

Review Article

Pertussis infection in adolescents and adults with persistent cough: A Review

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Abstract

Pertussis or whooping cough, generally considered as the disease of infants and children, is an acute respiratory tract disease responsible for around 300,000 deaths annually. However, recent reports from many countries of the world clearly indicate that people of all age groups including adolescent and adults could be suffering from this disease. Pertussis remains an underestimated and under reported disease in adolescent and adults due to atypical symptoms in these age groups. Moreover, pertussis has been re-discovered as a frequent cause of prolonged cough in adolescents and adults in the recent past but the diagnosis still is often missed unless specific diagnostic tests are applied. The affected adolescents and adults act as reservoirs of the disease to the vulnerable population of infants. There have been increasing reports of pertussis outbreaks in adults' population in many western countries and vaccination of this group is being planned. Additional booster doses of acellular pertussis vaccine may help to control and prevent pertussis.

Key Word: Pertussis

Introduction

Cough is a major reason for contact with general practitioners, accounting for nearly 30 million visits a year to primary care physicians in the United States¹. Cough may be caused by several factors including microorganisms. *B. pertussis* and *B. parapertussis* cause whooping cough in human which is one of the major health problems in the world and transmitted person to person by close contact with aerosolized droplets². Whooping cough is still a major disease worldwide and one of the important cause of death in malnourished children. It is estimated that there were over 51,000,000 cases of pertussis each year worldwide and 600,000 were reported deaths³. In most populations the disease is endemic, with epidemics occurring every 4 years in late winter and spring⁴. It is a widely held belief that pertussis is an exclusive childhood disease while in reality it affects all age groups⁵.

Wide-spread immunization among children has controlled the disease successfully since its introduction in the early 1940s for several decades⁶. Adults with waning vaccine-induced immunity are increasing and also suffering from pertussis⁷. Recently, an increase in reported cases of *pertussis* in adolescents and adults has been noted quite increasing in number in many countries despite of high immunization rates in children⁸. The clinical presentation in adolescents, adults and vaccinated individuals may be atypical, with paroxysmal cough of short duration or simply a persistent cough⁹⁻¹⁰. It has been suggested that up to 30% of adults with a prolonged cough may be due to from pertussis¹¹. Approximately 13-20% have cough illnesses in adolescents and adults were due to *B. pertussis* infection¹². The majority of the cases which were diagnosed clinically as bronchitis or upper respiratory infection but these could be a case of pertussis which would remain unrecognized¹³.

A study in China on multicenter clinical investigations of pertussis in children and adolescents with persistent cough found that about 11.3% patients were *B. pertussis* positive who had cough for more than 2 weeks¹⁴. In a study in Denmark it was found that the prevalence rate among association of *B. pertussis* with adults patients having chronic

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cough for 2-12 weeks, about 2% were found *B. pertussis* culture positive, 5.47% were *B. pertussis* PCR positive and 16.42% were positive for antibody for pertussis toxin¹⁵. In the United States, Wright (1995) carried out a study on pertussis infection in adults with persistent cough and demonstrated that no subject was culture positive for *B. pertussis*, but 21% subjects met the serological criteria for pertussis infection¹⁶. To evaluate the pertussis infection in Canada among adolescents and adults who had cough related illness of 7- 56 days durations were found that 19.9% had either laboratory - confirmed pertussis or laboratory evidence of pertussis¹⁷. In both Canada and the United States, Guris *et al* reported the highest incidence of pertussis cases among infants; as well as the rapid increase in incidence among adolescents and adults¹⁸. Pertussis has been shown to be an important cause of cough illness in college students, military recruits, referrals to pulmonary specialist and visitors to hospital emergency departments¹⁹⁻²¹. In India, about 9.52% patients found were culture positive for *B. pertussis* and 14.28% patient found were positive by direct florescence antibody (DFA) among patients having cough for more than 2 weeks²². Study on German adults who received pertussis subsequently suffering from cough illness that lasted more than 1 week had shown 26% prevalence in favor of laboratory evidence of pertussis²³. Seroepidemiological studies suggest that pertussis is a common and frequently unrecognized infection in adults^{24- 27}. A US study of adults with cough illness of more than 2 weeks duration found a prevalence of *B. pertussis* is 12.4%; where, only a single serum sample as tested, only IgG antibodies to pertussis toxin²⁸. Cherry studied on prolonged cough illness in adolescents and adults and reported that between 12 to 32% were due to the *B. pertussis* infection^{29- 32}.

