



Conventional Urinalysis as a Diagnostic Modality in the General Out Patient Department: A Case Study of a Tertiary Hospital in Nigeria

Otokunefor O ^{a,b*} and Odum EP ^{a,b}

^a Department of Chemical Pathology, Faculty of Basic Clinical Sciences, College of Health Science, University of Port Harcourt, Rivers State Nigeria, Nigeria.

^b University of Port Harcourt Teaching Hospital, Rivers State, Nigeria.

Authors' contributions

This work was carried out in collaboration between both authors. Author OO designed the study, performed the statistical analysis, wrote the protocol, and prepared the first draft of the manuscript. Author OEP managed the literature searches and editing. Both authors read and approved the final manuscript.

Article Information

DOI: <https://doi.org/10.9734/ajrre/2025/v8i1102>

Open Peer Review History:

This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: <https://www.sdiarticle5.com/review-history/129178>

Original Research Article

Received: 03/11/2024
Accepted: 06/01/2025
Published: 13/01/2025

ABSTRACT

Aims: Urinalysis is a simple yet sometimes overlooked investigation. The aim of this study is to report and describe all routine chemistry urinalysis done in the outpatient department of UPTH. The objective is to ascertain if it is beneficial in the patient management.

Study Design: This is a prospective, cross sectional descriptive study

Place and Duration of Study: General out-patient Department in a tertiary hospital in Nigeria. Between August and October, 2022.

*Corresponding author: Email: mayslady@hotmail.com;

Cite as: O, Otokunefor, and Odum EP. 2025. "Conventional Urinalysis As a Diagnostic Modality in the General Out Patient Department: A Case Study of a Tertiary Hospital in Nigeria". *Asian Journal of Research and Reports in Endocrinology* 8 (1):10-16. <https://doi.org/10.9734/ajrre/2025/v8i1102>.

Methodology: Convenience sampling method was adopted. The results of all patients who came to the clinic and were screened were included in the study. Data was obtained over a period of 3 months from the daily records. Urine protein and glucose values had been gotten using a dipstick urinalysis on spot urine. While the blood glucose value was obtained from a pinprick blood specimen using a glucometer. Information was exported to SPSS and data was analysed through descriptive statistics.

Results: A total of 1134 patient records were obtained. 63.2% (717) were females and 36.8% (417) were males. Four percent had glycosuria and 70% had some form of proteinuria.

Conclusion: Spot Chemical analysis of urine is an effective way to screen for and to identify people who have certain degrees of diabetes and renal disease. In this study 2.6% had severe proteinuria. All first point of call clinics should have an established protocol for proteinuria.

Keywords: Urinalysis; proteinuria; glycosuria; renal disease; general-out-patient-department.

1. INTRODUCTION

Urinalysis is one of the simplest tests (Patel, 2006) that can be done almost anywhere. This includes in the laboratory and as a point of care test, at various clinics and wards. It is also one of the cheapest tests that can be performed (Adeyemo et al., 2023). This is very important in resource poor settings, and in environments with an emerging health insurance system.

Urinalysis involves visual, chemical and microscopic examinations. Generally, in clinical chemistry urinalysis refers often to the chemistry of urine (Adeyemo et al., 2023).

When we talk about urinalysis as a point of care, usually, we refer to the simplified, compressed easy to use form of urinalysis;- the dipstick. Use of dipstick in medical practice dates as far back as 1956 (Patel, 2006). Dip stick urinalysis as simple and as basic as it is, is never outdated. The specimen is easy to obtain (by simple voiding) and is mostly non-invasive -with some extreme exceptions where it can be obtained through a supra pubic tap.

Urinalysis can be easily used to screen for a variety of disease conditions and to also monitor progress of disease, efficacy of treatment and more. An example is diabetes mellitus and some of its complications include ketoacidosis, and renal disease. Other examples include, hypertension, metabolic diseases, inborn errors of metabolism such as citrullinemia, Lesch-Nyhan's syndrome and glutaric aciduria amongst others (Steggall, 2007; Kennedy et al., 2016)

Urinalysis can also be used to screen for cancers and their recurrences. (Lei et al 2020) However, urinalysis has evolved over the years to include point of care tests for complex analytes such as Nuclear Matrix Protein 22. (NMP-22) and bladder tumour antigen (BTA) and can therefore be used

as a screening for bladder cancer to monitor recurrence (Lei et al., 2020; Hwa et al., 2010; Abubakar et al., 2019)

Most outpatient clinics in tertiary hospitals perform a routine point of care urinalysis. It is advisable that every patient that has a first contact with a health facility should have a urinalysis done. (Adeyemo et al., 2023) Side laboratories are encouraged in health care systems for efficient health delivery.

