SHORT COMMUNICATION

An Outbreak of Pertussis in Sarli Circle of Kurung-kumey District, Arunachal Pradesh, India

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An outbreak of suspected pertussis occurred in Sarli circle of Kurung-kumey district of Arunachal Pradesh in 2007. We investigated this outbreak to confirm the etiology, estimate the magnitude and identify reasons for its occurrence. Twenty-six deaths were reported from the circle. We identified 72 case-patients meeting the case definition of suspected pertussis. The overall attack rate was 30%. None of the under-five children surveyed had received any vaccine in the past. It is essential to establish facilities for conducting routine immunization in Sarli and organizing special campaign in the area to vaccinate all under-fives with full course of vaccines.

Keyword: *Arunachal Pradesh, Children, India, Outbreak, Pertussis.*

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Pertussis, an acute infectious disease caused by *Bordetella pertussis*, remains a major health problem in developing countries with an estimated 294,000 deaths in 2002(1). India reported 26,044 pertussis cases in 2005(1).

In late July 2007, health authorities of Kurung Kumey district of Arunachal Pradesh reported 30 deaths from Sarli circle (administrative sub-division) of the district with respiratory symptoms. Director of Health Services, Arunachal Pradesh constituted a rapid response team consisting of a pediatrician, a microbiologist and an epidemiologist. The team could reach the affected area only after 10 days because of incessant rains. The objectives of outbreak investigation were to (*i*) confirm etiology, (*ii*) estimate the magnitude, (*iii*) identify reasons for its occurrence, and (*iv*) formulate recommendations for preventing future outbreaks.

METHODS

Sarli is situated near Indo-China border under newly created Kurung Kumey district (***Fig.* 1**). There is no road connection to this remote outpost and it is a two days walk from the district headquarters. In 2007, Sarli circle had a population of 2471, residing in 26 villages. The population of these villages ranged from six to 213. All villages are spread out and farthest village is three days walk from Sarli. *Bangro*, *Nishing* and *Sulung* tribes inhabit the area.

We collected the line-list of individuals who died during the outbreak, prepared by sub-center health workers. As it was not possible to visit all villages, we established a 24-hour medical camp at Sarli and sent out messages to all village chiefs to bring the children who suffered or were suffering from respiratory illness. We defined a suspected case of pertussis(2,3) as occurrence of cough lasting at least 2 weeks with at least one of the following: (*i*) paroxysms of coughing (*ii*) inspiratory whooping, and (*iii*) post-tussive vomiting; among under-five children residing in Sarli circle since April 1, 2007. We interviewed parents who brought their children at the camp to ascertain the presence

FIG. 1 *Location of Sarli circle, Arunachal Pradesh, India.*

of symptoms and clinically examined all children. From children meeting the case definition, we collected information about age, sex, place of residence, date of occurrence of paroxysmal cough and immunization status. We also interviewed parents of 18 children who died due to suspected pertussis and who attended the medical camp with their other children, to authenticate the information about actual deaths.

Oral, gingival and throat swabs from case-patients were collected and sent to Regional Medical Research Center, Northeastern Region (ICMR), Dibrugarh for microbiological investigations.

We hypothesized that the outbreak was due to low coverage of pertussis vaccine. In absence of any data regarding vaccination coverage in Sarli circle, vaccination status of all children aged 12-60 months attending the medical camp was assessed. We described the outbreak over time through an epidemic curve, constructed an area map to describe its spatial distribution and calculated attack rates of suspected pertussis by age and sex.

RESULTS

During the 10 days period (6-15 August, 2007), 236 patients (122 under-fives) attended medical camp with different medical ailments. 72 (59%) of 122 under-fives met the case definition of suspected pertussis. There were 30 reported deaths. Of these, 26 were among under-fives, including 15 infants. Overall attack rate of suspected pertussis was 30% (***Table* I**). Median age of case-patients was 26 months (range, 3–60 months).

