ASIAN JOURNAL OF PHARMACEUTICAL AND CLINICAL RESEARCH

INNOVARE ACADEMIC SCIENCES
Knowledge to Innovation

Vol 9, Issue 3, 2016

Online - 2455-3891
Print - 0974-2441

Research Article

MICROALBUMINURIA – A RISK FACTOR FOR CARDIOVASCULAR DISEASE IN DIABETIC POSTMENOPAUSAL WOMEN

Deepti GN[1]*, LAKSHMI K[2], SUMATHI S[3]

[1]Department of Biochemistry, Pushpagiri Institute of Medical Science and Research Centre, Kerala, India. [2]Department of Microbiology, Sree Balaji Medical College and Hospital (Bharath University), Chennai, Tamil Nadu, India. [3]Department of Biochemistry, Sri Manakula Vinayagar Medical College and Hospital, Puducherry, India. Email: deeptign83@gmail.com

Received: 22 January 2016, Revised and Accepted: 24 March 2016

AQ1

ABSTRACT

Introduction: Diabetes is one of the common metabolic disorders. Microalbuminuria (MA) is usually estimated in diabetic patients and patients with risk of renal problems.

Objective: Our aim is to study the occurrence of MA in both apparently normal and diabetic postmenopausal women and to find out the relationship between MA and cardiovascular risk factors.

Methods: This study was conducted in a tertiary care hospital, Puducherry, for a period of 6 months. Serum and urine samples were taken from 50 apparently normal postmenopausal women and 51 diabetic women and compared. Serum was analyzed for urea, creatinine, uric acid levels, lipid profile, and the urine sample was estimated for microalbumin, creatinine levels. Urine albumin creatinine ratio and glomerular filtration rate were calculated using standard methods.

Results: About 47% of diabetic women and 46% of apparently normal postmenopausal women had MA. Total cholesterol (TC), triglycerides (TGL), and very-low-density lipoprotein (VLDL) values were higher in diabetic women when compared to the normal women. MA positive subjects had relatively higher TC, low-density lipoprotein, TGL, and VLDL levels when compared to MA negative subjects.

Conclusion: The occurrence of MA in normal postmenopausal women is almost similar to that of diabetic women. This suggests the importance of screening of MA even in normal postmenopausal women. In addition, abnormal lipid profile in diabetic patients favors the need for regular screening of MA and lipid profile in all diabetic patients.

Keywords: Microalbuminuria, Diabetes, Postmenopausal women, Lipid profile, Renal parameters.

INTRODUCTION

Diabetes mellitus (DM) comprises a group of common metabolic disorders that is characterized by hyperglycemia. In India, around 62 million people have diabetes, and it is expected to be more than 100 million by 2030 [1]. The gradual and progressive kidney damage that occurs in diabetic nephropathy is reflected in an increasing urine albumin excretion, which is detected initially as persistent microalbuminuria (MA) and subsequently as persistent macroalbuminuria [2,3].

MA may be defined as the urinary albumin excretion of 30-300 mg/dl in a timed urine collection in adults. When spot urine samples are used, MA may be expressed in urine albumin creatinine ratio (UACR) of 17-250 mg/g of creatinine in men and 25-355 mg/g of creatinine in women [4,5]. Various factors are known to influence the development of MA such as increased body mass index, hypertension, altered lipid levels, insulin resistance (hyperinsulinemia), smoking, salt sensitivity, elderly and endothelial dysfunction [6]. MA is the first manifestation of injury to the glomerular filtration barrier and predicts the development of overt nephropathy.

MA is routinely done to monitor the development of renal disorders, but recently it has been considered as a new marker for cardiovascular diseases (CVD). It is considered as a reflection of a generalized arterial process affecting the glomeruli, retina, and the intima of large vessels simultaneously [7]. MA is an independent predictor of CVD in both diabetic and non-diabetic men and women. To the best of our knowledge, very few studies have been conducted to study the relationship between MA and CVD in postmenopausal women. Hence, it was determined to find out the prevalence of MA in both diabetic and apparently normal postmenopausal women and compare the lipid profile and renal parameters among them.

