Screening Urine Dipstick Testing in Patients at a Primary Healthcare Clinic in Mankweng Hospital, Limpopo Province

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ABSTRACT Urine dipsticks are a useful and easy bedside test. Screening all patients older than 60 years is cost-effective for chronic kidney disease. However, there is no clear evidence that screening low-risk patients younger than 60 years is cost-effective. This study describes the results of screening dipstick urinalysis of patients at Mankweng Hospital's Primary Healthcare Clinic. This was a descriptive survey. Urine dipsticks tests were conducted on patients attending the clinic. There were 227 participants. Of these, 153 (67%) were female and 74 (33%) were male. Urine abnormalities were found in thirty-five percent of the participants. Most (26%) of the abnormalities were found in the age group of 20-24 years. The abnormalities included haematuria (19%), pyuria (12%), proteinuria (4%), ketonuria (11%), glycosuria (3%), nitrites (3%) and urobilinogen (0.4%). There was no significant association between urine abnormality and age. More females had urine dipstick abnormalities. More than a third of all the participants in this clinic-based survey had abnormal urine dipstick results.

INTRODUCTION

Urinalysis is a simple screening test**,** which has shown its effectiveness in detecting abnormalities at a low cost (Plata et al. 1998). Early detection and treatment of chronic kidney disease may delay or prevent the development of end-stage renal disease. Urine dipstick testing is as effective as microscopy and culture of urine for detecting urinary tract infections (Najeeb 2015). Urine dipstick testing in pregnant women is also effective for pre eclampsia (Pallavee 2015). Screening all patients older than 60 years is cost-effective even when other risk factors for chronic kidney disease are absent. However**,** Snyder and Pendergraph (2005) reported that screening low-risk patients younger than 60 years is not cost-effective. Routine urine dipstick screening in young patients may provide transient or false-positive results (Linshaw and Gruskin 1997; Khallid and Haddad 1999). Urine dipsticks tests have been used for urinary tract infection screening (Mambatta 2015). James (2015) reported that urine dipsticks testing are valuable in emergency care settings.

Objectives

1. To estimate the prevalence of abnormalities detected by routine dipstick urinalysis at Mankweng Hospital's primary healthcare clinic.
2. To determine the nature of the prevalent urinary abnormalities.
3. To compare abnormalities by age and gender.

MATERIAL AND METHODS

It was a cross-sectional study where patients' urine was analyzed using UriCHECK 10 dipsticks as they visited the primary healthcare clinic. The study population included all patients who could pass urine voluntarily (five years and above) who attended Mankweng Hospital's Primary Healthcare clinic during 2012.

Systematic random sampling was used. Patients were allocated numbered cards as they registered at the clinic. The first patient was chosen by a throw of a dice and then every third patient was recruited. Repeat patients within the period of the study were excluded. The sample size of the study was calculated based on the following formula:

$$n = \frac{Z^2 p(1-p)}{e^2}$$

Where,
- p is the prevalence (that is, the researchers used p=18%, Khallid and Haddad 1999)
- e is the sampling error (5%)
- Z is the confidence interval (95% CI)

The sample size required for the study was 227. Data collection was completed within nine days.

The components that were tested included blood, protein, glucose, ketones, nitrites, leukocytes, urobilinogen, bilirubin, specific gravity

and pH. UriCHECK 10, which is a dipstick test for ten components of urine, was used. This information was recorded on a data collection tool.

A fresh urine sample was obtained from participants and tested by two trained nurses. The data for the study was captured and analyzed using EpiInfo version 2002.

Ethical Considerations

Ethical clearance was obtained from the Medunsa Research and Ethics Committee (MREC).

RESULTS

A total of 227 patients participated in the study. Of these, 153 (67%) were female and 74 (33%) were male. Most (19%) were in the age group of 20-24 years, followed by 25 (11%) patients in the age group 60 years and above. The mean age was 33 years, and ranged from 5 to 84 years (Table 1).

The Relationship Between Urine Abnormality and Selected Demographics

The results illustrate a significant relationship between gender and abnormality (p<0.001). About 65 (43%) females had urine dipstick abnormalities while 15 (20%) males had abnormalities.

Table 2 indicates that females are 2.91 times more likely to show urine abnormalities than males.

