



Microalbuminuria – A Possible Marker for Stress

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Type of Publication: Original Research Paper

Conflicts of Interest: Nil

Abstract

Introduction

Psychological stress can have several health implications including kidney disease. It contributes to various changes in the kidneys. Association of stress with microalbuminuria is less explored, further it is not known whether major life events, perceived stress and the resulting stress scores alter urinary albumin excretion.

Material and Methods

The present study was an OPD/IPD based case control study in which we randomly screened patients and controls in the age group of 20-50 years, attending the psychiatric OPD. Patients and controls were assessed by the presumptive stressful life events scale(PSLE) and perceived stress scale(PSS). Urinary albumin and creatinine was estimated by VITROS 5.1 Fusion chemistry system from orthoclinical diagnostics by Johnson & Johnson.

Results

Values of albumin:creatinine ratio(ACR), were significantly higher in cases as compared to controls. ACR had a better significant correlation with PSLE

score($r=0.548$, p value <0.0001) as compared to PSS score($r=0.31$, p value <0.0068).

Conclusion

Microalbuminuria was significantly increased in individuals with higher stress scores. Hence it could be possible marker for stress.

Keywords : Microalbumin, Stress, PSLE, PSS

Introduction

Psychological stress occurs when an individual perceives that environmental demands tax or exceed his or her adaptive capacity to a point where psychological or physiological responses to the stress condition can put them at a risk for illness, injury or disease[1]. It is difficult to give one definition of stress, as its perception is different to different individuals. Major life events are thought to be associated with stress and other stress related outcomes[2].

Stress is determined by a person's perception to a change in environment[3]. While each subject faces quiet different problems, they respond with a stereotyped pattern of biochemical, functional and structural changes, essentially involved in coping with any type of increased

demand upon vital activity, particularly adaptation to new situations.

Growing evidence indicates that psychological stress can have implications for health outcomes like kidney diseases. It contributes to various changes in the kidneys[4-6]. It increases the glomerular membrane permeability leading to an increase in urinary protein excretion and appearance of other high molecular weight proteins in the urine. Blood supply to the kidneys, is subject to central nervous system control. Under psychological strain vasoconstriction in the renal vascular bed occurs in normotensive subjects[7-10]. It is plausible that the long term psychological stressors result in unchecked increased sympathetic nervous system activity once kidneys get chronically stressed. Timely diagnosis of stress is important to prevent such alterations.

Microalbuminuria is defined as a urine albumin excretion (UAE) range between 20 and 200 $\mu\text{g}/\text{min}$ or 30-300 mg in overnight or 24 hours collection or albumin/creatinine ratio (ACR) between 30-300 mg/g of creatinine[11]. It has been associated with different physiological and pathological conditions[11,12,13].

Association of stress with microalbuminuria is less explored and also it is not known whether major life events and perceives stress, results in urinary albumin excretion. Previous studies have correlated albumin creatinine ratio with anxiety and depression[14]. However they did not explore whether it is a depressive trait or stress per se which leads to the alteration in expression.

Materials and Methods

The Present study was OPD/IPD based case control study, in which we randomly screened patients in between 20 and 50 years, attending the psychiatric OPD of Subharti Medical College and hospital. The patients were assessed by the presumptive stressful life events scale (PSLE) and perceived stress scale (PSS) till 75 patients were assessed for stress without any other obvious illness and 70 healthy

age and sex matched controls were enrolled without any obvious stress.

Patients with the established diagnosis of diabetic nephropathy and neuropathy, retinopathy, hypertension, smokers, alcoholics, cardiovascular diseases, patients with nephropathy of any other origin were excluded. Ethical clearance was obtained from the institutional ethical committee and research council. After obtaining written informed consent, the individuals were evaluated for past history, clinical history and family history and subsequently assessed by psychiatric stress scales (PSLE and PSS).

Spot urine sample of patients were collected in a sterile urine container, then centrifuged and stored at minus 20 °C. For urinary creatinine analysis 1 part of spot sample was mixed with 20 parts of reagent grade water. Urinary albumin and creatinine was estimated by VITROS 5.1 Fusion chemistry system from Orthoclinical diagnostics by Johnson & Johnson USA. Data was analysed by using statistical package for social sciences version 21.0(SPSS v 21.0). Values were given as mean \pm SD. p value of <0.05 was considered as significant

Results

Out of 145 patients 75(51.72%) were cases and 70(48.27%) were controls. Further among the cases 45 (60%) were males and 30(20.9%) were females and in controls 40(57.14%) were male and 30(42.86%) were females. Values of albumin:creatinine ratio (ACR), were significantly higher in cases as compared to controls (Table 1). On analysing the correlation of ACR with PSS and PSLE among the the cases in our study group, it was found that there existed a significant correlation of ACR with PSLE, PSS ($p<0.05$). ACR was most strongly correlated with PSLE with a correlation coefficient of 0.548 and weakly correlated with PSS score with correlation coefficient of 0.31. [Figure 1 & 2]

Table no 1 Values of ACR PSLE and PSS in mean ± SD among cases and controls

	Group		p value
	Cases	Controls	
ACR (in mg/g of creatinine)	54.05 ± 52.29	10.73 ± 9.78	< 0.0001
PSLE score	275.69 ± 71.25	82.08 ± 27.23	<0.0001
PSS score	23.89 ± 5.42	7.92 ± 2.65	<0.0068

Figure no 1. Correlation between PSLE and ACR (mALB)

