International Journal on
Humanities and Social Sciences
ISSN: 2415 – 4822 www.ijohss.com

المجلة الدولية للعلوم الإنسانية والاجتماعية
العدد السابع فبراير 2019

Diagnosis and Treatment of Whooping Cough Disease in Children

(Application research in some of Iraqi hospitals)

Dr. Wasan Abdul Majeed Rasheed
Diploma in Pediatric
Ministry of Health
Baghdad – Iraq

ABSTRACT

Although there is a high uptake of vaccinations providing protection against Bordetella pertussis, the main cause of whooping cough, there has been an increase in the incidence of notifications of the disease in Iraq and other countries in recent years. The increase in cases of whooping cough is mainly evident in older children and adults. While these individuals may experience persistent and unpleasant symptoms ،most notably prolonged cough, symptoms may be mild, in part, because older children and adults have been vaccinated against the disease .

The most significant public health concern relating to whooping cough is that infected older children and adults may transmit the disease to unvaccinated infants who are most vulnerable to the symptoms. This article aims to develop the reader's understanding of whooping cough, including its prevention and management.

Introduction

Whooping cough, also known as pertussis, is an acute and highly contagious disease of the upper respiratory tract caused by Bordetella pertussis (Zhang et al 2012: 33). Classic pertussis is characterized by paroxysms of coughing, inspiratory whoop and post-tussive vomiting (Teng and Wang 2012: 67). Pertussis means violent cough (Ministry of Health 2011) and was known as 'the cough of 100 days', emphasizing
Its prolonged nature (Teng and Wang 2012: 70).

The problem of research is that although pertussis is an old disease but there is a lack of proper diagnosis and appropriate health protection, especially in infants, due to poor health awareness of the majority of the community.

The importance of research is the risk of pertussis, especially in neonates. The current research has highlighted the major signs and indicators of this serious disease in children, as well as accurate diagnosis and effective treatment.

The first chapter: theoretical aspect:

1- Epidemiology and public health issues

Before the introduction of pertussis vaccination in the 1950s, whooping cough was a leading cause of infant death, with huge amounts of death notifications annually in Iraq. Although vaccination has resulted in a 99% decrease in reported cases of whooping cough, there has been an increase in cases in recent years, particularly among adolescents and adults, and globally it remains a significant cause of infant death **(World Health Organization)** (WHO 2010a).

(WHO :2010a) reported that there were 16 million cases of whooping cough in 2008, resulting in the deaths of approximately 195,000children worldwide. Around 95% of mortality associated with pertussis occurs in developing countries, but the disease is still prevalent in countries where the uptake of both primary and booster vaccinations is high (Rittle, 2010: 22 ،WHO 2010a).

2- Transmission and at-risk groups

Whooping cough is highly contagious (Salisbury et al 2006: 23). It is transmitted via droplets in the air from coughing and sneezing, with individuals being infectious from just before and up to 21 days after the onset of cough (Bocka et al 2013: 44). Approximately 70-80% of susceptible household contacts and 50-80% of susceptible school contacts become infected following exposure (Altunaiji et al 2013: 50)، although the bacteria only live for four to six days outside the body (Kramer et al 2006: 103), Whooping cough is a cyclical disease and tends to occur in late summer and autumn (Bocka et al 2013: 40).

Epidemics occur every two to five years, but many countries are reporting an underlying trend of increasing notifications between and during epidemics (WHO 2010a).

The World Health Organization (WHO 2010a) recommends that infants are not vaccinated before the age of four weeks because there is insufficient evidence to demonstrate that the desired immune response will develop at this early age, although in recent years there has been an increase in infections in this age group.

Furthermore, in infants less than one year old ،about half are hospitalized - the younger the infant the more likely hospitalization is - while less than 5% of teenagers and adults with the disease are admitted to hospital (Centers for Disease Control and Prevention 2013a).

In addition, infants are more likely to develop severe complications, with death secondary to whooping cough mainly occurring in young infants (Willacy and Tidy 2013: 58), with prematurity, immunosuppression, and cardiovascular, respiratory and neurological disorders increasing vulnerability. However ،immunity, whether acquired through the disease itself or via immunization, is not life-long (WHO 2010b), leading to increasing numbers of young people and adults contracting whooping cough. Furthermore, because of this partial protection and having a more mature respiratory system, symptoms of the disease are less severe and whooping cough is either not recognized or is diagnosed at a relatively late stage (Teng and Wang 2012: 63). Therefore, older children and adults can transmit the infection to vulnerable infants One study in the United States found that mothers were the source of infection in 32 % of cases of whooping cough in infants. In adults, obesity and asthma increase the likelihood of developing whooping cough (Bocka et al 2013: 89) .

