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Research Article

EVALUATION OF LABORATORY PARAMETERS IN THE ESTIMATION OF THE REQUIREMENT FOR BACTEREMIA AND INTENSIVE CARE FOR PATIENTS SUFFERING FROM PYELONEPHRITIS AND GERIATRIC URINARY TRACT INFECTION**Dr Qamar Aslam, Dr Iram Imtiaz, Dr Sana Sajjad**
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Abstract:

Objective: In this research work, we examined the geriatric patients detected with UTI (Urinary Tract Infection) and assessed the impacts of parameters as WBC (White Blood Cells), count of neutrophil, count of platelets, MPV (Mean Platelet Volume), RDW (Red-Cell Distribution Width), creatinine, total bilirubin, albumin, direct bilirubin, rate of erythrocyte sedimentation, CRP (C-reactive Protein) and ratio of neutrophil/lymphocyte for the estimation of the requirement for the bacteremia and IC (Intensive Care) for patients present with the pyelonephritis.

Methodology: In the duration of this research work from January 2018 to December 2019, we evaluated 188 patients having 65 years of age or above retrospectively at the clinic for infectious diseases in Sheikh Zayed Hospital Rahim Yar Khan.

Results: In this research work, 66.0% (n: 124) patients were males and 34.0% (n: 64) patients were females. The values of laboratory findings of the patients suffering from pyelonephritis & urosepsis were lower significantly in the Red-Cell Distribution Width bacteremia patients ($P=0.0470$). The values of laboratory during application of 3rd step intensive care unit patients, who got treatment and discharge, were compared. There was significant low albumin in these patients, whereas AST, direct bilirubin and ALT were much high in those patients ($P<0.050$).

Conclusions: All the patients, whose bio-chemical features have altered, particularly during their admission stay & follow up period, they should be assessed meticulously in terms of urosepsis, failure of multiple organs and need for intensive care. There are many diagnostic tests for the prediction of the requirement of intensive care and sepsis. However, many of these procedures cannot be in action in the conditions of emergency. It is great benefit that these laboratory parameters are accessible easily and these all parameters can be performed in the conditions of emergency.

KEYWORDS: Urinary Tract Infection, Pyelonephritis, Mean Platelet Volume, Diagnostic, Intensive, Bio-Chemical, Geriatrics, Red-Cell Distribution Width.

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INTRODUCTION:

UTI (Urinary Tract Infection) is very common infection in the patients of elder age. The rate of incidence of Urinary Tract Infection including the bacteremia rises with the increase of the age [1,2]. This incidence is very high in the patients of elder age as well as suffering from DM (Diabetes Mellitus). It prompts some other severe complications with other abnormalities like xantho-granulomatous pyelonephritis, renal abscess, perinephric abscess and emphysematous [3,4]. Late diagnosis can be seen because of the atypical symptoms [5]. Determination of the complete count of blood is practical as well as cost effective and it also comprises the parameters vital for various diseases [6]. Red-Cell Distribution Width stated the heterogeneity of the circulating erythrocytes. Some large cohort research works have stated a positive association of the levels of Red-Cell Distribution Width with the infectious diseases and inflammation [6, 7].

Mean Platelet Volume is presented in the complete count of the blood which is much commonly in use in the departments of emergency. There is correlation of the size of the platelet with the functions and activity of platelet. The platelets of larger size are highly active as compared to the platelets of smaller sizes. There can be use of Mean Platelet Volume as a bio-indicator in the inflammatory abnormalities, conditions like sepsis [8]. In this research work, we examined the geriatric patients who got admission in our institute with the diagnosis of urinary tract infection and assessed the impacts of the parameters as WBC, count of neutrophil, count of platelets, Mean Platelet Volume, total bilirubin, Red-Cell Distribution Width, direct bilirubin, creatinine level, albumin, ESR (Erythrocyte Sedimentation Rate), CRP and ratio of neutrophil/ lymphocyte on the estimation of the requirement for bacteremia as well as intensive care for the patients suffering from pyelonephritis.

