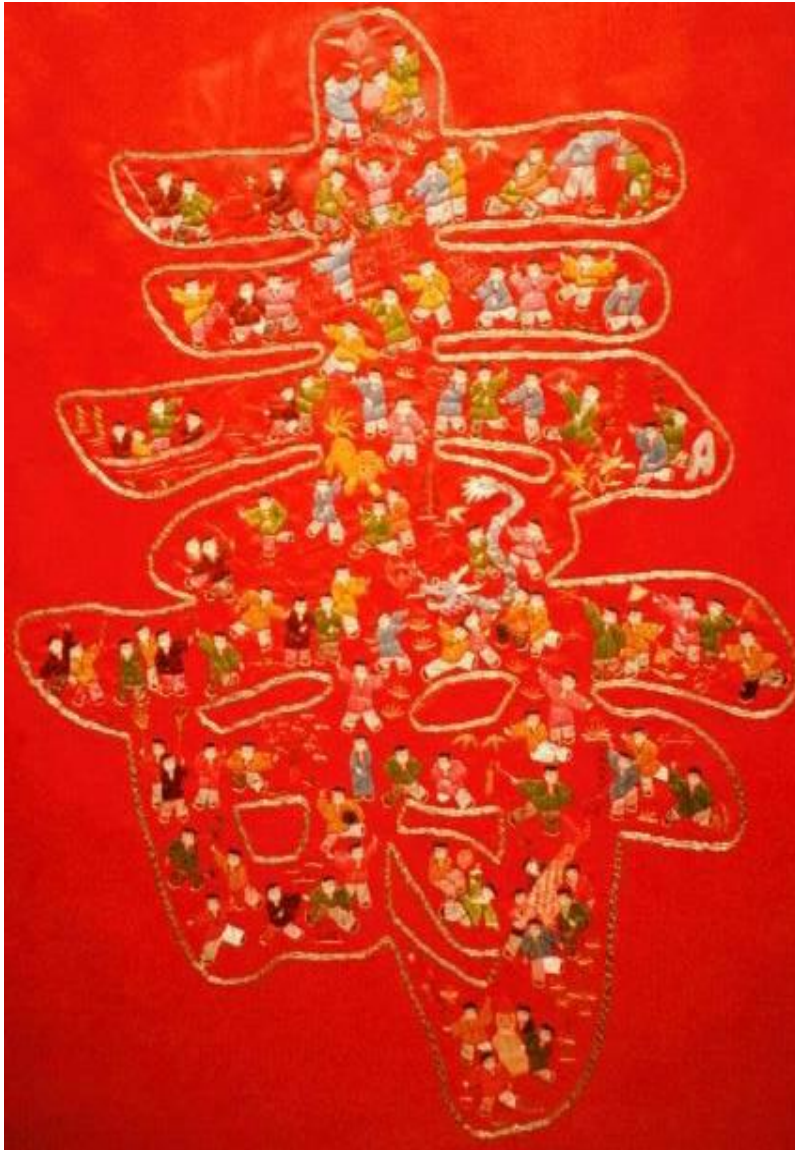




Prof Dr NAJLAA FAWZI

PERTUSSIS (WHOOPING COUGH)

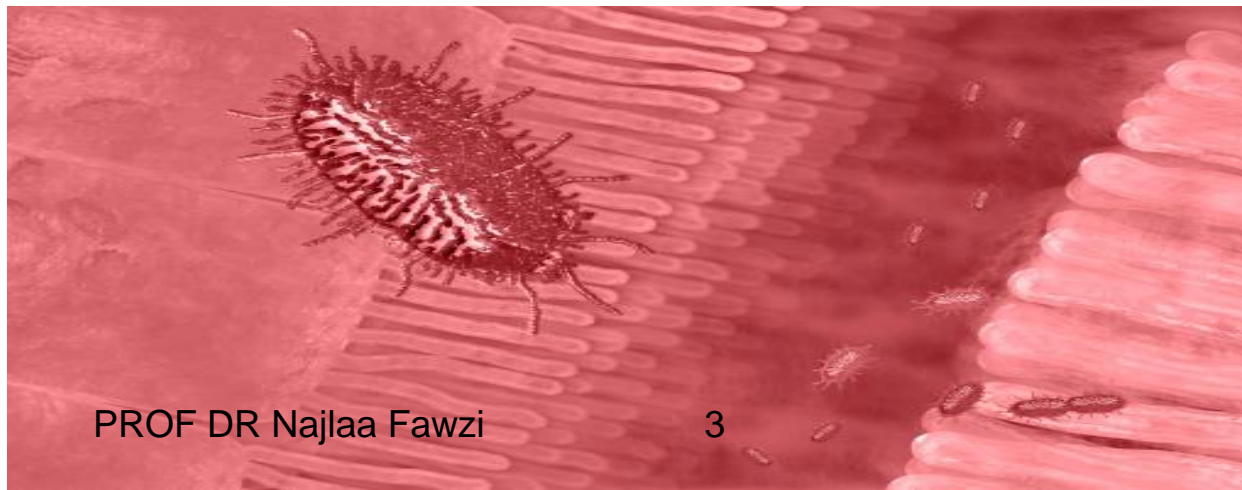


- **Pertussis = Latin “intense cough”**
- **BaiReKe = Chinese “100 day cough”**
- **Translation: an intense cough that lasts a long time**

Pertussis is acute highly infectious disease of children.

