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ORIGINAL ARTICLE

Diagnosis of spontaneous bacterial peritonitis in patients with chronic liver disease: Role of leukocyte esterase dipstick test.

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ABSTRACT… Objective: To find out the efficiency of leukocyte esterase reagent strip (LERS) testing for the diagnosis of spontaneous bacterial peritonitis (SBP). **Study Design:** Cross Sectional, Validation study. **Setting:** Department of Medicine, Unit-III, Bahawal Victoria Hospital, Bahawalpur. **Period:** January-December 2019. **Material & Methods:** A total of 235 patients of both gender, aged 18-60 years, having CLD with ascites, with any child pugh class and duration of CLD between 6-12 months were enrolled. Ascitic fluid was obtained at bedside and immediately dispatched for testing in a clean and dry test tube with reagent strip Multistix® 10 SG. Screening tests were calculated for accuracy of LERS test with respect to confirmed cytology testing. **Results:** Majority, 152 (64.7%) were male, 94 (40.0%) between 51-60 years age group and 146 (62.1%) had child pugh class C. Overall, mean age was noted to be 46.82+9.45 years. LERS testing turned out to be positive among 138 (5837%) cases. Confirmation of SBP through cytology was noted among 141 (60.0%). Sensitivity (SE), specificity (SP), positive predictive value (PPV), negative predictive value (NPV) and diagnostic accuracy of LERS for the diagnosis of SBP with respect to cytology confirmation was calculated to be 90.8%, 89.4%, 92.8%, 86.6% and 90.2% respectively. **Conclusion:** The LERS testing was found to have high SE, SP, PPV, NPV and diagnostic accuracy in diagnosing SBP among patients of CLD with ascites. LERS can be used at bedside while it very simple and easy to perform.

Key words: Chronic Liver Disease, Leukocyte Esterase Dipstick Test, Spontaneous Bacterial Peritonitis.

INTRODUCTION

Spontaneous bacterial peritonitis (SBP) is considered a major life threating disease. SBP is described as formation of infection in the abdominal cavity and a clear of source of infection is not known usually.[1,2] SBP occurs frequently among patients of portal hypertension which is commonly due to liver cirrhosis.[3] Patients having nephrotic syndrome are also prone to increased risk of SBP. Its prevalence among patients having cirrhosis and ascites is seen between 10-30% while 30-50% patients having SBP die.[4,5] If treatment of SBP is delayed, high chances of mortality persist.

In the last few decades, mortality associated with SBP has been observed to decline because of improvement about the possible underlying pathophysiology as well as availability of better diagnostic and treatment options. Improvement in prognosis is seen if antimicrobials are initiated early. With antimicrobial drugs, rapid response is expected among patients of SBP.[6]

Diagnostic paracentesis is considered to be the standard medical practice among newly diagnosed cases of ascites because of cirrhosis or among known patients of ascites presenting with SBP.[7] Ascetic fluid polymorphonuclear (PMN) count > 250 cells per mm^3 is taken as the diagnostic criteria for SBP. Ascitic fluid culture is observed positive among 40% to 90% cases of SBP.[8] Ascitic fluid total leukocyte and PMN count are not always asked because of delayed diagnosis time so there is always a need of a simple and rapid screening tool which can

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provide timely diagnosis of SBP.

In the recent years, some researchers have found effectiveness of dipstick testing for the diagnosis of SBP.[9] We did this research to find out diagnostic accuracy of leukocyte esterase reagent strip (LERS) testing for the diagnosis of SBP. Findings of this study will help in evaluation of this possible rapid way of accurately diagnosing cases of SBP. We hypothesized that patients of SBP can be facilitated with LERS testing. Considering cytology as gold standard, findings of this study could provide an economical way of diagnosing SBP and might prove very useful for rapid bedside diagnosis of SBP.

MATERIAL & METHODS

This cross sectional validation study was done at "The Department of Medicine, Unit-III, Bahawal Victoria Hospital, Bahawalpur" from 1st January 2019 to 31st December 2019. Approval from "institutional ethics committee" was acquired (68/ME/QAMC Bahawalpur). Written consent was sought from all study participants.

A total of 235 patients of both gender, aged 18-60 years, having CLD with ascites, with any child pugh class and duration of CLD between 6-12 months were enrolled. All patients having secondary bacterial peritonitis, or with peritoneal tuberculosis, or those who had peritoneal carcinomatosis were excluded. CLD was labeled with the help of ultrasonography as small size liver with coarse texture and having 1 of the following: i) portal vein diameter >10mm, ii) splenomegaly (size of spleen (length)>13 cm). Ascites was labeled as shifting dullness positive and confirmed on ultrasound.

Ascitic fluid was attained at bedside and instantly dispatched for testing in a hygienic and dry test tube with reagent strip "Multistix® 10 SG (Bayer)". As per maker's guideline, strip was engrossed in the ascitic fluid, removed after 2 minutes, and the color of the reagent square was related to color chart on the bottle. The dipstick was marked as negative or 4-tier positive (trace, +1, +2, +3). At the same time a sample of ascetic fluid was sent to institutional pathology laboratory for PMN count.

SBP was diagnosed as ascitic fluid infection without an evident intra-abdominal surgically-treatable source and total leukocyte count >500/ml, neutrophil count > 250/ml and serum ascitic albumin gradient >1.1. Screening tests for accuracy of dipstick test (SE, SP, PPV, NPV and diagnostic accuracy) were calculated. True positive (TP) cases were those who had SBP on dipstick test as well as on cytology. True negative (TN) were those who had no SBP on dipstick as well as on cytology. False positive (FP) were those who had SBP on dipstick test but not on cytology. False negative (FN) were those who had no SBP on dipstick test but had on cytology.