For example, in the university of port Harcourt teaching hospital. At least six clinics perform a routine dipstick urinalysis on all or a subgroup of their patients. These clinics include but are not limited to obstetrics and gynaecology, general surgery, internal medicine, general outpatient department, paediatrics and urology.

In our General outpatient department, a dipstick urinalysis is done routinely on all first time patients. Currently we use the glucose and protein dip stick.

In some parts of the world, mass screening of asymptomatic children is done at various times. Usually at the preschool level. In Nigeria, urinalysis is requested at entry level into some secondary and tertiary institutions.

A random urinalysis screening study carried out in Lagos by Braimoh et al on 1048 apparently healthy individuals revealed that 33.6% of participants had various forms of abnormalities with proteinuria being the most predominant (Braimoh et al., 2016)

Akor et al found something similar in a study carried out in primary school age children in Jos (Akor et al., 2009) Over 9% of participants (9.6%) had abnormalities with proteinuria being the most

predominant. (3.5%) (Lei et al 2020; Hwa et al, 2010; Abubakar et al 2019)

A study done among apparently healthy school aged children in Egypt revealed that at least 16.4% had undetected health abnormalities (Zein El-Abden et al., 2013)

In our nation with a developing health care system and an equally emerging national health insurance scheme, patients pay for medical treatment, out of pocket. We often fine tune urinalysis to decide the most important tests we need to perform. As a result, most urinalysis strips used in side laboratories assess for one or two parameters usually glucose and protein.

Urinalysis is very simple and therefore easily overlooked. It is far cheaper than many other investigations and can be easily applied to a wider set of people groups. We do not keep records and eventually, voluminous data that can be used to show a pattern about patients in a tertiary hospital in Nigeria is overlooked and not adequately documented.

This is the first step in a multi-staged study to report all urinalysis done in the university of Port Harcourt teaching hospital, (using the General Out Patient department as a template) first for three months, then one year and to give a detailed report of the findings. We will also assess the general benefits to the health care system. In addition to the urinalysis and spot blood glucose assessment would be done as well.

The aim of this study is to report and describe all routine analysis done in the outpatient department of UPTH. The objective is to ascertain if the routine urinalysis is beneficial in the patient management.

2. MATERIALS AND METHODS

2.1 Study Design

This is a prospective, cross sectional descriptive study.

2.2 Study Site

This study was carried out in the University of Port Harcourt Teaching hospital, a tertiary hospital in Rivers State, a cosmopolitan state in southern Nigeria. The hospital has over 500 bed spaces.

2.3 Sampling Technique and Methods of Data Collection

Convenience sampling technique was adopted. A Total of one thousand, one hundred and thirty - four patients that attended the General Out Patient Department (GOPD) over a period of three months were recruited.

Data was recorded sequentially in a log book as the results were obtained.

Spot urine was obtained from these patients and a dip stick urinalysis was done for glucose and Protein. Pin prick whole blood was obtained as well and a spot glucose estimation was done using a glucometer.

2.4 Statistical Methods

Information was put into an excel sheet and exported to SPSS. Data generated from the study was analysed through descriptive statistics. Frequencies and percentages were calculated for categorical variables while mean and standard deviation were calculated for quantitative variables

The Aim of this study was to ascertain if there was any correlation between the results obtained from the urinalysis and blood glucose test and the working diagnosis of the patient.

The objectives were to screen patients' urine for glucose and protein and to access their blood glucose levels using a point of care device. (glucometer). As well as to take note of their working diagnosis and see if there was any alignment.

3. RESULTS AND DISCUSSION

3.1 General Information

In total we have data from one thousand, one hundred and thirty -four (1134) patients. 63.2% (717) were females and 36.8% (417) were males.

Most of the patients were within the ages of 35-44 years accounting for 26.7% (303), followed by the 45-54 age group, (18.8%-213), the 25-34 age group (16.8%-191) the 55-64 age group (14.6%-166) and then others.

3.2 Glucosuria

Ninety – six percent (1088) had no glucose found on urinalysis and the remaining four percent had glycosuria.

