Disability, and not diabetes, is a strong predictor of mortality in oldest old patients hospitalized with pneumonia

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ABSTRACT

Background: Pneumonia causes more deaths than any other infectious disease, especially in older patients with multiple chronic diseases. Recent studies identified a low functional status as prognostic factor for mortality in elderly patients with pneumonia while contrasting data are available about the role of diabetes. The aim of this study was to evaluate the in-hospital, 3-month and 1-year mortality in elderly subjects affected by pneumonia enrolled in the RePoSi register.
Methods: We retrospectively analyzed the data collected on hospitalized elderly patients in the frame of the REPOSI project. We analyzed the socio-demographic, laboratory and clinical characteristics of subjects with pneumonia. Multivariate logistic analysis was used to explore the relationship between variables and mortality.
Results: Among 4714 patients 284 had pneumonia. 52.8% were males and the mean age was 80 years old. 19.8% of these patients had a Barthel Index ≤ 40 ($p < 0.0001$), as well as 43.2% had a short blessed test ≥ 10 ($p < 0.0117$). In these subjects a significant CIRS for the evaluation of severity and comorbidity indexes ($p < 0.0001$) were present. Although a higher fasting glucose level was identified in people with pneumonia, in the multivariate logistic analysis diabetes was not independently associated with in-hospital, 3-month and 1-year mortality, whereas patients with lower Barthel Index had a higher mortality risk (odds ratio being 9.45, 6.84, 19.55 in hospital, at 3 and 12 months).
Conclusion: Elderly hospitalized patients affected by pneumonia with a clinically significant disability had a higher mortality risk while diabetes does not represent an important determinant of short and long-term outcome.

1. Introduction

In Europe older people account for a greater part of population and by 2060 persons aged 65 and older will rise from 18% to 28% and those aged 80 and over from 5% to 12% [1]. Multimorbidity did increase among older persons from 62% of people aged 65–74 years to 82% for those aged ≥ 85 years [2]. Pneumonia represents a common infectious disease and in industrialized countries is a major causes of hospitalization and death, especially in older people affected by multiple chronic conditions [3]. Low functional status has been suggested as an independent prognostic factor for mortality in elderly people with pneumonia [4]. Among chronic conditions diabetes and the associated cardiovascular comorbidity represents the most prevalent cause of mortality and morbidity despite the efforts to improve cardiovascular risk factors through diet modification and physical activity [5]. Diabetes increase vulnerability to different infections and its prevalence ranged from 6% to 25% among patients with community-acquired pneumonia (CAP) [6]. It represents one of the main factors associated with increased likelihood of post-CAP hospitalization [7]. Different data are available about the prognostic factors associated with mortality in

hospitalized patients affected by CAP. Adamuz et al. [8] found that COPD, diabetes mellitus, cancer, dementia, re-hospitalization within 30 days of hospital discharge and nursing home were independently associated with 1-year mortality after hospitalization for CAP. Ishiguro et al. [9] observed that in a group of patients hospitalized for pneumococcal pneumonia advanced age, diabetes mellitus and a poor performance status were associated with severity of the infection, while a poor performance status was associated with mortality. Eurich et al. [10] found no correlation between glycemia alterations and an increased risk of death or readmission at 3 months or 1 year among patients admitted for CAP. On the contrary Falcone et al. [6] showed that among patients with type 2 diabetes hospital admission for pneumonia is associated with an elevated mortality rate within the first 30 days and one in three persons died at one year.

Given this background of contrasting findings, the aim of our study was to evaluate the in-hospital, 3-month and 1-year mortality in a subset of elderly patients affected by pneumonia, hospitalized in internal medicine and geriatric wards participating to the prospective RePoSI register.

2. Methods

Data were collected in the frame of the RePoSI (Registro Politerapie SIMI) project from January 2010 to December 2016 in 82 Italian hospitals. RePoSI is an independent and collaborative register, organized by the Italian Society of Internal Medicine (SIMI) the Mario Negri Institute for Pharmacological Research and the IRCCS Foundation Maggiore Policlinico Hospital. The design of the project has been described in details elsewhere [11]. Briefly, a network of internal medicine wards and geriatric wards was created in order to collect information on elderly patients, affected by multiple diseases and on polytherapy, in the frame of a register. Patients' eligibility criteria were: 1) admission to one of the participating wards during the 4 index weeks chosen for recruitment (each week was separated from the other by 3 months); 2) age ≥ 65 years; 3) having given informed consent. During each index week, the participating wards enrolled, at least, the first ten consecutive eligible patients. For each patient, the attending physician recorded, on a web-based case report form, data on: socio demographic details, the main reason for admission and comorbidities, diagnoses, treatment (including all drugs taken at hospital admission and recommended at discharge), clinical events during hospitalization and outcome. Data on mortality or any novel hospital admission were also collected, with a telephone interview performed by a physician to the patient or his/her relative, 3 and 12 months after hospital discharge. A final database was then created and checked by the Mario Negri Institute for Pharmacological Research.