There have been increasing reports of pertussis out breaks in adult's population in many western countries and vaccination of this group is being planned³³. Like many other developing countries of the world, morbidity and mortality rate due to pertussis is likely to be high in South Asian countries such as Pakistan, India, Bangladesh and Sri Lanka as well as countries of African continent³⁴⁻³⁶. There is also a very high probability of occurrence of adult's pertussis case in this region. Furthermore there is an overall lack of data related to laboratory confirmed cases of pertussis from these regions. The main reason behind this under reporting may be due to lack of adequate diagnostic facilities, poor surveillance systems and unawareness of physicians to the occurrence of these infections in adult population. Widespread use of DPT vaccination has resulted in the shifting of incidence of pertussis to adolescents and adults³⁷. It is estimated that

almost 20- 50% of all persistent cough cases in adults are caused by the *B. pertussis*³⁸⁻³⁹. Adult pertussis is both a significant health problem as well as an economic burden in both developing as well as developed countries⁴⁰.

In recent years there has been much concern in the lay and scientific literature about the "resurgence of pertussis"⁴¹. To summarize, there are 5 possible causes for the increased reporting of pertussis: (1) genetic changes in *B. pertussis* making vaccines less effective; (2) lessened potency of pertussis vaccines; (3) waning of vaccine-induced immunity; (4) greater awareness of pertussis and (5) the general availability of better laboratory tests in some areas of the country⁴².

Active immunization is the primary method of preventing pertussis. Control of pertussis requires continuous use of whole-cell or acellular pertussis vaccines to achieve and maintain pediatric vaccine coverage levels in excess of 90% and consider to adding booster doses during adulthood to prevent disease in that segment of the population and its subsequent transmission to infant⁴³. Acellular vaccines are currently licensed and being used in the UK, USA, Japan, Germany and Italy. They appear to be safe and effective and may soon replace whole-cell vaccines⁴⁴. The immunity on account of pertussis vaccine is estimated to last for about 3-5 years⁴⁵⁻⁴⁶.

In spite of good immunization coverage, the developed countries have shown a shift in the epidemiology of the disease to the adolescent and the adult age group, leading to a revision of their vaccination policies⁴⁷. The anticipation and early recognition of this change in the epidemiology is important because the affected adolescents and adults act as reservoirs of the disease to the vulnerable population of infants, for whom the disease can be life threatening⁴⁸.

Research in several countries had shown that pertussis is endemic among the adolescents and adults. It is suggested that a universal program of adolescent and adult boosters would decrease the circulation of *B. pertussis* in these age groups and possibly could lead to the elimination of the organism from the population⁴⁹. With the availability of vaccine, booster doses in adolescents have been introduced in Canada, Austria, Australia, France, Germany and the US, and many other countries are considering similar expansion of their immunization programs at present. In addition, universal immunization of adults (Austria, every 10 years) or targeting high groups (e.g., parents of newborns and other care-giver to children; Germany) are being practiced^{47, 50}.

Conclusion

Although the immunization rate of DPT is high, *B. pertussis* is still an important etiological factor associated with persistent cough. Pertussis is a common cause of persistent cough in adults and should be considered in differential diagnosis. Booster doses of acellular pertussis vaccine for children aged 6-8 years and adolescent or young adults aged 15-20 years may help to control and prevent pertussis.

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