Original Article

Hematological profile of septicemia in elder age group patients

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Abstract

Background: Septicemia is a devastating medical condition encountered in many hospitals of developing countries. Septicemia in elderly patient is a critical issue due to high rates of morbidity and mortality. More than 60% of septicemia patients are over 65 years of age. The increasing incidence of sepsis among elderly individuals is a major public health concern. Therefore, early and accurate diagnosis is vital to ensure that appropriate medical decisions are made. To this end, clinicians in intensive care units and emergency departments need to predict systemic infection at an early stage. However, early diagnosis of sepsis is difficult because the signs and symptoms of sepsis in elderly patients, such as fever, are nonspecific and may be blunted or absent. Therefore, laboratory findings are important in the diagnosis of sepsis. **Aims and Objectives**: The present prospective observational study was undertaken to carry out simple, easy to perform hematological tests for detection of sepsis, to evaluate the validity of single test and to see the utility of C - reactive protein in septicemia, to find out the relationship between hematological parameters and bacteriologic ally proven sepsis. **Material and Methods:** Present study was done in the department of Pathology Central Laboratory, Jawaharlal Nehru Medical College and Acharya Vinoba Bhave Rural Hospital for a period of one year from December 2014 to December 2015.The study group consisted of 61cases clinically suspected of septicemia in elders of the age 6 decades and above admitted in hospital. Two ml of Blood was collected in EDTA bulb from peripheral venipuncture and peripheral blood smear where made, stained with Leishman's stain and examined for any abnormality in morphology of blood cell. A complete blood count was performed by the cell counter (Backman coulter 5 AT diff).Laboratory investigation like CRP,micro ESR and blood culture were done. **Observation and Results**: After comparing the four test individually, latex –CRP showed sensitivity of (91.3.%) followed by Band /Neutrophil ratio (>=0.2) 78%, Leucopenia (<4000/cu. mm) 63.1 % and Micro ESR (≥ 15 mm at one hour) 60.8% in identifying septicemia. Similarly more specificity was found in latex – CRP (80%) ,followed by Band /Neutrophil ratio (>=0.12) 67%, Leucopenia (<4000/cu. mm) 66.6 % and Micro ESR (≥ 15 mm at one hour) 60% in identifying septicemia. **Conclusion:** Septicemia is a devastating medical condition encountered in many hospitals of developing countries where advanced diagnostic tools are not available in such situation hematological parameter like total leucocyte count,band / neutrophil ratio and morphologically, degenerative changes in neutrophil and serological test like CRP parameter can be easily obtained and used in early differentiation of septicemia from non septicemia cases in elderly patient as well help clinicians to diagnose septicemia.

Key Word: septicaemia, elder age.

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INTRODUCTION

Septicemia in elderly patient is a critical issue due to high rates of morbidity and mortality. More than 60% of septicemia patients are over 65 years of age[1]. The increasing incidence of sepsis among elderly individuals is a major public health concern. Therefore, early and accurate diagnosis is vital to ensure that appropriate medical decisions are made. To this end, clinicians in intensive care units and emergency departments need to predict systemic infection at an early stage. However,

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early diagnosis of sepsis is difficult because the signs and symptoms of sepsis in elderly patients, such as fever, are nonspecific and may be blunted or absent[2, 3]. Therefore, laboratory findings are important in the diagnosis of sepsis.

Laboratory parameter such as WBC count, differential count, C-reactive protein (CRP) level, procalcitonin level, and blood culture results can provide valuable information for the diagnosis of sepsis. WBC count is routinely recommended as an initial screening marker. Elevated WBC and absolute neutrophil count as well as left-shifted neutrophils are associated with sepsis[4]. These parameters can be determined using an automated hematology analyzer, but the morphology of neutrophils should also be reviewed through peripheral blood (PB) smears.

CRP has been shown to be a more sensitive and specific biomarker than WBC count[5]. Procalcitonin levels distinguish bacterial from viral infections, correlate well with clinical severity[6, 7], and show higher predictive sensitivity than CRP[8]. Blood culture remains the gold standard for diagnosing septicemia; however, this method shows low sensitivity[9], requires an adequate amount of blood and proper collection techniques to avoid contamination, and can delay diagnosis as the results may require several days.