Causative Organism

Bordetella Pertussis (Pertussis bacillus)



Reservoir of Infection

Man, cases whether typical, or mild not showing the paroxysms, [No Carriers].

The organisms find exit in respiratory discharges.

Modes of Transmission

- 1. Direct droplet infection; direct case – contact infection is the main mode of spread.**
- 2. Air borne infection, with in short distance of the case.**
- 3. Using soiled articles & fomites.**

In vaccinated populations, bacteria are frequently brought home by an older sibling.

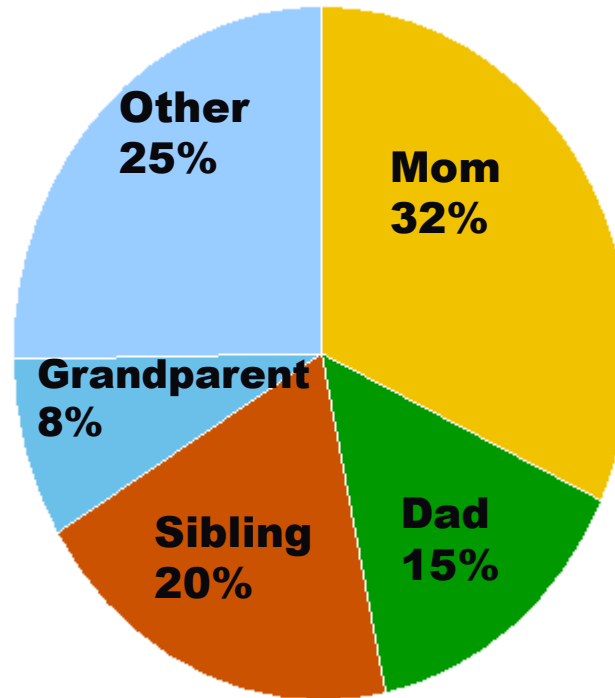
When the source of whooping cough was identified, mothers were responsible for 30-40% of infant infections.

75% Of Suspected Sources For Infant Pertussis Cases Were Family Members

20% Other Adults



33% Other Children



47% Mom or Dad



Source of pertussis for infants according to age ...

