

Albumin:Creatinine Ratio as Predictor Markers for Nephropathy in Sudanese Type 2 Diabetic Patients

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Abstract

Introduction: The aim was to assess albumin: creatinine ratio in type 2 DM patients and its relation to diabetic nephropathy complication.

Materials and methods: This case control study was conducted at Military hospital, (n = 205) diagnosed type 2 DM patients (94 males and 111 females), and [n 100] controls were included. Urinary Albumin: Creatinine ratio, ACR, was estimated by Cobas C-311[®] fully automated analyzer.

Results: Type 2 DM patients had higher level of albumin: creatinine ratio than controls *p*-value (0.000) No significant difference in level of albumin: creatinine ratio between males and females *p*-value (0.271). Moreover, patients, who received statin drugs showed increase in albumin: creatinine ratio level *p*-value [0.046] and there was a positive correlation between albumin: creatinine ratio level and duration of disease (r: 0.280, *P*-value 0.00).

Conclusion: The data suggested that, albumin: creatinine ratio is a useful diagnostic and predictor marker for diabetic nephropathy in type 2 DM patients.

Keywords

Albumin: creatinine ratio, nephropathy, type 2 DM, Sudan.

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Introduction

Diabetes mellitus (DM) is a chronic metabolic disorder [1-3]. Nearly, DM became most common chronic disorder [4] with increasing prevalence worldwide [5]. Diabetes affected more than 371 million adults worldwide in 2012. This number is expected to increase by 2030 to approximately 552 million adults [6], 80% were living in low and middle income countries [7]. In Sudan, prevalence of diabetes is rising from 9.3% in 2010 to 10.6% in four states in 2013 [7]. Type 2 diabetes mellitus is a complex condition, result from resistance of insulin action combine with impaired pancreatic function [8]. If left untreated, Type 2 DM can lead to chronic microvascular and macrovascular complications [9]. Some studies reported that, Type 2 DM is frequently accompanied with chronic low grade of inflammation which plays vital role in the development and

progression of diabetic complications [10].

One of the chronic and serious complication of type 2 DM is diabetic nephropathy [11, 12]. It can lead to increase mortality and morbidity and decrease the life quality [13]. The earliest clinical indication of nephropathy is the appearance of albumin in the urine [14]. The term 'microalbuminuria' meaning 'small size', actually refers to the presence of a relatively 'small quantity' of protein in the urine [15]. Detection of albumin: creatinine ratio (ACR) is an important screening tool because it is used as an early indicator of kidney disease progression and one of predictive factor of cardiovascular diseases, (CVD) [16-20].

Previous studies documented that, diabetic patients undergo a subsequent increase in the level of urinary albumin [21] that leads to activation of inflammatory pathways and progression of

renal and cardiovascular complications [22,23]. Therefore, we hypothesized that, ACR is associated with nephropathy in type 2 DM patients.

Materials and methods

In case control study we examined n=205 type 2 DM patients, [94 males and 111 females¹. The age for both ranged from 39 to 75years old. As control 100 subjects were recruited from both age and sex that apparently match healthy individuals. DM patients with inflammatory, liver and/or renal diseases were excluded. Written consents information was obtained from each participations. This study was approved by local committee of Al-Neelain University, Sudan.

Measurement of ACR

According to manufacturer, urine albumin and creatinine were analyzed by Cobas C-311[®] fully automated analyzer. Anti-

albumin antibodies reacted with antigen in the sample to form antigen-antibody complexes, followed by agglutination, and then complexes were measured turbidimetrically. Moreover, creatinine reacted with picrate in alkaline medium to form a yellow-red adduct. The rate of the dye formation was directly proportional to the creatinine concentration in the specimen and was measured photometrically.

Measurement of BMI

Body mass index [BMI] was calculated using (weight kg/height m²) formula.

Statistical analysis

All statistical analyses were performed using the SPSS software (Statistical Package for the Social Sciences¹ [version 17.0; SPSS Inc.). Independent *t*-test was employed to compare mean between groups. Pearson's correlation was used to correlate between study parameters and variables. Quantitative variables

were demonstrated as mean±SD and significant differences were considered as P -value ≤ 0.05 .

Results

The study comprised of 205 Type 2 diabetic patients and 100 health apparently controls. The mean level of ACR was significantly increased in the case group (37.3±29.3) compared with control group (7.27±6.38) with a p -value 0.000¹ as shown in (figure 1).

The results of the study showed insignificant differences in mean of ACR between males

(30.6±8.60) and females [42.9±7.21¹ with (p -value 0.271) as presented in (figure 2).

Figure 3 revealed that the patients' group that took cholesterol lowering agent (statin) showed a significantly higher ACR level (44.3±85.3) in contrast to untreated Patients (23.6±39.1) with [p -value 0.046¹].

In correlation analysis, there was positive correlation between ACR and duration of diabetes (r : 0.56 p -value 0.000) as demonstrated by (table1).