Of the participants, 80 (35%) had urine abnormalities. Urobilinogen was found in only

Table 2: Relationship between urine dipstick abnormality and gender

	Female		Male		p-value
	No	%	No	%	
Normal	88	58	59	80	0.001
Abnormal	65	43	15	20	

one person (age group 45-49). Significantly (p<0.001) more urine dipstick abnormalities were found in females 65 (43%). The odds ratio indicated that females were 2.91 times more likely to have urine abnormalities than males. There was no significant difference between the urine dipstick abnormalities and age group (p=0.4860) (Table 3).

Table 3: Association of gender on abnormality

Odds ratio	Std err	95% confidence interval	
2.91	0.952	1.515	5.572

Wald Test: P<0.001

Thirteen (16%) females with blood in urine were menstruating. Almost all 226 (99%) had specific gravities between 1.003 and 1.030. The mean pH was 5.27, and ranged from 5 to 8.

Table 4: Association between age and urine abnormality

	Number of participants	Mean age	Std dev	p-value
Normal	147	34.6	18.7	0.4860
Abnormal	80	32.9	16.1	

The relationship between age and urine dipstick abnormality is shown in Table 4. The mean age was 34.6 years in the patients with no dip-

Table 1: Urine dipsticks results

Age group	N (%)	Sex- Male	Blood	Protein	Glucose	Ketones	Nitrites	Leucocytes
5-9	14(6)	5	0	0	0	1	0	1
10-14	16(7)	10	1	0	0	3	0	1
15-19	16(7)	3	5	1	0	2	1	2
20-24	43(19)	8	15	4	0	10	2	7
25-29	23(10)	7	4	3	0	4	1	3
30-34	20(9)	7	4	1	0	3	0	2
35-39	20(9)	7	3	1	1	1	0	3
40-44	14(6)	3	3	1	2	0	1	2
45-49	11(5)	3	2	0	0	0	1	1
50-54	16(7)	5	2	0	0	0	0	1
55-59	9(4)	4	3	0	3	1	0	2
≥ 60	25(11)	12	2	0	1	0	0	3
Total	227	74	44	11	7	25	6	28

stick abnormality (normal), ranging from 5 to 84 years, while the mean in the group with dipstick abnormalities (abnormal) was 32.9 years, ranging from 7 to 81 years. There was no significant difference between normal and abnormal group with regards to age (p=0.4860).

DISCUSSION

In this study the mean age was 33 years with a wide range of 5-84 years. The majority (19%) of patients who attend this Primary Healthcare clinic were in the age group 20-24 years, followed by age group 60 years and above. In the study by Kerr et al. (1999), the age ranged from 17 to 94 years with a mean age of 50 years.

The researchers in this study found a urine dipstick abnormality rate of thirty-five percent. This appears to be significantly high, but if one considers the calculated rate of false positive/transient abnormality of eighty-four percent by Kaplan et al. (1997), the persistent abnormality rate could be much lower. Nine percent of pediatric patients were calculated to have an abnormal initial urinalysis. Upon retesting, only 1.5 percent of the patients were calculated to have a persistent abnormality (Kaplan et al. 1997). An overall abnormal urine analysis was found in 15.4 percent of University candidates (Khallid and Haddad 1999). The urinalysis in these candidates was part of a routine medical check-up. Dipstick urinalysis was positive in thirty percent of patients (Sultana et al. 2001). This is closer to findings in the study. It is apparent that the prevalence of urine abnormality is varied from one study to the other.

Females were more likely to have urine dipstick abnormalities than males (Odds ratio 2.91). There was no significant association between age and urine dipstick abnormality (p=0.4860).

The most frequent urine abnormality was hematuria (53%) followed by pyuria (35%), then ketones (31%). All females with blood abnormality were assessed for menstruation, and 13 (16%) were found to be menstruating. This means that actual blood abnormality prevalence was thirty-seven percent of the total abnormalities (n=80). In order to get a sense of the prevalence of the different abnormalities in the population, the percentages had to be calculated out of the total sample number of 227. The prevalence was then found to be 43 (19%) for hema-

turia, 10 (4%) for proteinuria, 25(11%) for ketones, 7(3%) for glucose, 6(3%) for nitrites, 28(12%) for leukocytes, and 1(0.4%) for urobilinogen. If subtracting those who were menstruating, the prevalence of blood would come down to 30 (13%).

