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Nosocomial infections and community clusters of pertussis in France, 2000-2005

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Pertussis is not a notifiable disease in France. In addition to a paediatric hospital sentinel surveillance system, pertussis epidemiological data have, since 1996, been gathered through the voluntary notification of community clusters by general practitioners, and since 2001 by the statutory notification of nosocomial infection to the relevant local health authority. The local health authority forwards the information to the French National Institute for Surveillance (InVS). The objective of this study was to analyse pertussis data outside the routine paediatric hospital sentinel surveillance system. We gathered all the information concerning healthcare-associated infections and community clusters of pertussis (specific forms, investigation reports, emails etc.) reported to the InVS between 2000 and 2005. The InVS received and analysed 67 reports with a total of 595 cases. Almost half of the reports (n=31) came from hospitals, and healthcare workers were usually first affected. Control measures were put in place in 22 healthcare facilities and the average duration of an outbreak episode was 48 days. Outside healthcare facilities, clusters were reported also from 17 daycare facilities or schools and five workplaces. Among the 595 cases, six deaths occurred in children under seven months of age. Pertussis is still occurring in France and affects those who are not or who are no longer protected by the vaccine. Infection of infants within the household could be prevented if their parents and siblings were immunised. The number and size of pertussis clusters in hospitals could be reduced through immunisation of health staff, and timely and adequate outbreak management.

Background

The high coverage of childhood vaccination for pertussis during the last 40 years has changed pertussis epidemiology in France [1]. The disease now mainly affects infants who are too young to be vaccinated and adolescents and adults who are no longer protected by booster vaccinations [2]. The vaccine schedule in France recommends an immunisation at the age of two, three, and four months, and two booster doses at the age of 15 to 18 months and 11 to 13 years. Since 2004, pertussis vaccination is recommended for health professionals in contact with children too young to have received all three doses of the vaccine (maternity, neonatology and paediatric ward). During pregnancy, siblings and the father should be vaccinated, and the mother should receive the vaccine after delivery. Adults planning a baby are also urged to get vaccinated before [3].

Pertussis is monitored through a paediatric hospital sentinel surveillance system described in detail in Bonmarin *et al.* (2007) [4]. This system does not allow comparison of the French situation with other European countries as it reflects only a very small part of the epidemiology in the community [5]. In addition to this system, general practitioners are asked to report community clusters of pertussis to the local health authority on a voluntary basis since 1996. Following the implementation of mandatory notification of nosocomial infection events in 2001 [6], nosocomial pertussis infections must now be reported.

As there is no pertussis surveillance in the community, we reviewed and described all the epidemiological data regarding pertussis that were forwarded to InVS between 2000 and 2005.

Methods

Each report provided information on either healthcare-associated events (sporadic cases or clusters) or community events (clusters only). These events were documented by emails, investigation reports or specific forms. A pertussis case was defined as a person with a

cough lasting for more than eight days, with a laboratory confirmation (positive culture, PCR or serology) or with a clinical confirmation (cough lasting for more than 14 days with at least one of the following symptoms: whoop, vomiting after paroxysms, apnoeas, cyanosis, lymphocytosis >10,000/mm^3) or with an epidemiological link to a laboratory-confirmed case. A cluster was defined as two or more epidemiologically linked cases (same hospital unit, office, classroom, etc).

For nosocomial infection, defined as a hospital-acquired infection, excluding colonisation, a specific form had to be completed containing a brief description of the healthcare facility, the episode (cluster or sporadic, type of organism, type of units affected), the investigation and the control measures that were implemented. We collected additional information received by email or through investigation reports when available.

Data collection for the community clusters, i.e. outside health facilities, was not standardised. Instead, we gathered the information received by emails and reports. There were no specific criteria for undertaking investigations, but they were carried out by the local or regional health authority in the event of a pertussis-related death or if the community event was prolonged.