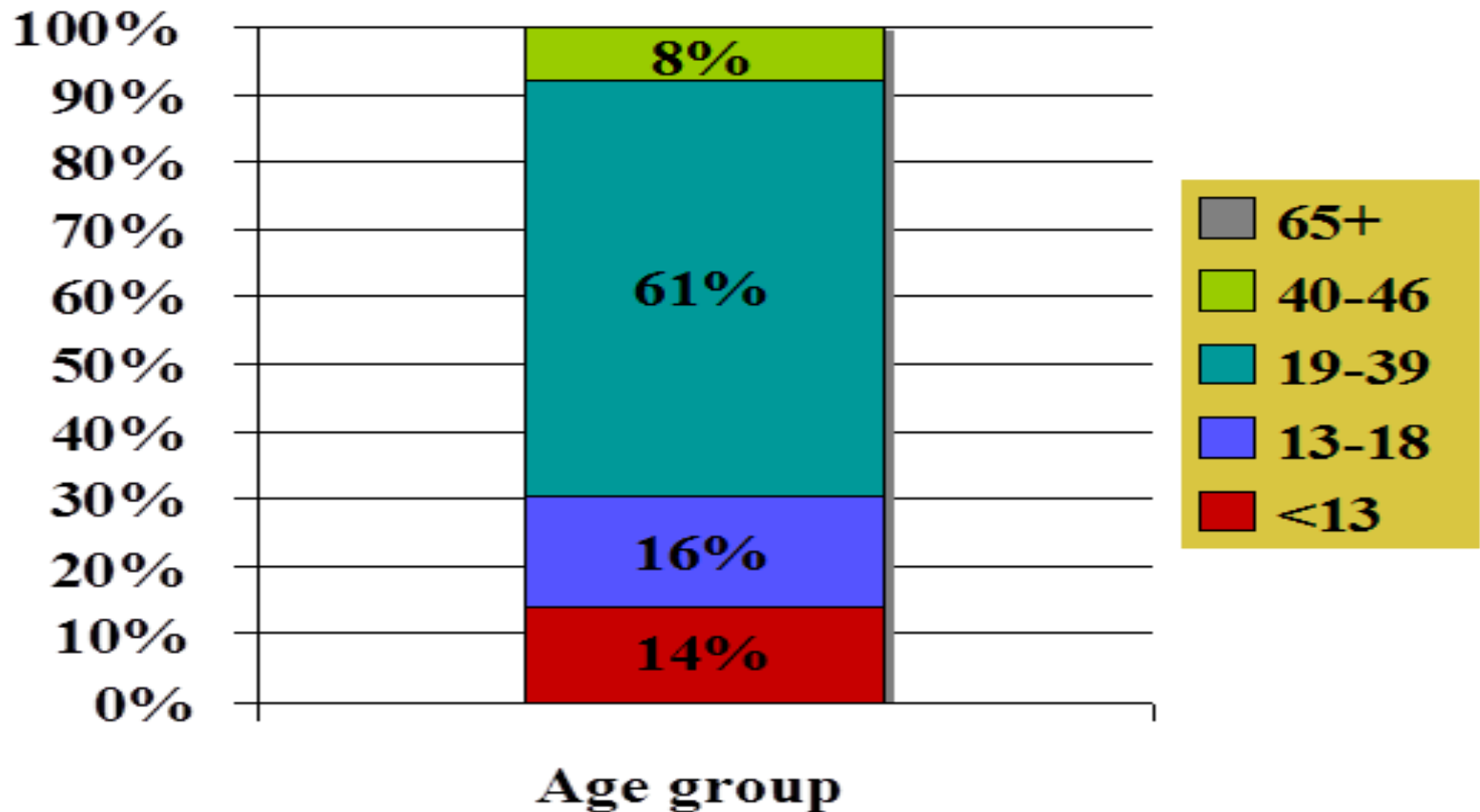
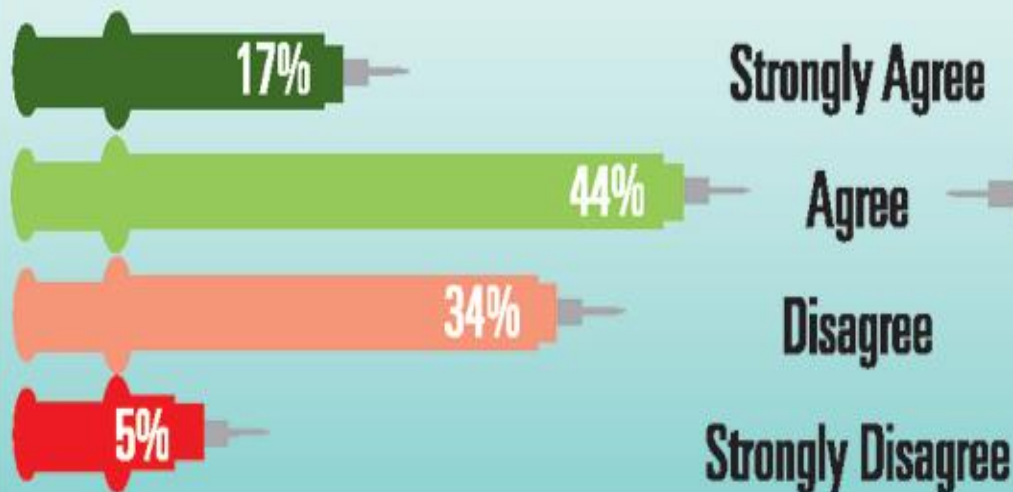


Figure 1. Opinions about Protecting Babies by Vaccinating Adults against Pertussis



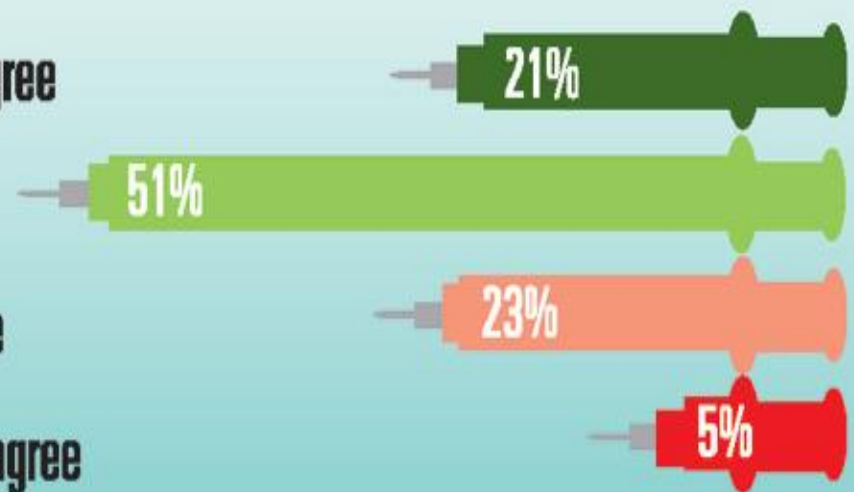
AT HOME :

Parents should make sure all adults receive the pertussis vaccine before visiting a newborn baby at home



AT THE HOSPITAL :

Parents have the right to insist visitors receive pertussis vaccine before coming to see a newborn baby in the hospital



Incubation period

Average 9-10days (range 6-20days)

Infectivity

- **Untreated Cases:** from onset of disease, and for 3 weeks after onset of characteristic paroxysmal coughing, infectivity is highest during the early catarrhal stage.