MATERIAL AND METHODS

Present study was done in the department of Pathology Central Laboratory, Jawaharlal Nehru Medical College and Acharya Vinoba Bhave Rural Hospital for a period of one year from December 2014 to December 2015.The study group consisted of 61cases of elders of the age 6 decades and above admitted in hospital presenting with symptoms and signs of Fever, Mental confusion, Diarrhea Nausea, vomiting, Rapid pulse, Rapid breathing, low urine output, shock and clinical suspicion of septicemia admitted to department of medicine are included in the study group. The patient aged below 6 decades, any prior history of antibiotics therapy and patients who were not willing to participate where excluded. Detailed history and thorough examination was done in each case.

Two ml of Blood was collected in EDTA bulb from sample from peripheral venipuncture and peripheral blood smear where made, stained with Leishman's stain and examined for Red cells: morphology, immature forms, inclusion bodies, arrangement of cells, White cells: differential count, abnormal or immature forms like band cells and band/neutrophil ratio,micro ESR,Platelets for adequacy and abnormal forms and Parasites- malaria, filarial. A complete blood count was performed by the cell counter (Beckman coulter 5 AT diff).

Micro ESR was obtained by collecting capillary blood in a standard microhaematocrit tube (75mm length, internal diameter of 1.1mm and outer diameter of 1.5mm) and reading the fall of erythrocyte column after one hour. Value of more than 15mm was considered as suggestive of infection.CRP was done by latex agglutination slide test. The cut off value of 0.6 mg/dl as recommended by the manufacturer (Tulip diagnostics (p) Ltd, India) was considered as evidence of infection.

Blood culture was done in all the cases before starting antibiotics. Those having positive blood culture were taken as 'proved' sepsis and the remaining as 'probable' sepsis. Other relevant investigations like chest x-ray and lumbar puncture were done as and when required. Sensitivity, specificity, positive predictive value(PPV) and negative predictive value (NPV) of TLC, B/N ratio, ESR and CRP were determined to define the diagnostic significance of each test using cut-off values. Blood culture was used as the gold standard to consider a positive for sepsis.

OBSERVATION AND RESULTS

The present study comprised of 61 patients cases of elders of the age 6 decades and above admitted in hospital presenting clinically with symptoms and signs of septicemia. The age range of patient in this study was 60 to 80 years with a mean of 70 years. In this study out of 61 clinically suspected cases of septicemia 46 are proven to have septicemia and 15 unproved cases are placed under the category of probable septicemia as shown in Table -1. Out of 46 cases of proven septicemia having positive blood culture 11 died and out of 15 cases of probable septicemia 3 died as shown in Table -2. The Band/Neutrophil ratio of >= to 0.12 was observed in 78 %of proven septicemia and 33.0% of probable septicemia cases. The overall positivity of the test was 67% in clinically suspected septicemia cases (Table-3).Similarly leucopenia (<4000/cumm) was found in 63.1% of proven septicemia and 33.3% of probable septicemia cases. The overall positivity for leucopenia was 55.7% in clinically suspected septicemia cases (Table-4).

The m-ESR was more than or equal to 15mm at one hour in 60.8 % of proven septicemia cases and 40% in clinically suspected septicemia cases. The overall positivity of the test was 55.7% in clinically suspected cases (Table-5).The latex agglutination test for CRP was positive (>= to 0.6mg/dl) in 91.3% of proven septicemia and 20% of probable septicemia cases. The overall positivity in clinically suspected septicemia cases was 73.7% (Table-6).After comparing the four test individually, latex –CRP showed sensitive of (91.3.%) followed by Band /Neutrophil ratio (>=0.2) 78%, Leucopenia (<4000/cu. mm) 63.1 % and Micro ESR (≥

15 mm at one hour) 60.8% in identifying septicemia. Similarly more specificity was found in latex – CRP (80%) ,followed by Band /Neutrophil ratio (>=0.12) 67%, Leucopenia (<4000/cu. mm) 66.6 % and Micro ESR (≥ 15 mm at one hour) 60% in identifying septicemia as shown in (Table 7).

Table 1: Distribution of patient

Clinically suspected septicaemia	61
Proven septicaemia	46
Probable septicaemia	15

Table 2: Blood culture and mortality in septicemia.

