

An outbreak of *Streptococcus pneumoniae* in an Italian nursing home

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ABSTRACT

Streptococcus pneumoniae is the main cause of community-acquired pneumonia worldwide; pneumonia occurs sporadically in most cases, but rare outbreaks have been reported. We describe an outbreak occurred in a 21-guests nursing home for elders in Aosta (Italy); outbreak occurred in april 2014 over a 2 weeks period, resulting in 12 out 20 guests affected (all with high fever and respiratory symptoms), two deaths (at home), nine patients referred to Hospital Emergency Room, and eight admissions. Urinary streptococcus antigen was positive in seven out of eight patient tested. None of the nursing home guests were vaccinated against *Streptococcus pneumoniae*. The Hospital Medical Direction and Public Health Service gave support and adopted strategies to contain the outbreak spread.

We underline the need for pneumococcal vaccination in nursing homes/Long-term care facilities; accurate check of hygiene behaviours in those setting is also mandatory.

Key words: *Streptococcus pneumoniae*, outbreak, Aosta, Public Health, hygiene behaviours

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INTRODUCTION

Pneumonia is sometimes referred to as the forgotten killer. The World Health Organization estimates that lower respiratory tract infections are the most common infectious cause of death in the world (the third most common cause overall), with almost 3.5 million deaths yearly [1]. Furthermore, an estimated 1.6 million people die of Invasive Pneumococcal Disease (IPD) annually, including one million children

under five years of age [2]. Severe community-acquired pneumonia is the most common cause of death from infection in developed countries: *Streptococcus pneumoniae* accounts for at least 40% of such cases in adults [3], even if a specific surveillance is difficult to achieve, leading to under diagnosis and poor knowledge of definite areas. In Europe surveillance of invasive pneumococcal disease, including meningitis, pneumonia, bacteraemia and sepsis is now provided by the European Center for Disease

Control (ECDC); in 2012 the overall reported confirmed case rate was 4.28 per 100 000 [4], comparable with the previous two years, and higher notification rates were observed in Nordic countries. IPD is predominantly found in adults aged 65 or over, followed by young children under five years and adults aged between 45 and 64 years. In Italy, the 2013 rate of IPD was of 1,64 per 100.000 and it is slightly increasing over years [5]. Pneumococcus is mainly transmitted by direct contact with contaminated respiratory secretions between household members, infants, and children; affected patients are generally not regarded as highly contagious, and respiratory isolation in both community and hospital settings is rarely indicated; moreover, airway colonisation by pneumococci is readily detectable in about 10% of healthy adults, 20–40% of healthy children are carriers, and more than 60% of infants and children in day-care settings can be carriers [6].

Community-acquired pneumonia that is severe enough to require hospitalization is associated with excess mortality over the subsequent years among survivors, [7-9] even among young people without underlying disease [8]. Admission to the hospital for community-acquired pneumonia is also costly,

especially if care in an intensive care unit (ICU) is required [10-11].

Streptococcus pneumoniae occurs sporadically in most cases; anyway, outbreaks may verify, in particular in closed communities and in the pre-vaccine era [12-13]. In this report we describe an outbreak of pneumococcal disease in a nursing home for elders in *valle d'Aosta* region, Italy.

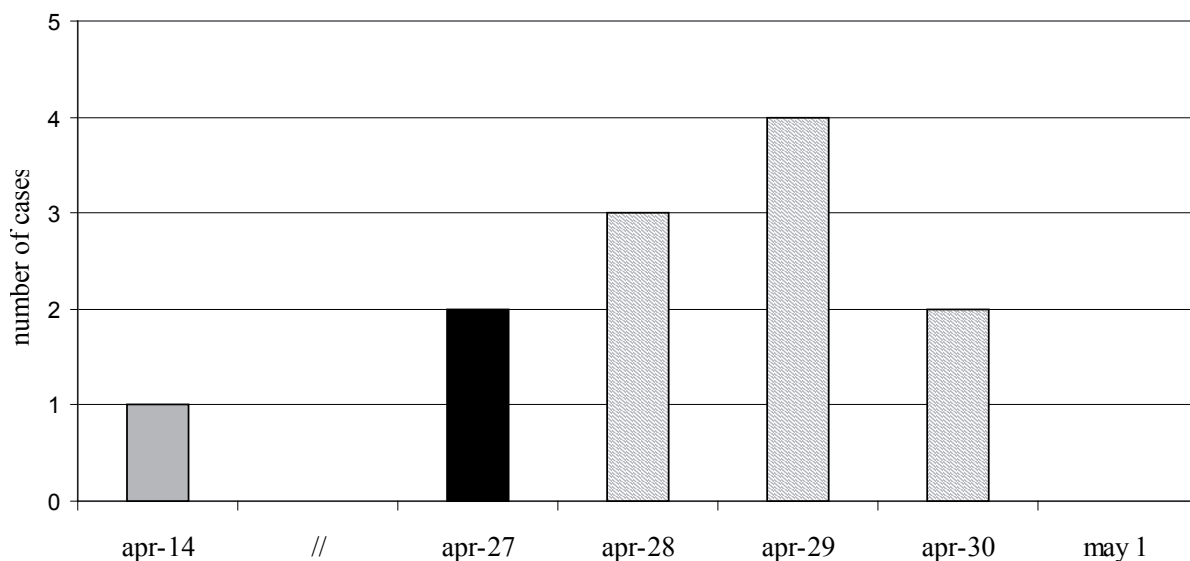
METHODS

The outbreak occurred in a nursing home for elders in Aosta, the main town of the Alpine Italian Region Valle d'Aosta, northern Italy. This residential structure can accommodate up to 21 guests (19 patients in residential care and two in semi-residential care). The nursing home has got both two beds rooms and single bed rooms, and one dining room. At outbreak onset (April 2014) 20 patients were present, 12 females (mean age: 86 years; range 70-98) and 8 males (mean age: 83 years; range 77-95); none them had been vaccinated against *Streptococcus pneumoniae*.

