuria among the diabetic patients.

## Conflict of interests

The authors declared no conflict of interests.

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