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## INTRODUCTION

Inflammation occurring in the lung parenchymal tissue is defined as pneumonia. Pneumonia is generally divided into two groups: community-acquired pneumonia (CAP) and hospital-acquired pneumonia (HAP) (1). While CAP is defined as community-acquired, HAP is defined as pneumonia occurring during hospitalization or 48 hours after discharge (1,2). Furthermore, pneumonia resulting in lower respiratory tract infections is the third leading cause of death worldwide. Considering the causes of mortality, CAP takes fifth place in the world (3). In Turkey,

while lower respiratory tract infections are in fifth place among all causes of death, they take first place in deaths caused by infection (4).

Pneumonia patients, especially those with CAP, can often be treated as outpatients. However, they need to be hospitalized in some cases. Cases requiring hospitalization lead to severe health problems (5). Intensive care support may be required in these patients who need to be treated by hospitalization, and a mortality of 50-55% is observed in these patients (6).

Due to the increase in living conditions and quality of life

# Investigation of the factors determining hospitalization of patients diagnosed with community-acquired pneumonia in the emergency department

## Abstract

**Aim:** In the present study, we investigated in which cases the treatment of patients diagnosed with community-acquired pneumonia in the emergency department should be continued by hospitalizing them.

**Materials and Methods:** The study included 150 patients diagnosed with community-acquired pneumonia in the emergency department within one year. Patients' age, gender, comorbid diseases, complaints at the time of admission, vital signs, physical examination findings, laboratory tests, radiological images, and hospitalization status were examined. Correlations between patients' gender, comorbid diseases, radiological infiltration, sputum cultures, blood parameters, and their hospitalization-discharge status were also investigated.

**Results:** The patients' mean age was  $63.62 \pm 16.24$  years. Of the patients, 87 (58%) were male, and 63 (42%) were female. A total of 93 (62%) patients were hospitalized, and 57 (38%) patients were discharged from the emergency department. When the comorbid diseases of the patients were considered, COPD was the most common comorbid disease in all patients, both hospitalized and discharged (62 [41.4%], 45 [30%], and 17 [11.4%], respectively). There was radiological infiltration in 84 (56%) hospitalized patients and 27 (18%) discharged patients. Sputum cultures were obtained from 42 (28%) hospitalized patients, and reproduction was detected in 11 (7.3%). Sputum cultures were obtained from 5 (3.3%) of 57 (38%) discharged patients, and there was no reproduction in any of these patients. A statistically significant difference was identified between patients' comorbid diseases, radiological infiltrations, reproduction in sputum cultures, and their hospitalization-discharge status.

**Conclusion:** The treatment of patients diagnosed with community-acquired pneumonia in the emergency department should be performed by hospitalizing them, especially in the presence of comorbid diseases, and detecting radiological infiltrations and reproduction in sputum cultures.

**Keywords:** Community-acquired pneumonia, emergency department, hospitalization

nowadays and as a result of positive developments in the medical world, the average life expectancy of people becomes longer, leading to an increased elderly population (7). Concerning the prevalence of pneumonia in the elderly population, it occurs at a rate of 18.2% in the 65-69 age group, while it is observed at a high rate of 52.3% in patients aged 85 and older (8). Furthermore, in the presence of underlying comorbidities such as chronic obstructive pulmonary disease (COPD), diabetes mellitus (DM), chronic renal failure (CRF), hypertension (HT), coronary artery disease (CAD), congestive heart failure (CHF), and chronic liver disease in elderly patients, pneumonia is more common in these patients and may lead to a more severe disease picture (9).

After the physical examination, the radiological representation of infiltration in the lungs allows pneumonia to be diagnosed (5). Serum C-reactive protein (CRP) and white blood cell (WBC) levels have been shown to be high in these patients (4). However, these values are the main acute phase reactants increasing in trauma cases apart from infection and inflammation, which are frequently used in clinical practice (10). Antimicrobial treatment should be initiated in a short time after these values increase and the diagnosis of pneumonia is established clinically and radiologically. A continuous increase in these blood values during treatment or the failure to lower them despite the provided treatment suggests inadequate treatment or a complicated infection picture (11). Furthermore, the delayed onset of treatment leads to increased morbidity and mortality (12). In the current study, we examined patients diagnosed with community-acquired pneumonia in the emergency department. We investigated the correlations between these patients' gender, comorbid diseases, radiological findings, sputum cultures, laboratory values, and hospitalization status.

