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Survey of eye patients' urine for possible biomarkers of primary open angle glaucoma in Gwagwalada, Nigeria

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Background: Primary open angle glaucoma (POAG) remains a major cause of blindness and visual impairment. Options for its investigation are expanding, though some are not clinically practical. Many bio-products are excreted in the urine especially water, chemicals, electrolytes, nitrogenous chemicals (urea, creatinine), vitamins,

hormones, and organic compounds.[1] A study found that higher urinary albumin-to-creatinine ratio (per 50mg/g increase) was independently associated with POAG.[2] Albuminuria has been linked with POAG.[3,4,5] This study compared urine parameters of POAG patients with non-glaucoma eye patients (NGEP) with the aim of identifying possible biomarkers for POAG.

Methods: Midstream urine samples of 235 adult eye patients (96 POAG and 139NGEP) were analysed for electrolytes, urea, creatinine, protein, transaminases and lipids in addition to the use of the combi-dipstick urinalysis.

Results: The mean age was 49.88±13.75 years and 114 (48.5%) were males.The mean values of some urine parameters in the POAG group compared with NGEP were as follows: urea(POAG-46.86mg/dL versus NGEP-39.18mg/dL, p=0.015); sodium (POAG-85.22 mmol/L versus NGEP-24.53mmol/L, p<0.001);total protein (POAG-0.74g/dL versus NGEP-0.55g/dL, p=0.012); and globulin (POAG-0.59g/dL versus NGEP-0.38g/dL, p=0.004); potassium (POAG-37.04mmol/L versus NGEP-53.30mmol/L, p<0.001); Alkaline phosphatase (POAG-12.23U/L versus NGEP-22.01U/L, p<0.001); Alanine transaminase (POAG-8.99U/L versus NGEP-14.00U/L, p<0.001); Aspartate transaminase (POAG-10.50U/L versus NGEP-21.49U/L, p<0.001);cholesterol (POAG-3.89mmol/L versus NGEP-17.30mmol/L, p<0.001); and triglyceride (POAG-11.37mmol/L versus NGEP-20.19mmol/L, p<0.001).There were no significant differences in the mean values of urine creatinine, chloride, albumin, total bilirubin and direct bilirubin.

Based on the combi-dipstick urinalysis, significantly higher proportions of NGEP were positive for bilirubin and protein compared with the POAG group as follows: bilirubin (POAG-0.0% versus NGEP-7.91%, p=0.005); and protein (POAG-4.17% versus NGEP-14.39%, p=0.011). On the other hand, a lower proportion of NGEP (51.8%) had normal pH compared with 87.5% in POAG patients (p<0.001).

Discussion: This study found that mean urine urea was significantly higher in POAG while mean urine creatinine was not different between the two groups. Also, mean urine sodium was higher in POAG, while mean urine potassium was significantly lower in POAG. Mean urine chloride was similar in both groups.The mean values of the transaminases and alkaline phosphatase were also significantly lower in POAG, while the mean total protein and globulin were significantly higher in POAG. Mean urine albumin as well as direct and total albumin were not significantly different between the 2 groups, although, urine mean cholesterol and triglyceride were significantly lower in POAG.

The reasons for these differences are not clear and this portrays the need for further studies.Nevertheless, these findings have translational potential in the early detection of POAG. Investigation for many of these urine parameters, though rarely routinely performed in clinical practice, may be preferable to blood tests because urine sample is routinely obtained non-invasively.

In conclusion, the mean values of urine urea, sodium, potassium, alkaline phosphatase, Alanine transaminase, Aspartate transaminase, total protein, globulin, cholesterol and triglyceride were associated with POAG. Further research into their status as possible biomarkers for POAG is recommended.

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