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Original article

Pertussis in the central-west region of Brazil: one decade study

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ABSTRACT

In many parts of the world, numerous outbreaks of pertussis have been described despite high vaccination coverage. In this article we report the epidemiological characteristics of pertussis in Brazil using a Surveillance Worksheet. Secondary data of pertussis case investigations reported from January 1999 to December 2008 recorded in the Information System for Notifiable Diseases (SINAN) and the Central Laboratory for Public Health (LACEN-MS) were utilized. The total of 561 suspected cases were reported and 238 (42.4%) of these were confirmed, mainly in children under six months (61.8%) and with incomplete immunization (56.3%). Two outbreaks were detected. Mortality rate ranged from 2.56% to 11.11%. The occurrence of outbreaks and the poor performance of cultures for confirming diagnosis are problems which need to be addressed. High vaccination coverage is certainly a good strategy to reduce the number of cases and to reduce the impact of the disease in children younger than six months.

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Introduction

Pertussis is an acute infection of the respiratory tract with a growing number of people at risk of contracting the disease in many parts of the world.¹ Even after the decrease in prevalence following the advent of the Diphtheria, Tetanus, Pertussis (DTP) vaccine, pertussis has remained a significant public health problem. Globally, an estimated overall

annual incidence of 50 million cases, 95% of them in developing countries,¹ and approximately 300,000 deaths have been caused by this disease, with a mortality rate of around 1% in developing countries and 0.04% in developed countries.²

In many parts of the world, numerous outbreaks of pertussis have been described despite high vaccination coverage.^{3–5} In this article, we report the epidemiological characteristics of pertussis in the state of Mato Grosso do Sul, Brazil.

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Materials and methods

This descriptive, cross-sectional and retrospective study included all Pertussis Surveillance Worksheet used from January 1999 to December 2008 to report pertussis suspected cases to the Health Department of the State of Mato Grosso do Sul, Brazil. The data were collected from worksheets after local institutional review board approval.

The Brazilian vaccination scheme against *Bordetella pertussis* is composed by three doses at two, four and six months with the first booster at 6 to 12 months after the third dose and second booster at four to six years.⁶

It was used the terms established by the Brazilian Ministry of Health⁶ for the case definition. Suspected case – every individual presenting dry cough for 14 days or more associated with one or more of the following symptoms: paroxysmal cough – sudden uncontrollable cough, with 5–10 quick and short coughs in a single exhalation; inspiratory whoop, post-cough vomiting; or having a history of contact with a pertussis case confirmed by clinical criteria.

Confirmed case: (a) by laboratorial criteria: isolation of *Bordetella pertussis*; (b) by epidemiological criteria: any suspected case which has had contact with a pertussis confirmed case by laboratory testing, between the beginning of the catarrhal period up to three weeks after onset of the disease paroxysmal period; (c) by clinical criteria: every suspected case of pertussis whose hemogram shows leukocytosis (over 20,000 leukocytes/mm³) and absolute lymphocytosis (over 10,000 leukocytes/mm³) and negative or not performed culture; and absence of epidemiological linkage; and no confirmation of another etiology.

Excluded case: any suspected case that does not conform to any of the previously described criteria for confirmed cases.

The incidence rate was calculated based on the population estimated by the Brazilian Institute of Geography and Statistics (IBGE) during the study period. Statistical analyses were performed using the program Epi Info 3.5.1.

This study was approved by the Federal University of Mato Grosso do Sul Research Ethics Committee, under protocol no. 1147.

Results

During the 10 years of the study period, the average of pertussis incidence in Mato Grosso do Sul was 1.07 cases/100,000 population and the average of vaccine coverage was 81.48%. The vaccine used in Brazil is the whole-cell pertussis vaccine (WCVs).

Of the 561 pertussis suspected cases that were reported to the Health Department of the State of Mato Grosso do Sul – Brazil, 238 (42.4%) were confirmed and 281 (50.1%) were excluded. No classification was defined in the worksheet of 42 (7.5%) cases and these cases were not considered as confirmed or excluded.

Considering the confirmed cases, 132 (55.5%) were female and 106 (44.5%) were male. The highest incidence of cases (61.8%) occurred between zero to six months of age (Table 1).

Among infected children, contagion occurred in 134 (56.3%) cases before the patient had reached the age recommended

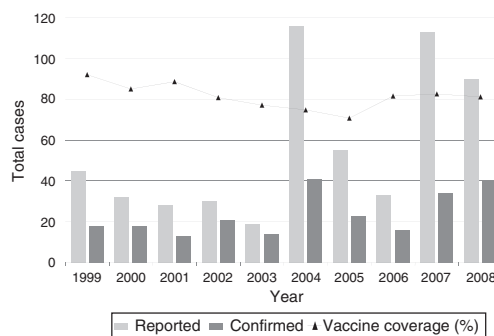


Fig. 1 – Reported and confirmed pertussis cases and percentage of vaccine coverage, Mato Grosso do Sul, 1999–2008.

for the initiation of the vaccination scheme or showed incomplete immunization (up to two doses). Fig. 1 demonstrates the distribution of reported and confirmed pertussis cases during the study period and the percentage of vaccine coverage in the state.

Regarding the diagnostic confirmation criteria, 7.6% (18/238) of the pertussis cases were confirmed by laboratory testing (positive culture), 22.7% ($n = 54/238$) by epidemiologic linkage (suggestive clinical profile and contact with confirmed case), 68.1% (162/238) by clinical criteria (suggestive clinical profile associated with leukocytosis and lymphocytosis) and the confirmation criteria was not included in the Pertussis Surveillance Worksheet of 1.7% ($n = 4/238$) cases. Nasopharyngeal secretion culture was collected of 61 confirmed cases patients and 18 (29.5%) of these cultures were positive.

Two pertussis outbreaks were observed in the state in 2004 and 2007. Fifty cases were reported during the first outbreak and 11 (22%) were confirmed while 68 cases were reported during the second outbreak and 12 (17%) cases were confirmed. No pertussis-related deaths occurred during the outbreaks.

Five deaths occurred among the confirmed cases and patients age ranged from 18 days to three years. The case fatality ratio over the whole 10-year period was 4.9% (4/82) in children up to two months and 0.9% (1/108) in children older than two months. Only one child was diagnosed by positive *Bordetella pertussis* culture; the others were confirmed by clinical criteria. The highest mortality rate of 11.11% was recorded in 2000. In the years 1999, 2002 and 2008, mortality rates were 5.56%, 4.46% and 2.56%, respectively.

Discussion

Bordetella pertussis infection remains a serious problem to children not immunized or with incomplete immunization. In Porto Alegre, 54% of children with pertussis had incomplete vaccination schedule with only 0–2 vaccine doses having been administered.⁷ The infection in these population suggests that adults who have lost their vaccinal immunity can be important sources of infection.^{3,6}

The higher incidence of pertussis in children up to six months has been also described by other Brazilian authors.^{7,8} In Recife,⁸ 72.5% of pertussis cases were found to occur in

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