We analyzed the characteristics of patients with pneumonia and diabetes compared to those with diabetes without pneumonia recruited in the REPOSI registry. Socio-demographic variables such as age classes, marital status, living arrangement and hospital admissions were all considered. As clinical characteristics, we evaluated: disease distribution at hospital admission (classification was based on the International Classification of Diseases-Ninth Revision), cognitive status and mood disorders (tested with the Short Blessed Test, SBT, [12] and the Geriatric Depression Scale, GDS [13], functional status at hospital admission (measured by means of the Barthel Index, [14] classified as mild (BI 75-90), moderate (BI 50-74), severe (BI 25-49) and total dependence (BI 0-24), severity and comorbidity indexes (evaluated respectively by the Cumulative Illness rating Scale CIRS-s and CIRS-c) [15], kidney function by means of eGFR (calculated using the Chronic Kidney Disease Epidemiology Collaboration formula [16] and in-hospital, 3-month and 1-year mortality rates. The association between variables and mortality (in-hospital and at 3–12-month follow-up) was analyzed.

2.1. Statistical analysis

Data were reported as percentages for categorical variables and as means (95% confidence intervals) for quantitative variables. A Barthel Index (BI) score of ≤40 was used to select patients with significant disability according to our population characteristics. The comparison between groups was made using the exact Fisher test for contingency tables and the z test for comparison of proportions. The non-parametric Mann-Whitney U test was used for comparison of quantitative variables. Multivariate logistic analysis was used to explore the relationship between variables and outcomes (in-hospital, 3-month and 12-month follow-up mortality). Odds ratios (ORs) and 95% confidence intervals (95%CIs) were computed. The choice of variables was performed according to the Hosmer-Lemeshow methodology [17]: after univariate analysis, only variables with a p < 0,20 were included in the final model; then, through a backward process, variables were excluded until a significance level of p < 0,05 was reached for each variable. A two-tailed p < 0,05 was considered statistically significant. Stata (StataCorp. 2016. Stata Statistical Software: Release 14.1. College Station, TX: StataCorp LP) was used for database management and analysis.

3. Results

4714 inpatients aged 65 years or older were eligible for this analysis; 284 of them had pneumonia (6.0%). All types of pneumonia were included. Among patients with pneumonia 52.8% were male and the mean age was 80 years old with approximately one quarter of the patients being 85 years old or older. Patients smokers or ex smokers were 44.5% and only 3.9% were underweight (Table 1). Laboratory and clinical characteristics of inpatients with and without pneumonia are shown in Table 2. Pneumonia patients showed a higher fasting glucose level (p = .0063), more leucocytosis (p < .0001), more frequent cognitive impairment (p = .0009), more clinical significant disability (p < .0001), more frequent urine catheterization (p = .0236). Moreover in-patients with pneumonia showed a higher severity and comorbidities index by CIRS (p < .0001 respectively). To evaluate the variables independently associated with in-hospital, 3-month and 1-year mortality, a multivariate analysis was performed as described in statistical analysis section. The final multivariate model, corrected for sex and age, is shown in Fig. 1. In subjects with pneumonia diabetes was not independently associated with in-hospital, 3-month and 1-year mortality [O.R. 0.53 (0.11–2.63), 0.73 (0.29–1.84), 0.56 (0.16–1.90), respectively]. On the contrary the BI was independently associated with in-hospital, 3-month and 1-year mortality [O.R. 9.88 (2.60–37.50), 6.33

Table 1
Socio-demographic characteristics of the RePoSI population at hospital admission according to in-patients with pneumonia.

Variables	Patients with pneumonia
No. of subjects	284
Men (%)	52.8
Age[a]	80.4 (79.6–81.3)
Marital status (%)	
Married	34.8
Widow	1.8
Separated	0.7
Divorced	8.0
Never smoked (%)	49.5
Ex-smoker (%)	44.5
Smoker (%)	6.0
BMI[a]	25.8 (25.2–26.4)
Underweight patients (%)	3.9

BMI = Body mass index.
  [a] Data are reported as mean (95% confidence interval).