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COMMUNITY ACQUIRED PNEUMONIA, RISK FACTORS AND MORTALITY IN PATIENTS ADMITTED TO INTERNAL MEDICINE ICU UNIT, AI AZHAR UNIVERSITY'S HOSPITALS

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Abstract

Pneumonia is one of the leading cause of death· Previous studies considered that advanced age, renal failure, heart failure, septic shock and acute respiratory distress syndrome as significant risk factors for pneumonia: Despite the high mortality in patients with pneumonia admitted to an ICU, the risk factors data for death remain limited.

A total of 90 of community-acquired pneumonia patients aged ≥30 years at Al Hussein University Hospital from September 2017 to December 2018 were studied. They suffered from acute illness and evidence of consolidation on a chest radiograph. Risk factors related to socio-demographic factors, drug use, clinical history were investigated by questionnaire, laboratory assays, radiological assay and culture and sensitivity and statistically analysis

The results showed high mortality especially among elderly patients and those with neoplastic disease or chronic renal failure. The other prognostic factors related to increased mortality included mechanical ventilation, acute respiratory distress syndrome (ARDS), acute renal failure, septicemia, and septic shock. Mortality rate was 40/90 patients. Age, under body weight, smocking, chronic illness as diabetes, heart disease, renal disease

Keywords: Risk factors, ICU unit, Community acquired pneumonia

Introduction

Community acquired pneumonia (CAP) is an acute lower respiratory tract infection (cough with lower respiratory tract symptoms as chest pain or dyspnea) and systemic manifestations (>38^{O}C, shivers & aches) and consolidation or new radiographic shadow on chest radiography, sweating and fevers (Mandell *et al,* 2007).

Critically patients with CAP as confusion, high urea, high respiratory rate, low blood pressure (CURB) and some studies add age above 65 to be(CURP + age 65) risk class 3-5 upon admission (Dellinger *et al,* 2008)

Major criteria for CAP were under mechanical ventilation and developed septic shock needed levodopa (Liapikou *et al,* 2009). Minor criteria for CAP (respiratory rate > 30 cycles/min, arterial oxygen partial pressure/ fractional inspired oxygen (PaO2/FiO2) < 250mmHg, multi-lobes pneumonia, coma or conscious impaired level, BUN level > 20 mg/dl, WBC count <4x109cells/l), platelet count <100x109/1, < 36^{o}C, SBP <90mmHg & required large amount of fluid, 2 majors or 3 minor indicated risky criteria (Rello *et al,* 2009).

The adult respiratory distress syndrome (ARDS) is acute onset of bilateral pneumonia, PaO2/FiO250mmHg, pulmonary artery wedge pressure<18mmHgwithout left ventricular failure. The acute renal failure (ARF) increased serum creatinine level (>4mg/dl) with 75%, glomerular filtration rate reduction and urine output <0.3ml/kg/24hr, or anuria for 12hrs (Brower *et al,* 2004). CURB-65 score (confusion, blood urea >42,8mg/dl, respiratory rate> 30/min, blood pressure <90/ 60mmHg, age> 65) indicated hospitalization (Lim *et al,* 2001). But, community acquired pneumonia (CAP) was life-threatened nosocomial and required ICU admission (Kamath *et al,* 2006), with mortality rates 20-50% (Trotter *et al,* 2008).

The HAP occurred at a rate of 5-10/1000 at hospital admissions (Kalil *et al,* 2016), without difference in mortality rate among ventilator associated pneumonia (VAP) as to short or long antibiotic course (Pugh *et al,* 2015). Vaccines and publication guide lines

to manage nosocomial pneumonia mortality rate was 15 to 50% (Vallés *et al,* 2014).

Relapse of pneumonia was initial causative organism associated with the clinical or radiological pneumonia signs post treatment (Fekih *et al,* 2009). CAP was responsible for most infectious disease worldwide, with advanced diagnosis and management, yet there were gaps to improve recurrence and relapse or pneumonia (Ranzani *et al,* 2019).

The work aimed to study the risk factors to the community acquired pneumonia mortality and morbidity in patients admitted to the Internal Medicine ICU Unit, Al Azhar University's Hospitals .

Patients and Methods

Nighty patients (60 males & 30 females, aged between 35 to 72 years) with community acquired pneumonia attendant the ICU, from September 2017 to December 2018 were selected, with ethical consent from patients or their relatives.

Patients were subjected medical sheets with stress on smoking, alcoholism; chronic obstructive pulmonary disease (COPD), diabetes mellitus, chronic cardiac diseases, chronic renal failure, chronic neurologic diseases, chronic liver diseases, neoplasm, steroids, and immuno-suppressive drugs. Acute physiology and chronic health evaluation II (APACHE II) were scored. CAP symptoms were evaluated for vital signs at the admission, CT scan radiology & mechanical ventilation need (Estenssoro and Dubin, 2016)

Laboratory examinations: CBC, C reactive protein, prothrombin time, prothrombin concentration, serum sodium, potassium, urea, creatinine, AST, ALT & arterial blood gases as well as gram stain, culture, and sensitivity of blood and sputum, as well as stool analysis to identified pneumonia causative agent

Exclusion criteria were patients on immunosuppressive drugs and corticosteroids for more than 30 days or leukocyte counts < 1000 cells/ml or neutrophils < 500 cells/ml), extra-pulmonary infection as bacteremia and endocarditis, lung complications as abscess and/or fibrosis or patients with septic shock.