- **Treated Cases:** specific antibiotics therapy eliminates infection in about 7 days after starting treatment.

SUSPECTED CASE DEFINITION FOR CASE FINDING WHO

A suspected case is a person of any age with a cough lasting ≥ 2 weeks, or of any duration in an infant or any person in an outbreak setting, without a more likely diagnosis and with at least one of the following symptoms, based on observation or parental report:

- ✓ **paroxysms (fits) of coughing**
- ✓ **inspiratory whooping**
- ✓ **post-tussive vomiting, or vomiting without other apparent cause**
- ✓ **apnea (only in < 1 year of age)**

OR

➤ **clinician suspicion of pertussis.**

Note that pertussis in immunized or previously infected individuals can present without the classic signs of pertussis, and therefore might not be captured by the above case definition.

Clinical Picture

Pertussis is a local disease of respiratory tract.

✘ In apparent [atypical] Cases: do not show the typical paroxysms, and so are difficult to diagnose clinically, they are met with partly immune children & young adults.

🦠 **Typical untreated Cases:** they pass through the following stages:

🕒 **Catarrhal stage: 1-2 weeks, insidious onset, with slight or no fever; upper respiratory catarrh; rhinitis, sneezing, dry irritating cough & lacrimation. This is the stage of maximum infectivity**

Disease Progression:

Weeks

0 1 2 3 4 5 6 7 8 9 10 11 12

Stage 1 Catarrhal Stage

May last 1 to 2 weeks

- Symptoms: runny nose, low-grade fever, mild, occasional cough - Highly contagious

Stage 2 - Paroxysmal Stage

Lasts from 1-6 weeks; may extend to 10 weeks

Symptoms: fits of numerous, rapid coughs followed by "whoop" sound; vomiting and exhaustion after coughing fits (called paroxysms)

Stage 3 - Convalescent Stage

Lasts about 2-3 weeks; susceptible to other respiratory infections for many

Recovery is gradual. Coughing lessens but fits of coughing may return.

- **Paroxysmal stage: 2-4 weeks, paroxysmal attacks of spasmodic coughing.**
- **Can be more frequent at night**
- **Each attack followed by characteristic whoop with expectoration of tenacious clear mucus & vomiting.**

Maximum complications occur in this stage.

● **Convalescence:** 1-6 weeks, begins when whooping & vomiting stop, though coughing may persist for some weeks there after.

Treated Cases Chemotherapy eliminates infection and the case progressively improves in short time.

Period Of Communicability Of Pertussis

Whooping cough is highly infectious, spreading to 70 to 100% of susceptible household contacts and 50 to 80% of susceptible school contacts.

Persons with pertussis are most infectious during the catarrhal period and the first 2 weeks after cough onset (i.e., approximately 21 days).

Complications

Major complications of pertussis in infants and children are of 3 types: **pulmonary**, **neurologic** (acute pertussis encephalopathy), and **nutritional**

In develop settings, complications of pertussis such as bronchopneumonia occur in about 6% of infected children.

**PERTUSSIS
(WHOOPIING COUGH)**



OF PERTUSSIS-ASSOCIATED
DEATHS HAVE BEEN AMONG

INFANTS

LESS THAN ONE YEAR OLD.

Learn more about the diseases
that can be prevented by vaccines at

vaccinateyourbaby.org/eBook.pdf

ECBT
every child by two

In infants —complications from whooping cough are more severe and may include:

- ✓ **Pneumonia**
- ✓ **Slowed or stopped breathing**
- ✓ **Dehydration or weight loss due to feeding difficulties**
- ✓ **Seizures**
- ✓ **Brain damage**

Because infants and toddlers are at greatest risk of complications from whooping cough, they're more likely to need treatment in a hospital. Complications can be life-threatening for infants younger than 6 months old.



INFANT BEING TREATED FOR SEVERE PERTUSSIS INFECTION. SHE RECEIVED EXTRACORPOREAL MEMBRANE OXYGENATION (ECMO), A PROCEDURE THAT CAN TAKE OVER THE WORK OF THE LUNGS AND HEART. SHE ALSO RECEIVED DIALYSIS TO HELP HER KIDNEYS KEEP WORKING.