## MATERIALS AND METHODS

Patients aged 18 and over who presented to the emergency department within one year and were diagnosed with community-acquired pneumonia in the emergency department were included in our study. Patients with suspected hospital-acquired pneumonia were excluded from the study. The age, gender, comorbid diseases, complaints at the time of admission, vital signs, physical examination findings, laboratory tests (hemoglobin, white blood cell, CRP), radiological images, sputum cultures, hospitalization (ward or intensive care)-discharge status, and mortality of patients were examined. All these data were retrospectively screened from the hospital records. The correlations between patients' gender, comorbid diseases, radiological infiltration, sputum culture results, and their hospitalization-discharge status were also investigated. Furthermore, the correlations between patients' laboratory values (hemoglobin, white blood cell, and CRP) and their hospitalization status were examined.

Ethical approval for this study was acquired from the Scientific Research and Publication Ethics Committee of İnönü University dated 05.03.2019 and with decision number 2019/5-10.

## Statistical Analysis

All data acquired were statistically analyzed using the IBM SPSS (version 20.0; SPSS™, Chicago, IL) program. Numerical data obtained by measurement were presented as mean and standard deviation (SD), whereas numerical categorical data were presented as number (n) and percentage (%). The statistical analysis of categorical variables was conducted by Pearson's chi-square test. A value of  $p < 0.05$  was considered significant in all tests.

## RESULTS

The study included 150 patients diagnosed with community-acquired pneumonia in the emergency department. The patients' mean age was  $63.62 \pm 16.24$  years. Of the patients, 87 (58%) were male, and 63 (42%) were female. A total of 93 patients (62%) were hospitalized. Of these patients, 59 (39.3%) were male, and 34 (22.7%) were female. Fifty-seven (38%) patients were discharged from the emergency department. Of these patients, 28 (18.7%) were male, and 29 (19.3%) were female (Table-1). No statistically significant difference was revealed between the gender of the patients and their hospitalization-discharge status ( $p = 0.085$ ). In addition, exitus occurred in 10 (6.7%) of 150 (100) patients. All of these 10 patients (6.7%) were male.

**Table 1. Hospitalization-discharge status of the patients according to their gender**

| Gender | Hospitalization<br>n (%) | Discharge<br>n (%) | Total<br>n (%) | <i>p</i> |
|--------|--------------------------|--------------------|----------------|----------|
| Male   | 59 (39.3)                | 28 (18.7)          | 87 (58)        | 0.085    |
| Female | 34 (22.7)                | 29 (19.3)          | 63 (42)        |          |
| Total  | 93 (62)                  | 57 (38)            | 150 (100)      |          |

Considering the patients' comorbid diseases, the most common comorbid disease was COPD observed in 62 patients (41.3%), followed by malignancy in 24 patients (16%), HT in 19 patients (12.7%), CAD in 16 patients (10.7%), and DM in 10 patients (6.7%). Nineteen patients (12.6%) had no comorbid disease. No statistically significant difference was identified between the patients' gender and their comorbid diseases ( $p = 0.077$ ) (Table-2).

The patients' comorbid diseases and hospitalization-discharge status were evaluated. The most common comorbid disease in hospitalized patients was COPD observed in 45 patients (30%), followed by malignancy in 16 (10.7%) patients, CAD in 11 (7.3%) patients, HT in 8 (5.4%) patients, and DM in 7 (4.7%) patients. Six (4%) patients did not have any comorbid diseases. Upon examining the comorbid diseases of the discharged patients, the most common comorbid disease was COPD observed in 17 patients (11.3%), followed by HT in 11 patients (7.4%), malignancy in 8 patients (5.3%), CAD in 5 patients (3.4%), and DM in 3 patients (2%). Thirteen (8.6%) of the discharged patients had no comorbid disease. A statistically significant difference was found between the patients' comorbid diseases and their hospitalization-discharge status ( $p = 0.013$ ) (Table-3).