Results

There was significant difference between groups regarding to vital signs as non survivors patients were hypertensive (100±30), tachycardia (120±20) normal to low body temperatures (36.5±1.3), high respiratory rate (35±10) & low Pao2/Fio2 (90±75).

Most of the patients were anemic with hemoglobin (9.7±3.1), high CRP(480±120), high total leucocytes (14.2±5.2), normal platelet count (210±130), high renal function with blood urea (62±15) and serum creatinine (2.3±1.6), but normal serum sodium, & potassium (140±7, 3.6±1.4, 32±15).

Most of the patients were represented by bilateral and multinodular pneumonia in need of mechanical ventilation (98% non-survivors) and (60% survivors). About 30% of patients developed ARDS in non-survivors and 2% in survivors and other risk factors as renal failure and neoplasia; the mortality rate was high (40%). Admitted cases due to microbial infections were only 54(60%).

There was high significant difference as to age survivors (40±14), and non survivors (65±12), and non survivors smoking was a risk factor for mortality (80%). Other medical problem as cardiac disease, renal disease, liver disease, neoplastic problem, or previous stroke was a risk factors for mortality in pneumonia patients high significant difference between survivors and non-survivors. Non-survivors developed septicemia (50%) compared to survivors (6%). Patients received corticosteroid and cytotoxic drugs has high mortality rate as 4 cases (10% of total death) died and patients received cytotoxic drugs only five with 80% death and one case (2%) of this group survived. There was high significant difference between study groups regarding to CIRB score.

Non-survivor patients on admission special maneuvers used the vasopressor and inotropes (75%) and vasopressors and inotropes in 9 (18%) survivors' patients. Regarding to dialysis 6 patients (15%) in non-survivors need dialysis and one case (2%) needed dialysis. six cases (15%) needed blo-

od transfusion was done but only one case (2%) in survivors needed blood transfusion. Central venous catheterization was done for 39 patients (98%) in non-survivors and 30 patients (60%) in survivors ones. Details were given in tables (1, 2, 3, 4 & 5).

Table 1: Comparison between survivors and non-survivors regarding to vital signs

Data	Non-Survivors	Survivors	T test	P value
Body temperature (°C)	36·5±1·3	38±1·2	-8.38	<0·0001
Systolic blood pressure (mmHg)	100±30	130±20	-6.255	<0·0001
Heart rate (beats/min)	120±20	100±15	-5.989	<0·0001
Respiratory rate (breaths/min)	35±10	22±5	-8.356	<0·0001
PaO2/FiO2 ≤ 250 (mmHg)c	90(75)	550(35)	-42.3	<0·00001

Table 2: Comparative laboratory investigation among patients

Data of the patients	Non-Survivors	Survivors	T test	P value
Hemoglobin (g/dl)	9·7±3·1	12.7±2.3	5.666	<0.0001
Total leukocyte count (×109 /l)	14·2± 5·2	18.7±2.4	5.639	<0.0001
Platelets (×109 /l)	210±130	220±30	0.578	>0.28
C-reactive protein (mg/dl)	480±120	470±130	0.416	>0.34
Serum sodium (mmol/l)	140±7	137±3	3.005	>0.002
Serum potassium (mmol/l)	4·6±1·3	4.1±0.9	2.374	>0.0001
Serum urea (mg/dl)	62±15	35±7	11.55	<00001
Serum creatinine (mg/dl)	2·3±0.6	1.3±0.3	11.323	<00001

Table 3: Laboratory and radiological results among patients

Data	number	Percent
Bilateral/multilobar infiltrate in Chest X Ray	54	60%
Shock at admission	27	30%
Microbial identification	54	60%
Overall mortality	36	40%

Table 4: Comparison between survivors (50) and non-survivors (40) as to risk factors

Variables	Non-survivors	Survivors	Chi square	p value
Age, years	65±12	40±14	T =1.98	≤0·03
Smokers	80%(32)	24%(12)	39. 38	≤0·00001
Body mass index	16±3%	24±4%	11.97	<0.00001
Neoplastic disease	5%(2)	0.5%(1)	1.4615	≤0·23
Liver disease	25%(10)	6%(3)	5.888	<0.02
Congestive heart failure	45%(15)	6%(3)	7.1938	≤0·007
Cerebral stroke	10%(4)	6%(3)	2.1213	≤0·202
Chronic renal disease	40%(16)	6%(3)	8.15	≤0·04
Immunosuppression	10%(4)	2%(1)	0.8595	≤0·35
Septicemia	50%(20)	6%(3)	18.2838	≤0·002
Acute renal failure	75%(30)	30%(15)	20.4	≤0·00001
Bacteremia	30%(12)	6%(3)	7.1938	≤0·007
Mechanical ventilation	98%(38)	60%(30)	21.76	≤0·00001
ARDS	30%(12)	2%(1)	22.94	≤0·00001
CURB scores 1 and 2. CURB scores 3, 4 and 5	30%(12) 70%(30)	70%(35) 30%(15)	22.275	≤0·00001

