

Is Routine Testing for Proteinuria Indicated in Diabetic Eye Clinics?

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Abstract

Purpose: The presence of albuminuria of ≥ 20 mg/dL, detectable on urine dipstick, represents significant early nephropathy requiring intervention. This study aimed to identify the incidence of previously undiagnosed renal impairment in patients attending a Diabetic Eye Clinic at the Birmingham and Midland Eye Centre, which has a diverse social and ethnic catchment area.

Methods: An observational cohort audit was performed and a total of 42 consecutive patients' urine samples were tested for albuminuria by dipstick.

Results: Albuminuria was found in 17/42 (40.5%) patients, but only 5 patients were aware of having renal impairment. In 10/17 (58.8%) patients General Practitioners (GP) were also unaware of the renal impairment. Patients with previously undiagnosed albuminuria tended to be younger, have a shorter duration of diabetes and have a higher systolic and diastolic blood pressure ($p < 0.05$).

Conclusion: Our results suggest that a significant proportion of patients attending diabetic eye clinics have renal impairment that is not known to their General Practitioners. Performing this quick and simple test in the clinic may aid early diagnosis and improve clinical care and prognostic outcomes.

Keywords: Diabetes; Retinopathy; Clinic; Proteinuria; General Practitioner

Introduction

The UKPDS has recognised diabetic retinopathy to be a risk factor in the development of renal impairment in Type 2 diabetics [1]. The presence of albuminuria is a strong risk factor for the development of other microvascular disease [2].

Early detection of kidney disease allows better implementation of blood pressure control [3-5], use of ACE inhibitors [6], better HbA1c [7-9] and cholesterol level control [10-12] that can delay progression of renal disease to end stage renal failure.

Guidelines for general practitioners recommend annual review for diabetic patients but there is wide variation in achievement of national service framework diabetic targets [13,14] especially in regions of high socio-economic deprivation and ethnic variation [15]. In addition, patients developing renal impairment in the interim may not be diagnosed until their next visit.

It has been previously shown that measuring blood pressure is of value in diabetic eye clinics, providing an opportunity to allow the identification of new hypertensive patients and those with inadequate control [16]. This study aimed to ascertain if urinalysis with urine dipstick on a routine basis was of value in patients attending diabetic eye clinic.

Materials and Methods

An observational cohort audit was conducted at Birmingham and Midland Eye Centre, a large tertiary referral centre with a multi ethnic population base. Data were collected on patients with diabetes attending a diabetic eye clinic in 2007. Information was collected on both demographic and clinical aspects including; duration and type of diabetes, treatment, retinopathy stage, other ocular disease and previous ocular surgery. Blood pressure was measured using OMRON automated sphygmomanometer and albuminuria (urinary albumin ≥ 200 mg/l) using urine multistick with a Bayer Clinitek 50 electronic analyser. The blood pressure was measured after the instillation of mydriatic drops as this is known to have an effect on blood pressure [16,17]. A positive urine dipstick was defined as those demonstrating +1 grade on the analyser which is equal to 200 mg/l [17].

A questionnaire including specific questions regarding any known renal impairment to the patient themselves was also completed. Information was collected from a combination of the patient and their notes.

Patients with positive urine dipstick were followed, to ascertain if their general practitioners were aware of any renal impairment on their own general practice records.

Analysis using T test, Chi squared and Logistic regression to identify significant characteristics of both patients with proteinuria and of those whose general practitioners were aware and unaware of renal failure. Analysis used SPSS version 13.0 and statistical significance at $p < 0.05$ were assumed throughout analysis.

Results

In total 42 patients were recruited from clinics and demographic information regarding the sample is shown in Table 1. The results demonstrated that albuminuria was found in a large proportion of the sample, 17/42 (40.5%) patients. But of the patients with proteinuria only 5/17 (29.4%) patients were aware of having any renal impairment. A large proportion of the general practitioners 10/17 (58.8%) were also unaware of any renal impairment.