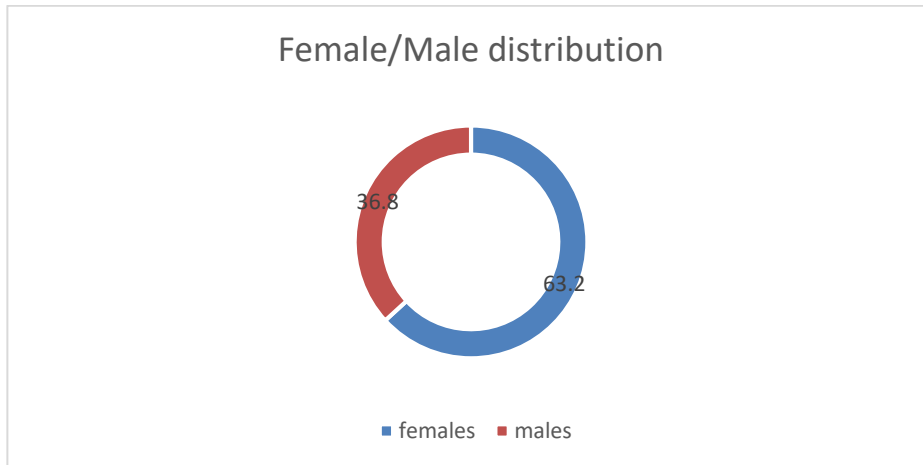


Fig. 1. Sex distribution of patients

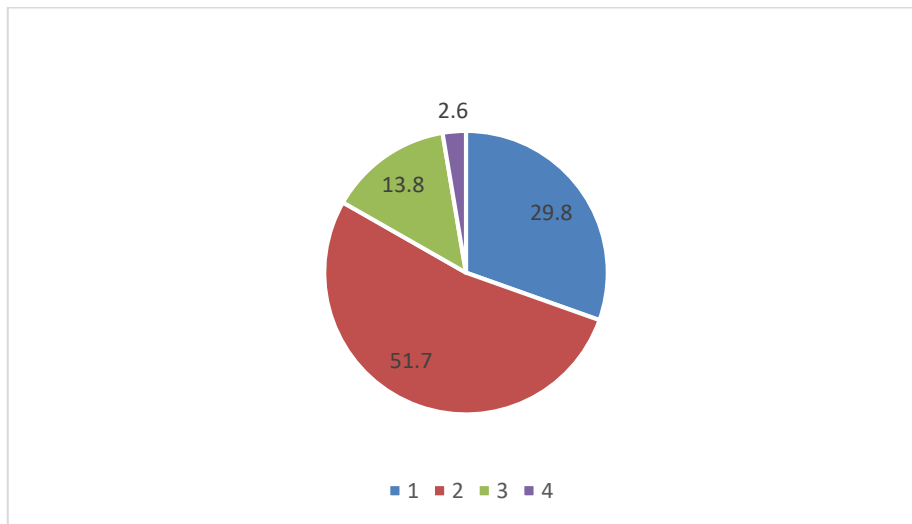


Fig. 2. Proteinuria. 1. Negative, 2. Trace, 3. One Plus, 4. Two Plusses.

3.3 Proteinuria

29.8 % (338) were negative, 51.7% (586) had trace amounts, 13.8% (156) had one plus and 2.6%(29) had 2 plusses.

3.4 Plasma Glucose

Whole blood glucose revealed the following; no one had a value less than 2.2mmol/L, 1.5% (17) had values less than 3.5mmol/L. 70.8% (803) had values between 3.5-5.5mmol/L, 7.9% (90) had values between 7.1 and 10.9mmol/l while 5% had values above 11.0mmol/L (57)

3.5 Diagnosis and Presenting Complaints

Presenting symptoms and diagnosis classified together with some departments, those of

significance are as follows. General surgery and urological issues accounted for 17.2% (195), Obstetrics and Gynaecological related issues for 11.8% (134), orthopaedic, 9.8% (111), hypertension 4.0% (45), diabetes 3.8% (43), renal, 1% (11.34).

Most patients that come to the GOPD are first time patients including those with minor ailments that do not need to be sent to a specialist clinic.

Slightly less than 6% of patients has glucose in their urine. This is higher than the percentage of people with confirmed diabetes and buttresses the fact that urinalysis can be used as a screening tool for diabetes mellitus. Glucose is found in the urine when the renal threshold of 10mmol/l is exceeded. This threshold is sometimes increased in diabetic patients,

(Hieshima et al., 2020) and those who are diabetic but have a blood glucose level below the threshold will also not have a positive value for urine glucose (Cleveland Clinic, 2024)

Over 70% of participants had some form of proteinuria. This is twice the upper limit of that expected for the general population, which is 8--33%.13 Majority of them were in trace amounts. A small community based study done in Enugu with just 262 participants had a prevalence of 85.9% for trace proteinuria (Onodugo et al., 2019). This is far higher than the 51% found in our study. Trace proteinuria is generally regarded as normal and has minimal clinical implications (Nakajima et al., 2020).