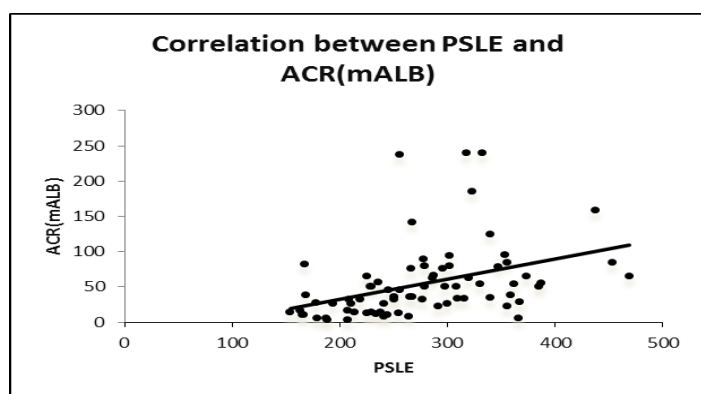
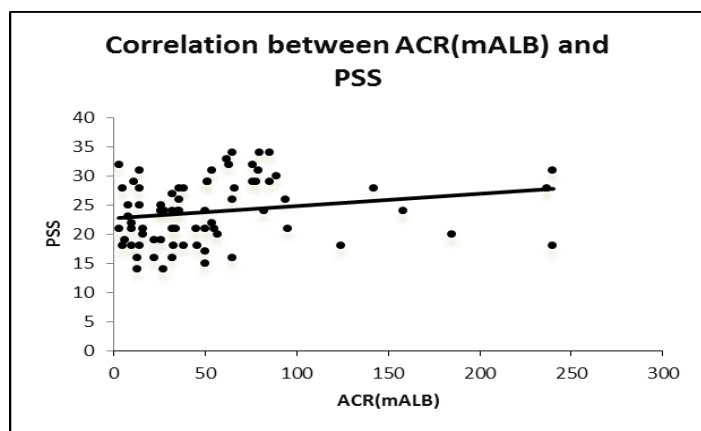


Figure no 2. Correlation between ACR (mALB) and PSS



Discussion

Present study was designed to explore 1) if stress due to major life events are associated with microalbuminuria, 2) if perceived stress can be associated with increased albumin excretion.

This study showed that there was a raised albumin:creatinine ratio, significant life event stress scores

as well as perceived stress scores in cases as compared to control. Previous study have reported increased albuminuria in stressed individuals[15] although no study correlating albumin:creatinine ratio with PSLE and PSS were found. Dalui [15] demonstrated depression, anxiety and albuminuria amongst primary caregivers of patient with mental illness. Mean values of current state and trait anxiety, depression, urinary albumin:creatinine ratio were significantly higher in caregivers than controls. Psychological stress can be associated with caregiving to mentally ill and cancer patients and can be one of the determinants of albumin excretion rate in otherwise healthy subjects.

The urinary albumin:creatinine ratio (UAL:Cr) was found to be significantly higher among the cases than controls as shown in earlier studies [14,15]. Koner et al [14] in their study indicated that urinary protein excretion is a potential marker for stress in subjects who did not suffer from any obvious kidney disease. They found that HADS (measure of stress) and urinary protein:creatinine ratio along with excess albumin were significantly higher in the caregivers as compared to the controls. Their results indicate that the family caregivers of advanced cancer patients undergo anxiety and depression associated with stress leading to increased oxidative stress and glomerular permeability to proteins. There are many other reports which show that stress causes proteinuria[7-11]. In our study none of the controls had microalbuminuria and none of the cases had macroalbuminuria. Though more than half of the cases had microalbuminuria, but only few had values in the higher side and most of them had their value in the lower side of microalbuminuria range (30-300mg/g of creatinine). Remaining cases did not show microalbuminuria at all. Most of the cases were from lower socioeconomic status and lower literacy and it is a well-established fact that biochemical reference values vary with the type of population, race, and ethnicity so this

could be possible reason for lower limit of urinary Microalbumin in cases population. Spearman rank correlation coefficient in cases demonstrate a significant yet partial positive correlation between UAL:Cr ratio and PSLE scores and very weakly positive correlation with PSS. It was evident from the results that if there was an increase in the stress factors, there was obvious increase in the urinary albumin:creatinine ratio. This result can be explained by the fact that major life events act as stressors, lead to significant increased physiological stress that affects the renal system causing temporary changes in the kidneys resulting in albuminuria. Ratnakar et al [14] have also shown that stress leads to increased glomerular permeability to proteins. As cases as well as controls were exclusively screened for other causes of albuminuria, so this marked difference between cases and controls could be due to stress induced by major life events. While interview none of the patients reported any anxiety or depression along with stress, so there is less chance of prevalence of microalbuminuria in cases due to it. The cases were apparently normal and they did not report any other obvious illness. Hence underlying mental stress due to major life events, may generate psychological stress, of which microalbuminuria could be one such markers.

The major limitation of this study was the difference in the literacy between the cases and the controls. As most educated patients refused to enrol for the study, extracting accurate information and history from the illiterate patients was difficult. Besides, it was also not possible to collect urine for three times on different days due to feasibility issues. So the physiological variation [high intra-individual CV(30-50%) and diurnal variation(50-100% higher during the day)][16] could influence the albumin excretion in urine although we tried to compensate this variation by taking albumin/creatinine ratio. So, further studies in a larger population with equal

number of other socioeconomic and educated individuals should be planned.

Conclusion

This study shows there is significant stress scores (PSLE and PSS), Microalbuminuria in the stressed individuals as well as good correlation between PSLE and Microalbumin in comparison to controls. To ascertain the role of Microalbumin as simple, non invasive psychological stress marker we propose to conduct the study with a larger sample size with different socioeconomic class in future.

Acknowledgement

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the institutional ethics committee

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