| Socio-demographic variable | Frequency (Percentage %) |
|--|--------------------------|
| Sex | . |
| M | 23 (54.8) |
| F | 19 (45.2) |
| Mean Age Years (S.D) | 62.8 (11.5) |
| Range | 38-84 |
| Mean Duration of diabetes Years (S.D) | 17.43 (10.2) |
| Range | 1-43 |
| Type of diabetes | . |
| Type 1 | 5 (11.9) |
| Type 2 | 37 (88.1) |
| Treatment Change in last 6 months | . |
| Y | 18 (19.0) |
| N | 34 (81.0) |
| Type of appointment | . |
| First Visit | 5 (11.9) |
| Follow up | 37 (88.1) |
| Initial Referral | . |
| Hospital diabetic clinic | 21 (50.0) |
| Optometrist | 11 (26.2) |
| General Practitioner | 8 (19.0) |
| General Ophthalmological clinic | 1 (2.4) |
| Other | 1 (2.4) |
| Maculopathy | . |
| Y | 29 (69.0) |
| N | 13 (31.0) |
| Retinopathy Type (number) | . |
| Background | 27 |
| Preproliferative | 2 |
| Proliferative | 12 |
| Patients with known renal impairment | . |
| Y | 5 (14.3) |
| N | 37 (85.7) |
| Known hypertensive and on treatment | . |
| Y | 34 (81.0) |
| N | 8 (19.0) |

Table 1: Demographic information of sample.

| | General Practitioner aware of renal failure | General Practitioner unaware of renal failure | P- value |
|---|---|---|----------|
| Mean Duration of Diabetes (Years) | 18.4 | 11.8 | <0.05 |
| Mean Age (Years) | 71.4 | 59.3 | <0.05 |
| Mean Systolic Blood pressure (mmHg) | 141.1 | 148.7 | <0.05 |
| Mean Diastolic Blood Pressure (mmHg) | 89.5 | 68.8 | <0.05 |

Table 2: Risk factors compared in those with General Practitioner aware of renal failure and unaware of renal failure.

| | Hospital Diabetic Clinic | Optometrist | General Practitioner | General Ophthalmology clinic |
|--|--------------------------|-------------|----------------------|------------------------------|
| General Practitioner aware of renal failure | 2 | 4 | 3 | 1 |
| General Practitioner unaware of renal failure | 6 | 0 | 1 | 0 |
| Chi square 7.71 df 3 p<0.05 | | | | |

Table 3: Chi square test comparing initial referral source in those whose General Practitioners were aware and unaware of albuminuria.

| | Background | Pre-proliferative | Proliferative | Maculopathy |
|----------------------------|------------|-------------------|---------------|-------------|
| Albuminuria present | 16 | 1 | 6 | 0 |
| No albuminuria | 11 | 1 | 6 | 1 |
| Chi square 1.56df3 p=0.67 | | | | |

Table 4: Chi Square test Comparing retinopathy and albuminuria.

The characteristics of patients with previously undiagnosed albuminuria were that they were younger ($p<0.05$), had a shorter duration of diabetes ($p<0.05$) and had higher systolic and diastolic blood pressure ($p<0.05$) (Table 2). The patients with previously undiagnosed albuminuria were more likely to be initially referred from optometrist (Table 3). On analysis an association between retinopathy type and albuminuria was not found (Table 4). A logistic regression was performed and no association was found between general practitioner awareness of renal failure and other factors such as hypertension, type of diabetes, ethnic origin, retinopathy type,

maculopathy, hypertension and treatment for hypertension (Table 5). albuminuria and without albuminuria to other variables and no A further analysis was performed to compare patients with associations was identified.

| Albuminuria and sex of patient | | | | |
|---|---------------------------------------|--------------------------|--|--------------------|
| | Male | | Female | |
| Albuminuria present | 11 | | 8 | |
| No albuminuria | 12 | | 11 | |
| Chi square 0.14 df1 p=0.71 | | | | |
| Albuminuria and appointment | | | | |
| | First | | Follow up | |
| Albuminuria | 2 | | 21 | |
| No albuminuria | 3 | | 16 | |
| Chi square 0.50 df 1 p0.480 | | | | |
| Albuminuria and type of diabetes | | | | |
| | Type 1 Diabetes mellitus | | Type 2 diabetes mellitus | |
| Albuminuria | 1 | | 22 | |
| No albuminuria | 4 | | 15 | |
| Chi square 2.77df 1 p 0.96 | | | | |
| Albuminuria and treatment change | | | | |
| | Treatment change last 6 months | | No Treatment change last 6 months | |
| Albuminuria | 6 | | 17 | |
| No albuminuria | 2 | | 17 | |
| Chi square 1.63 df 1 p 0.201 | | | | |
| Albuminuria and retinopathy and maculopathy | | | | |
| | Background | Pre-proliferative | Proliferative | Maculopathy |
| Albuminuria | 16 | 1 | 6 | 1 |
| No albuminuria | 11 | 1 | 6 | 0 |
| Chi square 1.56 df 3 p 0.67 | | | | |
| Albuminuria and hypertension | | | | |
| | Known hypertension | | No previous known hypertension | |
| Albuminuria | 18 | | 5 | |
| No albuminuria | 16 | | 3 | |
| Chi square 0.239 df 1 p 0.63 | | | | |
| Albuminuria and receiving treatment for hypertension | | | | |
| | Blood pressure treatment | | No blood pressure treatment | |
| Albuminuria | 19 | | 4 | |
| No albuminuria | 15 | | 4 | |
| Chi square 0.90df 1 p 0.76 | | | | |

