CPD Article

Pertussis – An update for general practice

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Abstract

Although there has been a global decline in the incidence of pertussis in the past four decades, the incidence has increased in developed countries, particularly in preteens, adolescents and adults. These groups provide a major reservoir of the disease for vulnerable unimmunised or incompletely immunised infants. This trend has not yet been documented in South Africa.

In young infants, the diagnosis is made on the basis of clinical features. Older age groups do not usually show the typical clinical picture, leading to misdiagnosis and underreporting. The culture of *Bordetella pertussis* from the posterior nasopharynx remains the gold standard for diagnosis but laboratory diagnosis is complex and unavailable in most settings.

Erythromycin, instituted early in the course of illness, remains the treatment of choice although there is now good evidence for the use of other macrolides, particularly in the neonate. Immunisation of young infants remains the best preventative method against the disease. Due to the re-emergence of the disease in older age groups, developed countries are recommending booster vaccines in adolescents.

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Introduction

Pertussis is an acute, highly contagious respiratory disease. The causative organism, *Bordetella pertussis* is a Gram-negative coccobacillus with many virulence factors notable for their roles in adhesion of the bacteria to ciliated respiratory epithelium and toxic properties. The *pertussis* toxin and tracheal cytotoxin play a central role in disrupting the normal functions of ciliated epithelial cells. The World Health Organization (WHO) estimated three years ago that 1.4 million deaths in the under-fives were due to vaccine-preventable diseases and pertussis accounted for 20% of these.[1] Two-thirds of all global cases are from developing countries. In a five year period (1998 to 2002), approximately 28 cases were formally reported in South Africa, 83% of these in children under a year of age.[2] The true incidence is probably higher but poorly reflected due to underreporting. Although predominantly a childhood disease, it accounts for 7% of adult cough illnesses annually in some countries. [3,4] In the past decade, in developed countries, a rising incidence and a shift in age distribution of the disease, has been noted, with studies indicating that 12 to 32% of cases of cough persisting for more than two weeks are due to pertussis in adults and adolescents and cases of patients older than 15 years accounting for 62% of pertussis notifications in one study. [4,5] Accurate information on adolescent and adult pertussis in South Africa is lacking.

Diagnosing Pertussis

Diagnosis is essentially clinical. Laboratory confirmation is not routinely carried out in South Africa although some tertiary institutions

Table I: Clinical diagnosis of pertussis

Classic pertussis (older infants, young children)	Neonate and young infant (< 3months)	Adolescent and adults
Catarrhal(1 to 2 weeks) stage with non-specific flu-like symptoms, High communicability **Paroxysmal** (2 to 6 weeks) stage; hallmark of the disease, dry irritative paroxysmal cough associated with inspiratory whoop, sometimes posttussive vomiting. **Convalescent** stage; cough paroxysms diminish in number, severity and duration over several weeks.	Catarrhal phase only a few days, usually unnoticed. Cough may be absent. Typical whoop not a feature More likely to present with apnoeic spells.	Generally don't show distinct stages. Mostly prolonged cough '9' more than two weeks) without the typical whoop.

Table II: Laboratory diagnosis of Pertussis (11,12,13)

Culture	Direct Fluorescent antibody (DFA) test	Polymerase chain reaction (PCR)	Serology PT IgG and IgA
Positivity highest in first 2 weeks of illness. Special medium required for specimen transportation Results in +/- 7 days	Low sensitivity (65%) but highly specific (99%) Results in 24-48 hours Recommended for use with culture, not alone	Diagnostic yield almost fivefold, in comparison with culture. Results in 24-48hrs.	Particularly useful in: adolescents and adults, late stages of disease Less sensitive and specific in young children > 2fold titre rise between acute and convalescent phase sera or single high values in adolescents and adults.

PT= Pertussis Toxin

have the means to do so.

Following an incubation period ranging from 3 to 12 days, unimmunised or incompletely immunised older infants and young children generally present with the classic three stage picture although an estimated 25 to 30% present with mild or atypical features and are misdiagnosed. [6] Symptoms can last up to six weeks.

The clinical features of pertussis are shown in Table I.

