



## ESTIMATION OF URINARY PROTEIN CREATININE INDEX IN OBESE AND NON-OBESE INDIVIDUALS

### Biochemistry

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### ABSTRACT

Prevalence of obesity is increasing in both developed and developing countries. Many serious health hazards can occur due to obesity. A few reports show that obesity may be causally related to kidney injury. Microproteinuria is an early sign of nephropathy. Urinary protein:creatinine index (PCI) is reported to be a good indicator of microproteinuria, which obviates the need for collection of 24-hour urine. Therefore, the present investigation was undertaken to measure urinary PCI in obese but otherwise healthy individuals. The investigation was conducted on 25 healthy obese subjects of both sexes aged 20 years or more and 25 age- and sex-matched healthy non-obese control subjects. Urinary PCI of each subject was measured in untimed urine specimens. The urinary PCI was significantly higher in obese individuals as compared to controls. The qualitative tests for proteins in urine were normal in all the subjects. The present study shows that: (a) urinary protein excretion is increased in obesity and (b) urinary PCI in random urine specimens can be a good alternative to measurement of proteins in 24-hour urine.

### KEYWORDS

Obese, Non-obese, Microproteinuria, PCI

### INTRODUCTION

Obesity means an excess deposition of fat in the body to the extent that it may have an adverse effect on health, leading to reduced life expectancy.<sup>1</sup> In clinical practice, obesity is defined on the basis of weight and stature or Body Mass Index (BMI).<sup>2,3</sup> BMI is a person's weight in kilograms divided by the square of height in meters i.e. BMI = Weight (kg) / Height (m<sup>2</sup>). According to Expert Panel on the Identification, Evaluation, and Treatment of Overweight in Adults, normal weight is defined as a BMI of 18.5-24.9, overweight as a BMI of 25.0 - 29.9 and obesity as a BMI of 30.0 or higher for adults aged 20 years or older.<sup>4</sup>

Obesity is reported to increase the risk of diseases like coronary heart disease, type 2 diabetes mellitus, breathing difficulties during sleep, certain types of cancer and osteoarthritis. In both developed and developing countries, the prevalence of obesity is increasing to epidemic proportions.<sup>5</sup> Conditions like diabetes mellitus and hypertension accompanied by obesity may lead to kidney dysfunction.<sup>6</sup> To control hypertension and diabetes mellitus, obesity is a good target and it also helps to stabilize chronic kidney failure.<sup>7</sup>

Increase in glomerular permeability and failure to reabsorb filtered protein by the tubular cells cause proteinuria. Normally, most of the healthy adults excrete 20-150 mg of protein in urine in 24 hours. Patients with diabetes mellitus are at a high risk of renal damage. Persistent proteinuria is the key indicator of diabetic nephropathy.<sup>8</sup> Elevated creatinine level also indicates renal insufficiency.<sup>9</sup>

A small increase in urinary protein excretion, undetectable by qualitative tests, is known as microproteinuria. Microproteinuria is traditionally detected by measuring urinary protein in 24-hour urine. For convenient and quick detection of a minor increase in protein excretion, some researchers have proposed the calculation of protein-to-creatinine ratio, albumin-to-creatinine ratio and protein creatinine index (PCI) in random urine samples.<sup>10</sup> These ratios are based on the fact that the creatinine excretion remains fairly invariable in the presence of a stable glomerular filtration rate, and therefore, these ratios neutralize the variations in the urinary protein excretion during the day.<sup>11</sup>

The present investigation was undertaken to find out whether urinary protein excretion is increased in obesity and whether increase in

protein excretion can be detected in random urine specimens by measuring PCI.

### MATERIAL AND METHODS

The study was conducted on 25 obese but otherwise healthy subjects of both sexes aged 20 years or higher and 25 non-obese healthy age- and sex-matched control subjects. An untimed urine sample was collected from each subject without adding any preservatives. Immediately after collection, the urine samples were quantitatively analyzed for protein<sup>12</sup> and creatinine.<sup>9</sup> Urinary PCI was calculated by using the equation proposed by Shaw et al.<sup>13</sup>

$$\text{Urinary PCI} = \frac{\text{Urinary protein (mg/L)}}{\text{Urinary creatinine (mmol/L)}} \times 10$$

The mean ( $\pm$  SD) PCI of test group (obese subjects) was compared with that of control group by Student's unpaired t test. A p value of less than 0.05 was considered as significant.

### RESULTS

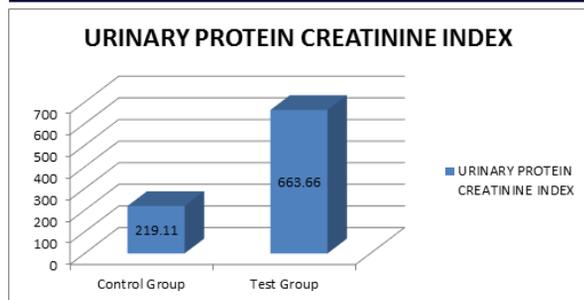
The mean  $\pm$  SD PCI of test group (obese subjects) was 663.66  $\pm$  123.04 which was significantly higher than that of the control group (219.11  $\pm$  61.75). The urinary creatinine of test group and control group was comparable. The difference in PCI was due to difference in urinary protein. The mean  $\pm$  SD urinary protein of test group (771.20  $\pm$  193.20 mmol/dl) was significantly higher than that of the control group (194.80  $\pm$  63.97).

**Table 1 Urinary protein, creatinine and protein creatinine index (PCI) in control group (non-obese) and test group (obese). All the values are mean  $\pm$  SD.**

	Control group (n=25)	Test group (n=25)	P value
Urinary protein (mg/dl)	194.80 $\pm$ 63.97	771.20 $\pm$ 193.20	< 0.001*
Urinary creatinine (mmol/dl)	9.27 $\pm$ 3.09	11.71 $\pm$ 2.37	> 0.05**
Urinary PCI	219.11 $\pm$ 61.75	663.66 $\pm$ 123.04	< 0.001*

\* Highly significant

\*\* Non-significant



**Fig.1 - Urinary PCI in control group (non-obese) and test group (obese).**

## DISCUSSION

In the present study, the mean urinary protein concentration and PCI were found to be significantly higher in the obese group as compared to the control group while the creatinine excretion in these two groups was comparable. This means that increased PCI was due to increased protein excretion.

Du et al had reported that individuals with obesity and central obesity had significantly higher urinary albumin creatinine ratio (UACR). They concluded that microalbuminuria was significantly associated with obesity and central obesity. They suggested that individuals with obesity and central obesity should be intensively managed to prevent renal diseases.<sup>14</sup>

Robert et al also found that BMI was associated independently with urinary protein creatinine and albumin creatinine ratios in African Americans with hypertensive nephrosclerosis, particularly in younger patients. An important observation was that obese individuals (BMI >30 kg/m<sup>2</sup>) and especially those with BMI >35 kg/m<sup>2</sup> had higher urine protein and albumin excretion rates.<sup>15</sup>

Our results are in conformity with these two previous reports. As the subjects included in the present study were otherwise healthy, the increased protein excretion could only be due to obesity. A minor increase in protein excretion (microproteinuria) could be an early indicator of renal dysfunction. This shows that obese individuals should be screened for microproteinuria, and that urinary PCI could be a quick and convenient alternative to 24-hour urine protein estimation for detection of microproteinuria.

## CONCLUSION

The present study shows that urinary protein excretion is increased in obesity and that this increase can be easily detected by measuring PCI in a random urine sample.

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