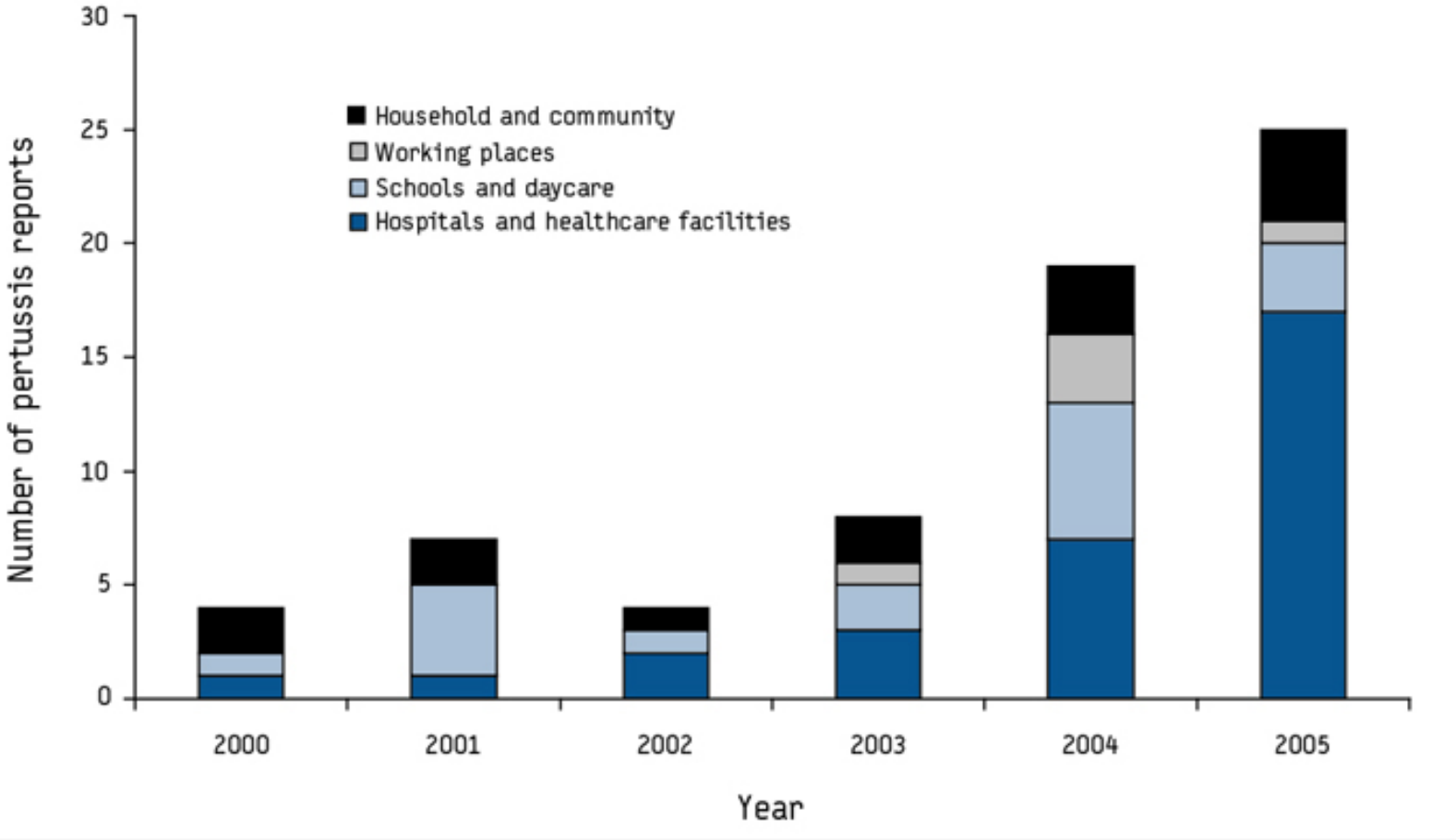
We created a datasheet covering the following variables: type of reporting (mandatory system or not), institutions involved (healthcare facility, schools etc.), number of cases per age group (0-15 years and >15 years), number of laboratory-confirmed cases, vaccination status (defined as correct number of doses according to age), number of deaths, date of onset of first and last case, reporting date, and control measures (type and coverage).
We analysed all reports received between 2000 and 2005. The duration of an event of clustered cases was calculated from the dates of disease onset of the first and last cases. The alert time was defined as the duration between the date of onset of the first case and the date the local authority was informed. Quantitative data were described as the sum and distribution of the variable and qualitative data as frequencies. We did not analyse variables when the values for them were missing in over 50% of the reports.

