ORIGINAL ARTICLE

Assessment of Urinary Albumin-Creatinine Ratio in the Diabetic Patient: A Retrospective Study

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Background

Microalbuminuria is one of the earliest markers of diabetic kidney disease. Hence, the National Institute for Health and Care Excellence (NICE, NG18) recommends screening diabetic adults, children and young people on an annual basis with urinary albumin-to-creatinine ratio (ACR) for the early detection of diabetic kidney disease. Timely detection of a positive urinary ACR leads to earlier intervention, better glycaemic control and surveillance.

Method

Patients over the age of 18 attending the Diabetes Clinic at Mater Dei Hospital over a 1-week period in June 2021 were identified. Data regarding order requests and test results of urinary ACR was collected from iSOFT Clinical Manager System and iLab Laboratory Information System in liaison with the Clinical Chemistry Lab.

Results

A total of 168 patients were identified for the purpose of this study. The majority (45.2%) had a new case appointment and were excluded. Results show that despite urinary ACR was requested by the reviewing physician (90.2%), only 49.4% of these test samples were submitted to the laboratory services. The median average urinary ACR was found to be 13.9mg/g.

Conclusion

There is appropriate knowledge amongst doctors caring for diabetic patients regarding the importance of checking urinary ACR yearly. Suboptimal sample submission rate highlights the lack of awareness amongst patients about its underlying use of detecting kidney disease. Hence, improved patient education and logistical planning are required to ensure detection and timely intervention.

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Moderately increased albuminuria (formerly known as 'microalbuminuria') is one of the earliest markers of diabetic kidney disease. The 24-hour urine collection has been the "gold standard" test. However the spot urinary albumin-to-creatinine ratio (ACR) is able to provide a more convenient way of assessment whilst still correlating accurately with 24-hour collections.

The National Institute for Health and Care Excellence (NICE) 2015 and 2021 recommends screening adults, children and young people with diabetes (type 1 or type 2) on an annual basis with urinary ACR for the early detection of diabetic kidney disease.[1,2] Timely detection of moderately increased albuminuria (ACR range 30-300mg/g) reduces the risk of progression to severe diabetic nephropathy by alerting both the physician and the patient to the need for better glycaemic control and surveillance.

The use of an early morning urine sample is recommended to mitigate the risks of a false positive result. If the initial test is suggestive of moderately increased albuminuria then the result should be confirmed on 2 separate samples of early morning urine, prior to performing further investigations or instituting treatment.[1]

This study aims to assess whether urinary ACR is being requested and performed on an annual basis in the diabetic patient as recommended by NICE guidelines.

METHODOLOGY

The audit was carried out over a 1-week period in June 2021. A retrospective analysis of the use of urinary ACR in the preceding year was carried out for all patients attending their diabetes clinic visit in the designated 1-week period.

The patient cohort was identified through the Central Patient Administration System (CPAS) lists. Recruitment criteria were used to assess eligibility (Table 1). Data regarding order requests and test results of urinary ACR as well as HbA1C and renal function tests was collected from iLab Laboratory Information System (LIS), in liaison with the Clinical Chemistry laboratory at Mater Dei Hospital. The datasets evaluated are presented in Table 2.

During this study, there was no patient contact. No experiential or patient identifiable data was extracted or utilised. Permission was obtained from all the consultants in the Department of Diabetes as well as the Head of Department. Clearance from MDH data protection team was also sought.

Table 1   Recruitment criteria

Inclusion criteria
Age between 18-100
Under regular review by a Diabetes consultant at Mater Dei Hospital

Exclusion criteria
Being a new case referral
Failing to attend for two consecutive years
Gestational diabetes

Table 2   Datasets

Dataset
Age
Gender
Number of HbA1C tests performed by the laboratory over the past 1 year
Average HbA1C result per patient over the past 1 year
Number of ACRs requested per patient by the caring physician over the past 1 year
Number of ACR tests per patient performed by the laboratory
Number of renal profiles requested per patient by the caring physician over the past 1 year

RESULTS

A total of 168 patients were identified through the CPAS lists. 76 of these patients were excluded from the study. The main reason for exclusion was being a new case appointment (Table 3). There were more males (n = 54) than females (n = 38) with a median age of 61.5 years and an inter-quartile range (IQR) of 21.3 years. Also whilst urine ACR was requested by the reviewing physician (90.2%), only 49.4% of these test samples were submitted to the laboratory services.

