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## Research Article

# Significance of the Dipstick in the Screening of Asymptomatic Bacteriuria in Diabetic Patients

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## Abstract

The urinary tract infections are very common and represent an important part of the workload in clinical microbiology laboratories. The aim of this study is assessing the interest of the Urine dipstick (BU) in excluding asymptomatic bacteriuria among diabetic patients, forming a significant part of consultants, and compare it with the reference examination that constitutes the cytobacteriological urine examination (urinalysis) for good decision making about the maintenance or removal of systematic ECBU. This is a prospective study in the laboratory of bacteriology at Mohamed V Military Hospital Instruction in Rabat (HMIMV), spread over six months from May to October 2012. The study included patient's external diabetics, consultants and cooperative, presenting at the bacteriology lab for a urine culture. Patients with urinary catheter, incontinent and without diabetes were excluded from the study. All history (especially diabetes) was noted. The urine sample was taken as sterile as possible on which are made both a urinalysis and a test for BU. Patients were included among 427 diabetic subjects, female gender represented 180 (42%) and male was 247 (58%). Outcomes reported 173 positive strips (40%) suggestive of bacteriuria with a predominance of positive results in 92 women (21%) than in men 81 (19%). The results of the urine cultures are reported 36 ECBU (soit9%) reported bacteriuria, 21 (58%) men and 15 (42%) in women. The incriminated germ in 72% of cases were Escherichia coli, 330 (77%) sterile urine culture and 61 (14%) contaminated urine. In case of diabetes, atypical or absence of clinical signs evocative of urinary infection, requires the use of a reliable screening technique. Dipstick, which has been proven the excellent performance, fulfills perfectly the criteria for a screening test for urinary infection.

Keywords: Dipstick; Asymptomatic bacteriuria; Diabetic patients

## Introduction

The urinary tract infections are very common and represent an important part of the workload in clinical microbiology laboratories. Diabetic patient is at higher risk of infection. Those infections are predominant among women and most remains asymptomatic. The aim of this study is assessing the interest of the Urine dipstick (BU) in excluding asymptomatic bacteriuria among diabetic patients, forming a significant part of consultants, and compare it with the reference examination that constitutes the cytobacteriological urine examination (urinalysis) for good decision making about the maintenance or removal of systematic ECBU.

## Patients and Methods

This is a prospective study in the laboratory of bacteriology at Mohamed V Military Hospital Instruction in Rabat (HMIMV), spread over six months from May to October 2012. The study included patient's external diabetics, consultants and cooperative, presenting at the bacteriology lab for a urine culture. Patients with urinary catheter, incontinent and without diabetes were excluded from the study. All history (especially diabetes) was noted. The urine sample was taken as sterile as possible on which are made both a urinalysis and a test for BU.

Urine are analyzed visually, a microscopic examination and culture to uro-calibrated loop was made on in culture. A test for BU (type Insight Expert) was made for each patient presenting for a urine culture. Except for the presence of leukocyte esterase and nitrites, other markers of BU were not taken consideration. The reading is made visually in comparison with the color scale. Detecting nitrites or leukocyte even at trace levels judge the test strip as evocative of bacteriuria. A strip is considered negative if one detects neither leukocyte esterase or nitrites. The diagnostic characteristics (i.e., predictive value, sensitivity, specificity, likelihood ratios) were calculated.

The major decision rule was the negative predictive value with its 95% confidence interval. An estimation of the cost-effectiveness was based on the same group of patients and based on approximate cost data collected from the billing department of HMIMV. All data, including the profile of patients, the results of urine culture and BU were recorded and analyzed using Microsoft Excel 2007.

## Results

Patients were included among 427 diabetic subjects, female gender represented 180 (42%) and male was 247 (58%). The average age was 59 years. The results of the test strips are shown in Table 1, the values for the semi-quantitative characteristics are described. Outcomes reported 173 positive strips (40%) suggestive of bacteriuria with a predominance of positive results in 92 women (21%) than in men 81

**Table 1:** Semi-quantitative results of the test strip markers of urinary tract infection.

| Dipstick | Leukocyte Esterase |
|---|---|
| Negative | 277 |
| Traces | 1 |
| Positive (+) | 98 |
| Positive (++) | 19 |
| Positive (+++) | 32 |
| | **Nitrites** |
| Negative ( absence of nitrites ) | 355 |
| Positive ( presence of nitrites ) | 72 |

**Table 2:** Comparison of the results of test strips and urine culture.

| Results of the Strip | Results ECBU | | | |
|---|---|---|---|---|
| | Sterile | Contaminated | Bacteriuria | Total |
| Positive | 108 | 33 | 32 | 173 |
| Negative | 222 | 28 | 4 | 254 |
| Total | 330 | 61 | 36 | 427 |

(19%). The results of the urine cultures are reported in Table 2 with 36 ECBU (soit9%) reported bacteriuria, 21 (58%) men and 15 (42%) in women. The incriminated germ in 72% of cases were Escherichia coli, 330 (77%) sterile urine culture and 61 (14%) contaminated urine.

