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Pertussis Infection: Concerns for a Resurgence?

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Abstract

Pertussis infections have increased in recent years. Routine immunizations for pertussis have decreased due to concerns over the COVID 19 pandemic. Many children are missing preventative care visits where vaccines are typically administered. The Center for Disease Control recommends that preventative care continue during the pandemic. Nurses must assist with promoting immunizations to decrease the risk of a pertussis resurgence.

Keywords: Pertussis, Immunization, Preventative Care, Well-child Visits

Introduction

The COVID-19 outbreak has dramatically changed the lives of all Americans. The impact on the United States health care system is substantial. The largest impact is the death toll, with the pandemic claiming over 200,000 lives at the end of September, 2020 [1]. Concerns over viral transmission has led to stay-at-home orders in many states. Families may not be willing to risk contracting COVID-19 by going to health care settings for preventative care services. Vaccine-preventable illnesses, such as pertussis, could be ignored as concerns rise over the novel coronavirus. The fear of contracting COVID-19 in medical offices may prohibit families from obtaining routine immunizations normally administered during well-check visits. Evidence indicates that routine well-child visits declined dramatically after the onset of the COVID-19 pandemic.

Effect on Office Visits

The Health Care Cost Institute compared healthcare claims for office visits in 2019 and 2020 and found that childhood immunizations were down about 60% in mid-April, 2020 compared to 2019, with a 33 percent decline in the diphtheria, tetanus, and pertussis vaccines [2]. Pediatric practices across the country have reported only seeing 20-30 percent of the normal number of pediatric patients. Because of this decrease in visits, pediatricians are facing significant financial difficulties and many are finding it challenging to keep offices open [3]. Closed practices could also play a factor in decreased immunization rates, as pediatrician offices are a mainstay in the immunization of children. To eradicate a disease through herd immunity, vaccination rates must be 95% or higher [4]. These factors raise significant concern about the spread of infectious diseases, such as pertussis.

Pertussis Epidemiology

Pertussis, commonly referred to as whooping cough, is a highly contagious acute respiratory disease caused by the gram-negative coccobacillus, Bordetella pertussis. The illness affects all age groups, but infants and children are at most risk for complications. Infants in particular suffer significant morbidity, with miserable symptoms for several weeks. In comparison to other age groups, infants have the highest rates of hospitalizations and death; about half of infants who develop pertussis are hospitalized with an increased rate of intensive care admission [5]. Bacterial pneumonia is the most common complication of pertussis in infants, followed by encephalopathy and seizures [6].

The natural history of pertussis includes three stages: catarrhal, paroxysmal, and convalescent. Pertussis is most contagious during the first stage, with relatively nonspecific symptoms of low-grade fever, runny nose, malaise, and an intermittent cough persisting for one to two weeks. The paroxysmal stage begins with episodes of severe spasmodic cough accompanied by copious thick secretions which are difficult for the child to expel. At the end of each coughing attack, the child inhales with thecharacteristic whooping sound. The paroxysmal cough lasts for two to three weeks during which the child is at greatest risk for respiratory complications [7]. Stage three is marked by a gradual decrease in cough severity. Recovery from the illness and cough can last for several weeks, leading to failure to thrive in some infants [6].

Between 2000 and 2016, more than 330,000 pertussis cases were reported in the United States [8]. Globally, 30 to 50 million cases occur annually, with 90 percent of cases in developing countries [7]. A substantial portion of these cases is attributable to infections in adults and adolescents [9]. A meta-analysis of case studies by Rittle [10] confirmed increasing rates of pertussis and identified adults and adolescents as the primary sources of infection. Results also indicated that the pertussis vaccine wavers in effectiveness over time. Adolescents were found to have a lowered level of immunity after completing their childhood vaccines. It was also reported that when individuals contracted pertussis after the waning of immunity, they were more likely to manifest atypical symptoms and were often underdiagnosed, increasing the risks to infants.

Although adults and adolescents comprise a significant number of the pertussis cases seen, infants suffer the greatest consequences. The CDC recommends infants be protected from pertussis through the process referred to as cocooning. This involves immunizing those in close contact with the infant, thus forming a protective barrier around the infant. Household members, including parents and siblings, must be immunized as the disease is highly infective once acquired, making the infant likely to become ill when exposed to pertussis. Transmission rates of up to 80% are common in household contacts of an infected person, primarily through the propulsion of respiratory droplets which become aerosolized by paroxysms of coughing [9].

The illness is most infectious in the initial catarrhal stage and during the first three weeks after the coughing begins [11]. The infected person may be unaware they have acquired pertussis, further increasing the likelihood of spreading the illness.

A study by Dean et al. [12] indicated half of asymptomatic individuals had laboratory evidence of pertussis infection, with the remainder only exhibiting symptoms of mild illness. A systematic review of other studies found that the rates of household contacts who were asymptomatic during infection ranged from 5 to 56 percent [13]. This asymptomatic infection may contribute to the transmission of pertussis in households.

Concerns for Infants

The decreasing immunization rates in adolescents is concerning for pertussis outbreaks in infants. The current recommendation for infant immunization is to administer a diphtheria, tetanus, and pertussis (DTaP) vaccine at two, four, and six months of age. Full protection is not accomplished until the series is completed, leaving the infant vulnerable to infection in the first few months of life [14]. Investigations into the five largest state-wide pertussis outbreaks revealed that under vaccinated individuals comprised a large proportion of pertussis cases [15]. Several studies have indicated that waning immunity also plays a significant role in these outbreaks [8]. The immunity appears to wane in 5 to 10 years after completing infant immunizations, leading to an increased risk of illness in adolescents and adults [16]. School nurses play an important role in tracking and recording immunizations so parents can be notified about missed or upcoming immunizations. As schools struggle to implement safety protocols during the pandemic, nurses may encounter difficulties managing immunization records.

Nurses providing prenatal education should also stress the importance of the cocooning process. Maternal immunization should begin prior to birth as vaccine safety and effectiveness during pregnancy has been well established. A large randomized controlled trial determined that TDAP elicited a significant antibody response in pregnant women and provided high antibody levels in the newborn infant [14]. Even with high immunization rates and compliance to completion of the vaccine series, the evidence suggests that the vaccine effectiveness wanes over time [17].

The pertussis vaccine is highly effective for the first year after immunization, but decreases to 84% effectiveness four years after administration [10]. This requires pregnant women to be vaccinated with each pregnancy, regardless of immunization status. In 2012, the Advisory Committee on Immunization Practices (ACIP) recommended all pregnant women should receive pertussis vaccination between twenty-seven and thirty-six weeks of gestation with each pregnancy, regardless if they had been previously immunized [18]. The American Congress of Obstetricians and Gynecologists (ACOG) has published support of this policy [19]. Nurses and midwives must educate patients about the importance of pertussis immunization during pregnancy, emphasizing the safety and efficacy of the vaccine.

Conclusion

Nurses are essential in improving immunization rates. Patients rely on nurses to provide accurate up-to-date information about vaccines. Staff must adhere to safety measures to insure that parents feel safe coming to offices and clinics for vaccines. Parents should also be reminded about the vital need to protect children from vaccine-preventable disease [20]. Organizational support is imperative during this health care crisis. The American Academy of Pediatrics has issued guidance to ensure children continue preventative care during the pandemic by providing a comprehensive strategy focused on ensuring children have access to immunizations and that pediatrician offices have the support to administer them [3]. Health care practices must focus on routine immunizations in adults and children as once social distance guidelines become more relaxed, children will be at more risk for illnesses, such as pertussis.

Conflicts of interest/Competing interests: I have no known conflicts of interest to disclose.

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