Results

Between 2000 and 2005, the InVS received and analysed 67 reports with a total of 595 cases. The annual number of reports increased during that period, particularly for healthcare-associated pertussis (Figure).

FIGURE

Annual number of reports on healthcare-associated events (sporadic cases and clusters) and community clusters (including schools, day care facilities and working places) of pertussis reported at national level, France, 2000-2005



The table summarises the results of the reports according to the age of the patients and the setting in which they occurred (healthcare facility or not).

TABLE

Number of cases per age group, laboratory confirmed cases and deaths according to setting, France, 2000-2005

	Cases				Laboratory-confirmed cases	Deaths
	0-15 years	> 15 years	Age unknown	All ages		
Healthcare facilities						
Clustered cases						
Total number of cases	20	228	10	258	100	0
Number of cases per cluster *						
Min	0	1		2	1	
Max	4	90		91	18	
Means	1	9		10	5	
Median	1	3		5	2	
Sporadic cases						
Total number of cases	2	2	0	4	3	0
Outside healthcare facilities						
Total number of cases	175	101	57	333	92	6
Number of cases per cluster *						
Min	1	1		2	0	
Max	26	19		33	11	
Means	7	4		9	3	
Median	4	3		5	1	

* The data indicate the minimum/maximum/mean/median number of patients that occurred in a cluster in a given age group

Healthcare-associated pertussis events

Of the 67 reports, 31 came from healthcare facilities; one from a centre for disabled people, one from a nursing home for the elderly and 29 from hospitals. They accounted for a total of 262 cases 39% of which were laboratory-confirmed. The vaccine status of the cases was missing in most reports, and the pertussis vaccine coverage of the health staff was not known.

The 31 reports covered four sporadic cases and 258 cases belonging to 27 different clusters. The number of cases per cluster varied from two to 91 cases, with a mean of 10 cases and a median of five cases. In 27 of the 31 healthcare-related pertussis events, staff were reported to be infected. In only seven of the 27 clusters the infection originated from patients. In three clusters, patients were secondarily infected. No deaths occurred.

Four reported events did not involve healthcare workers. Three of them affected children hospitalised since birth, infected by relatives or visitors. The source and place of infection for the last one was never found.

Among the 262 healthcare-associated cases, 17 (6%) were under one year of age. The source of infection in five of these infants were the parents, in two further cases it was health workers, and the source in the remaining 10 cases was unknown.

The hospital wards reporting pertussis events among staff or patients most frequently were paediatric (n=6), maternity (n=6) and neonatology wards (n=4). Based on available data from 21 of the 31 healthcare-associated events, the alert time varied from seven to 125 days, with a mean of 48 days and a median of 40 days. The duration of an episode (based on data from 20 of the 27 clusters) ranged from seven to 155 days, with a mean of 48 and a median of 35 days.

Control measures (including at least an attempt of active case finding among exposed individuals) were implemented in 22 of the healthcare facilities. Ten facilities organised large-scale antibiotic prophylaxis for exposed health staff and patients, whatever the degree of exposition, the risk to develop a severe form of pertussis or the risk to pass it to a vulnerable person (who could develop a severe disease). Healthcare workers in six of the 14 affected wards for which vaccination is recommended since 2004 were immunised following an episode of pertussis infections. The vaccine coverage in the one health facility for which such data was available, was 58% (348 of 596 staff members). Exposed patients, if already discharged, were called back for information and prophylaxis in six of the 16 units taking care of very young children and in two of the 15 other units. The highest number of people contacted by a health facility was 440.

Clustered pertussis events in the community

Of the 67 reports, 36 originated outside healthcare facilities. In total, 333 cases were affected, 53% of which were children under the age of 16, 30% were adults, and 17% were of unknown age. Laboratory data were available for 33 of those reports, and a total of 92 cases (33%) were laboratory-confirmed. Twenty of the children (6% of all cases) were infants under one year of age. The source of infection in five of these infants were the parents, in two further cases it was a sibling, and the source in the remaining 13 cases was unknown.

