Mortality causes in infectious diseases

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Abstract: Background: Infectious diseases still remain an important cause of death, despite available modern therapeutical approaches.

Methods: We performed an observational study, collecting data from patients admitted to "Dr. Victor Babes" Clinical Hospital for Infectious and Tropical Diseases, Bucharest between January 1st 2014 and December 31st 2015.

Results: Overall, 437 deaths were registered, sepsis being the main cause of death, representing 35%. Regarding gender distribution, we observed that sepsis related death was higher in females (52.9%) than males. HIV associated death was recorded in 54 patients. The mean age of death was 37 years CI95% (32.47 - 40.94), being the youngest age in the study group. Bronchopneumonia associated death represented 12.1% of the total numbers of recorded deaths, occurring mainly in older patients, with an average age of 70 years CI95% (65.38-74.54). The mortality rate of Clostridium difficile colitis was 3.43%. Central nervous system infections had a mortality rate of 11.8%. The mean age of death was 63 years CI95% (59.13 - 67.36).

Conclusions: First three causes of death were sepsis, HIV related complications and lower respiratory tract infections. Advanced age, immobilisation, underlying cardiac pathology were independent risk factor for mortality in the studied group

Key Words: sepsis, mortality, infectious diseases.

The introduction of vaccination in the general population and antibiotic use for the treatment of infectious diseases were a major contributor in the reduction of infection related mortality [1]. In nowadays, both worldwide as well as in Romania, we are seeing an alarming decrease in the child vaccination rate mainly due to the refusal of vaccination, which could favor the outbreak of different epidemics. At the same time, there's an overwhelming rise in bacterial resistance to antibiotics. Both these factors are a cause of increased mortality at a general population level [2].

Antibiotic resistance is currently a serious threat for public health. It is present and rising both in first line antibiotics, as well as second line therapy. At the initiative of UK’s Prime Minister David Cameron, the UK Government formed an experts committee for the surveillance of bacterial antibiotic resistance in 2014, and the committee’s conclusions are worrying. Every year, 500,000 people in Europe and 2 million in the United States are infected with antibiotic resistant bacteria. These bacteria are the cause of 700,000 deaths per year worldwide, out of which 27,000 are in Europe and 23,000 in the United States.

The increase in antibiotic resistance will cause 300 million deaths by the year 2050 (10 million death per year), out of which the most will be recorded in Asia (4.7 million per year) and Africa (4.1 million per year), and the least in Europe (390,000 per year) and United States (317,000 per year).

By the year 2050, antibiotic resistant bacteria
related death will be the leading cause of deaths in the world, outranking cancer (8.2 million deaths per year), diabetes (1.5 million per year), diarrheal diseases (1.4 million per year) and road injuries (1.2 million per year) (Fig. 1).

Some of the most frequent causes of infectious diseases related deaths are lower respiratory tract infections (third cause of global mortality, WHO 2015 [3]), diarrheal diseases (eight cause of global mortality, WHO 2015 [13]); important causes of infectious diseases mortality are also central nervous system infections, infectious endocarditis and sepsis. Age and related comorbidities represent a predictive infection related mortality factor; the elderly and patients with comorbidities (diabetes, cirrhosis, cancer, etc.) are at a higher risk of mortality [4-5].

**OBJECTIVE**

The aim of the study was to stratify the main causes of death in an infectious diseases hospital, and to evaluate the demographic and comorbidity characteristics.

**METHODS**

We performed a retrospective, observational non interventional data collection from patients admitted and treated in “Dr. Victor Babes” Clinical Hospital for Infectious and Tropical Diseases from Bucharest between January 1st 2014 and December 31st 2015. Demographic data, diagnosis, comorbidities and clinical outcome were collected from patient’s medical records.

Diagnosis was established according to the International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD-10) Version for 2010.

**Statistical analysis**

Statistical analysis and graphs were performed in SPSS v.20. t-test has been used for characterizing numerical data and for categorical data Pearson chi-squared test. A p-value lower than 0.05 was considered significant.