Standard case definitions recommended by the WHO and Centers for Disease Control (CDC), incorporate:

1. Clinical definition: cough lasting for more than 14 days with other associated symptoms like posttussive vomiting or whoop.
2. Laboratory definition: positive culture or polymerase chain reaction (PCR) or positive paired serology. (See Table II)

These definitions make allowance for a clinical diagnosis without laboratory confirmation as well as a true laboratory-confirmed case, both of which are notifiable.[7]

Lymphocytosis on full blood count is a valuable diagnostic adjunct in the setting of suggestive clinical symptoms.

Suitable posterior nasopharyngeal specimen for laboratory analysis can be obtained either by nasopharyngeal swab (NPS) or nasopharyngeal aspiration (NPA),the latter considered to obtain a better specimen.

Differential diagnosis and complications

Important conditions that need to be differentiated from pertussis include:

- Tuberculosis
- Infection with viruses such as adenovirus and other respiratory viruses
- Mycoplasma, Chlamydia trachomatis and pneumoniae infections

Respiratory complications include; secondary bacterial pneumonia, atelectasis, interstitial and subcutaneous emphysema due to alveolar rupture associated with forceful coughing paroxysms. Convulsions, coma and encephalopathy due to cerebral hypoxaemia can complicate pertussis, although this is rare. Other less serious complications include otitis media and subconjuctival haemorrhages.

Treatment and Prophylaxis

Most patients need only ambulatory outpatient management with the recommended antibiotics, antitussives for symptom relief and general supportive management The usefulness of steroids has not been established in controlled studies. Neonates and young infants are most at risk of complicated disease and should be referred for management at secondary or tertiary medical centres.

Macrolide antibiotics reduce the duration and severity of symptoms and lessen the period of communicability.[8] Close contacts at risk of acquiring severe disease,

Table III: Pertussis treatment and Chemoprophylaxis. Adapted from the CDC Recommendations. (8)

Erythromycin for 14 days	Clarithromycin for 7 days	Azithromycin for 5 days	Sulfamethoxazole-Trimethoprim
For infants >1month and children: 40-50mg/kg/day in 4 divided doses. For adults: 2g/day in 4 divided doses	15mg/kg/day in 2 divided doses 1g/day in 2 divided doses. Not for pregnant women	Preferred for infants <1month at 10mg/kg/day >1month: 10mg/kg/d on day1 then 5mg/kg/day for 4 days For adults: 500mg/d 1 day then 250mg/d 4 days	For patients and contacts unable to use Macrolides. Not in pregnant or breastfeeding women or infants <2months.

should receive post-exposure prophylaxis with the same antibiotics as for active disease to prevent secondary disease, which is estimated to occur in 80% of household contacts.[3] High-risk contacts include:

- Infants
- Persons with immunodeficiencies
- Persons with medical conditions such as chronic lung disease, cystic fibrosis.

On the basis of a literature review, the existing scientific evidence and a theoretical rationale, the CDC currently recommends agents listed in Table III.

Prevention

The immunisation of young infants protects more than 80% of them from clinical disease.[9] Both the whole-cell(DTwP) and acellular(DTaP) vaccines are available in combination with diphtheria and tetanus toxoid. DTaP has significantly less local and systemic adverse events but is more costly than DTwP. Frequent local adverse reactions associated with DTwP include erythema and swelling at injection site. Mild systemic reactions of fever, drowsiness and prolonged crying have also been noted. Severe events such as convulsions, hypotonic hypo-responsive episodes have been noted in association with the use of DTwP although they are extremely rare and the vaccine's direct causality in these events has not been proven beyond doubt. The perceived advantage of the DTaP which contains purified antigenic components of *B. pertussis* and thus substantially less endotoxin, is that it is less frequently associated with local and systemic events and has not been linked to severe events.[9] There is no clinically significant immunological interference between DTaP and other vaccines that are administered simultaneously but at different sites, except for reduced immunogenicity of the Haemophilus influenzae b vaccine when used in combination with some DTaP vaccines.

Although available and in use in some settings in South Africa, DTaP has not yet been incorporated into the national immunisation programme.

Childhood vaccine-induced immunity is estimated to last up to12 years. Some developed countries have already incorporated preschool and adolescent boosters into their programmes. Adolescent and adult immunisation have been found to be safe and to confer as much as 92% protectivity to the recipients.[10] This practice is not recommended or practiced in South Africa where the extent of the problem is unclear. The emphasis is mainly on maintaining good childhood immunisation coverage which remains the best preventative method so far.

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