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Original Article

Atherogenic lipids and vascular complications in a selected diabetic population with normal urinary albumin/creatinine ratios

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ABSTRACT

Objective: To test the hypothesis that at different urinary albumin/creatinine ratios within the normal ranges, diabetics have low but similar prevalence of metabolic and micro vascular disease.
Methods: The study sample consisted of normotensive diabetics not taking any medications known to effect blood pressure and lipids. The data were collected from the Diabetes Register. The diabetics were subgrouped according to the urinary albumin/creatinine ratios. MA is defined as present if the albumin/creatinine ratio (ACR) is more than 2 mg/mmol.
Results: MA was present in 16% of the 152 diabetics. Total cholesterol, systolic BP, and triglycerides were significantly high in diabetics with ACR $\geq 1 < 2$ compared with <1. The prevalence rates for retinopathy and neuropathy in the MA group were also significantly high. However, a large number of diabetics without MA had had established complications (37% retinopathy, 40% neuropathy, and 16% peripheral vascular disease). Because these results were based on single early morning urine samples, we looked at their MA in the past year. After exclusion of regressed and progressed groups, the complications rate remained the same.
Conclusion: The high prevalence of metabolic and vascular complications seen even in absence of MA indicates an early intervention and those diabetics should not wait unitl CVD risk scores raise to receive preventive treatment.

1. Introduction

Persistent microalbuminuria portends progression to renal failure. Microalbuminuria (MA) indicates incipient nephropathy and is a predictor of cardiovascular mortality [1,2]. The prevalence of MA varies from 9% to 54% [3,4] in various studies however all these studies have hypertensives and those taking medications that could have influenced these rates.

Early detection and intervention of MA will delay the onset of renal failure as well as the associated metabolic and vascular complications [5,6]. Coronary heart disease accounts for a large number of deaths in diabetics with renal failure. Dyslipidemias are recognized in renal failure but the onset of these may be much earlier [7,8]. There is little information on metabolic and vascular complications in the early stages of the MA.

Therefore, we aimed to study (a) the prevalence of MA, (b) the associated complications – lipids, retinopathy, peripheral vascular disease, neuropathy and blood pressure in a selected group of diabetics without MA.

2. Materials and methods

Every registered diabetic undergoes an annual examination in the month of his or her birth at the diabetes clinic in the University Hospital of Hartlepool. Demographic details are continuously updated on the electronic Diabetes Register. The data for this study were collected by going through each patient's case record at his/her last annual check up. Hb A1c%, albumin/creatinine ratio (ACR in mg/mmol), total cholesterol, triglycerides and HDL cholesterol were all measured and low density lipoprotein (LDL) cholesterol is calculated using the Friedwald's formula. Using strict criteria, diabetics with the following conditions were excluded – overt proteinuria, urinary infection, known hypertensives or those antihypertensives, diuretics, on lipid lowering therapy, thyroid disorder, pregnancy, hormone treatment; includes steroids, malignancy, connective tissue disorder, bowel disorder e.g. coeliac disease, ulcerative colitis, abnormal liver function tests and above normal serum creatinine values.

The data were grouped based on ACR: <1; $\geq 1 < 2$ and ≥ 2 but no overt proteinuria. Complications were summed and Chi-Square

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Table 1
General characteristics of the study population.

Parameter	ACR < 1	ACR ≥ 1 < 2	ACR ≥ 2
Number of diabetics	104	24	24
Age (years)	51.5 ± 1.59	62.4 ± 2.91*	55.8 ± 3.36
Gender			
Men	63% (66)	77% (17)	62% (15)
Women	37% (38)	29% (7)	38% (9)
Duration (years)	12.5 ± 1.36	11 ± 1.68	14.6 ± 2.56
BMI	28.4 ± 0.54	27.4 ± 0.85	28.8 ± 1.6
Type			
1	50% (52)	17% (4)	29% (7)
2	50% (52)	83% (20)	71% (17)
Previous high BP	70% (73)@	88% (21)	67% (16)

* $P < 0.07$ compared with ACR < 1.
@ $P < 0.001$ compared with ACR ≥ 2.