**Table 2. Comorbid diseases of the patients according to their gender**

| Gender | Comorbid diseases |                     |             |              |             |               | Total<br>n (%) | p     |
|--------|-------------------|---------------------|-------------|--------------|-------------|---------------|----------------|-------|
|        | COPD<br>n (%)     | Malignancy<br>n (%) | HT<br>n (%) | CAD<br>n (%) | DM<br>n (%) | None<br>n (%) |                |       |
| Male   | 37 (24.7)         | 17 (11.3)           | 6 (4)       | 12 (8)       | 6 (4)       | 9 (6)         | 87 (58)        | 0.077 |
| Female | 25 (16.6)         | 7 (4.7)             | 13 (8.7)    | 4 (2.7)      | 4 (2.7)     | 10 (6.6)      | 63 (42)        |       |
| Total  | 62 (41.3)         | 24 (16)             | 19 (12.7)   | 16 (10.7)    | 10 (6.7)    | 19 (12.6)     | 150 (100)      |       |

COPD: Chronic Obstructive Pulmonary Disease, HT: Hypertension, CAD: Coronary Artery Disease, DM: Diabetes Mellitus

**Table 3. The patients' comorbid diseases and their hospitalization-discharge status**

| Gender     | Hospitalization<br>n (%) | Discharge<br>n (%) | Total<br>n (%) | p     |
|------------|--------------------------|--------------------|----------------|-------|
| COPD       | 45 (30)                  | 17 (11.3)          | 62 (41.3)      | 0.013 |
| Malignancy | 16 (10.7)                | 8 (5.3)            | 24 (16)        |       |
| HT         | 8 (5.3)                  | 11 (7.4)           | 19 (12.7)      |       |
| CAD        | 11 (7.3)                 | 5 (3.4)            | 16 (10.7)      |       |
| DM         | 7 (4.7)                  | 3 (2)              | 10 (6.7)       |       |
| None       | 6 (4)                    | 13 (8.6)           | 19 (12.6)      |       |
| Total      | 93 (62)                  | 57 (38)            | 150 (100)      |       |

COPD: Chronic Obstructive Pulmonary Disease, HT: Hypertension, CAD: Coronary Artery Disease, DM: Diabetes Mellitus

In the radiological imaging of the patients, it was examined whether there was infiltration or not. Eighty-four (56%) of the hospitalized patients had radiological infiltration, whereas no radiological infiltration was observed in 9 patients (6%). Of the patients discharged, 27 (18%) had radiological infiltration, and 30 (20%) had no radiological infiltration. A statistically significant difference was detected between the patients' radiological infiltration and their hospitalization-discharge status ( $p<0.005$ ) (Table-4).

**Table 4. Hospitalization-discharge status of the patients according to radiological infiltration**

| Radiological infiltration | Hospitalization<br>n (%) | Discharge<br>n (%) | Total<br>n (%) | p      |
|---------------------------|--------------------------|--------------------|----------------|--------|
| Infiltration              | 84 (56)                  | 27 (18)            | 111 (74)       | <0.005 |
| No infiltration           | 9 (6)                    | 30 (20)            | 39 (26)        |        |
| Total                     | 93 (62)                  | 57 (38)            | 150 (100)      |        |

Sputum cultures were obtained from 47 (31.3%) of the 150 patients included in the study, and they were taken from 42 (28%) of the 93 (62%) hospitalized patients. Reproduction was detected in 11 (7.3%) of these 42 patients (28%). Sputum cultures were acquired from 5 (3.3%) of the 57 (38%) discharged patients, and no reproduction was identified in any of these patients. A statistically significant difference was found between the patients' sputum cultures and their hospitalization-discharge

status ( $p<0.005$ ) (Table-5). No statistical significance was revealed between the Hb, WBC, and CRP levels of the patients and their hospitalization-discharge status.

**Table 5. Reproduction in sputum cultures and hospitalization-discharge status**

| Reproduction in sputum culture | Hospitalization<br>n (%) | Discharge<br>n (%) | Total<br>n (%) | p      |
|--------------------------------|--------------------------|--------------------|----------------|--------|
| Reproduction                   | 11 (7.3)                 | 0 (0.0)            | 11 (7.3)       | <0.005 |
| No reproduction                | 31 (20.7)                | 5 (3.3)            | 36 (24.0)      |        |
| Culture not taken              | 51 (34.0)                | 52 (34.7)          | 103 (68.7)     |        |
| Total                          | 93 (62.0)                | 57 (38.0)          | 150 (100.0)    |        |

## DISCUSSION

CAP occurs more commonly, especially in developing countries. While its incidence in developing countries is 20-30%, it is 3-4% in developed countries. Although its incidence changes with age, it increases significantly in very young and elderly people (13). In developed countries, especially community-acquired pneumococcal and Haemophilus influenzae type b pneumonia has decreased with vaccinations. However, the increase in hospital-acquired pneumonia due to resistant gram-negative bacteria has become an important health problem, on the other hand (14). The diagnosis of pneumonia should be established early and effective treatment should be in a timely initiated in order to prevent this. It is now possible to determine the factors causing pneumonia using advanced molecular methods. In this way, the diagnosis and treatment of patients progress faster, and the unnecessary use of antibiotics is prevented (15).