Blood culture	Positive	Negative	Total
No of patient	46 (75%)	15(25%)	61
Died	11(23.9%)	3(20%)	14

Table 3: Bands/Neutrophil count in septicemia

Band/ Neutrophil Ratio	Proven sepsis (n=46)		Probable sepsis (n=15)		Total no (n=61)		Control (n=61)	
	No	%	No	%	No	%	No	%
Band/ Neutrophil Ratio >= 0.12	36	78	5	33	41	67	2	3
Band/ Neutrophil Ratio < 0.12	10	22	10	67	20	33	59	97

Table 4: Leucocytes count profile in Septicemia

Leukocyte count (per cu mm)	Proven sepsis (n=46)		Probable sepsis (n=15)		Total no (n=61)		Control (n=61)	
	No	%	No	%	No	%	No	%
WBC <4000	29	63.1	5	33.3	34	55.7	6	9.8
WBC >=4000	17	36.9	10	66.6	27	44.2	55	90.1

Table 5: Micro ESR Profile in septicemia

Micro ESR At one hour	Proven sepsis (n=46)		Probable sepsis (n=15)		Total no (n=61)		Control (n=61)	
	No	%	No	%	No	%	No	%
>=15 mm	28	60.8	6	40	34	55.7	5	8.1
<15 mm	18	39.1	9	60	27	44.2	56	91.8

Table 6: CRP Profile (Latex Agglutination Method)

Latex CRP Test	Proven septicemia (n=46)		Probable septicemia (n =15)		Total no (n=61)		Control (n=61)	
	No	%	No	%	No	%	No	%
Positive (≥o.6 mg/dl)	42	91.3	03	20	45	73.7	2	3.2
Negative (< 0.6 mg/dl)	04	8.6	12	80	16	23.3	59	96.72

Table 7: Sensitivity and Specificity of four most useful individual tests

	Sensitivity (%)	Specificity (%)
Latex CRP (≥0.6 mg /dl)	91.3	80
Band /Neutrophil (≥0.12)	78	67
Micro ESR(≥ 15 mm at one hour)	60.8	60
Leucopenia (<4000/cu. mm)	63.1	66.6

DISCUSSION

Septicemia in elderly age patients remains a critical clinical issue because of the high rates of morbidity and mortality. More than 60% of sepsis patients are over 65 years of age[1]. In the present study out of 61 clinically suspected cases of septicemia 14 died. The definite diagnosis of septicemia is often difficult at early stage merely on clinical presentation due to non specific clinical presentation. Depending on signs and symptoms

clinicians can suspect septicemia but to establish diagnosis of septicemia laboratory test are essential. Various indirect markers of infection when studied collectively are very useful and reliable marker of septicemia.[10,11] The predicative ability of this marker vary widely in different literature.[12-15] Therefore, early and accurate diagnosis is vital to ensure that appropriate medical decisions are made. In our study we have done heamatological investigations with special emphasis given to parameter like total leukocyte count, band /neutrophil ratio >= to 0.12, degenerative changes in neutrophil (toxic granules,cytoplasmic vacuoles),m ESR >= to 15 mm at first hour and serological investigation like C-Reactive protein >= to 0.6 which can be done easily to to see its usefulness in diagnosing the clinically suspected cases of septicemia. Sensitivity (diagnosing infection when it is present) and Specificity (not diagnosing infection when it is not present) of the test were calculated based on definition by Feinstein (1975) in detecting septicemia.

Elevated WBC and absolute neutrophil count as well as left-shifted neutrophils are associated with septicemia[4] but present study showed leucopenia (55.7) with neutrophilia and increased in band/neutrophil ratio in 67% clinically suspected cases of septicemia. CRP test showed sensitivity 91.3%and specificity 80% in predicting septicemia. Similar observation were made in the study done by varsha, usha *et al*[16]. Leucopenia showed sensitivity 63.1%and specificity 66.6% in predicting septicemia while sensitivity of 78% and specificity of 67% was observed in band/neutrophil ratio. Study done by Philip AGS,Hewitt JR *et al* correlated leucopenia and increased band neutrophil ratio in bacterial infection[13].

Hence in the present study we found that in a clinically suspected cases of septicemia hematological parameter like total leucocytes count, band / neutrophil ratio and morphologically, degenerative changes in neutrophil and serological test like CRP which can be done easily are helpful for clinician in early diagnosis of septicemia.

This study is a prospective observational study and is limited by its small sample size and highly selected group. These limitations may have led to incorporation bias overestimating the diagnostic power of the investigated markers. Larger prospective cohort studies are needed to further validate the clinical usefulness of these parameters.

CONCLUSION

Septicemia is a devastating medical condition encountered in many hospitals of developing countries where advanced diagnostic tools are not available in such situation hematological parameter like total leucocytes count, band / neutrophil ratio and morphologically, degenerative changes in neutrophil and serological test like CRP parameter can be easily obtained and used in early differentiation of septicemia from non septicemia cases in elderly patient as well help clinicians to diagnose septicaemia.

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