Clusters occurred in eight primary schools, eight secondary schools and one daycare nursery, affecting a total of 110 children and 38 adults. Information about age was available from three of the eight primary schools, where 26 of the 33 cases were over eight years old. In two other schools, it was reported that the affected pupils were in 4th and 5th grade. The information that was provided regarding the immunisation status of the children was incomplete.

Five clusters occurred in various workplaces. A total of 35 cases were reported in these clusters, and the duration of the episode, known for three of the locations, was 43, 52, and 61 days.

Six deaths occurred, all of them among infants. Two deaths occurred in infants younger than three months-old who had laboratory-confirmed infections. The source of infection for one infant was the mother, and unknown for the other. The remaining four deaths occurred in Guyana, a French overseas district: two infants aged two months, one infant aged three months and one aged seven months. They were among 68 cases reported in two different clusters of pertussis that occurred in Guyana, and the proportion of children younger than 16 years-old in those clusters was 66%.

Discussion

This report analyses data on pertussis outside the routine paediatric hospital sentinel surveillance system. They must be interpreted with caution seeing as clusters among the community are not always reported and local and regional health authorities often only informe the InVS when they need assistance. The nosocomial infections surveillance system, put in place in 2001, is also not exhaustive.

There is an increase in reported pertussis infections, mainly from hospitals. This is mostly due to a more efficient surveillance system and increased awareness of the issue among medical staff [7].

The burden of the disease for healthcare facilities is not negligible. Firstly, despite probable under-reporting, this study shows that outbreaks in healthcare facilities are not a rare event (17 reports in 2005). Secondly, even though the duration of the episodes did not take into account the three weeks of active surveillance following the last case detection (to ensure that the episode is under control), our data confirm that pertussis outbreaks are often prolonged (median 35 days). The economic consequences can be serious, as shown by an outbreak with 91 cases reported in our study that led to medical and productivity costs of 46,661 euros [8]. Our study therefore confirms that pertussis infections are time- and resource-consuming.

Control measures, including active case finding, antibiotic therapy or chemoprophyalxis, and immunisation update, as defined in Floret *et al*. [7] are difficult to assess. Nevertheless, the study highlights several points that could be improved:

- Healthcare staff are often the source of infection in the healthcare-associated pertussis clusters. As most of the clusters originated from units targeted by the 2004 recommendations [3], vaccination of health workers could reduce the burden of the disease in such settings.
- The alert is often late. This is probably due to late diagnosis among health staff and to a delay in reporting to the occupational physician. This needs to be improved, especially as health workers do not spontaneously use a mask when they are coughing and thus coninue to spread the disease.
- The control measures, especially large-scale prophylaxis, can lead to adverse effects, as observed recently in Paris where 33% of the people receiving Azithromycin suffered adverse effects. This can also reduce the compliance even with a short regimen [9,10]. The impact of large-scale prophylaxis is not easy to assess. The 2004 recommendations regarding pertussis vaccination of health professionals in contact with infants could help to lower the risk of pertussis clusters among health workers [3] and could minimise the use of antibiotics to control clusters.
- Of the four clusters involving only patients, two clusters originated from visitors. Visitors should therefore report any illness to the health staff and either wear a protective mask if they have a cough, or postpone their visit.

Following this study, a standardised and detailed form for collecting data regarding pertussis clusters in health facilities was made available on the InVS website (http://www.invs.sante.fr/surveillance/coqueluche/default.htm). This form should improve data collection and help to assess control measures.

Outside healthcare facilities, there was no increase in reported pertussis cases. Among the six infant deaths reported, only one could have been prevented by the vaccine. Apart from infections that occurred in Guyana where infants were probably infected by older children, the source of infection (where known) for infants under one year of age, was mainly the parents of the case. This emphasises the need for protection of parents by immunisation, as recommended in the 2004 vaccine strategies [3]. So far, less than 10% of new parents are immunised against pertussis. In the few districts like Guyana where the three dose-coverage is not yet above 90%, the

vaccine coverage among children should be increased to avoid infection of infants by non-vaccinated children. This study, did not allow assessment of the number of cases and deaths among infants that could have been avoided by adequate and prompt control measures (rapid case detection and antibiotics).