3- Notifiable disease

The highly contagious nature of whooping cough and the fact that it can cause significant illness or death in infants, provides an incentive to governments worldwide to monitor the incidence of the disease. This is achieved in Iraq through the notification process) National Institute for Health and Care Excellence (NICE 2010). Suspected cases of whooping cough should be notified to the local Centre (Health Protection Agency (HPA) 2012a), and should occur as soon as possible, with good practice necessitating that referral is followed up in writing within three days (NICE 2010) .

4- Presentation

B. pertussis is a gram-negative coccobacillus (Altunaiji et al 2013: 69), which attracts itself to and damages ciliated respiratory epithelium in the nasopharynx, and bronchi and bronchioles (Bocka et al 2013: 38). It then produces toxins that paralyze the cilia and cause local tissue damage and inflammation, leading to impaired mucus clearance. Furthermore, phagocytic functions are inhibited, lymphocytosis occurs and insulin secretion increases (Ashraf et al 2013: 145) these processes result in the formation of a mucopurulo sanguineous exudate in the respiratory tract, compromising the small airways. This can predispose the individual to atelectasis, cough, cyanosis and pneumonia (Bocka et al 2013: 125). The lungs and bloodstream tend not to be involved.

The incubation period for whooping cough is usually seven to ten days (Altunaiji et al 2013: 172).

The disease lasts around six to eight weeks, but can last up to 12 weeks and has three stages:

1. **Catarrhal .**
2. **Paroxysmal.**
3. **Convalescent.**

The catarrhal phase lasts one to two weeks . It is characterized by dry, unproductive cough ،nasal discharge, sore throat and low-grade fever. Whooping cough is highly contagious during this stage (NICE 2010, Oakley 2013: 67) . The paroxysmal phase lasts one to ten weeks and is characterized by coughing paroxysms. Between coughing episodes the individual is usually relatively well and can often sleep. Coughing episodes tend to be more common at night and may be triggered by external stimuli, such as a cold or noise .

During paroxysmal coughing episodes, the individual will cough up to 30-40 times without taking a breath and until the lungs are emptied of air. This is followed by an inspiratory gasp, resulting in the 'whoop' which is caused by breathing through partially closed vocal cords (Willacy and Tidy 2012: 103) .

Thick mucus plugs and watery secretions can occur, with petechiae and subconjunctival haemorrhages often present (Oakley, 2013: 83) .

The convalescent phase can last from two to three weeks to several months. Frequency and severity of symptoms gradually improve, although chronic cough may persist.

In infants, this phase may be prolonged and the cough may appear to get worse (NICE 2010, Teng and Wang 2012: 92, Oakley 2013: 60).

5- Infants

Infants presenting with pertussis may be acutely unwell . They frequently lack the typical paroxysmal cough and whoop, and they may be too weak to cough or may become apneic and cyanotic following coughing episodes Parents often report symptoms such as gagging, gasping, choking, apneic episodes ، cyanosis and post-tussive vomiting (Teng and Wang, 2012: 99) .

6- Older children and adults

In older children and adults symptoms may be mild and not recognized as whooping cough (Bocka et al 2013: 67). There may be a cough and no whoop. However, individuals may experience sweating episodes with facial flushing, and may feel faint and exhausted from coughing (Centers for Disease Control and Prevention 2013a). The cough may occur only at night and often some time elapses before medical advice is sought (Teng and Wang, 2012: 136).

The second chapter: practical aspect:

1- Clinical diagnosis

A diagnosis of whooping cough is made if the individual has clinical features consistent with the disease (Jenkinson 1995: 78). The diagnosis is further supported if the individual has been in contact with a person who is confirmed as or suspected of having whooping cough, and in infants and young children who have not completed the full vaccination schedule (NICE ,2010) recommends that hospital admission is considered for infants aged six months or younger who present with symptoms of whooping cough. At this age infants are likely to cope poorly with the symptoms of the disease and may not have received all the vaccinations they require.

2- Differential diagnosis

A differential diagnosis of whooping cough can be made through culture and isolation of B. pertussis and/or detection of its deoxyribonucleic acid. This is usually from nasopharyngeal swabs or aspirates ،or from serological tests. However, the(HPA 2012b) advises that diagnostic tests are not completely reliable and, therefore, negative results should not be used to rule out whooping cough .