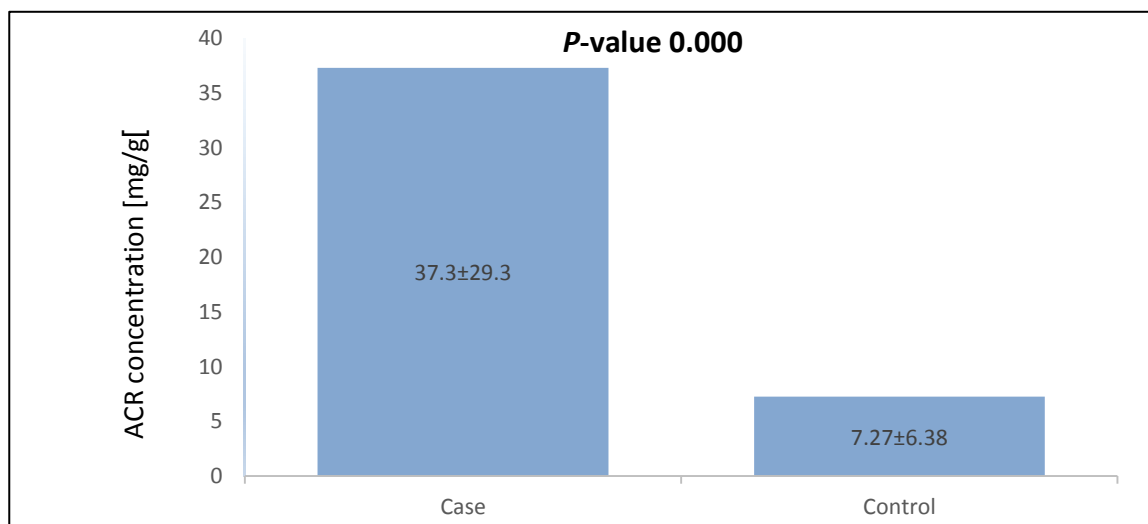


Figure (1): mean level of ACR in case and control groups

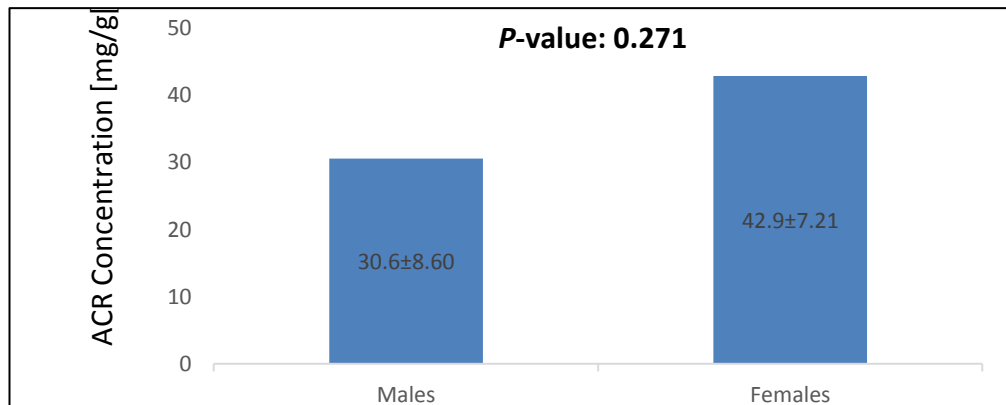


Figure (2): mean level of ACR in patients group classified according to gender

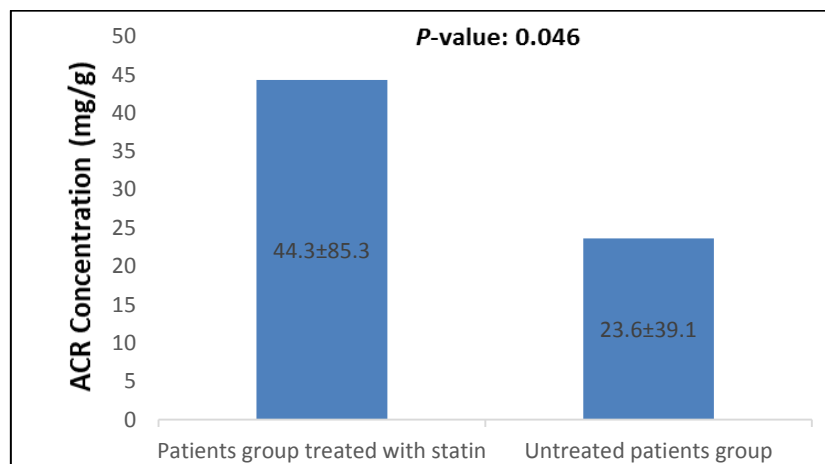


Figure (3): mean level of ACR in patients group classified according to statin treatment

Table [1]: Correlation of ACR with BMI, age and duration of disease

Correlation	R	P-value
ACR with BMI	0.06	0.378
ACR with age	0.28	0.688
ACR with duration	0.28	0.000**

(R): Pearson correlation test, P-value less than 0.05 was statistically considered significant.

Discussion

In this study we found that, ACR level was significantly higher in type 2 DM patients compared to control. Our results were in agreement with previous studies, which suggested that, urine albumin/creatinine ratio was significantly increased in type 2 diabetic patients ^[24, 25]. Recently, the inflammatory pathway play the curtail role in type 2 pathogenesis, development and progression of the diabetes complications ^[14]. ACR also revealed insignificant differences in males when compared with females. Indeed, our results were in line with another study that reported that the prevalence of microalbuminuria was not statistically different according to gender ^[26].

Moreover patients who received statin treatment reported higher ACR; earlier studies suggested that inhibition of mevalonate synthesis by statins resulted in proteinuria by its action in proximal tubules ^[27].

The correlation between ACR and duration of disease reveled positive association, whereas no correlation was observed between BMI and age. Chinese type 2 DM patients showed positive correlation of ACR with course of disease and BMI and no correlation with age ^[28]. Other study observed linear relationship of ACR with age but no correlation with BMI ^[29]. The discrepancy in the findings of studies may be attributed to variation in dietary habits, life style, heterogeneity and ethnicity of selected population.

Conclusion

The study concluded that, ACR had significantly higher in type 2 DM patients and positively associated with duration of disease. Therefore, ACR might be useful diagnostic predictor marker for nephropathy in type 2 DM patients. Since, periodic monitoring should be recommended especially for patients with long time of DM.

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Competing of interest

All authors have declared that, no competing of interest exists.

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