**RESULTS AND DISCUSSIONS**

Between January 1st 2014 and December 31st 2015 we have recorded 437 deaths out of 36745 patients, with a mortality rate of 1.18%. The average age of the deceased patients was 65.81 years, [95% CI: 64.06, 67.55]. Regarding gender distribution, we have noticed a slight predominance of male with a 54% out of total cases (Fig. 2). Three hundred fifty-eight (82%) of patients were residing in urban areas (Fig. 3).
Out of the 437 deaths in our hospital between 2014-2015, sepsis was the cause of death for 153 patients (35%). Sepsis mortality rate during the studied period was 15%. One third of sepsis (50) related deaths were bedridden patients, due to neurologic complications, mainly in elderly patients. The mean age of bedridden patients was 74 years old [CI95%: 71.10-76.26]. 30(19.6%) of sepsis related deaths were recorded in the first 24 hours of hospitalization. Sepsis related death was higher in females (52.9%) than males (47.1%).

Second cause of mortality was HIV related complications 54 patients (12.4 %). The mean age of death was 37 years old [CI95%: 32.47, 40.94], being the youngest age group in the study. Severe immunosuppression, that leads to opportunistic infections (cerebral toxoplasmosis, pulmonary tuberculosis), as well as intravenous drug use, were the indirect causes of death [6].

Bronchopneumonia associated deaths was diagnosed in 53 patients, representing 12.1% of the total number of death. The mortality rate in hospitalized patients from bronchopneumonia was 15.9%. Older age was an important risk factor for mortality, bronchopneumonia occurring in people with an average age of 70 years CI95% (65.38-74.54). An important comorbidity for these patients was cardiac disease that was observed in 81.13% of cases, including cardiac arrhythmia, heart failure. Also, in 49.05% of bronchopneumonia associated deaths, malignancy and immobilization have contributed to the biological and physical damage of these patients. Regardless of intensive care unit hospitalization in 39 (73.6%) of patients and mechanical ventilation that was performed in 17 (32%) patients, mortality rate was similar to reported mortality in literature [7].

Excessive use of antibiotics, especially in elderly, has made Clostridium difficile the main cause of colitis with an upward trend in the past years [8].

Thirty-five (8%) patients have died by Clostridium difficile colitis between 2014-2015, with an average age of 77 years [95%CI: 73.78, 79.82]. The mortality rate of Clostridium difficile colitis was 3.43%. In 21 (60%) of cases, immobilization and neoplasia were important comorbidities. We have noticed a significant statistical difference among female and male patients, with a 65.7% female cases, compared with 34.3% male cases (p=0.01).

Central nervous system infections (CNS), which are some of the most serious infectious diseases, had a mortality rate of 33 (11.8%) in the studied period [9]. In regards to the etiology of CNS infection deaths, bacteria was identified in 9 patients of cases (27.3%), Mycobacterium tuberculosis in 4 patients (12.1%); 2 patients had a viral etiology, 1 fungal. In 17 cases the etiology remained unknown. The mean age of death by CNS infections was 63 years [95%CI: 59.13, 67.36], with an age interval between 33 and 81 years old.

Endocarditis occurred in 25 (5.7%) patients, with a mortality rate of 13.4% [10]. Previous heart conditions were important trigger in 96% of patients; only 1 younger man did not have an underlying heart condition. Out of the 25 endocarditis patients, 56% were male, with a mean age of 63 years [95% CI: 54.48, 71.52], comparing to a mean age of 76 years [95%CI: 71.25, 80.20] in the female patient group.

Influenza still remains an important morbidity and mortality cause, despite the existence of prophylaxis (vaccination) and efficient antiviral treatment [11]. 6 out of 437 deaths (1.37%) were influenza related, with a mortality rate of 2.85% between 2014-2015. Influenza B, a non-epidemic type of influenza virus, was responsible for 3 deaths; 2 cases had influenza encephalitis (Fig. 4).

Other causes of death, such as leptospirosis, malaria, were rare, only 1 case of each being recorded. The global mortality causes are shown in Figure 5.

CONCLUSIONS

First three causes of death were sepsis, HIV related complications and lower respiratory tract infections.
Advanced age, immobilization, and underlying cardiac pathology were independent risk factors for mortality in the studied group.

Infectious diseases still remain an important cause of death, despite available modern therapeutical approaches, a part of the cause being due to the decrease in vaccination, increase in antibiotic resistance and the increase of life expectancy in patient with multiple comorbidities.

A particular characteristic of infectious diseases is the threat of an increase in mortality due to the emergence of new epidemics and pandemics.

Conflict of interest. The authors declare that there is no conflict of interest arising out of this manuscript.

References