Possible complications of pertussis in older children and adults

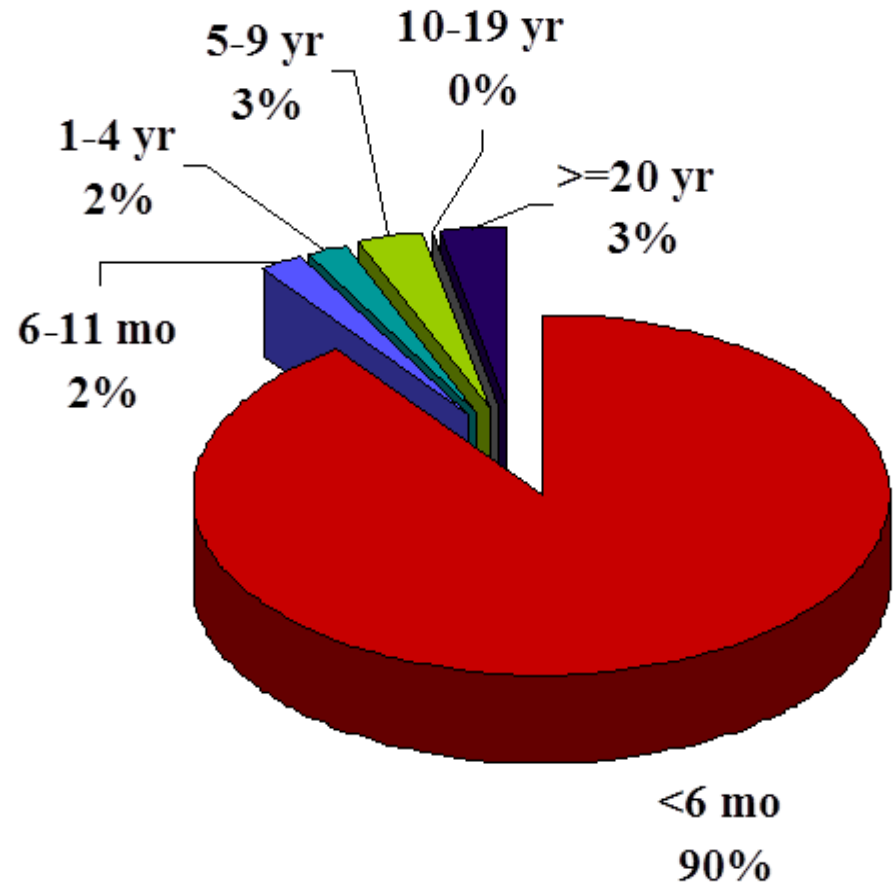
Complications in older children and adults are usually much less serious than those in infants and young children.

May include:

- **Nose bleeds and burst blood vessels in the white of the eye from intense bouts of coughing**
- **Bruised ribs as a result of intense coughing**
- **Hernia due to intense coughing**
- **A swollen face**
- **Ulcers on the tongue and mouth**
- **Ear infections such as otitis media**

Pertussis Mortality

- **Death from pertussis occurs rarely but young infants <6 months of age are most at risk**
- **Risk factors for mortality**
 - **Female sex**
 - **BW <2500 grams**
 - **Apgar score <8**
 - **Mother with <12 years of education**



Whooping cough kills about 250,000 children worldwide every year and many surviving children are left with brain damage.



Severe unmanaged cases, especially in infants & young children, are exposed to high case fatality, caused mainly by bronchopneumonia, enteritis, and cerebral complications, the majority of deaths reported below three years of age.

In developed countries , lethality of pertussis is very low (<1/ 1000)

In developing countries, the average CFR for pertussis has been estimated at almost 4% in infants and at 1% in children aged 1–4 years.



Diagnosis

➡ **Clinical:** based on finding the typical paroxysmal attacks of coughing, ending in high pitched inspiratory whoop.

➤ **Laboratory:**

Diagnosis of pertussis should only be attempted in patients with symptoms compatible with pertussis, such as prolonged coughing with paroxysms and/or whooping or choking.

