

Predictive Values of Urine Dipstick and Microscopy Examination for UTI in Children with Different Ages

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Objectives

The UTI is a common disease in children with different ages. The gold standard test for diagnosis of UTI is the culture yielding a colony count of greater than 105 CFU/ml. However, this culture result requires more than 2 days and may delay the antimicrobial treatment of these acutely sick children. Prompt diagnosis of UTI in children is clinically needed, urine dipsticks are often used as an alternative to microscopy, although the diagnostic performance of dipsticks at different ages has not been established systematically. In this study, we compare urine dipstick with/without microscopy tests in infants versus older children for UTI diagnosis. We calculate the AUROC and several parameters to compare the predictive value of different combinations of these urine tests. .

Methods

We collect reports of urine dipsticks/microscopy and accompanied urine cultures from April 2008 to May 2010. These laboratory tests results were not duplicated, only patients under 18-years-old with one pair of urine analysis and urine culture were collected. There were 436 patients enrolled, 49.1% (214) cases were under 1 year-old. The other patients were between 1 to 5 years-old (17.9%) and 5 to 18 years-old (33.0%). The report of urine analysis included urine dipstick (nitrite, leucocyte esterase) and microscopy sediment (WBC, Bacteria). The confirmed test of UTI was urine colony > 105/CFU with pathogenic microorganisms.

Results

In all ages of children (0 to 18 years-old), the leucocyte-esterase or microscopy WBC had the highest predictive value for UTI, but did not perform well (AUROC= 0.632 and 0.646, respectively). In infant group, there was no significant difference of predictive values between single urine dipstick or microscopy and combination of above tests, the AUROCs were all around 0.6. The predictive value of nitrite test in dipstick was almost equal to the microscopy bacteria seen in each age groups. Both of these two tests performance were poor than leucocyte-esterase and microscopy WBC. The most best performance of urine tests was combination of urine dipstick and microscopy results in 5-18 years-old group (AUROC=0.82).

Table1: Comparison of dipstick test and microscopy sediment of age 0-18 children (n=436)

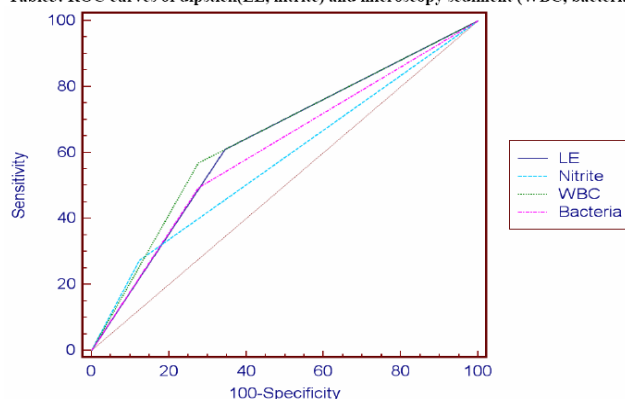
	Dipstick Test		Microscopy Sediment	
	LE	Nitrite	WBC	Bacteria
Sensitivity	60.96	27.40	56.85	49.32
Specificity	65.52	87.59	72.41	72.41
PPV	47.10	52.60	50.90	47.40
NPV	76.90	70.60	76.90	73.90
Positive likelihood ratio	1.77	2.21	2.06	1.79
Negative likelihood ratio	0.60	0.83	0.60	0.70
Area under the ROC cur	0.632	0.575	0.646	0.609

Note: LE:leucocyte esterase

Table2: Comparison of dipstick test and microscopy sediment of different age groups

	Dipstick Test		Microscopy Sediment	
	LE	Nitrite	WBC	Bacteria
Group 1: age ≤1 (n=214)				
Sensitivity	54.02	25.29	48.28	44.83
Specificity	66.14	81.89	73.23	69.29
PPV	52.20	48.90	55.30	50.00
NPV	67.70	61.50	67.40	64.70
Positive likelihood ratio	1.60	1.40	1.80	1.46
Negative likelihood ratio	0.70	0.91	0.71	0.80
Area under the ROC cur	0.601	0.536	0.608	0.571
Group 2: 1<age ≤5 (n=78)				
sensitivity	60.00	13.33	60.00	33.33
specificity	71.43	98.41	76.19	82.54
PPV	33.30	66.70	37.50	31.30
NPV	88.20	82.70	88.90	83.90
Positive likelihood ratio	2.10	8.40	2.52	1.91
Negative likelihood ratio	0.56	0.88	0.53	0.81
Area under the ROC cur	0.657	0.559	0.681	0.579
Group 3: 5<age ≤18 (n=144)				
sensitivity	75.00	36.36	72.73	63.64
specificity	61.00	88.00	69.00	70.00
PPV	45.80	57.10	50.80	48.30
NPV	84.70	75.90	85.20	81.40
Positive likelihood ratio	1.92	3.03	2.35	2.12
Negative likelihood ratio	0.41	0.72	0.40	0.52
Area under the ROC cur	0.680	0.622	0.709	0.668

Table3: ROC curves of dipstick(LE, nitrite) and microscopy sediment (WBC, bacteria)



Conclusion

Although urine analysis, include urine dipstick and microscopy examination, provide much information, only the leucocyte-esterase and microscopy WBC were the most informative tests about children' UTI, even in infants group.