(HPA, 2012b) also suggested that treatment and intervention should not be delayed while waiting for results. (Dodhia et al, 2017: 56) concluded that correct diagnosis of whooping cough is essential because symptoms in young infants and adolescents can be atypical. Unexplained persistent cough can lead to significant parental anxiety and result in inappropriate investigations and treatment.

3- Prophylactic treatment

Altunaiji et al (2017) conducted a Cochrane review of antibiotics used for whooping cough and concluded there was insufficient evidence to determine the benefits of prophylactic treatment of whooping cough. However, the review's recommendation is in line with advice provided by the HPA (2012a), which states that antibiotics are given prophylactically to at-risk groups.

Prophylactic treatment should be given within 21days of the onset of cough in the index patient -the patient first identified as having whooping cough (Teng and Wang 2012). Altunaiji et al (2013) noted that the type of antibiotic and the dose used for contact prophylaxis are the same as those recommended in the treatment of whooping cough (Table 1). Children should be excluded from school for five days from the onset of treatment, and a primary and booster immunization schedule should be completed once the child is recovered fully (HPA 2012a).

4- Nursing care

Although B. pertussis can infect all age groups, infants and young children are most severely affected by the disease. Therefore, nursing care of this patient group will be the focus of discussion.

5- History taking

A detailed history should be taken when whooping cough is suspected so that the most appropriate child and family-centered treatment plan can be put in place. This should include the date of onset and nature of symptoms (HPA 2012a). Dodhia et al (2002) also noted that age is an important factor in determining the severity of the disease and prognosis. Lloyd and Craig (2017) suggested that history taking in nursing is not new and that several theoretical perspectives have been provided. However ،Fawcett and Rhynas (2012) concluded that history taking was not previously included in nursing texts as it was perceived to be part of the doctor's domain.

Lloyd and Craig (2007) and Douglas et al (2009) provided systematic guidelines for taking a comprehensive patient history However, the principles of family-centered care must also be applied, including recognizing and valuing parents as being central to the care process, responding to parents' needs and supporting them to care for their child . using the skills of observation, palpation ،percussion and auscultation These skills include assessment, measurement and monitoring of vital signs,When used in conjunction with Pediatric Early Warning Systems (PEWS), observations can provide an early indication that more complex intervention may be required reported favorable results in relation to reduced morbidity and mortality in children and young people through the application of PEWS، the authors note a need for a standardized approach through an effective national system.

Following assessment of the infant, child or young person with whooping cough، nursing care should be holistic. In the infant, care will focus on respiratory assessment and management, including administration of oxygen therapy. According to Haines ،(2009)infants and children receiving oxygen therapy should have continuous oxygen saturation monitoring, with at least one-hourly observations of respiratory rate and heart rate.

The frequency of these observations and the recording of blood pressure should be adjusted in accordance with the patient's condition (Gormley-Flemming 2010: 140). Furthermore ، infants with whooping cough, particularly those with severe apnea, pneumonia and seizures, may require mechanical ventilation and care in a pediatric intensive care unit (Teng and Wang 2012: 148).

Depending on the severity of the infant's condition, particular attention should be given to assessing hydration status. An acutely unwell infant who is becoming tired may not feed adequately. Compromised oral intake combined with post-tussive vomiting increases the risk of dehydration. Haines (2009)uggested that feeding can cause splinting of the diaphragm as a result of an increase in gastric contents; therefore to maintain hydration and blood glucose levels, nasogastric or intravenous infusion should be considered. Infants and children presenting with pyrexia should be managed in line with NICE (2013) guidance, which suggests that the use of antipyretic agents should be considered in children with fever who appear distressed or unwell.

6- Prognosis and complications

Most individuals with whooping cough do not develop serious complications (Teng and Wang 2012: 107). Despite this, an estimated 6% of children and 24% of infants who contract pertussis can experience related health problems (WHO 2010a). In infants less than two months of age, fatality rates are estimated to be 1% ,although NICE (2010) suggests the mortality rate caused by whooping cough in children under six months old is estimated to be 3.5%, compared with 0.03% in the general population.

