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Accepted 2 April 2017

http://dx.doi.org/10.1016/j.jinf.2017.04.002



## Fatal pertussis in infancy, Italy

**KEYWORDS**
Pertussis;
Infants;
Pulmonary hypertension

*Dear Editor,*

Outbreaks of pertussis have recently occurred in industrialized countries with high vaccination rates such as the US, Australia and many European countries, involving particularly adolescents, adults and young infants.[1] The reasons for "resurgence" of pertussis include waning of immunity from vaccination or natural infection over time, low coverage by acellular vaccine, genetic changes in *Bordetella pertussis* strains, greater awareness of the disease, and improved diagnostic ability through the spread use of new molecular techniques.[2] Due to waning of mother's immunity over time, transplacental transfer of pertussis antibodies is not protective, and infants too young to have completed their vaccination schedules are particularly vulnerable. They have the highest rate of morbidity, hospitalization, complications, intensive care unit (ICU) admission, and mortality.[3]

The incidence of pertussis deaths among infants in developed countries has increased, with very high mortality rates in those less than 3 months of age.[3] Surprisingly, a national surveillance study up to 2012 showed that deaths from pertussis have not been reported in Italy since 2002.[4] In addition, no death occurred in Tuscany, Italy, over the period 2013–2014, despite a dramatic increase in hospitalization rate (up to 95,7 per 100,000) in infants.[5]

A recent article in this Journal has highlighted the emerging problems associated with *B. pertussis* infection in infants and strategies to ameliorate this.[1] We report a retrospective chart review of six fatal cases of pertussis in infants recently admitted to three Italian tertiary care pediatric centers. A death attributed to pertussis was confirmed if: *i*) *B. pertussis* was isolated by culture or

**Table 1** Characteristics of the patients at admission.

| Pts | Gestational age (weeks + days) | Age (days) | Underlying conditions | Pertussis immunization | Duration of symptoms at presentation | Referring modality | Clinical features | Ongoing antibiotics |
|---|---|---|---|---|---|---|---|---|
| CM | 26 + 5 | 89 | BPD | No | 3 | Pediatrician | Rhinitis, dry cough, wheezing | CLR |
| PN | 41 + 1 | 51 | No | No | 3 | Parents | Dry cough, tachypnoea | No |
| CA | 40 + 2 | 95 | No | 1st dose | 5 | Pediatrician | Dry cough, tachypnoea, poor feeding | CLR |
| SA | 40 + 3 | 23 | No | No | 7 | General hospital | Fever, dry cough, tachypnoea | No |
| ZV | 38 + 1 | 24 | No | No | 4 | Parents | Dry cough, tachypnoea, poor feeding | No |
| AM | 36 + 0 | 23 | No | No | 2 | Pediatrician | Rhinitis, dry cough, wheezing | No |

BPD, Bronchopulmonary dysplasia; CLR, clarithromycin.

**Table 2** Laboratory data, infective source, radiological findings, intervention in ICU, and outcome.

| Pts | WBC $\times 10^3$/mL (percentage lymphocytes/ neutrophils) at admission | WBC $\times 10^3$/mL (percentage lymphocytes/ neutrophils) at peak | B. pertussis identified by RT-PCR | Infective source | Chest X-Ray pneumonia | Pulmonary artery pressure (mmHg) | Additional intervention in ICU | Time to death from hospital admission (days) | Time to death from ICU admission (days) |
|---|---|---|---|---|---|---|---|---|---|
| CM | 17,4 (31/54) | 109,1 (46/41) | LTA | Unknown | Bilateral | 38 | iNO | 6 | 2 |
| PN | 31,2 (72/17) | 104,1 (43/49) | NPA | Unknown | Bilateral | 32 | | 5 | 1 |
| CA | 71,5 (34/59) | 71,5 (34/59) | NPA, BAL | Unknown | Bilateral | 35 | RBC, PLS | 6 | 1 |
| SA | 83,3 (21/70) | 83,3 (21/70) | NPA,BLD | Brother | Bilateral | Normal | iNO, RBC, PLS | 4 | 1 |
| ZV | 34,1 (61/33) | 65,5 (38/55) | NPA, BLD | Mother | Bilateral | 39 | iNO, RBC, PLS, PLT | 2 | 1 |
| AM | 15,2 (62/24) | 78,7 (26/62) | NPA | Unknown | Bilateral | 60 | iNO | 4 | 2 |

WBC, white blood cells; RT-PCR, real-time polymerase chain reaction; LTA, lung tissue autopsy; NPA, nasopharyngeal aspirate; BAL, bronchoalveolar lavage; BLD, blood; iNO, inhaled Nitric Oxide; ECMO, Extra Corporeal Membrane Oxygenation; RBC, Red Blood Cells; PLS, Plasma; PLT, Platelets.