MATERIAL AND METHODS:

This research work was a retrospective study. This research work was carried out in accordance with the guidelines of Helsinki Declarations and ethical board of the Hospital gave the permission to conduct this research work. In this current research work from January 2018 to December 2019, patients with 65 years of age or more were assessed retrospectively at the clinic of infectious diseases. In 1st stage, we included the patients who were present with the confirm diagnosis of urinary tract infections. We evaluated the data about demography of the patients, existing comorbid conditions, results of urine & blood cultures. In 2nd stage, 19 patients with focus of double infection were excluded from this research work. The

assessment of the laboratory parameters at day of admission was carried out in accordance with the diagnosis. In 3rd stage, we carried out the comparison of the parameters like values of white blood cells, count of neutrophil, count of platelets, Red-Cell Distribution Width, Mean Platelet Volume, total bilirubin, creatinine, direct bilirubin, albumin, ESR, CRP and ratio between neutrophil/lymphocyte for the prediction of the bacteremia risk as well 3rd stage intensive care for the patients suffering from urosepsis & pyelonephritis. SPSS V.23 was in use for the statistical analysis of the collected information. We presented the categorical variables in frequencies or percentages and numerical variables in average and standard deviations. We used the Student's T-test for the comparison of the continuous variables. P value of less than 0.050 was significant statistically.

RESULTS:

In the duration of this research work, a sum of 188 patients over the age of 65 years got admission in our hospital due to urinary tract infection. There were 66% (n: 124) male patients and 34.0% (n: 62) female patients. Median age of the patients was 78 years. Among the patients detected with urinary tract infections, 63.30% (n: 119) patients were present with pyelonephritis, 28.70% (n: 54) patients were present with cystitis, 3.70% (n: 7) patients had urosepsis, 2.70% (n: 5) patients were present with prostatitis, 1.10% (n: 2) had epididymo-orchitis and only one patient was present with pyonephrosis. We found another infectious focus in 19 patients. There was presence of pneumonia in 7.40% (n: 14) patients, infection of soft tissue in 1.60% (n: 3) patients, Mucor mycosis in 0.50% (n: 1) patients and spondylodiscitis in .50% (n: 1) together with urinary tract infection. We found no additional comorbid condition in 9.60% (n: 18) patients. There was presence of HTN (Hypertension) in 42.90% (n: 73) patients, DM (Diabetes Mellitus) in 38.20% (n: 65) patients, benign prostatic hyperplasia in 28.20% (n: 48) patients, malignitein 25.2% (n: 43), ischemic cerebrovascular complications in 17.60% (n: 30) patients, chronic renal failure in 12.90% (n: 22) patients, Alzheimer in 12.30% (n: 21) patients and nephrolithiasis was available in 5.80% (n: 10) patients.

When we examined the findings of urine culture, 9.0% (n: 17) patients were present with no reproduction. There was reproduction of Escherichia coli in 68.40% (n: 117) patients, Klebsiella spp. in 19.30% (n: 33) patients, P. aeruginosain 4.70% (n: 8) patients, Candida spp. in 2.90% (n: 5) patients and Enterococcus spp. in 1.80% (n: 3) patients. There was presence of proteus mirabilis in 1.20% (n: 2) patients,

Staphylococcus aureus in 1.20% (n: 2) patients and coagulase negative staphylococci in only 0.60% (n: 1) patient. The culture of blood of 11.10% (n: 21) patients formed the same organisms as produced by culture of urine. There was reproduction of E. coli in blood culture of 76.20% (n: 16) patients, Klebsiella spp. in 14.30% (n: 3) patients, P. aeruginosa in 4.80% (n: 1) patient and Enterococcus

spp. in 4.80% (n: 1) patient. We discharged the 92.60% (n: 174) patients with condition of healing and 7.40% (n: 14) patients were transferred to intensive care units.

Different parameters of laboratory after the exclusion of 19 patients as determined on the day of application are available in Table-1.

Table-I: Various Laboratory Parameters Determined on the Admission Day of Patients (Median+ IQR).