Besides cough of ≥2-weeks duration, common clinical features of 72 case-patients identified in medical camp were paroxysms of coughing (100%), post-tussive vomiting (100%), inspiratory whooping (1.3%), tearing of frenulum of tongue (4.2%) and sub-conjunctival hemorrhage (1.3%). No pathogen could be isolated from the samples sent for

TABLE I INCIDENCE OF SUSPECTED PERTUSSIS, ARUNACHAL PRADESH, INDIA, 2007

Demographic Characteristics	Population*	No. of case-patients†	No. of deaths‡	Total case-patients	Attack rate (%)
Age group					
0-1 yrs	55	24	15	39	71
2-5 yrs	267	48	11	59	22
Male, No (%)	188 (58.4%)	31(43.0)	13 (50)	44 (44.9)	23§
Tribe					
Bangro	162	38	14	52	32
Nishing	113	23	5	28	25
Sulung	47	11	7	18	38
Overall	322	72	26	98	30

** The population denominators were estimated based on following assumptions: (a) 13% of the total population is under-fives (b) estimated number of infants= [Number of live birth- (No. of live birth X Infant mortality rate)] where No. of live birth = birth rate of the area X total population of the area. Birth rate and Infant mortality rate of the district during 2008 was 22/1000 population and 60/1000 live births respectively (c) sex ratio of the district = 901 females: 1000 males (2001 census); †Suspected case-patients among those attending medical camps; ‡Deaths as reported by local health workers and local administration; §Attack rate in females 40%.*

microbiological investigations. None of the suspected case-patients could undergo *X*-ray evaluation to rule out pneumonia.

Attack rates of suspected pertussis were higher among infants (71%), females (40%) and among *Sulung* tribe (40.4%) (***Table* I**). Cases started occurring from 1st week of April 2007 and reached a peak during July 2007 (***Fig.* 2**). Cases were reported from 12 of the 26 villages (data not shown). None of the 122 under-fives who attended the medical camp had received any primary vaccination.

DISCUSSION

A large outbreak of pertussis with high mortality occurred in a remote district of Arunachal Pradesh during 2007. The outbreak occurred due to low coverage of pertussis vaccine. The administrative coverage of three doses of DPT vaccine in the district in 2007 was <5%(4). As per NFHS-3, the coverage of fully vaccinated children in Arunachal Pradesh was only 28%(5). Difficult terrain, inclement weather and all public health facilities not conducting fixed day immunization sessions could be the reasons for low coverage.

During our investigation, we could not search for case-patients in all villages because of the distances involved and the inclement weather. Magnitude of the outbreak based on number of case-patients who attended medical camp is likely to be an underestimate of actual cases that might have occurred in the area. This could also be the reason for lower attack rates observed during this outbreak, as outbreaks in unvaccinated children are often associated with very high attack rates(6).

Deaths due to pertussis, though rare, can occur due to complications like pneumonia and encephalopathy. The disease could also be fatal among infants, malnourished and unvaccinated children. In the present outbreak, we did not calculate the case-fatality ratio as the information about all pertussis cases in area was not available. However, deaths of 26 under-fives in the area indicates severity of the outbreak as well as inadequate management of the case-patients. A large proportion of death among infants observed in this outbreak is comparable with the disease epidemiology in pre-vaccination era(6).

Absence of laboratory confirmation was the main limitation of our investigation. Non-availability of transport media and long delay in transporting samples to the laboratory in Assam could be the reasons for this. The case definition of cough of two