Table 5: Management other than antibiotics and oxygen among groups

Intervention	Non-Survivors	Survivors	T test	P value
Inotropes/vasopressors	75%(30)	18%(9)	24.133	≤0·00001
Dialysis	15%(6)	2%(1)	0.8595	≤0·35
Red blood cell transfusion	15%(6)	2%(1)	4.88	≤0·03
Central venous catheterization	98%(38)	60%(30)	22.4245	≤0·00001

Discussion

The respiratory infections led to significant mortality and morbidity in critically sick patients with the advances in the ventilation strategies and novel development antimicrobial antibotics (Alotair *et al,* 2015). Symptoms of bronchopneumonia may be like other types of pneumonia. This condition often began with flu-like symptoms that could become more severe over a few days, symptoms included fever, a cough that brings up mucus, shortness of breath, chest pain, rapid breathing, sweating, chills, headaches, muscle aches, pleurisy, or chest pain that results

from inflammation due to excessive coughing, fatigue, confusion or delirium, especially in older people (Franco, 2017)

Generally speaking, bacteria, viruses, fungi, and parasites cause pneumonia (Brochot *et al,* 2017). Also, all these causative agents were potential cause of the acute neonatal pneumonia, transmitted vertically from the mother or acquired from the postnatal environment (Hooven and Polin, 2017).

The infection causes inflammation in the air sacs in your lungs, which are called alveoli. The alveoli fill with fluid or pus, making it difficult to breathe. In the present study, mortality was 40%. This more or less agreed with Abdel Aziz *et al.* (2016) who found 46.7% mortality in patients with microorganisms, which was 55.6% in *S. aureus* and 27.3% in *S. pneumonia* CAP patients. Also, the poly-antimicrobial therapy (>2 antibiotics) was a predictor of mortality as patients given >2 antibiotics were in the bad need of the broader spectrum of antibiotic mortality as compared to those patients on one antibiotic (Zilberberg, 2010).

In the present study, prognostic factors in the community-acquired pneumonia patients were ten independent death predictors included the male sex, diabetes mellitus, malignancy, neurologic disease, tachypnea, hypotension, hypothermia, leucopenia, bacteremia, and multi-lobar infiltrates. This agreed with risk factors between survivor and non survivors (Mohan *et al,* 2019). No doubt, the inappropriate antibiotic treatment was a risk factor for CAP, especially caused by *Legionella pneumophila* or *Chlamydia pneumonia* (Bermejo-Martin *et al,* 2017), which agreed with the present outcome data.

In the present study, CAP underweight was a risk factor due to nutritional deficiency or pneumonia affected immune system. This agreed with Hedlund *et al.* (1995) who found significant difference between patients regarding to body mass index.

In the present study, age, smoking, malnutrition, CAP, chronic bronchitis/ COPD, asthma, functional impairment, immunosuppressive therapy and oral steroids were definitive risk factors for CAP. This agreed with Jordi *et al.* (2017) who found that smoking was risk factor pneumonic males due to *Legionella pneumophila*, and aging for the CAP patients (Farr *et al,* 2000), chronic bronchitis, COPD, and asthma (Almirall *et al,* 2010).

Undoubtedly, chronic liver diseases were risk factor for the CAP (Fernández-Solá *et al,* 1995) as well as heart disease; especially congestive heart failure was association between 92% pneumococcal infections (Lipsky *et al,* 1986). To treat such severe CAP cases with low dose corticosteroids was risky as they caused severe pulmonary infections due to immunosuppressive effects (Ruiz *et al,* 1999). Besides, the mortality rate (55%) was higher among CAP patients who required mechanical ventilation (Yoshimoto *et al,* 2005). Physicians should target smoking individuals particularly those with COPD, asthma, heart disease or diabetes mellitus, and those who smoke, for pneumococcal vaccination at the earliest opportunity at any time a year (Torres *et al,* 2015). Wunderink and Waterer (2017) stated that pneumonia care bundles were being defined to improve the outcomes. They added that the increased recognition of both acute and long term cardiac complications was shifting the concept of pneumonia from an acute lung disease to a multisystem problem with adverse chronic health consequences.

Again, the present diabetes mellitus cases were not associated with severe CAP especially insulin dependent patients, which agreed with Reyes *et al.* (2017). Thus, association between pneumonia and previous upper respiratory tract infections due to influenza and other viral infections was fatal (Ge *et al,* 2019)

Conclusion

The range of risk factors and underlying the medical conditions were associated with an increased risk of CAP in adults.

Understanding of the types of individual at greatest risk of CAP can help to ensure that

interventions to reduce the risk of infection and burden of disease are in need to reduce the mortality and cost of treatments.

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