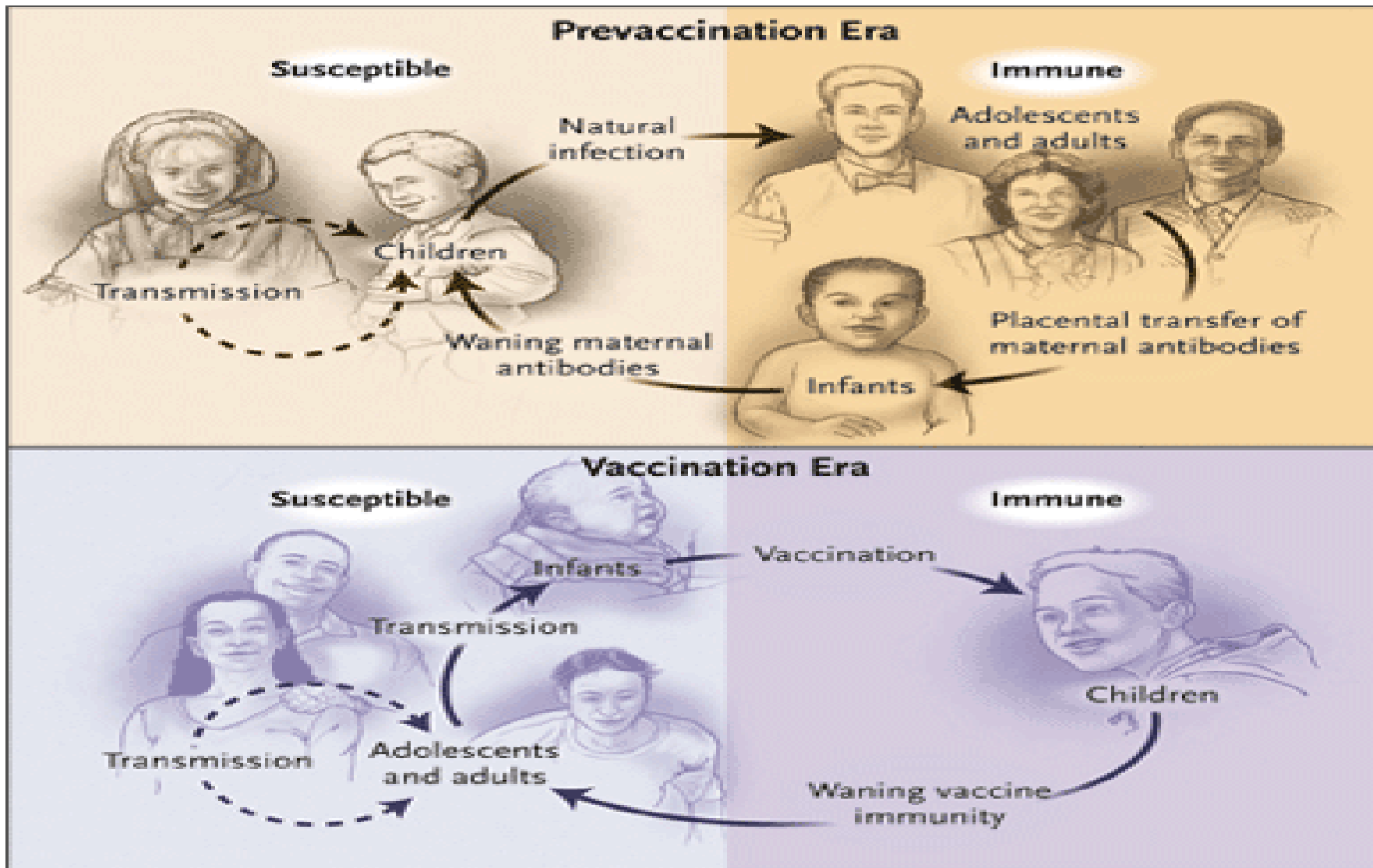
In infants, older vaccinated children, adolescents and adults the clinical course may not be typical, and prolonged coughing may be the only symptom.

In these cases, diagnosis of pertussis requires laboratory methods for confirmation

Diagnosis is most accurately made by PCR (polymerase chain reaction) testing in a pathology laboratory of mucus from the nose and throat, combined with clinical history, although blood tests are still used in some places.

Susceptibility

- 1. Begins at birth, no maternally acquired immunity ??**
- 2. The highest around school age [5-7] years, and almost all become immune by the age of 15 years.**
- 3. Sex ;incidence and fatality being more in females than in males.**



4-The whooping cough vaccine received as a child in time wears off. This leaves most teenagers and adults susceptible to the infection during an outbreak — and there continue to be regular outbreaks.

In recent years, many cases of whooping cough have been recognized in adults and adolescents due to waning immunity. These individuals are a significant source for the transmission of infection to infants.

Pertussis: who is at risk?

