

Study of Microalbuminuria in Non-Diabetic and Non-Hypertensive Normal Individuals

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ABSTRACT

Introduction: Microalbuminuria, defined as an albumin excretion rate (AER) of 30–300 mg/24 hours, is a critical early biomarker for glomerular damage and generalized endothelial dysfunction. This study investigates the prevalence of microalbuminuria in individuals without diabetes or hypertension to identify sub-clinical markers of cardiovascular and renal risk. **Materials and Methods:** We conducted a cross-sectional study of 95 healthy volunteers categorized by age (25–40 and 40–65 years) and lifestyle habits (smoking and alcohol consumption). Urinary albumin was measured via Nycocard U-Albumin assay, and serum lipid profiles were analyzed using enzymatic methods. **Results:** Microalbuminuria levels were significantly higher in the 40–65 age group (128 \pm 9.9 mg/24h) compared to the 25–40 age group (79 \pm 9.2 mg/24h). The combination of smoking and alcohol consumption synergistically increased albumin excretion and total cholesterol while lowering high-density lipoprotein (HDL) levels. **Conclusions:** In non-diabetic and non-hypertensive populations, advancing age and tobacco/alcohol use are major drivers of microalbuminuria. Early screening provides a critical window for clinical intervention to prevent end-stage renal disease and cardiovascular events.

Keywords: Endothelial Dysfunction; Glomerular Damage; Albumin Excretion Rate; Lipid Profile; Aging; Tobacco Use; Alcohol Consumption; Metabolic Syndrome; Cardiovascular Risk.

INTRODUCTION

Proteins are essential structural components of human physiology. In a healthy renal system, the glomerular filtration barrier prevents the excretion of large molecules like albumin. This barrier is maintained by a net negative charge from heparin sulfate proteoglycans. When this barrier is compromised, albumin is the first protein to penetrate, resulting in microalbuminuria.

Microalbuminuria serves as a "mirror" of systemic vascular health. While its role is well-documented in diabetic nephropathy, its significance in apparently healthy individuals remains vital. This study evaluates how age and lifestyle habits impact urinary albumin excretion in a healthy cohort to identify early predictors of vascular damage.

MATERIAL AND METHODS

2.1 Ethical Considerations

The study protocol was approved by the Local Institutional Review Board. Informed consent was obtained from all participants prior to their inclusion in the study.

2.2 Study Design and Participant Selection

A total of 95 human subjects (aged 25–65 years) were screened. To ensure accuracy, we excluded individuals with urinary tract infections, high-grade fever, pregnancy, or recent heavy physical exercise.

2.3 Laboratory Procedures

A 24-hour urine collection was performed. Urinary albumin was quantified using the Nycocard U-Albumin assay. Serum creatinine was measured using the Jaffe Method. Total cholesterol, HDL, and Triglycerides (TGL) were analyzed using standard enzymatic kits.

2.4 Statistical Methodology

Data are expressed as Mean/ SD. Differences were assessed using independent t-tests. All *P* values are reported to 2 digits past the decimal point unless lower than 0.01 (then 3 digits). *P* values lower than 0.001 are expressed as *P*<.001.

RESULTS

Microalbuminuria was significantly associated with age and lifestyle habits. In the 40–65 age group, mean microalbumin levels reached 128 \pm 9.9 mg/24h, compared to 79 \pm 9.2 mg/24h in the younger group (*P*<.01). Table 1 summarizes these physiological and biochemical shifts.

Smoking and alcohol consumption showed a synergistic effect. Subjects in the 40–65 age group who were both smokers and alcoholics exhibited higher cholesterol (253 \pm 34 mg/dL) and lower HDL (46 \pm 8.9 mg/dL) compared to their non-smoking peers.

DISCUSSION

Summary of Key Findings: Microalbuminuria is prevalent in healthy middle-aged individuals, particularly those with tobacco and alcohol habits. This leakage suggests a direct toxic effect on the glomerular capillary negative charge barrier.

Strengths and Limitations (Must): A strength is the exclusion of comorbidities like diabetes and hypertension.

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Parameter	Value
Micro Albumin	79 ± 9.2
Nycocard – U – Albumin	15.3 ± 8.2
Creatinine	0.7 ± 0.1
Cholesterol	201 ± 35
HDL	49 ± 6.6
TGL	60 ± 9.2

Table-1: Age Group 25–40 Years (Women)

Parameter	Value
Micro Albumin	128 ± 9.9
Nycocard – U – Albumin	20 ± 10.0
Creatinine	0.8 ± 0.1
Cholesterol	253 ± 34
HDL	46 ± 8.9
TGL	119 ± 8.6

Table-2: Age Group 40–65 Years (Women)

Parameter	Value
Micro Albumin	66 ± 10.2
Nycocard – U – Albumin	12 ± 6.8
Creatinine	0.7 ± 0.1
Cholesterol	191 ± 34.1
HDL	47 ± 7.6
TGL	78 ± 6.18

Table-3: Non-Alcoholics and Non-Smokers (Age Group 25–40 Years)

Parameter	Value
Micro Albumin	120 ± 10.4
Nycocard – U – Albumin	21 ± 8.0
Creatinine	0.7 ± 0.1
Cholesterol	230 ± 39.8
HDL	45 ± 9.3
TGL	95 ± 9.4

Table-4: Alcoholic and Smokers (Age Group 25–40 Years)

Parameter	Value
Micro Albumin	108 ± 10.2
Nycocard – U – Albumin	19.8 ± 3.9
Creatinine	0.7 ± 0.2
Cholesterol	234 ± 40
HDL	32 ± 9
TGL	155 ± 10

Table-5: Exclusively Smokers (Age Group 25–40 Years)

Parameter	Value
Micro Albumin	99 ± 9
Nycocard – U – Albumin	20 ± 12.1
Creatinine	0.7 ± 0.1
Cholesterol	206 ± 35
HDL	44 ± 6.9
TGL	82 ± 8.1

Table-6: Non-Alcoholics and Non-Smokers (Age Group 40–65 Years)

Parameter	Value
Micro Albumin	124 ± 7.4
Nycocard – U – Albumin	22 ± 4.2
Creatinine	0.8 ± 0.2
Cholesterol	253 ± 22.1
HDL	45 ± 9.3
TGL	119 ± 7.1

Table-7: Alcoholic and Smokers (Age Group 40–65 Years)

Parameter	Value
Micro Albumin	126 ± 3.8
Nycocard – U – Albumin	21 ± 8.7
Creatinine	0.7 ± 0.1
Cholesterol	217 ± 40
HDL	36 ± 5.4
TGL	150 ± 7.

Table-8: Exclusively Smokers (Age Group 40–65 Years)

A limitation is the cross-sectional design, which cannot establish a temporal relationship between microalbuminuria and future clinical events.

Interpretation and Implications: Microalbuminuria reflects generalized endothelial damage. In the context of the metabolic syndrome, the correlation between high AER and low HDL confirms its role as a precursor to systemic atherosclerosis.

Controversies and Future Research: While traditionally viewed as a renal marker, our findings support the theory that it reflects systemic vascular health. Future research should track these "healthy" individuals to monitor progression to overt proteinuria.

CONCLUSION

Microalbuminuria in non-diabetic and non-hypertensive individuals is influenced by age and habits. Early screening is an effective tool for identifying at-risk individuals.

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