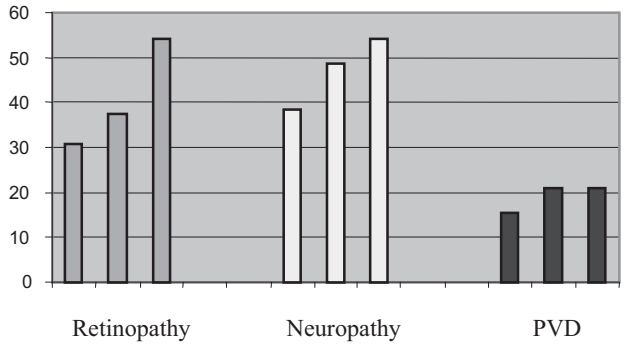

Fig. 2. Retinopathy, neuropathy and peripheral vascular disease.

test was applied for the numbers. *t*-Tests were used to compare continuous variables in the groups. Data are expressed as mean ± standard error. A statistical value of $P < 0.05$ is considered significant. In view of the sample sizes, the results were not shown separately for Type 1 and Type 2 diabetics.

3. Results

Fourteen percent (152) of the 1066 diabetics screened at annual check up qualified for the study. This is a small fraction and is not unexpected in view of the wider exclusion criteria set for the study. Diabetics with ACR ≥ 2 are being followed for intervention. We preferred the cut off of 2 as this had been widely accepted and used before [9].

About 52% of Type 2 diabetics were on insulin. A large number (110 of the 152) of diabetics had at least one high blood pressure reading (systolic BP > 129 mm Hg and or diastolic BP > 89 mm Hg) recorded in the past year. (Table 1)

The prevalence of MA is 16% in our study. In the 135 diabetics who had a normal ACR < 2 last year, 9 patients had a normal reading at last year but progressed to an ACR > 2 giving an incidence of 6.6%. These are subject to further investigation and intervention and for now are grouped in ACR > 2 for the purpose of the current discussion. Subgroups became small by classifying diabetes, however the trends in the results remained unchanged. The number of diabetics who progressed or regressed is very small to make comparisons between then, however excluding them from the analysis did not affect the significance or the trends. The prevalence of MA fell to 13% from 16% when the cut off was ≥2.5.

Figs. 1 and 2 show the lipids and vascular complications. Hb A1c% was significantly high in the microalbuminuria group. Systolic BP, total cholesterol and triglycerides were high in the middle group. Total cholesterol readings were much higher in the MA group. The number of diabetics with retinopathy and neuropathy in the MA group is also significantly higher (Table 2).

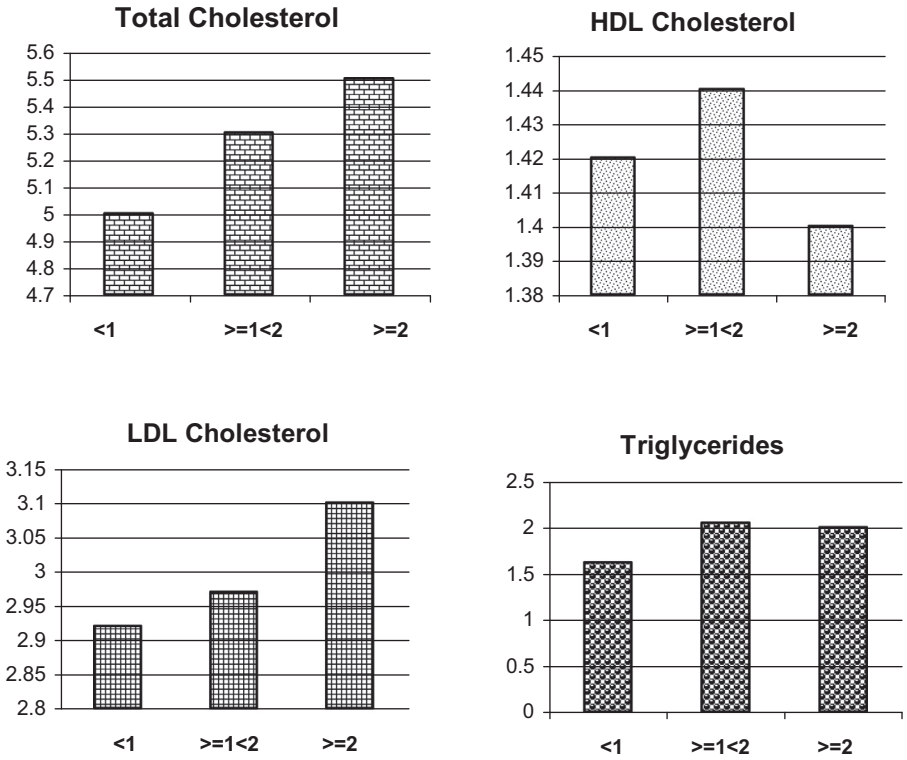

Fig. 1. Lipids in diabetics at different ACR levels.