Proteinuria can be transient or persistent. The persistent one can have benign causes. (Haide & Aslam 2023; Haynes & Haynes 2006) This is discussed further below.

Some countries such as Japan have a protocol to investigate proteinuria (Haider & Aslam, 2023). It is a stepwise process. The first step is a deep stick screening, then a spot Urine creatinine protein ratio is done, and those with a value above 15mg/dl would be further investigated (Haider & Aslam, 2023). There is a treatment protocol with a six-monthly review. This would need to be established in our institution. Patients with proteinuria should be assessed, after a thorough history (including clinical features, urine changes and drug history) and physical examination has been done (Haider & Aslam, 2023). A protocol for specimen collection should also be put in place. This is to prevent contamination.

A ten-year study in Japan involving over 250,000 individuals found out that the yearly incidence for proteinuria was higher in males than females and ranged from 0.68 – 1.31%. It was also discovered that risk factors included hypertension, diabetes and renal disease (Nagai et al., 2013). Our study however only accounted for prevalence rates.

A study done in Calabar involving 1500 asymptomatic school age children found out that the prevalence of persistent proteinuria using dip stick urinalysis and spot urine creatinine protein ratio was similar with a value of 1.8% for dip stick urinalysis (Uzomba et al., 2017). Dipstick urinalysis can be used effectively as a screening tool for proteinuria.

When proteinuria is present, it is important to eliminate false positives. For example, rule out semen or mucous in the urine. Dehydration too can contribute.

Trace proteinuria is not of concern to the clinician, however when the proteinuria is significant, it is essential that we establish if it is transient or persistent. This requires repeating the urinalysis within a short period of time.

Persistent proteinuria is caused by renal disease while transient proteinuria can be caused by pregnancy and UTI amongst others (Haider & Aslam, 2023; Haynes & Haynes, 2006). Orthostatic proteinuria can persist but it is a benign cause (Haider & Aslam, 2023; Uehara et al., 2014). An algorithm should be put in place to help effectively establish causes of transient proteinuria. Important things to look out for includes if the person is below 30 years, or pregnant, or has any signs or symptoms of urinary tract infection, or has participated in strenuous exercise.

Patients with proteinuria that point towards kidney disease will further need to be evaluated. Early treatment is key to slowing down the progress of chronic renal failure. Hence carrying out a routine urinalysis in these subsets of patients is of utmost importance. The record (history) of the patient with urinary changes is essential for monitoring the evolution of the condition of possible carriers of kidney diseases because it presents silent evolution,

Most of the recipients had normal blood glucose values, 1.5% had values in the hypoglycaemic range and 5% had values in the diabetic range. For ease of interpretation, all values were treated as random as it was difficult to ascertain and differentiate those who were fasting from those who were not. The percentage that was within the diabetic range correlated closely with those who were known diabetic patients. This information is extremely useful to the doctors seeing the patients.

Overall routine urinalysis is necessary for all first time and returning patients to the GOPD and is useful in screening for and identifying patients that might have various causes of persistent proteinuria that requires treatment as well as in screening for and identifying patients with diabetes in the first instance and those who are on treatment but are not adhering or have poor control. The fasting blood glucose helps to

consolidate this. Incorporating the fee for urinalysis into the consultation fee in the general outpatient department would help ensure sustainability of services.

3.6 Limitations

The study did not differentiate the values for random and fasting glucose and this made interpretation difficult.

4. CONCLUSION

This study shows recent data from our centre corroborate that urinalysis is an effective way to screen and to identify people who have certain degrees of diabetes and renal disease. In this study 2.6% had severe proteinuria. All first point of call clinics should have an established protocol.

4.1 Recommendations

1. Have a protocol for investigating proteinuria and disseminate this to all departments that screen for proteinuria.
2. Have a protocol for obtaining specimen to reduce contamination
3. Having a chart in patients hospital folder to record results for urinalysis so multiple results from different visits can be seen at a glance
4. Have yearly records in place and have comparative yearly studies with 5 – 10 year summaries. In Nigeria we have limited “banking data” or studies that have information in high thousands as compared to studies from some other European countries and Britain where there are studies or banking data involving 20 to 100,000 data set.

CONSENT

It is not applicable

ETHICAL APPROVAL

Approval to obtain the data and report findings was obtained.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Authors hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of this manuscript.

ACKNOWLEDGEMENTS

Authors declare that there was no funding for this received from any group or individual.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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