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ORIGINAL ARTICLE

Evaluation of Absolute Neutrophil Count, Band Count and Morphological Changes in Neutrophils in Diagnosing Bacterial Infections

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ABSTRACT

Aim: To evaluate the absolute neutrophil count, band count and morphological changes in diagnosing acute bacterial infections among patients presenting with acute febrile illness.
Methodology: It was cross sectional analytical study conducted after taking approval from institutional ethical review committee. Total 726 patients were included. The cut-off for leukocytosis was $19.6x10^9$/l. Counted 200 WBC. Band cells were counted according to College of American Pathologists Survey criteria. If band count is 20%, it is considered an increased count. Chi square test was applied.
Results: The Acute neutrophil count was elevated significantly in positive cases ($p<0.01$). Band cells were elevated in +ve cases when comparing with their counterpart ($p<0.01$). The morphological changes in neutrophils in both culture positive and negative samples showed that toxic granules were seen in > ¾ samples, Dohle bodies in 80.9% and vacuoles in 69.1% culture positive cases.
Conclusion: Study findings indicate that ANC and band count is significantly higher in patients with acute bacterial infection.
Keywords: Neutrophil, Toxic granulation, Bacterial infections

INTRODUCTION

A significant provider to morbidity and mortality are bacterial infections. Proper patient supervision depends on a prompt and precise diagnosis[1]. The most frequently requested laboratory tests include a manual count of immature granulocytes, complete blood count with DLC, and a culture for bacterial pathogens[2,3]. Leukocyte and absolute neutrophil count, neutrophil percentage, and particularly increases in bands and other immature neutrophils have been used as laboratory tests to signify acute bacterial infections because an increase in neutrophil manufacture from the bone marrow is expected during acute bacterial infection[4,5].

Neutrophils are a kind of white blood cell. An absolute neutrophil count may be used to confirm for infection, inflammation, leukemia, and other conditions. Band cells are an immature form of neutrophils. They are vital for combating disease[6]. That's why body produces them in surplus during an infection. A normal band cell count is 10% or less. A high band count could offer an early suggestion that a grave infection is present. The morphologic changes for neutrophils in acute bacterial infections include toxic granulation, cytoplasmic vacuolization, Howell-Jolly body-like inclusions, and Döhle bodies.[7] The absolute neutrophil count (ANC) is an estimate of the body's capability to fight infections, especially bacterial infections. An ANC measures the number of neutrophils in the blood. The most frequent reason of a elevated neutrophil count is infection. Mostly bacterial infections cause an elevated neutrophil count but not all. Viral infections do not normally cause neutrophilia but they may in the early stage of infection. Some fungal and parasitic infections can effect neutrophilia as well[8].

Since long, it has been known that acute infections are correlated with elevated levels of band cells, WBC, and absolute neutrophil count (ANC). Manual band count's superiority over the WBC and ANC in predicting bacterial infections, however, is debatable[9].

The objective of the study was to evaluate absolute neutrophil count, band count and morphological changes in diagnosing acute bacterial infections among patients presenting with acute febrile illness.

METHODOLOGY

It was cross sectional analytical study done at CMH, Multan after taking approval from institutional ethical review committee. Total 726 patients were included. 363 cases presenting with complaint of fever and not taking any antibiotics and acute bacterial infection was confirmed by culture, while 363 patients with culture negative for bacteria were studied. Samples were taken in EDTA vial. The cut off value for leukocytosis was $19.6x10^9$/l. A band cell calculation of 20% was considered an elevated count. Chi square test was applied for statistical difference.

RESULTS

Total 726 cases were enrolled in the study. Out of total 726 patients, 363 patients were culture positive for bacteria and in 363 cultures for bacteria was negative. Absolute neutrophil count (ANC) was raised in 327 patients in which culture was positive while 65 patients with culture negative showed ANC elevation. Similarly band cell count was also elevated in 342 patients with +ve bacterial infection while in only 43 patients with culture negative band count was high. The morphological changes in neutrophils in both culture positive and negative samples showed that toxic granulation were present in 283(77.9%) samples, Dohle bodies in 294(80.9%) and vacuoles in 251(69.1%) culture positive samples while toxic granulation, Dohle bodies and vacuoles were present in only 72(19.8%), 54(14.9%) and 98(26.9%) in culture negative samples respectively.

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Table 1: ANC, and band cells in diagnosing bacterial infections

Variables	ANC > $8x10^{9}/L$		P value	Band cells . 20%		P value
	Yes	No		Yes	No	
Culture Positive	327(83.4%)	36(10.8%)	<0.01	342(88.8%)	21 (6.2%)	< 0.01
Culture Negative	65 (16.6%)	298(89.2%)		43 (11.2%)	320(93.8%)	
Total	392 (100%)	334(100%)		385 (100%)	341 (100%)	

Table 2: Morphological changes of neutrophils

Variables	Culture Positive		Total	Culture Negative		Total
	Yes	No		Yes	No	
Toxic granulation	283 (77.9%)	80 (22.1%)	363 (100%)	72(19.8%)	291 (80.2%)	363(100%)
Dohle bodies	294 (80.9%)	69 (19.1%)	363 (100%)	54(14.9%)	309 (85.1%)	363 (100%)
Vacuoles	251 (69.1%)	112(30.9%)	363(100%)	98(26.9%)	265 (73.1%)	363 (100%)

DISCUSSION

Total 726 cases were enrolled in the study. Out of total 726 patients, 363 patients were culture positive for bacteria. The age distribution of the patients in the study showed that main percentage of the patients was between 01-20 years of age group. The proportion of male patients in the study was high and >2/3 of the patients were occupant of urban areas. Absolute neutrophil count (ANC) was raised in 327 patients with positive culture while 65 patients with culture negative patients having ANC raised. Acute neutrophil count was elevated in positive cases ($p<0.01$). Band cells elevated in +ve cases.

The study findings showed that morphological changes in neutrophils in both culture positive and negative samples revealed that toxic granulation were present in more than three fourth samples, Dohle bodies in 80.9% and vacuoles in 69.1% culture positive samples while toxic granulation, Dohle bodies and vacuoles were present in only 72(19.8%), 54(14.9%) and 98(26.9%) in culture negative samples respectively. These results are consistent with the results of Sabah et al.[10] who observed increased band cells in acute bacterial infection. Marchand et al[11] recommended that ANC and band cells were elevated than TLC in bacterial infection. Gombos et al[12] showed that band cells is a poor gauge of bacteremia and TLC with ANC are better marker of bacteremia.

CONCLUSION

ANC and band count is significantly higher in patients with acute bacterial infection. Morphologic changes in neutrophils especially toxic granulation, Dohle bodies and vacuoles were present in higher proportion of culture positive patients.

Conflict of interest: Nil

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