Minor complications include subconjunctival haemorrhage, weight loss, epistaxis, repeated vomiting, and facial oedema, ulceration of the tongue or frenulum, and otitis media. Sleep disturbance, incontinence ،rib fractures, inguinal hernia and rectal prolapse can also occur (Centers for Disease Control and Prevention 2013b). More severe complications include pneumonia, seizures, pneumothorax ،encephalopathy caused by severe paroxysmal-induced hypoxia and apnea, and metabolic disturbance (Teng and Wang 2012, Centers for Disease Control and Prevention 2013b). Pulmonary hypertension is a serious complication, leading to cardiac failure and shock (Paddock et al 2008), and leukocytosis ، where a white blood cell count of more than ،100,000is associated with increased incidence of fatality (Bocka et al 2013: 110).

TABLE (1)
Recommended antibiotic treatment and post-exposure prophylaxis for pertussis by age group

Age group	**Clarithromycin**	**Azithromycin**	**Erythromycin**	**Co-trimoxazole** (considered if macrolides are contraindicated or not tolerated)
Neonates (<1 month)	Preferred in neonates. 7.5mg/kg twice per day for 7 days.	10mg/kg once per day for 3 days.	Not recommended because of the association with Hypertrophic pyloric stenosis.	Not licensed for infants below 6 weeks.
Infants (1month to 12months)	Under 8 kg: 7.5mg/kg twice per day for 7 days.	12-1months: 10mg/kg once per day for 3 days.	12-1months: 125mg every 6 hours for 7 days.	6weeks to 6 months: 126mg every 6 hours For 7 days. 6months to 1 year: 240mg twice per day for 7 days.
Children	11 -8kg: 62.5mg twice per day for 7 days.	1<year: 10mg/kg (max 500mg) once per	2-1years: 125mg every 6 hours for	5-1years: 240mg twice per day for 7 days.

	19-12kg: 125mg twice per day for 7 days. 29-20kg: 187.5mg twice per day for 7 days. 40-30kg: 250mg twice per day for 7 days.	day for 3 days.	7days. 8-2years: 250mg every 6 hours for 7days. 8<years: 500mg every 6 hours for 7days.	12-6years: 480mg twice per day for 7 days. 18-12years: 960mg twice per day for 7 days.
Adults	500mg twice per day for 7 days.	500mg once per day for 3 days.	500mg every 6 hours for 7 days.	960mg twice per day for 7 days.
Pregnant women	Not recommended.	Not recommended.	Preferred antibiotic. Not known to be harmful.	Contraindicated in pregnancy.

Note: doses for treatment and prophylaxis are the same for all ages

Source: The Researcher

7- Discharge planning

Discharge of children and young people is an essential part of care management. Smooth and effective discharge ensures that health and social care systems are proactive in supporting and meeting the needs of patients, their families and careers (RCN 2010). suggested that to be effective, planned, timely and safe discharge planning should be considered from the point of admission.

8- Prevention

There are several vaccines available for whooping cough. Historically, whole cell vaccines were the mainstay of immunization programs; these contained B. pertussis cells that, while no longer harmful, contain all the antigens that the immune system would encounter during 'natural' infection with the bacteria (WHO 2010a). However, in the 1970s confidence in the vaccine declined following a suggested link between the vaccine and brain damage (WHO 2010b). This led to a reduction in the uptake of the vaccine and a significant increase in the number of infections (WHO 2010b). While public and professional confidence in the vaccine improved during the 1980s, concern about adverse effects led to the introduction of a cellular vaccines in Iraq in 2017 a cellular vaccines contain between one and five of the components of B. pertussis known to provoke an immune system response. These vaccines are less likely to cause local or systemic effects. However, the (WHO 2010b) states that the efficacy of a cellular vaccines has yet to be established, especially as they are variously combined with vaccines against other infections and recommends continued surveillance.

9- Immunizations to protect

against whooping cough have been combined in single 4-in-1 or 5-in-1 preparations, with those that protect against polio, tetanus, diphtheria and Haemophilus influenzae ,

Furthermore, other immunizations are scheduled to take place during the same appointment. Combining vaccinations in this way is justified on the basis that it confers maximum immunity early in life .

Reducing the number of separate visits to the health clinic helps to ensure concordance with the vaccination schedule, while minimizing the number of injections means infants and children face fewer painful experiences.

However, combining vaccinations may increase the risk of minor adverse effects a diverse effect of the pertussis vaccine include localized inflammation and pain at the injection site, and systemic effects such as vomiting, fretfulness and poor feeding (WHO 2010b).

Maximum protection against pertussis is not achieved until the primary course of vaccinations is complete, usually when the baby reaches four months of age. In infants who have received all scheduled doses, about 85% will have immunity against pertussis, or at least be afforded some protection and are unlikely to experience the full effect of the infection . Booster immunizations are required because immunity is not life-long (WHO 2010b).