All the data was entered on per-designed template. Data was analyzed employing SPSS version 26.0. SE, SP, PPV, NPV, and diagnostic accuracy of LERS was calculated according to calculations given in Table-I.

RESULTS

Table-I shows characteristics of study participants. Majority, 152 (64.7%) were male, 94 (40.0%) between 51-60 years age group and 146 (62.1%) had child pugh class C. Overall, mean age was noted to be 46.82+9.45 years.

Leukocyte Esterase Reagent Strip Test	Cytology		Total
	Disease	No Disease	
Disease	A	B	A+B
No Disease	C	D	C+D
Total	A+C	B+D	A+B+C+D

A. Sensitivity = TP /All positive cases on cytology x 100
B. Specificity = TN / All negative cases on cytology x 100
C. PPV = TP / all positive cases on dipstick test x 100
D. NPV = TN / all negative cases on dipstick test x 100
Diagnostic Accuracy = TP=TN/TP+TN+FP+FN

Table-I. Validation of LERS for the Diagnosis of SBP

LERS testing turned out to be positive among 138 (5837%) cases. Confirmation of SBP through cytology was noted among 141 (60.0%).

SE, SP, PPV, NPV and diagnostic accuracy of LERS for the diagnosis of SBP with respect to cytology

confirmation was calculated to be 90.8%, 89.4%, 92.8%, 86.6% and 90.2% respectively as shown in Figure-1.

Characteristics		Number (%)
Gender	Male	152 (64.7%)
	Female	83 (35.3%)
Age Groups (years)	18-30	28 (11.9%)
	31-40	39 (16.6%)
	41-50	74 (31.5%)
	51-60	94 (40.0%)
Child Pugh Class	A	26 (11.1%)
	B	63 (26.8%)
	C	146 (62.1%)

Table-II. Characteristics of study participants (n=235)

Cytology	Leukocyte Esterase Reagent Strip Test	
	Positive	Negative
Positive	128 (True Positive)	13 (False Negative)
Negative	10 (False Positive)	84 (True Negative)

Table-III. Findings of leukocyte esterase reagent strip testing with respect to cytology as gold standard diagnosing SBP

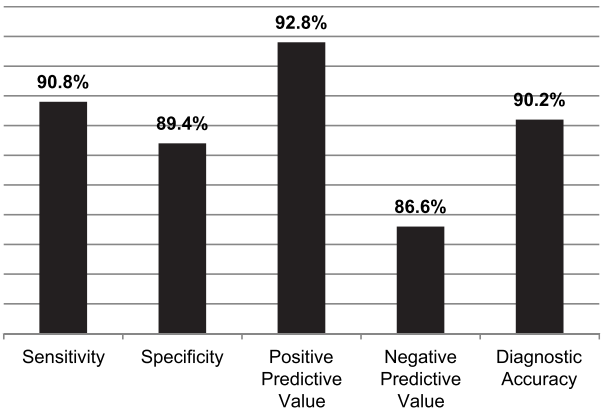

Figure-1. Sensitivity, Specificity, PPV, NPV and Diagnostic Accuracy of LERS for the Diagnosis of SBP

DISCUSSION

Rapid diagnosis of SBP is vital among patients having CLD and ascites as these are linked with high rates of morbidity as well as mortality if timely treatment is not done.[10] In Pakistan, prevalence of SBP has been observed to be ranging between 32-64% of patients with CLD.[11,12] It is also a fact that in resource limited settings, timely performing PMN cell count is not always possible which could delay and endanger affected individual's outcome.

Leukocyte esterase enzyme has been noted be a significant marker for PMN cell activity.[13] Utility of LERS test for diagnosing SBP was evaluated in the present study. LERS testing turned out to be positive among 138 (5837%) cases. SE, SP, PPV, NPV and diagnostic accuracy of LERS test for the diagnosis of SBP with respect to cytology confirmation was calculated to be 90.8%, 89.4%, 92.8%, 86.6% and 90.2% respectively. Our findings correlating really well with the observations of Khatwani NR et al from Larkana who evaluated 94 patients of cirrhosis and ascites found LERS test to have SE, SP, PPV and NPV to be 92%, 95%, 96% and 90% respectively.[14]

Honar N et al from Iran evaluating LERS in the diagnosis of SBP among pediatric age group with cirrhosis noted that SE and SP of LERS test with respect to PMNs ≥250 mm^3 to be 87.8% and 91.7%, whereas with regards to ascitic fluid culture, these were seen to be 88.2% and 77.4%.[9] Efficiency of LERS test for the diagnosis of SBP as per PMNs ≥250 mm^3 while when noted for ascitic fluid culture, it was observed to be 90.7% and 78.7% respectively.

Torun S et al from Turkey analyzing efficiency of LERS test among patients of SBP noted that SE, SP, PPV and NPV of LERS were 93%, 100%, 100%, and 98%, respectively which is again showing the utility of LERS for the rapid diagnosis of CLD patients having SBP.

On the basis of these findings, LERS can be really helpful while doing work up for the patients suffering with SBP. LERS is simple and affordable while it can easily be done at the bed site while the results of the testing can be seen in a duration of 2 minutes showing the efficiency and role of this simple testing tool. LERS also fits effortlessly into the practicing routines of clinicians working indoors and can really facilitate the diagnosis of SBP.

CONCLUSION

The LERS testing was found to have high sensitivity, specificity, PPV and NPV in diagnosing SBP among patients of CLD with ascites. LERS can be used at bedside while it very simple and

easy to perform.

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AUTHORSHIP AND CONTRIBUTION DECLARATION

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2	Ghulam Jilani	Drafting.	
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