METHODS

This is a cross-sectional study conducted in a tertiary care hospital in Puducherry, for a period of 6 months. The study included both apparently normal and diabetic postmenopausal women above the age of 45 years attending the OPDs of the institution. Patients with known case of renal disorders, hypertension, urinary tract infections, or acute illness and subjects on hormone replacement therapy were excluded from the study. Among the 101 subjects included in the present study, 50 were non-diabetic, categorized as Group 1 and 51 were diabetic, categorized as Group 2. After obtaining the consent from the patient, relevant history was taken. Blood pressure was measured in all subjects to rule out hypertension. The early morning fasting urine and blood samples were collected from all the subjects and were analyzed. Blood was collected in a clot activator tube and was centrifuged to obtain the serum for biochemical analysis. The serum was analyzed for glucose, urea, creatinine, uric acid, total cholesterol, high-density lipoprotein (HDL), low-density lipoprotein (LDL), and triglycerides (TGL). Urine was analyzed for microalbumin, creatinine, and UACR was calculated. Glomerular filtration rate was calculated using modification of diet in renal disease formula [8]. All serum parameters and urinary creatinine were analyzed in fully Auto analyzer – Cobas Mira Plus EIA RS 232. Urine microalbumin was analyzed in semiautoanalyser – BIOTRON BTR 830.

Subjects with UACR more than 25 mg/g and less than 355 mg/g are considered as MA positive [4].All the data obtained were statistically

analyzed using SPSS software. Statistical probability seen using Student's t-test represented by p value. Statistical significance was considered at $p<0.05$.

RESULTS

Distribution of MA

The distribution of MA in each group is as follows:

Around 47% of diabetic women and 46% of apparently normal postmenopausal women had MA.

In general, the 2 groups were compared for renal parameters and lipid profile. The average fasting blood sugar for group 1 was 91 mg/dl and that of group 2 was 145 mg/dl (Fig. 1).

There was no significant difference in the renal parameters between the 2 groups. TC, TGL, and VLDL values were higher in group 2 compared to group 1 but not statistically significant.

We also compared those with and without MA in each group (Table 1).

In group 1, there was no significant difference in renal parameters in those with and without MA. TC and LDL were significantly higher in those with MA than those without MA (Table 2).

In group 2, there was no significant difference between the renal parameters between those with and without MA. TGL and VLDL were significantly higher in those with MA (Table 3).

When we compared the microalbuminuria positive subjects with and without diabetes, the values of TGL and VLDL were higher in subjects with DM. The average microalbumin level was also high in subjects with DM (Table 4).

DISCUSSION

This study was conducted in a tertiary care hospital in Puducherry in the Department of Biochemistry. It was carried out to find out whether MA can be used as a cardiovascular marker. The study included 101 postmenopausal women, of which 50 were apparently normal and 51 were having DM. They were further classified into those with and without MA depending on their microalbumin level in urine.

In our study, 46% of non-diabetic postmenopausal women and 47% of diabetic postmenopausal women were having MA. This suggests that the occurrence of MA in non-diabetic postmenopausal women is similar to that of diabetic subjects. In a previous study, it was shown that the occurrence of MA in apparently normal postmenopausal women is high and regular screening for MA in them was suggested [5].

In our study, when we compared the lipid profile between the diabetic and non-diabetic group, the total cholesterol, LDL, and TGL were high in those

