Egyptian Journal of Chest Diseases and Tuberculosis (2015) **64**, 453–458

HOSTED BY

The Egyptian Society of Chest Diseases and Tuberculosis

Egyptian Journal of Chest Diseases and Tuberculosis

www.elsevier.com/locate/ejcdt
www.sciencedirect.com

ORIGINAL ARTICLE

Platelet count and level of $paCO_2$ are predictors of CAP prognosis

Hala Mohamed Shalaby Samaha *, **Amany Ragab Elsaid**

Faculty of Medicine, Mansoura University, Egypt

Received 28 December 2014; accepted 11 February 2015
Available online 13 March 2015

KEYWORDS

Community acquired pneumonia;
Intensive care unit;
Complete blood count;
HIV;
Pneumonia severity index;
Mechanical Ventilation

Abstract *Objective:* The purpose of our study was to examine patients hospitalized with CAP association between abnormal platelet count and levels of $paCO_2$ and ICU admission and 30 days mortality.

Methods: This retrospective study was conducted on 173 patients diagnosed as CAP admitted to Mansoura University Hospital. Arterial blood gases and CBC were obtained at admission with the measurement of platelet count and $paCO_2$. Data were collected and analyzed.

Results: Patients with abnormal platelet count thrombocytopenia (19%) or thrombocytosis (28%) had a higher length of hospital stay, were more in the need for ICU admission, more use of mechanical ventilation invasive or non invasive more 30 days mortality rate with more association of pulmonary complication like pleural effusion.

Both groups of hypercapnia (13%) and hypocapnia (42%) had a higher ICU admission and higher 30 day mortality rate.

Conclusion: Patients with abnormality in platelet count and levels of $paCO_2$ were associated with an increase in ICU admission and higher 30 day mortality.

They should be considered for inclusion in future severity criteria to identify patients who are in need for a higher level of care.

Introduction

Community-acquired pneumonia (CAP) represents one of the most common causes of ICU admission [1]. Prior investigations of CAP in the ICU have shown that the requirement for mechanical ventilation is associated with increased mortality compared with non-ventilated patients [2–8].Platelets have been increasingly recognized as an important component of innate and adaptive immunities [9–11].

Platelet response in antimicrobial host defense is similar, in many ways, to the leukocyte response: both cell types contain antimicrobial peptides that act against a broad range of pathogens. After platelets and neutrophils are activated, they accumulate at the site of infection to produce a direct contact between their antimicrobial peptides and invading bacteria. Leukocytes need to phagocytize bacteria to achieve interaction with intracellular peptides; platelets can also internalize microorganisms into phagosomelike vacuoles, enhancing pathogen clearance.

* Corresponding author.

Peer review under responsibility of The Egyptian Society of Chest Diseases and Tuberculosis.

http://dx.doi.org/10.1016/j.ejcdt.2015.02.002

Antimicrobial peptides from both cells exert a rapid, potent, and direct antimicrobial effect that contributes to limiting the infection [12].

Clinicians have always evaluated the degree of leukocytosis in patients with pneumonia as an indication of systemic inflammatory response and severity of disease. Thrombocytopenia is also a recognized marker of poor outcomes in patients with pneumonia, due to the association of low platelet counts with disseminated intravascular coagulation and severe sepsis [13].

Hypoxemic respiratory failure is well recognized as a prognostic marker in different severity-of-illness scores to predict poor clinical outcomes in hospitalized patients with CAP [14].

By contrast, ventilatory abnormalities reflected by an alteration in $PaCO_2$ have not been considered a poor prognostic marker unless arterial pH changes are observed [15–17].

$PaCO_2$ is widely accepted as an indicator of ventilator adequacy. Abnormally high levels may indicate severe respiratory fatigue and impending cardiopulmonary arrest [18].