The data have also shown the waning protection after vaccination. This waning effect explains the clusters we observed in schools, with cases aged over eight years. We have little information on the vaccine status of the individual cases in this study, but the coverage for the pertussis booster immunisation among teenagers between 11 and 13 years is lower than 50% in France, which may explain the clusters in secondary schools.

Finally, pertussis also affects adults and the long duration of the outbreaks is probably linked to a late diagnosis. The information collected outside healtcare facilities has been described previously [2] and does not add to the current knowledge. Nevertheless, our data is an opportunity to reinforce the message to clinicians in France who are not all aware of the epidemiology of pertussis today. Pertussis should be suspected when an adult or an adolescent has a cough for more than one week, especially at night, and if there is a suspected source of infection. Infants are the main group at risk: control measures must be put in place rapidly to protect them, even for a single case, and household members must be vaccinated.

Conclusion

Despite very good vaccine coverage, pertussis still occurs in France. Outbreaks occur regularly in healthcare facilities, and the number and size of pertussis clusters in hospitals could be reduced through immunisation of health staff and timely and adequate outbreak management. Infants are the main group at risk and should be protected first through the immunisation of household members.

References

1. Baron S, Njamkepo E, Grimprel E, Begue P, Desenclos JC, Drucker J, et al. Epidemiology of pertussis in French hospitals in 1993 and 1994: thirty years after a routine use of vaccination. Pediatric Infectious Disease Journal. 1998;17(5):412-8.
2. Gilberg S, Njamkepo E, Du Châtelet IP, Partouche H, Gueirard P, Ghasarossian C, et al. Evidence of Bordetella pertussis infection in adults presenting with persistent cough in a french area with very high whole-cell vaccine coverage. J Infect Dis. 2002 Aug 1;186(3):415-8. Available from: http://www.journals.uchicago.edu/JID/journal/issues/v186n3/011376/011376.html
3. Avis du Haut Conseil de la santé publique de France - Calendrier vaccinal 2007. Bulletin épidémiologique hebdomadaire 2007 Jul 24;(31-32):269-88 [In French].
4. Bonmarin I, Lévy-Bruhl D, Baron S, Guiso N, Njamkepo E, Caro V, et al. Pertussis surveillance in French hospitals: results from a 10 year period. Euro Surveill 2007;12(1)[Epub ahead of print]. Available from: http://www.eurosurveillance.org/em/v12n01/1201-226.asp
5. Tozzi AE, Pandolfi E, Celentano LP, Massari M, Salmaso S, Ciofi degli Atti ML. Comparison of pertussis surveillance systems in Europe. Vaccine. 2007 Jan 4;25(2):291-7.

6. Décret n° 2001-671 du 26 juillet 2001 relatif à la lutte contre les infections nosocomiales dans les établissements de santé et modifiant le code de la santé publique (deuxième partie : Décrets en Conseil d'Etat), 2001-671, Décret n° 2001-671 du 26 juillet 2001 relatif à la lutte contre les infections nosocomiales dans les établissements de santé et modifiant le code de la santé publique (deuxième partie : Décrets en Conseil d'Etat), (2001).
7. Floret D, Bonmarin I, Deutsch P, Gaudelus J, Grimprel E, Guerin N, et al. [Action to be taken when facing one or more cases of whooping-cough]. [In French]. Arch Pediatr. 2005 Aug;12(8):1281-91.
8. Ward A, Caro J, Bassinet L, Housset B, O'Brien JA, Guiso N. Health and economic consequences of an outbreak of pertussis among healthcare workers in a hospital in France. Infect Control Hosp Epidemiol. 2005 Mar;26(3):288-92.
9. Vanjak D, Delaporte MF, Bonmarin I, Levardon M, Fantin B. [Cases of pertussis among healthcare workers in a maternity ward: management of a health alert]. [In French]. Med Mal Infect. 2006 Mar;36(3):151-6.
10. Giugliani C, Vidal-Trecan G, Traore S, Blanchard H, Spiridon G, Rollot F, et al. Feasibility of azithromycin prophylaxis during a pertussis outbreak among healthcare workers in a university hospital in Paris. Infect Control Hosp Epidemiol. 2006 Jun;27 (6):626-9.

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