Table 3   Reasons for exclusion

Reasons for exclusion	Number of patients
Being a new case appointment	39
Failing to attend the past 2 diabetes clinic appointments	34
Having gestational diabetes	2
Undergoing dialysis	1

Table 4 *ACR, HbA1c and renal profile descriptive measures*

Test	Requested/year			Performed/year		
	Total	Patients (%)	Per patient*	Total	Patients (%)	Per patient*
ACR	147	83 (90.2%)	1 (1 - 4)	57	41 (49.4%)	1 (1 - 3)
HbA1c	143	87 (94.6%)	1 (1 - 3)			
Renal Profile	149	86 (93.5%)	1 (1 - 4)			

Mode of average requests per patient with range in brackets.

Further descriptive measures for the laboratory results are presented in Table 4 and Table 5.

DISCUSSION

This study was able to assess whether diabetic patients are having a urine ACR checked on an annual basis as part of their diabetes care. The study was based on investigations requested and performed over a one-year period during which the COVID pandemic was ongoing. This might have affected patient's willingness to engage with medical services for investigation and management of their diabetes. In addition, the short assessment period of 1-week may have also been a limitation in this study. The patient cohort obtained (n=92) after applying exclusion criteria however allows for generalizability.

The study focused on ACR tests requested by diabetes physicians. Henceforth ACR requests and results by other specialties were not considered. Although most diabetes doctors ordered urinary ACR tests for their patients, 10% of the patient cohort did not have this test ordered. This statistic needs to be further evaluated.

Worryingly 50.6% of the patient cohort did not submit a urine ACR despite this test being requested. This might be due to communication failure or logistical issues. Diabetes care in Malta is historically either tertiary based (at Mater Dei Hospital) or community based with often little overlap or communication between the two. Urine ACR is often ordered prospectively for the next diabetes visit. Patients then receive a letter reminding them to have their blood tests taken at a phlebotomy clinic prior to their diabetes appointment. There is however no specific reminder for urine sample submission to pathology services.

CONCLUSION

Despite there being appropriate awareness amongst diabetes doctors regarding the need of an annual urine ACR check, half of the tests requested were not submitted to laboratory services. This highlights the need for improved doctor and patient awareness, as

Table 5 *Test results in patient cohort*

Test	Median	Range	Inter-Quartile Range
HbA1c (%)	7.2	4.9 – 13.7	2.15
ACR (mg/g)	13.9	0 – 4788.5	31.9
Creatinine (µmol/L)	75	37 – 493	31.1
eGFR (mL/min/1.73m²)	89.3	11 – 207.6	45.8

SUMMARY BOX

What is already known about the subject?

- Moderately increased albuminuria is one of the earliest markers of diabetic kidney disease.
- Annual screening of diabetic patients with urinary ACR leads to timely detection and intervention.

What are the new findings?

- There is appropriate awareness amongst diabetes doctors regarding the need for a yearly urinary ACR check.
- Patients should be educated regarding its importance and purpose of detecting diabetic kidney disease. Further strategies for its submission should be implemented.

well as better logistical planning for submission of urine ACR samples. The following recommendations are made:

1. to educate patients regarding the importance of an annual urine ACR check during the diabetes consultation

2. to highlight the need for a urine ACR check in the appointment letter

3. to consider random submission of urine ACR as opportunistic screening in clinic (whilst being aware of the risk of a false positive result).

4. to introduce paper notices at Outpatients to continue raising awareness amongst doctors about the importance of requesting a urine ACR.

REFERENCES

1. National Institute for Health and Care Excellence..\(2015\) Diabetes (type 1 and type 2) in children and young people: diagnosis and management. Retrieved from https://www.nice.org.uk/guidance/ng18/chapter/Recommendations#type-2-diabetes

2. National Institute for Health and Care Excellence..\(2021\) Chronic kidney disease: assessment and management. Retrieved from https://www.nice.org.uk/guidance/ng203/resources/chronic-kidney-disease-assessment-and-management-pdf-66143713055173