In Iraq, a booster vaccination of pertussis must be offered to mothers 28-38 weeks into their pregnancy. This booster vaccination is being introduced as a temporary measure motivated by the increase in cases of pertussis in infants under the age of two months. The vaccination includes diphtheria, polio and tetanus because there is no formula that contains pertussis antigens only Administering the vaccine to mothers should induce the formation of anti-pertussis antibodies, which can cross the placenta principally in the final weeks of pregnancy .

These antibodies will only provide temporary passive immunity because the infant's immune system has not itself been triggered to mount a response and the infant will not, therefore, have the memory cells required to produce antibodies quickly when the bacterium is encountered again.

The third chapter:

Conclusion

Whooping cough is a highly infectious disease and, despite a high uptake of vaccinations، there has been an increase in the number of cases of the disease worldwide. Although the increase in cases is mainly evident in older children and adults, the disease may be readily transmitted to unimmunized infants, who are at increased risk of mortality and morbidity from whooping cough.

Whooping cough remains a modifiable disease. It is a protracted condition, usually lasting six to eight weeks, but can last up to three months, characterized by paroxysms of coughing, inspiratory whoop and post-tussive vomiting. Nursing care is supportive and must be responsive to the individual needs of the child and family .

Guidance supports the use of antibiotics given prophylactically to certain at-risk groups and full immunization is central in preventing. whooping cough, although the immunity it confers is not life-long.

References

1. Zhang L, Prietsch SOM, Axelsson I, Halperin SA (2012) Acellular Vaccines for Preventing Whooping Cough in Children (Review). tinyurl. com/m5u969j (Last accessed: October 31 2012.
2. (Teng and Wang 2012). Pertussis means violent cough Ministry of Health 2011) and was known as 'the cough of 100 days', emphasising its prolonged nature (Teng and Wang 2012).
3. World Health Organization (2010a) Pertussis vaccines: WHO position paper. Weekly Epidemiological Record. ww.who.int/wer/2010/ wer8540.pdf (Last accessed: October 31 2013.).
4. Salisbury D, Ramsay M, Noakes K (Eds) (2006) Immunisation Against Infectious Disease. tinyurl.com/ os9wmnq(Last accessed: October 31 2013.).
5. Bocka JJ, McNeil BK, Aronoff SC (2013) Pertussis. http://emedicine. medscape.com/article/967268- overview (Last accessed: October 31 2013.)
6. Kramer A, Schwebke I, Kampf G (2006) How long do nosocomial Paediatric early warning systems: where do we go from here? Paediatric Nursing. 21, 1, 14-17.
7. Bocka JJ, McNeil BK, Aronoff SC (2013) Pertussis. http://emedicine. medscape.com/article/967268-overview (Last accessed: October31 2013.)
8. Willacy H, Tidy C (2012) Whooping Cough. www.patient.co.uk/doctor/ whooping-cough (Last accessed: October 31 2013.)
9. Altunaiji SM, Kukuruzovic RH, Curtis NC, Massie J (2013) Antibiotics for whooping cough (pertussis) (Review). The Cochrane Collaboration. Issue 7. CD004404.
10. Ashraf NM, Ali H, Javed R (2013) Review of Bordetella pertussis: pathology, epidemiology and immune response. Journal of Public Health and Biological Sciences. 2, 2, 207-213.
11. nice.org.uk/nicemedia/ live/14171/63908/63908.pdf
12. Jenkinson D (1995) Natural course of 500 consecutive cases
13. of whooping cough: a general practice population study. British Medical Journal. 310, 6975, 299-302.
14. Dodhia H, Crowcroft NS, Bramley JC, Miller E (2017) UK guidelines for the use of erythromycin chemoprophylaxis in persons exposed to pertussis. Journal of Public Health edicine. 24, 3, 200-206.

15. Gormley-Flemming E (2010) Assessment and vital signs: a comprehensive review. In Glasper A, Aylott M, Battrick C (Eds) Developing Practical Skills for Nursing Children and Young People. Hodder Arnold, London, 109-147.
16. Dixon L, Goldberg R, Iannone V et al (2009) Use of a critical time intervention to promote continuity of care after psychiatric inpatient hospitalization. Psychiatric Services. 60, 4, 451-458.
17. Douglas G, Nicol F, Robertson C (Eds) (2009) Macleod's Clinical Examination. Twelfth edition. Churchill Livingstone Elsevier, Edinburgh.