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Research Article

Gender May Affect Community Acquired Pneumonia (CAP)

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Abstract

Background

Several prognostic factors are associated with mortality in patients hospitalized with community acquired pneumonia (CAP). Among them are gender, hypothermia, hypotension, tachypnea, type 2 diabetes mellitus, neoplastic diseases, and bacteremia. Several studies suggested an association with gender (higher mortality in women) and a higher APACHE score. In prospective studies females had worse outcomes, longer hospital stays, and a higher (15%) mortality rate. Hospitalization with CAP in older adults was associated with functional and cognitive impairment and mental depression increased mortality of the aged.

Methods

We studied middle-aged patients that were admitted with CAP but without signs and symptoms of severe sepsis or septic shock and followed them only during hospitalization.

Results

65 patients (27 males and 39 females aged 64.6±18.3 and 59.7±21.3 years) were enrolled to the study. We found a difference in height (males > females) [p=0.001], BMI (females > males) [p=0.005] and depression (females > males) [p=0.006]. As for depression - we found that males were not affected, but women had 2 independent variables that were related with depression - hypertension and abdominal circumference.

Conclusions

We found a gender effect on length of stay and on depression only among women admitted with CAP. Age and weight were independent variables that affected length of hospital stay. Only women had a moderate degree of depression that was inversely related to hypertension and abdominal circumference. For women with CAP - being more obese and hypertensive affected mood positively - those women suffered less depression.

Introduction

Hospitalization with community acquired pneumonia (CAP) in older adults was associated with functional and cognitive impairment and mental depression that increased mortality of the aged.

Among the prognostic factors that are associated with mortality in patients hospitalized with CAP are gender, hypothermia, hypotension, tachypnea, type 2 diabetes mellitus, neoplastic diseases, bacteremia, depressed consciousness, and leucopenia. Several studies suggested an association with gender and a higher APACHE score. In many prospective studies females had worse outcomes, longer hospital stays, and a higher mortality rate.

We studied middle aged patients that were admitted with CAP but without signs and symptoms of severe sepsis or septic shock and followed them only during their hospitalization.

Our hypothesis was that length of stay would be affected by gender and depression.

Methods

A prospective pilot study that enrolled middle-aged patients (men and women aged 40 to 60 years old) admitted with CAP without severe sepsis or septic shock, that did not have any oncologic disease, renal impairment, immunological or inflammatory condition.

CAP is defined as pneumonia that was acquired by a patient that is not immune compromised while being in a normal not institutionalized environment (not in a hospital or a hospitalized/home care facilities).

We wanted to study the effect of gender and mood/depression on length of stay and clinical outcome during hospitalization.

Patients were enrolled during a period of 3 months (the winter of 2010) in a community governmental hospital in the north of Israel. Clinical parameters included height and BMI, length of stay, ankle brachial index (ABI) and depression. All clinical parameters were measured on the day of admission.

Length of stay was defined by the days that were needed for hospitalization for each patient. A "1 day of hospitalization" was counted if the patient was hospitalized for at least 24 hours.

Inflammatory markers included C reactive protein (CRP) and tumor necrosis factor alpha (TNF- α). The degree of depression was determined using the Patient Health Questionnaire 9 (PHQ-9). PHQ-9 scores of 5, 10, 15, and 20 represented mild, moderate, moderately severe, and severe depression, respectively (15).

For statistical analysis we used the Student's T Test for gender difference and logistic regression analysis to find the independent variable that affects other parameters.

The study was approved by the Internal Review Board (IRB) of the Baruch Padeh Poria Hospital (number 26-2008) and every patient signed a consent form before enrolment to the study.

Results

65 patients were enrolled to the study. There were 27 male and 39 female patients aged 64.6 ± 18.3 and 59.7 ± 21.3 years old (respectively). No difference was observed in age, abdominal circumference, length of stay, maximal temperature (Table 1). However, we did find a difference in height (males vs. females) [$p=0.001$], BMI [$p=0.005$], and level of depression (PHQ-9) [$p=0.006$] (Table 1).

	No.	Age	Height	BMI	Length	Temp	Depression
Males	27	64 ± 18	1.69 ± 0.09	27 ± 5	5.7 ± 2.1	38.1 ± 0.8	6.4 ± 5.0
Females	38	59 ± 21	1.59 ± 0.06	32 ± 8	5.5 ± 2.4	37.9 ± 0.7	10.7 ± 6.3
P-value		0.33	0.001	0.005	0.65	0.30	0.006

Age – mean age in years

Height – meters

Length – length of stay in days

Temp – temperature in degrees of Celcius

Depression – depression determined by the depression scale PHQ-9

Table 1. Clinical Characteristics by Gender.

No significant difference was found between levels of hemoglobin, WBC, PLT and in markers of inflammation – CRP and TNF α (Table 2).