We hypothesized that an abnormal platelet count may be an important marker to assess severity of disease in patients with CAP. The primary objective of this study was to investigate the association of platelet count at the time of hospitalization with mortality at 30 days in patients with CAP. The secondary study objective was to examine the association between abnormal $PaCO_2$ and the need for invasive mechanical ventilation, ICU admission, and 30-day mortality in patients hospitalized with CAP.

Materials and methods

Study design and patient data

This was a retrospective cohort study of 173 patients admitted with CAP to the Mansoura University Chest Department between June 2010 and March 2013.

Patients enrolled were a part of the community-acquired pneumonia. Clinical and laboratory data were collected for each patient. These include a total of 36 variables regarding patient's demographic, co-morbidity, physical examination, laboratory, and chest radiographic findings.

Collected data were used to estimate patient's CAP severity using the pneumonia severity index (PSI) and CRB-65 (confusion, respiratory rate, blood pressure, 65 years of age and older). We excluded patients with previous use of oral corticosteroids ($\geqslant$10 mg prednisone equivalent per day for at least 2 weeks); other immunosuppressive therapy; active solid or hematologic neoplasms; HIV infection; active TB; hematologic disease involving platelets and/or leukocytes, such as essential thrombocytosis or myelodysplastic syndrome; and patients hospitalized within the preceding 21 days due to chronic obstructive pulmonary disease.

Study definitions

CAP was defined as the presence of a new pulmonary infiltrate on the chest radiograph at the time of hospitalization associated with at least one of the following: (1) new or increased cough, (2) an abnormal temperature ($<$35.6 °C or 37.8 °C), (3) an abnormal serum leukocyte count (leukocytosis, left shift, or leukopenia defined by local laboratory values). Hypotension was defined as a systolic blood pressure, $<$90 mm Hg or diastolic blood pressure, $<$60 mm Hg. Alteration of gas exchange was defined as, $PaCO_2$ values from the arterial blood gas measured in the first 24 h of admission with CAP, the patients were stratified into 3 groups: normal $PaCO_2$ (35–45 mm Hg), hypocapnic ($PaCO_2 \leqslant 35$ mm Hg), and hypercapnic ($PaCO_2 > 45$ mm Hg).

Thrombocytopenia and thrombocytosis were defined as platelet counts $\leqslant$100,000/L or $>$400,000/L, respectively. Significant leukopenia and leukocytosis were defined here as WBC counts of $\leqslant$4000 and $>$25,000 respectively.

The study outcome, 30-days mortality, was defined as death by any cause during the period of 30 days after hospital admission.

Statistical analysis

Categorical variables were described as frequencies and percentages and compared with x2 or fisher exact test when appropriate.

Continuous variables were expressed as mean ± SD and compared between groups using one way analysis of variance, for data not normally distributed.

Data were processed with the SPSS (Statistical Package for Social Science) version (16).

The level of significance.

$p < 0.05$ significant.
$p < 0.01$ highly significant.
$p < 0.001$ very highly significant.

Results

During the study period, we evaluated 173 patients (94 males (54%) and 79 females (46%)) with community acquired pneumonia who met inclusion criteria and in whom the platelet count was taken at admission was available (see Tables 1 and 2).

33 patients (19%) were with thrombocytopenia **(group I)**, 49 patients (28%) with thrombocytosis **(group III)** and 91 patients (53%) with normal platelet **(group II)**.

All group patients' age and sex matched without a significant difference.

There was no difference between groups in antibiotic receiving prior admission, active smoking history, the presence of comorbidity like heart failure, renal failure, liver failure and other chronic illnesses like diabetes mellitus and neurological disease.

There was no significant difference between the studied group as regards the leukocytic count and heamatocrit value.

Patients with thrombocytosis had a higher heart rate at the admission.

Patient with thrombocytosis and thrombocytopenia were more in need for I.C.U admission and more in need for invasive mechanical ventilation as p value between groups less than 0.001.

The mortality rate within 30 days of hospital admission and length of hospital stay were higher in patients with thrombocytosis and thrombocytopenia than in patients with normal platelet count, and p value less than 0.01.