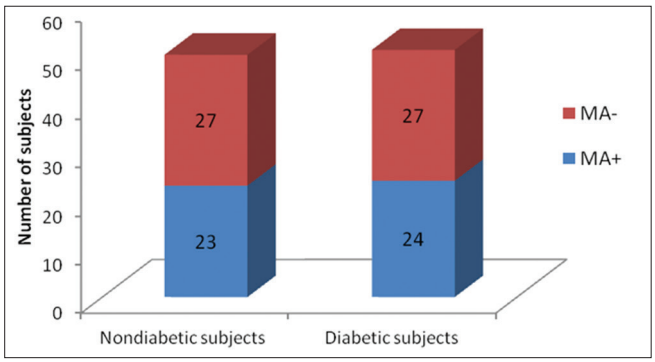

Fig. 1: Distribution of microalbuminuria in diabetic and non-diabetic women

Table 1: Comparison of renal parameters and lipid profile between both groups

Parameters	Group 1	Group 2	p value
Urea (mg/dl)	23±7	23±9	0.49
Creatinine (mg/dl)	0.8±0.1	0.9±0.3	0.11
Uric acid (mg/dl)	5.3±1.3	5.5±1.4	0.2
GFR (ml/min)	76±12	75±26	0.49
UACR (mg/g)	32±30	37±36	0.20
TC (mg/dl)	209±34	218±37	0.08
TGL (mg/dl)	147±58	165±77	0.09
HDL (mg/dl)	39±11	40±10	0.29
VLDL (mg/dl)	29±12	35±20	0.05
LDL (mg/dl)	140±32	142±40	0.35

GFR: Glomerular filtration rate, UACR: Urine albumin creatinine ratio, TC: Total cholesterol, TGL: Triglycerides, HDL: High-density lipoprotein, VLDL: Very-low-density lipoprotein, LDL: Low-density lipoprotein

Table 2: Comparison of biochemical parameter in group 1

Parameter	MA+	MA−	p value
FBS (mg/dl)	91±16	92±16	0.43
Urea (mg/dl)	25±8	22±6	0.05
Creatinine (mg/dl)	0.9±0.16	0.8±0.1	0.23
Uric acid (mg/dl)	5.3±1.3	5.3±1.4	0.43
GFR (ml/min)	75±13	77±12	0.26
TC (mg/dl)	220±34	199±33	0.01
TGL (mg/dl)	151±58	144±60	0.33
HDL (mg/dl)	41±10	38±12	0.16
VLDL (mg/dl)	30±12	29±12	0.33
LDL (mg/dl)	141±31	132±32	0.03

GFR: Glomerular filtration rate, TC: Total cholesterol, TGL: Triglycerides, HDL: High-density lipoprotein, VLDL: Very-low-density lipoprotein, LDL: Low-density lipoprotein, FBS: Fasting blood sugar, MA: Microalbuminuria

Table 3: Comparison of biochemical parameters in group 2

Parameters	MA+	MA−	p value
FBS (mg/dl)	140±62	150±57	0.27
Urea (mg/dl)	23±12	23±7	0.49
Creatinine (mg/dl)	0.9±0.4	0.9±0.2	0.46
Uric acid (mg/dl)	5.5±1.4	5.6±1.6	0.45
GFR (ml/min)	81±34	71±16	0.09
TC (mg/dl)	227±37	211±36	0.06
TGL (mg/dl)	194±100	140±36	0.005
HDL (mg/dl)	41±12	40±10	0.37
VLDL (mg/dl)	44±32	28±7	0.008
LDL (mg/dl)	142±46	143±36	0.48

GFR: Glomerular filtration rate, TC: Total cholesterol, TGL: Triglycerides, HDL: High-density lipoprotein, VLDL: Very-low-density lipoprotein, LDL: Low-density lipoprotein, FBS: Fasting blood sugar, MA: Microalbuminuria

Table 4: Comparison of biochemical parameters in microalbuminuria positive subjects with and without diabetes

Parameters	Group 1	Group 2	p value
Urea (mg/dl)	25±8	23±12	0.53
Creatinine (mg/dl)	0.9±0.16	0.9±0.4	0.6
Uric acid (mg/dl)	5.3±1.3	5.5±1.4	0.54
GFR (ml/min)	75±13	81±34	0.4
TC (mg/dl)	220±34	227±37	0.49
TGL (mg/dl)	151±58	194±100	0.07
HDL (mg/dl)	41±10	41±12	0.99
VLDL (mg/dl)	30±12	44±32	0.06
LDL (mg/dl)	141±31	142±46	0.58
UACR (mg/g)	54±33	65±37	0.3