Diagnosis	Pyelonephritis	Urosepsis	Cystitis	Prostatitis
WBC (mm ³)	10850 (7655-14550)	9300 (8690-23630)	7100 (5850- 8590)	7740 (6500-11335)
Hb (g/dL)	11.9 (10.4-13.2)	12.6 (10.4-14.6)	12.7 (11.4-13.9)	12.1 (9.9-13.2)
Platelet (mm ³)	248 (197-340)	191 (114-261)	248 (197-342)	221 (188-310)
AST (U/L)	25 (18-39)	25 (18-39)	25 (18-39)	20 (18-25)
ALT (U/L)	18 (13-26)	20 (14-265)	15 (11-21)	17 (13-25)
Urea	58 (42-82)	72 (53-129)	48 (37-58)	53 (31-64)
Creatinine	1.2 (0.9-1.6)	2 (0.7-2.5)	0.9 (0.8-1.4)	1.4 (1-1.7)
ESR (mm/h)	51 (31- 69)	35 (24-81)	32 (22-45)	56 (47-82)
CRP (mg/L)	92 (37-132)	73 (25-209)	11 (4.7-27)	19 (14-34)
Albumin (g/dl)	3.5 (3.2-3.9)	3.2 (2.9-3.3)	4 (3.8-4.3)	3.8 (3.5-4.1)

Hb; Hemoglobin, AST; Aspartate aminotransferase, ALT; Alanine aminotransferase.

We compared the values of laboratory of the patients suffering from pyelonephritis & urosepsis having or without bacteremia and found much low only in the Red-Cell Distribution Width bacteremia patients (P=0.0470) (Table-2).

Table-II: Comparison of Laboratory Values During the Application of Patients with Pyelonephritis and Urosepsis Who Had and Did Not Have Bacteremia (Median + IQR)

Lab Values	Patients with bacteremia	Non-bacteremic patients	p values
WBC (mm ³)	17300 (9450-278509)	12000 (9875-21855)	0.657
Neutrophil	13300 (7295-22700)	11000 (8165- 18500)	0.858
Plt (mm ³)	279 (185-349)	353 (184- 536)	0.102
MPV	8.5 (8.1-9)	8.4 (8.1-9.2)	0.882
RDW	13.4 (13.1-15.1)	15.8 (14.3-17.3)	0.047*
Neutrophil/lymphocyte ratio	12.5 (3.8-31)	14.1 (5.1-30.6)	0.139
CRP (mg/L)	159 (46-221)	104 (54-181)	0.131
ESR (mm/h)	54 (43-93)	48 (36- 81)	0.288
Albumin (g/dl)	3.3 (3-3.8)	2.8 (2.4- 3.6)	0.273
Total bilirubin	0.6 (0.5-0.8)	0.9 (0.5-0.1)	0.26
Direct bilirubin	0.2 (0.1-0.4)	0.3 (0.2-0.5)	0.47
Creatinine	1.5 (0.9-2.4)	1.3 (0.5-1.6)	0.074
AST (U/L)	28 (17-60)	41 (22-71)	0.307
ALT (U/L)	20 (18-23)	19 (13-47)	0.187

*, p<0.05.

Total 95.20% (n: 20) bacteremia patients got discharge after healing and 4.80% (n: 1) got transfer to intensive care unit. We found no significant differences statistically between bacteremia & being transfer to intensive care unit (P=0.684). Total 57.10% (n: 4) patients of urosepsis got discharge with healing and 42.90% (n: 3) patients were transferred to intensive care unit. Being sent to intensive care units was much high as compared to patients

of pyelonephritis ($P=0.010$). In comparison to the values of laboratory of the patients with urosepsis & pyelonephritis needing 3rd-step intensive care and patients suffering from urosepsis & pyelonephritis got discharge with healing; in the patients who were in need of intensive care, whereas there was significant low albumin, and direct bilirubin, ALT and AST were much higher (Table-3). We found no significant differences in the other parameters in both groups.

Table-III: The Laboratory Values During the Application of Patients Who Required Third-Stage ICU and Who Were Discharged with Healing (Median+ IQR).