Pregnant women



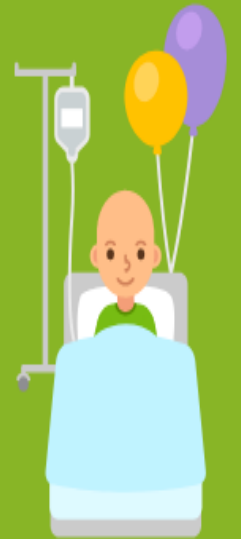
Babies



Close contact to a known case



Weakened immune system



Waning immunity



The elderly



**Pertussis remains endemic worldwide
and tends to be a cyclic disease.
Epidemics usually occur every 3 to 4 years.**

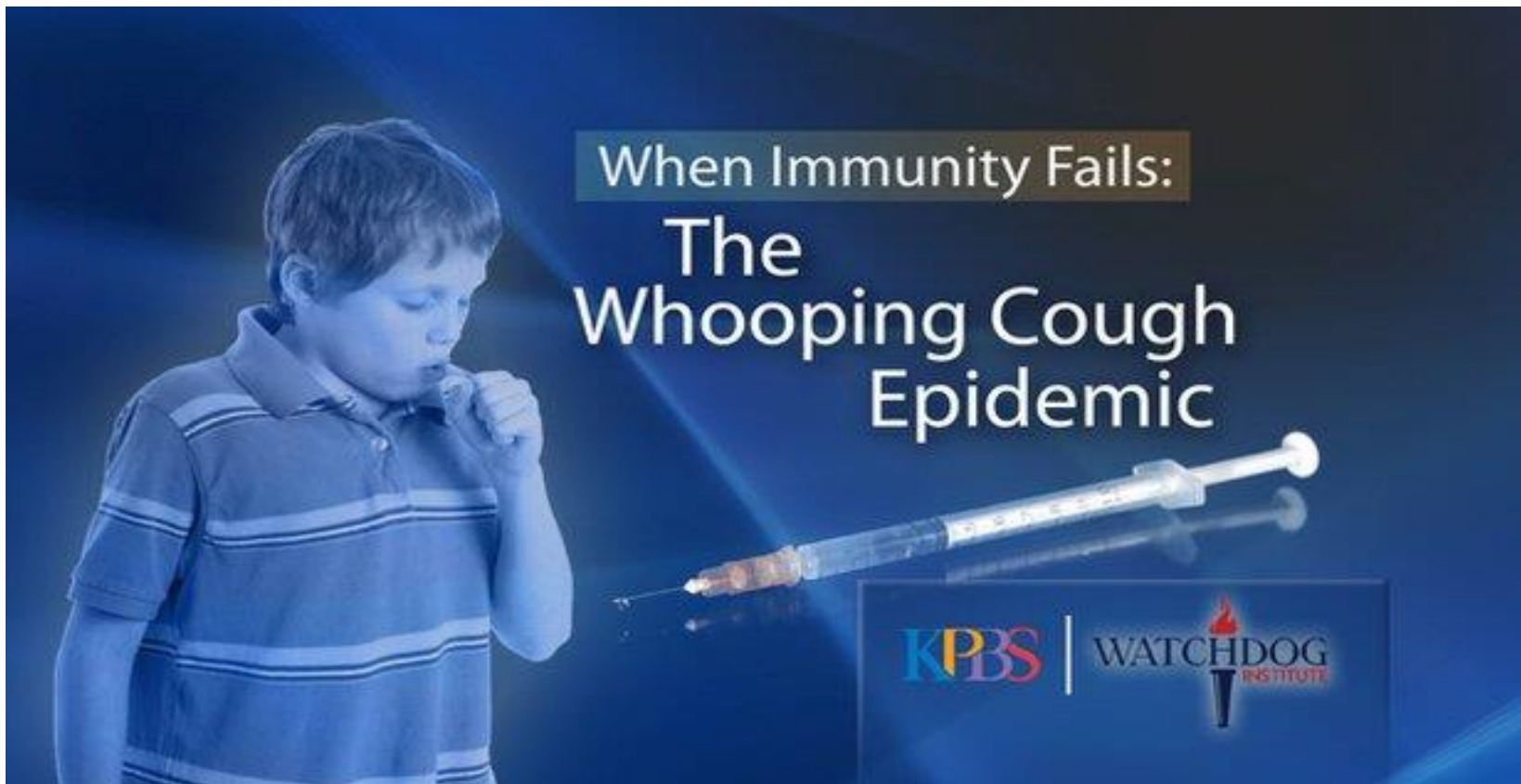
0.2/10.000 cases 812 in Iraq 2019

Reported NNDSS pertussis cases: 1922-2018



SOURCE: CDC, National Notifiable Diseases Surveillance System and 1922-1949, passive reports to the Public Health Service

Reasons for rising incidence



Reasons for rising incidence

- **Waning of vaccine- and infection-induced immunity (waning after 5-10 years)**
 - **~ 15 years after active disease**
 - **~ 5-10 years after vaccination**
- **Increased recognition and reporting**
- **Availability of better diagnostic tests**
- **? Use of less potent pertussis vaccines**
- **? Emergence of vaccine-resistant strains**

PREVENTION and CONTROL



Prevention

General preventive measures of respiratory [droplet] infection must be followed, but specific prevention is the effective measures by immunization [active & seroprophylaxis], and chemoprophylaxis.

▶ **Active Immunization:**

By Pertussis vaccine.

Immunity against pertussis

The aim of pertussis vaccination is to reduce risk of severe disease in infants and young children. Two types of pertussis vaccines are available: whole cell vaccines based on killed *B. pertussis* organisms and acellular pertussis vaccines based on one or several highly purified pertussis antigens.

WHO recommends providing all infants with three doses of pertussis vaccine in infancy, with one booster dose in children 1–6 years of age

Immunity against pertussis

- ❑ **Vaccination against pertussis does not give life-long immunity**
- ❑ **Individuals who have had pertussis can become re-infected and spread infection to others**
- ❑ **This spread of infection is important particularly in children too young to be vaccinated**



The wP vaccines are produced from cultures of selected *B. pertussis* strains that are subsequently killed, usually by heating or treatment with formalin.

- **These vaccines are generally not used in older children because of concerns regarding reactogenicity.**
- **Vaccines containing wP must not be frozen. They should be stored at 2–8 °C.**
- **Studies to date indicate that aP vaccines are more effective than low-efficacy wP vaccines**

Vaccine safety

Vaccination with wP vaccines is frequently associated with minor local and systemic adverse reactions (1 in 2–10 vaccinations), such as local redness and swelling, induration, fever and agitation.