GFR: Glomerular filtration rate, UACR: Urine albumin creatinine ratio, TC: Total cholesterol, TGL: Triglycerides, HDL: High-density lipoprotein, VLDL: Very-low-density lipoprotein, LDL: Low-density lipoprotein

with DM. This is in correlation with various studies done in the past which also showed that diabetes is associated with dyslipidemia with increase in TGL, small dense lipoproteins, and decrease in HDL cholesterol [9-11].

In our study, the level of TGL was high in MA positive subjects with diabetes than those without diabetes. When the lipid profile was compared between MA positive and negative apparently normal postmenopausal women, the TC and LDL were significantly higher in those with MA. Similarly, in the diabetic group, TC and VLDL were significantly higher in those with MA. A study conducted by Agarwal *et al.* showed that urine microalbumin can be used as an early marker for complications in the hypertensive patient [12].

This clearly shows that MA is associated with cardiovascular risk factors such as dyslipidemia. The actual mechanism for their association is not well-known, but the possible mechanism is thought to be endothelial dysfunction and vascular damage.

CONCLUSION

We conclude that MA may be considered as a marker for CVD not only in diabetic individuals but also apparently normal postmenopausal women. Hence, annual screening of MA in all postmenopausal women irrespective of their diabetic status is recommended. Necessary preventive actions at the early stage may help in minimizing the adverse effects.

REFERENCES

1. Mohan V, Anbalagan VP. Expanding role of the Madras Diabetes Research Foundation - Indian diabetes risk score in clinical practice. Indian J Endocrinol Metab 2013;17(1):31-6.
2. Mogensen CE. Microalbuminuria and hypertension with focus on Type 1 and Type 2 diabetes. J Intern Med 2003;254(1):45-66.
3. Viberti G. Regression of albuminuria: Latest evidence for a new approach. J Hypertens Suppl 2003;21(3):S24-8.
4. Glassock RJ. Is the presence of microalbuminuria a relevant marker of kidney disease? Curr Hypertens Rep 2010;12(5):364-8.
5. Deepti GN, Lakshmi K, Sumathi S. Study on microalbuminuria in apparently normal postmenopausal women. Asian J Pharm Clin Res 2014;7 Suppl 1:87-9.
6. Garg JP, Bakris GL. Microalbuminuria: Marker of vascular dysfunction, risk factor for cardiovascular disease. Vasc Med 2002;7(1):35-43.
7. Roest M, Banga JD, Janssen WM, Grobbee DE, Sixma JJ, de Jong PE, *et al*. Excessive urinary albumin levels are associated with future cardiovascular mortality in postmenopausal women. Circulation 2001;103(25):3057-61.
8. Levey AS, Coresh J, Greene T, Stevens LA, Zhang YL, Hendriksen S, *et al*. Using standardized serum creatinine values in the modification of diet in renal disease study equation for estimating glomerular filtration rate. Ann Intern Med 2006;145(4):247-54.
9. Haffner SM. Lipoprotein disorders associated with Type 2 diabetes mellitus and insulin resistance. Am J Cardiol 2002;90(8A):55i-61.
10. Goldberg IJ. Clinical review 124: Diabetic dyslipidemia: Causes and consequences. J Clin Endocrinol Metab 2001;86(3):965-71.
11. Ginsberg HN. Review: Efficacy and mechanisms of action of statins in the treatment of diabetic dyslipidemia. J Clin Endocrinol Metab 2006;91(2):383-92.
12. Agarwal S, Prabhu MV, Arun S, Pinto VJ, Gopalkrishna BK, Mangla D. Correlation of microalbuminuria with cardiovascular morbidity in essential hypertension. Int J Clin Cases Invest 2013;5(6):67-76.

Author Query???

AQ1: Kindly check and abstract sub heading as per journal style (Objective, Methods, Results and Conclusion