The "leukocytes isolated" situation has not been encountered. Comparing the results of the dipstick to the reference examination that is the ECBU is figured on Table 2, briefed us on the diagnostic performance of the dipstick and the discordance between the two tests was measured four cases of false negative described in Table 3. This comparison is used to calculate the performance of the dipstick in Table 4. The effectiveness of each strategy is defined by the sensitivity. The ECBU strategy being the reference strategy, it sensitivity is 1. It is 0.89 for BU strategy. The unnecessary use of ECBU expressed by the cost of induced positive urinalysis for patients detected (ie x% Positive strips cost ECBU).

## Discussion

Diabetic and above all in cases of chronic poor glycemic control patient has a higher risk of infection [1]. Diabetes is a complicating factor for urinary infections [2], independent risk factor for pyelonephritis [3,4]. The urinary tract infections are up to four times most frequent in diabetic patients compared to non-diabetic patient with a prevalence of 30%, they are predominant in women with a prevalence of 64.6% [5,6].

This was to evaluate the benefit of BU in excluding the asymptomatic bacteriuria in diabetic patients by measuring the discrepancy between the BU and ECBU with less workload and a moderate cost. NPV (negative predictive value) is among others, the primary endpoint its interest lies both in the fact that it is inversely proportional to the number of false negatives and closely linked with the number of cases of the disease in population in question. The study sample has a prevalence of bacteriuria (9%) recovered quite close to the rate (13%) patients with diabetes in the bacteriology laboratory in 2009 [7]. When a negative result of urine dipstick (N LE and negative), the probability of predicting the absence of bacteriuria

**Table 3:** Description of cytological and bacteriological characteristics of false negative results.

| Sno | Sex | Ages | Leukocyturia (/ ML) | Hematuria (/ ML) | Culture | |
|---|---|---|---|---|---|---|
| | | | | | Bacteriuria CFU / mL | Germ |
| 1 | male | 27 | $10^4$ | | $10^5$ | *E.coli* |
| 2 | male | 76 | $4.10^6$ | $2.10^4$ | $10^6$ | *E.coli* |
| 3 | male | 65 | $10^4$ | | $10^5$ | *K.pneumoniae* |
| 4 | female | 53 | $10^4$ | | $10^5$ | *E.coli* |

**Table 4:** Characteristics diagnostic test strip for the detection of bacteriuria in 427 diabetic leukocyte esterase or nitrite positive.

| | Leukocyte Esterases or Positive Nitrites |
|---|---|
| NPV (%) (Negative Predictive Value) | **98,2** |
| PPV (%) (Positive Predictive Value) | 22,9 |
| Sensitivity (%) | 88,9 |
| Specificity (%) | 67,3 |
| LR-(Likelihood ratio) | 0,16 |
| LR+(Likelihood ratio) | 2,7 |
| Undetected bacteriuria (%) | 1 |
| ECBU can be saved (%) | 59 |

(NPV = 98%) is very efficient. As a result, the discrepancy between the BU and urine culture is negligible with a proportion of 1% undetected bacteriuria (i.e. 4 false negative results).

The testing reveals a high sensitivity (89%), the relative lack of specificity (71.4%) is due to the high frequency of false positives (FP = 108 or 29.5%). A weak positive predictive value (PPV = 23%) is related to both high number of FP to the relatively low prevalence of bacteriuria (9%) which makes the PPV and NPV drop increases. The values of the positive and negative likelihood ratio (LR + = 2.7 and LR = 0.16) express a strong diagnostic supply of dipstick [8]. The BU has identified almost all of bactériuriques patients, it reduces the daily workload (up to 59% of the urine may be excluded from the analysis at the laboratory of bacteriology).

The data in ICE ratio, considering the unit cost of both tests and unnecessary use ECBU show that BU is a cost-effective test. However, reducing the workload, the contribution of human resources and the number of false negatives with impacts on the management of undetected asymptomatic patients, wichare hard to quantify and were not considered in the assessment ICE ratio. The data of the literature report diabetic bacteriuria a variable frequency ranging from 5.7% to 32.5% [9]. BU has already been assessed previously in France, a first study reported a prevalence of bacteriuria 9%, carried out in a specialized department of Endocrinology on retrospective data, revealed a relatively high rate of false negatives (FN = 12) [10].

A further study interested in diabetic subjects (with bacteriuria rate of 19%) showed a lower VPN, these results are improved by combining an unusual marker: the test glucose [11-17]. Our study affirming the effectiveness of BU and prevent the systematic sending a sample to the bacteriological laboratory in the event of a negative test. Therefore, achieving the urinalysis in diabetic patients is recommended in the diagnosis of symptomatic UTI or asymptomatic bacteriuria confirmation (if positive urinary strip).

## Conclusion

In case of diabetes, atypical or absence of clinical signs evocative of urinary infection, requires the use of a reliable screening technique. Dipstick, which has been proven the excellent performance, fulfills perfectly the criteria for a screening test for urinary infection.

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