Lab Values	Patients with pyelonephritis and urosepsis transferred to the ICU-level 3	Pyelonephritis and urosepsis patients discharged with healing	p values
WBC (mm3)	10430 (6850-14837)	10620 (7700-14600)	0.789
Neutrophil	8465 (5427-12000)	8200 (5410-11000)	0.809
Plt (mm3)	231 (185-313)	247 (191-347)	0.711
MPV	8.9 (7.8-8.4)	8.6 (7.9-9.2)	0.791
RDW	15.2 (13.3-17)	15.6 (14.2-16.7)	0.589
Neutrophil/ lymphocyte ratio	7.5 (4.2-25.7)	6.07 (3.7-11.8)	0.4
CRP (mg/L)	73 (55-131)	92 (35-132)	0.773
ESR (mm/h)	31 (20.3-57)	52 (31-71)	0.103
Albumin (g/dl)	3.2 (2.5-3.3)	3.6 (3.2-4)	0.004*
Total bilirubin	0.9 (0.4-1.5)	0.6 (0.4-0.9)	0.151
Direct bilirubin	0.5 (0.7-0.2)	0.2 (0.1-0.3)	0.005*
Creatinine	1.3 (0.5-1.8)	1.2 (0.9-1.7)	0.753
AST (U/L)	46 (27-129)	24 (18-37)	0.004*
ALT (U/L)	28 (16-109)	18 (12-23)	0.008*

*; $p<0.05$.

DISCUSSION:

The complicated urinary tract infection is very common in geriatric population. There is more frequent presence of Urinary Tract Infection in the elders of both genders. In this research work, male patients were more in number as compared to the female patients. There was presence of diabetes in 30.0% Urinary Tract Infection patients [9]. In one other research work on diabetics & non-diabetics having age from 55 to 75 years, the rate of incidence of Urinary Tract Infection was 12.20% in patients of diabetes and 6.70% in non-diabetics [10-11]. Mahesh also reported a positive relationship between the diabetes mellitus, Urinary Tract Infection and urinary instrumentation [12]. In this research work, we were not able to detect any additional comorbid condition in 9.60% (n: 18) patients. In every age, the most common factor of infection was *E. coli* in population of elder age. In one multi center research work conducted in Turkey on 611 patients, most frequent separated agent for the complications acquired from community was also *E. coli* [13]. Also, in one other local research work, where the average age of the patients was sixty, they found *E. coli* in 40.80%, *Candida* spp. in 23.0%, *Enterococcus* spp. in 11.0%, *P. aeruginosa* in 7.60% and *K. pneumoniae* in 6.80% cultures [14]. In this current research work, we also detected the *E. coli* and *K. pneumoniae* as active

agents, which is consistent with data present in this particular literature.

There is increase in the incidence of bacteremia in complicated Urinary Tract Infection with the increase in the age of the patients. In one research work conducted in past, there was presence of bacteremia with a frequency of 61.0% for patients of elder age who got admission in hospital because of pyelonephritis. There was also high prevalence of shock [10]. In this research work, there was presence of bacteremia in 21 patients.

Some large cohort research studies stated a strong association in the levels of Red-Cell Distribution Width with inflammation [6] and infectious complications like sepsis, acute pancreatitis and septic shock [7]. There is always increase in the Red-Cell Distribution Width particularly in the patients with anemia due to iron deficiency. The high incidence of anemia due to iron deficiency in the patients of elder age may restrict the usage of Red-Cell Distribution Width. There can be mild appearance of Urinary Tract Infection in the geriatric patients or it may cause bacteremia, sepsis or even lead to high mortality rate [14]. Meyers assessed one hundred bacterial episodes over 65 years of age in their research work and they discovered that the main source of bacterium

(27.0%) was genitourinary [17]. One other research work evaluated the bacteremia Urinary Tract Infection and stated the rate of mortality as 16.10% [6].

There are some limitations of this research work as the study design of this research work was retrospective and this research work was carried out in a single center. There is need of prospective and multi-center research works for the provision of the more accurate results.

CONCLUSION:

The results of this research work concluded that urinary tract infection in the geriatric patients may be challenged with various conditions and rate of bacteremia among them is very high. The patients with altered bio-chemical parameters, particularly during their admission stay and period of follow up, should be assessed meticulously regarding urosepsis, failure of multiple organs and need for intensive care. There is high amount of the diagnostic tests for the prediction of requirement for intensive care and sepsis. But many of these tests cannot be performed in conditions of emergency. So, there is great benefit of these parameters which we used in this research work because these parameters are accessible easily and can be performed in conditions of emergency.

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