- **Prolonged crying and febrile convulsions are not uncommon**
- **As local reactions tend to increase with age and with the number of injections, wP-containing vaccines are usually not recommended for use in children aged ≥ 7 years, adolescents and adults.**

- **To reduce the reactogenicity of booster doses, aP-containing vaccines with reduced concentrations of the antigens have been formulated for use in adolescents and adults.**

Additional pertussis vaccination strategies in some countries include booster doses in adolescents and adults, as well as immunization of pregnant women to protect newborn infants too young for direct vaccination through transfer of maternal antibodies.

Vaccination of health-care workers

Several studies have shown that health-care workers (HCWs) are at increased risk of pertussis, and that transmission in health-care settings poses substantial risk of infection for infants and immunocompromised individuals

Give aP vaccine.

Vaccination during pregnancy

If a mother has a dose of whooping cough vaccine from 20 weeks of pregnancy, this can provide good protection for the baby until they can have their first vaccine at 6 weeks of age. aP vaccine is used for pregnant women.

People of all ages need WHOOPIING COUGH VACCINES



DTaP

for young children

- ✓ 2, 4, and 6 months
- ✓ 15 through 18 months
- ✓ 4 through 6 years

Tdap

for preteens

- ✓ 11 through 12 years

Tdap

for pregnant women

- ✓ During the 27-36th week of each pregnancy

Tdap

for adults

- ✓ Anytime for those who have never received it

www.cdc.gov/whoopingcough



- ▶ **Health Education:** of parents, for basic knowledge of the disease & the protective value and precautions with the vaccination.
- ▶ **Seroprophylaxis:** antipertussis immunoglobulin; 2.5 ml IM, can be given to protect susceptible intimate contacts, especially infants & young children. Protective value, however, is not certain. So far, there is no evidence of its efficacy in well-controlled trials, so chemoprophylaxis is preferred.

▶ **Chemoprophylaxis:**

Oral erythromycin or clarithromycin can be given in proper dosage, for 5 days after the last contact with the case.

- **If within 3 weeks of exposure, prophylaxis recommended for all household and close contacts (regardless of age or vaccination status).**
- ✓ **If 3 weeks have passed since exposure, still consider prophylaxis for households with high risk contacts:**
 - **Young infants**
 - **Pregnant women**
 - **People who have contact with young infants**

CONTROL

Control measures are taken for:

✓ **Cases**

✓ **Contacts**

✓ **School**

1- Control of Cases :

- ✓ **Reporting to local health authority.**
- ✓ **Isolation at home; practically difficult to fulfill, since the majority of cases are mild, with no or slight fever, they usually move in the community and go to school, and so spread infection to exposed susceptible children.**
- ✓ **Infants younger than 6 months generally require hospitalization**

Approximately half of babies less than 1 year old who get pertussis need treatment in the hospital.

- ✓ **Cases should be removed from the presence of young infants , especially non immunized infants , until the patients have received at least 5 days of a minimum 14 days course of antibiotics.**
- ✓ **Suspected cases who do not receive AB should be isolated for 3 weeks.**
- ✓ **Concurrent disinfection of respiratory discharges; & any soiled objects, and terminal cleaning & airing of the room.**

Treatment

- **Primary role of treatment is to accelerate clearance of organisms and limit transmission**
 - **Treat as late as 3 weeks after cough onset if age >1 year**
 - **Treat as late as 6 weeks after cough onset if age <1 year**
- **Treatment during catarrhal or early paroxysmal stage may modify duration and severity of illness**
- **Otherwise treatment generally does not affect clinical course**


- ❑ The antibiotic erythromycin or azithromycin is a front-line treatment . Newer macrolides are frequently recommended due to lower rates of side effects.
- ❑ Trimethoprim- sulfamethoxazole may be used in those with allergies to first line agents or in infants who have a risk of pyloric stenosis from macrolides.
- ❑ Effective treatments of the cough associated with this condition have not yet been developed

✓ **Proper feeding**

- ✓ **Release : pupils can return to school ; with proper chemotherapy [one week after starting AB], with no ,or not sure of chemotherapy [3weeks after onset of whooping stage, and satisfactory general condition]**

2- Control of Contacts :

 **Protection of contacts: passive immunization is not effective, and the initiation of active immunization to protect against recent exposure is also not effective.**

 **Inadequately immunized household contacts less than 7 years of age should be excluded from day care center for 21 days after last exposure or until cases & contacts receive 5 days course of AB**

🌐 Close contacts under 7 years who not received 4 doses of pertussis vaccine or have not receive a dose within 3years should be given a dose as soon as after exposure as possible.

🌐 A 7 days course of erythromycin or clarithromycin for household & other close contacts, regardless of immunization status and age is recommended.

Control of Pertussis in School: when case appear in school:

- **Isolation of cases and return to school according to case management.**
- **Segregation of susceptible family contacts for 2 wks.**
- **Surveillance of susceptible school contacts for 2wk, to exclude any; once respiratory catarrh appears**
- **Surveillance of all school children until no more cases appear [case finding]**
- **Chemoprophylaxis of susceptible family & school contacts**