Khallid and Haddad (1999), in their study with University candidates found the prevalence to be 8.1 percent for pyuria, 6.1 percent for hematuria, 4.8 percent for proteinuria and they concluded that these values were significant to warrant routine urinalysis. Urine specimens testing positive for bacteriuria were found in 27.6 percent of the sample (Midthun et al. 2003). The study by Topham et al. (2004) revealed 3.8 percent proteinuria and 1.7 percent hematuria. In general, results of urine components from most studies show low values, but these could be clinically significant in individual patients. The researchers of the current study found higher levels of urine abnormalities probably because this sample was clinic based. The researchers propose that routine dipstick urinalysis is more likely to yield positive results in patients visiting a healthcare center than in people in the community. A Cochrane review also confirmed that screening with urinary dipsticks reduces morbidity and mortality (Krogsbøll 2015).

CONCLUSION

Urinary abnormalities as detected by dipsticks are high in primary care settings. Urine dipstick testing is feasible. The most common abnormalities are hematuria and pyuria.

RECOMMENDATIONS

It seems that urine dipstick testing adds value to the management of primary healthcare patients attending a health facility and should be part of screening for first time patients.

LIMITATIONS OF THE STUDY

The urine was tested once, and therefore the researchers do not know the effect of false/transient abnormalities.

REFERENCES

Kaplan RE, Springate JE, Feld LG 1997. Screening dipstick urinalysis: A time to change. *Paediatrics*, 100(6): 919-921.

Kerr S, Marshall C, Sinclair D 1999. Emergency physi-
cians versus laboratory technicians: Are the urinal-
ysis and microscopy results comparable? A pilot
study. *The Journal of Emergency Medicine,* 17(3):
399-404.

Khallid NS, Haddad FH 1999. Routine urine analysis in
university candidates: Is it worthwhile? *Eastern
Mediterranean Health Journal,* 5(1): 118-122.

Linshaw MA, Gruskin AB 1997. The routine urinaly-
sis: To keep or not to keep; that is the question.
Paediatrics, 100(6): 1031-1032.

Mambatta AK, Jayarajan J, Rashme VL, Harini S, Me-
non S, Kuppusamy J 2015. Reliability of dipstick
assay in predicting urinary tract infection. *Journal
of Family Medicine and Primary Care*, 4(2): 265-
268. doi:10.4103/2249-4863.154672.

Midthun SJ, Paur RA, Lindseth G, Von Duvillard SP
2003. Bacteriuria detection with a urine dipstick
applied to incontinence pads of nursing home res-
idents. *Geriatic Nursing,* 24: 206-209.

Najeeb S, Munir T, Rehman S, Hafiz A, Gilani M, Latif
M 2015. Comparison of urine dipstick test with
conventional urine culture in diagnosis of urinary
tract infection. *J Coll Physicians Surg Pak,* 25(2):
108-110. doi: 02.2015/JCPSP.108110.

Plata R, Silva C, Yahmita J, Perez L, Schieppati A,
Remuzzi G 1998. The first clinical and epidemio-
logical programme on renal disease in Bolivia: A
model for prevention and early diagnosis of renal
diseases in the developing countries. *Nephrology
Dialysis Transplantation,* 13: 3034-3036.

Roberts James R 2015. Urine dipstick testing: Every-
thing you need to know. *Emergency Medicine News,*
37(5): 14–17 doi: 10.1097/01.EEM. 0000
465706.70572.46

Snyder S, Pendergraph B 2005. Detection and evalua-
tion of chronic kidney disease. *American Family
Physician,* 72(9): 1723-1734.

Sultana RV, Zalstein S, Cameron P, Campbell D 2001.
Dipstick urinalysis and the accuracy of the clinical
diagnosis of urinary tract infection. *The Journal of
Emergency Medicine,* 20(1): 13-19.

Topham PS, Jethwa A, Watkins M, Rees Y, Feehally J
2004. The value of urine screening in a young adult
population. *Family Practice,* 21(1): 18-21.