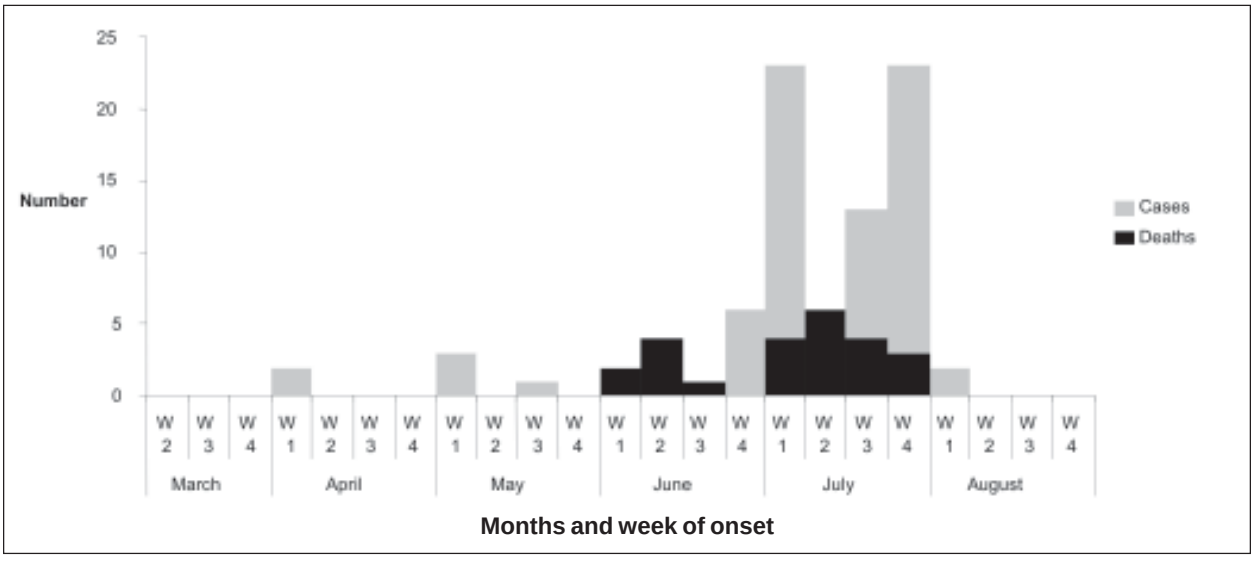

FIG. 2 *Epidemic curve of suspected pertussis cases and deaths by week of onset, Sarli circle, Kurung Kumey district, Arunachal Pradesh, India, 2007.*

WHAT THIS STUDY ADDS?

- An outbreak of suspected pertusis is reported from Kurung-kumey, a remote district of Arunachal Pradesh.

weeks or more has been shown to be both sensitive (84-92%) and specific (63-90%), and has been suggested during outbreak setting(7). We used a more specific case definition by including case-patients having other symptoms like paroxysmal cough, inspiratory whooping and post-tussive vomiting among under-five children, as well as included deaths that occurred among under-fives. Thus, the clinical picture of case-patients and fact that majority of them were among infants, indicate that the outbreak was due to pertussis.

Based on these findings, we recommend establishing facilities for conducting routine immunization in Sarli and organizing special campaign in the area to vaccinate all under-fives with full course of vaccines; educating the community about need for childhood vaccination; and strengthening disease surveillance system in the district and making available viral/bacterial transport media for common epidemic-prone diseases, at the state laboratory.

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REFERENCES

1. World Health Organization. WHO-Vaccine preventable diseases: monitoring system. 2006 global summary: WHO, Geneva, 2006. Available at: http://www.who.int/vaccines-documents/GlobalSummary/GlobalSummary.pdf. Accessed 10 March, 2009.
2. World Health Organization. WHO Recommended Surveillance Standards. Second edition. WHO/CDS/CSR/ISR/99.2 Available at: http://www.who.int/csr/resources/publications/surveillance/whocdscsrisr992.pdf. Accessed 10 March, 2009.
3. Centers for Disease Control and Prevention. Guidelines for the Control of Pertussis Outbreaks. Atlanta: Centers for Disease Control and Prevention: 2000.
4. District Health Action Plan, 2007; Koloriang, Kurung Kumey district: Office of District Medical Officer; 2007.
5. International Institute for Population Studies. National Family Health Survey (NFHS-3) 2005-2006, India. Mumbai: IIPS; 2007.
6. Cherry JD. Pertussis in the preantibiotic and prevaccine era, with emphasis on adult pertussis. Clin Infect Dis 1999; 28(Suppl 2): S107-111.
7. Patriarca PA, Biellik RJ, Sanden G, Burstyn DG, Mitchell PD, Silverman PR, *et al.* Sensitivity and specificity of clinical case definitions for pertussis. Am J Public Health 1988; 78: 833-836.