	No.	Hg	WBC	PLT	CRP	TNF α
Males	27	11.8 ± 1.5	9836 ± 1276	225108 ± 118000	2.1 ± 0.7	7.7 ± 8.3
Females	38	12.1 ± 1.6	12375 ± 6323	275343 ± 47399	1.9 ± 1.0	5.1 ± 5.4
P-value		0.67	0.94	0.058	0.36	0.15

Hg – hemoglobin

WBC – white blood cells/mm³

PLT – platelets/mm³

CRP – C reactive protein (mg/ml)

TNF α – tumor necrosis alpha (pg/ml)

Table 2. Laboratory Data by Gender.

As for depression – we found that males were not affected by depression. However, among women, analysis using linear regression showed that there were 2 independent variables that were statistically significant: hypertension and abdominal circumference.

Discussion

Several prognostic factors are associated with mortality in patients hospitalized with CAP. Among them are gender, hypothermia, hypotension, tachypnea, type 2 diabetes mellitus, neoplastic diseases, and bacteremia [1], depressed consciousness, leucopenia, empirical antibiotic therapy not recommended by international [2], high risk class of pneumonia severity index, positive blood culture, alcohol consumption and multi-lobar involvement [3, 4], functional status at admission, hyperkalemia and lymphopenia [5], hip fracture, chronic obstructive lung disease and ischemic stroke [6]. Several studies suggested an association with gender (higher mortality in women) and a higher APACHE score [7, 8]. In most of the prospective studies females had worse outcomes, longer hospital stays, and a higher (15%) mortality rate [9]. Hospitalization with CAP in older adults was associated with functional and cognitive impairment [10], and mental depression increased mortality of the aged [11].

It is a known phenomenon that women have higher BMIs and men are taller; however, it is a new clinical finding that women admitted with CAP had more depression. An observational cohort study that followed 892 patients with infections over 26 months found that factors associated with death from pneumonia included higher APACHE II score, malignancy, type 2 diabetes mellitus, old age, and female gender [7]. Patients with CAP from 80 hospitals in 17 countries were followed for 10 years. Females had worse outcomes for CAP with longer hospitalizations and a higher (15%) death rate [9]. Age and gender had a strong influence on the incidence of CAP and that the incidence CAP increased by age and was higher in males. Very elderly people had a 15 fold higher incidence of CAP associated with influenza virus and a 5 fold higher incidence of infections caused by Chlamydia compared to young adults [10].

Women admitted with CAP tended to be more depressed than males. Interestingly there were 3 independent variables that were significant for the development of depression – hypertension and abdominal circumference. Being hypertensive and obese seemed to be protective against the development of depression during hospitalization with CAP.

Studies have discussed the issue of mood and depression and its effects on general health and survival, and one of these studies showed that patients who survived hospitalization with pneumonia had more subsequent impairment in activities and instrumental activities of daily living than those who survived myocardial infarction hospitalization [11]. Depression was associated with increased mortality of the aged, and

part of the mechanism might be explained by the suppression of immunological resistance [12]. Mortality from pneumonia in patients with moderate to severe depression was 4 times higher compared to patients with mild to moderate depression [12]. A high rate of new functional limitations appeared following sepsis, and the decline in cognitive and physical function persisted for at least 8 years [13]. On the other hand, pre-sepsis depression was significantly associated with the incidence of post-sepsis cognitive impairment [14].

Several studies suggested that inflammation may have an effect on prognosis in patients with sepsis. A recent study documented pronounced clinical and laboratory signs of systemic inflammatory host response (SIRS) upon initial hospitalization as a favorable long term prognostic factor [16].

Interleukin 6 174 GG genotype was associated with lower mortality in patients with CAP, irrespective of the causal pathogen [17]. Concentrations of TNF α , IL-6, IL-8, and IL-10 were higher in patients with CAP who died during hospitalization [18, 19].

Weight and pneumonia – we assumed that obese women will have longer hospitalizations and will be more depressed. We found that indeed being more obese with CAP may lengthen hospital stay, but it also had some benefit – more obese women had less depression.

Study limitations

This was a pilot study that evaluated the effect of gender and depression on the clinical outcome and length of hospitalization among patients that were admitted with a community acquired pneumonia. The small population sample is a significant limitation. Another limitation is the group of patients that we chose to enroll to the study – all were conscious patients without severe sepsis and without septic shock.

A major limitation is the age of our patients – neither was older than 80 years old or younger than 30 years – that way, we neglected a large group of elderly patients that are known to be in the dangerous zone for cardiovascular complications and are known to have high mortality rates.

We plan to continue our pilot study and expand it to larger populations, with more variable groups of patients with sepsis and for a longer period of follow up (not just in-hospital outcome).

Summary

Only women had a moderate degree of depression. For women with CAP - being more obese and hypertensive affected mood positively - those women suffered less depression.

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