The outbreak involved 12 out of 20 guests, and is summarized in Figure 1:

FIGURE 1

EPIDEMIC CURVE, *STREPTOCOCCUS PNEUMONIAE* OUTBREAK IN A NURSING HOME



Grey column: suspect index case, recovered
 Black column: died
 Lined columns: hospital admitted, recovered

- Case 1 , april 14th: possible index case: a guest with rhinitis, sore throat, cough, high fever, treated with resolution after short course of oral antibiotics
- Case 2, april 27th: sudden onset of high fever and productive cough in a guest, who died soon there after, before antibiotic start
- Case 3, april 27th: in the night acute onset of febrile dyspnoea in a second host with severe comorbidities; patient was referred to Hospital Emergency Room, where he died the next morning.
- Cases 4-12, april 28th-30th : nine more guests were referred to Hospital Emergency Room, all with respiratory symptoms (cough and purulent sputum), and pyrexia;
- All nine patients had a chest radiograph showing focal infiltrate.
- Eight patients were admitted to the Hospital
- The ninth had a less severe clinical picture and was therefore discharged and treated with oral antibiotics.
- The remaining eight guests remained asymptomatic during the epidemic period, received anti pneumococcal conjugated vaccine soon after but no antibiotic prophylaxis; next, two nursing-home workers and some of their relatives reported symptoms of airway infection, without further complications.

Seven of eight patients were clustered in the Geriatry ward, the eighth, suffering from significant hypoxemic respiratory failure, was admitted in a single room in the Infectious Diseases ward. The average age of the patients admitted was 84,2 years (range: 70-95). All patients were bedridden with encephalopathies based, vascular and/or degenerative significant cognitive impairment. Seven of eight patients had a positive *Streptococcus pneumoniae* urine test; by contrast, blood cultures were performed in three cases, all negative. Five patients were treated with third generation intravenous cephalosporin (one of them had in association with oral macrolide), three patients were treated with intravenous levofloxacin followed by early oral switch. Therapy was effective, with full recovery in all cases and an average hospital stay of 7.3 days.

To foster outbreak interruption in the nursing

home the following activities were started by the Public health service, since April 30:

1. Structural and hygiene status of the residency were carefully verified, in particular those of air ventilation and conditioning systems.
2. Employees access was limited and authorized to those strictly necessary.
3. New guests admissions were interrupted.
4. All health care workers (HCW's) were requested to wear personal protective equipments: gowns, disposable gloves, surgical masks.
5. Hand washing need was emphasized for both HCW's and visitors
6. Cleaning protocols in all areas were critically reviewed
7. Three daily air changes by natural ventilation were ensured in all structure areas.
8. Finally, close survey of remaining guests and of personnel was started, to promptly diagnose possible new cases of infection.

The above cited measures showed effective, without further cases of febrile illness in the following weeks; new guests were accepted after June, the first.

DISCUSSION

Pneumococcus outbreaks are increasingly unfrequent, especially since progressive diffusion of vaccine, even in countries, like Italy, with a low and scattered vaccine coverage in adults [14]. In particular, we found only 12 published outbreaks of serious pneumococcal disease in closed settings, including elderly care residential settings, in a four decades period [15,16]. In recent years, largest outbreaks occurred in Canada, with hundreds of cases reported [17], and in Japan, with 15 cases reported in 2009 [18]. Anyway, at our knowledge, this is the first reported outbreak in a nursing home in Italy; at this regard , our finding is of concern, given progressive population ageing in Italy and wide distribution of thousand nursing homes over all the national territory.

The outbreak we describe has been clinically significant, affecting more than half of the nursing-home guests, causing several

hospital admissions and two probably related deaths. This is not surprising; Pneumococcus pneumonia is a severe disease, and results in the death of 20 to 40% of elderly patients [7]: unfortunately, in our case the lack of blood cultures isolates didn't allow analysis and susceptibility patterns of the involved strains. The outbreak causes are clear enough; *Streptococcus pneumoniae* frequently colonizes the upper respiratory tract: as such it is not considered a typical communicable disease; however special conditions of overcrowding and promiscuity in gated communities allow to overcome the critical threshold for epidemic spread of the germ, both in small facilities as our and in much larger ones, as previously described [15]. At this regard, even if a wide range of control measures were started, it is likely that the most useful had been halting new admissions and limiting accesses from both visitors and unnecessary employees; recently, the early mobility bundle showed efficacy in reducing the incidence of hospital-acquired pneumonia [19], and it should be implemented also, if not especially, in long-term

care settings. In valle d'Aosta region a network of more than forty small nursing homes was created (15 to 40 guests in most cases), with the aim of hosting elders as close as possible to their family and social behaviours. Side effect of such policy is in the difficulty of sharing health practices of common interest; such as, typically, hygiene protocols and behaviours: in valle d'Aosta this is even more challenging since nursing home management belongs to different non-healthcare organizations.

In conclusion, nursing homes concentrate high risk elders and therefore must be considered at high risk for dangerous infective outbreaks. Hygiene and surveillance protocols are mandatory in nursing homes and their sharing by the whole network of nursing homes in a given territory should be ensured by the local health authorities. Finally, anti pneumococcal vaccination by conjugate vaccine in the institutionalized elders should be a priority, especially since the efficacy of polysaccharide conjugated vaccine in adults against pneumococcal pneumonia has been demonstrated [20].

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