Numerous studies have been carried out on pneumonia. One of these studies from our country examined a total of 150 pneumonia cases diagnosed with CAP in the emergency department within one year. Of these patients, 103 (68.7%) were male, and 47 (31.3%) were female. The patients' mean age was  $69.15 \pm 13.34$  (min: 19, max: 92) years (16). In another study examining 142 patients hospitalized due to community-acquired pneumonia, 88 (62%) patients were male, and 54 (38%) were female. The mean age of the patients was  $59.68 \pm 20.35$  (min: 18, max: 95) years (2). In our study, the gender distributions and mean ages of the patients were similar to those in the literature.

Many studies have also examined comorbid comorbidities in pneumonia patients. When accompanying comorbid diseases were examined in a study involving 100 patients hospitalized in the intensive care unit due to CAP, 95 (95%) patients were found to have one or more comorbid diseases. The most common comorbid disease was COPD observed in 34 (35.8%) patients, followed by chronic neurological disease in 31 (32.6%) patients, cardiovascular diseases in 25 (26.3%) patients, endocrine and metabolic diseases in 20 (21.1%) patients, chronic kidney disease in 9 (9.5%) patients, malignancy in 8 (8.4%) patients, asthma in 6 (6.3%) patients, interstitial lung disease in 5 (5.2%) patients, and psychiatric disease in 3 (3.2%) patients (17). In another study conducted with 262 patients, there were pulmonary diseases in 96 (37%) patients, malignancy in 74 (29%), CHF in 74 (29%), and DM in 67 (26%) patients (18). In another study, the most common comorbid diseases were COPD at 23.7%, DM at 17.2%, and CHF at 15.1% (19). Upon reviewing a study carried out abroad, the most common comorbid diseases were revealed to be respiratory diseases at 28% and CAD at 27% (20). In our study, the most common comorbid disease was COPD observed in 62 patients (41.4%), in line with the literature, followed by malignancy in 24 patients (16%). We attributed the frequent occurrence of malignancy in our patients to the presence of oncology and hematology centers in our hospital providing services in the region.

In a study, when the hospitalization-discharge status of patients diagnosed with CAP in the emergency department was examined, it was seen that 120 (80%) of 150 patients were hospitalized, and 30 (20%) were discharged from the emergency department (16). In another study examining pneumonia and lower respiratory tract infections in the emergency department, 590 (71.08%) patients were hospitalized, and 240 (28.92%) patients were discharged (21). In our study, 93 (62%) patients were treated by hospitalization, and 57 (38%) patients were discharged. While the hospitalization status of patients varies in the literature, the hospitalization rate in our study was lower compared to the literature.

Radiological imaging is the most important diagnostic method used in the diagnosis of pneumonia. One of the studies carried out demonstrated that the presence of lesions on radiological imaging in CAP was an indicator of poor prognosis, and the most common radiological finding was patch-like infiltrations at a rate of 38% (22). A study was performed with 193 patients who were hospitalized due to CAP-detected infiltration in 192 (99.5%) patients on radiological imaging. Moreover, when the sputum culture samples of these patients were examined, there was a reproduction in 9 (4.7%) patients (1). Considering the hospitalized patients in our study, the infiltration rate in radiological imaging was similar to that in the literature. However, the reproduction rate in sputum cultures in our study was higher compared to that in the literature.

## LIMITATIONS

The small number of patients, a retrospective, and the single-center study are the limitations of our study.

## CONCLUSION

Most patients present to the emergency department with respiratory complaints. Many respiratory and cardiac diseases underlie these complaints, and a significant part of these patients are diagnosed with pneumonia. After the diagnosis of these patients is established, their treatment should be initiated in the early period. Furthermore, if necessary, their treatment should be continued in the hospital by hospitalizing them. In the present study, we found that patients diagnosed with community-acquired pneumonia should be treated by hospitalization, particularly in the presence of comorbid diseases, radiological infiltrations, and reproduction in sputum cultures.

### Conflict of interests

*The authors declare that there is no conflict of interest in the study.*

### Financial Disclosure

*The authors declare that they have received no financial support for the study.*

### Ethical approval

*Ethical approval for this study was acquired from the Scientific Research and Publication Ethics Committee of İnönü University dated 05.03.2019 and with decision number 2019/5-10.*

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