| Albuminuria and ethnicity | | | | |
|--|----------------|----------------|-----------|---------|
| | Afro-Caribbean | Asian | Caucasian | |
| Albuminuria | 3 | 9 | 7 | |
| No albuminuria | 9 | 5 | 9 | |
| Chi square 4.05df 2 0.13 | | | | |
| Albuminuria and duration of diabetes, age, systolic and diastolic blood pressure | | | | |
| | Albuminuria | No albuminuria | T test | P value |
| Mean duration | 16.5 | 18.5 | -0.63 | 0.53 |
| Mean Age | 64.0 | 61.3 | 0.45 | 0.45 |
| Mean systolic blood pressure | 143 | 138 | 0.78 | 0.78 |
| Mean diastolic blood pressure | 79.3 | 75.7 | 0.78 | 0.78 |

Table 5: Albuminuria present or absent on urine dipstick and other factors.

Interestingly, a large proportion of patients attending diabetic eye clinics (18/42, 42.9%) were found to have elevated blood pressure > 30/80 mmHg.

Discussion

The results demonstrate that a large proportion of patients attending diabetic eye clinic have proteinuria. And a large proportion of these patients are themselves unaware of any renal impairment as are their general practitioners. Albuminuria is a risk factor for the development of macrovascular disease and end stage renal failure [2]. Early detection allows better control of blood pressure [3-5] use of ACE inhibitors [6], HBA1c [7-9] and cholesterol control [10-12] as recommended by national guidelines [15].

Patients with proteinuria whose general practitioners were unaware of renal impairment were of a significantly younger age. These patients had significantly higher mean diastolic blood pressures in comparison to those whose general practitioners were aware of renal failure. T tests demonstrated a significant difference between patients whose general practitioners were aware and unaware of renal impairment and the initial referral to the diabetic eye clinic. The results suggest that these patients with unknown renal impairment are part of a cohort with elevated diastolic blood pressure and it is known that these are risks for the development of microvascular and macrovascular complications of diabetes [5,10]. Identifying and treating these patients is beneficial as improving risk factors will prevent development of microvascular complications such as albuminuria and retinopathy. Elevated blood pressure is well known to have an effect on the progression of diabetic retinopathy secondary to retinal hyperperfusion and shunting of capillaries [17].

A large Australian study of 10, 944 participants found that urine dipstick analyses have a high negative predictive value and are 100% sensitive and 83.7% specific at detecting albuminuria when compared to a corresponding albumin to creatinine ratio for the patient [17]. They therefore provide a quick reliable indicator of renal impairment in clinical practice. In our study the general practitioners of all patients with positive albuminuria were informed so that appropriate management could be initiated. Although beyond the scope of this

study it would be interesting to ascertain the number that had an abnormal albumin to creatine ratio on further investigation.

This study was conducted on a small number of patients from one consultant's outpatient clinic. A large prospective multicentre cohort study with age matched control subjects would be recommended to increase the power and validity of the results obtained. However the results from this study suggest routine urinalysis is valuable in diabetic eye clinics. Patients may have developed unknown renal impairment in between their routine diabetic follow up appointments. In clinical practice this may be more feasible in multidisciplinary clinics, which combine general diabetic medical management and ophthalmological assessment of the patient.

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Conflict of Interest

None of the authors has conflict of interest with the submission.

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