SEVERE INFANTILE PERTUSSIS IN NIGERIA, REPORT OF TWO CASES: THE NEED FOR REVIEW OF CURRENT PERTUSSIS VACCINATION SCHEDULE

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ABSTRACT

***Background**: Pertussis, whooping cough is a highly contagious bacterial infection. Although the growing majority of cases are above 6years, 10-15% of all cases of pertussis occur in infants younger than 6 months and more than 90% of deaths occur in this age group. Vaccination against the disease in Nigeria usually occurs between 6 and 14 weeks of age, leaving these neonates and infants largely unprotected, especially when exposed before and during this period. Maternal immunisation during pregnancy has been shown to be an effective prevention strategy for children too young to be vaccinated.*

***Case report**: We present two cases; a 6- week old male infant and a 9 week old female; who presented with symptoms of severe cough, apnoeic episodes and seizures. Full blood count showed lymphocytosis and chest x-ray revealed patchy opacities in one of them. Diagnosis was made clinically and they were managed with erythromycin and azithromycin respectively as well as intensive supportive care.*

***Conclusion**: Pertussis should be considered in any infant presenting with cough and apnoea, as it can be associated with significant morbidity and mortality requiring aggressive supportive care. The management of pertussis in developing countries urgently needs a scale up of diagnostic capacity and prevention strategies.*

***Key-words:**Bordetella, infant, maternal immunization, Nigeria, pertussis, whooping cough.*

INTRODUCTION

Pertussis, whooping cough is a highly infectious bacterial infection affecting all age groups. The annual worldwide incidence of pertussis in 2017 was estimated to be 24.1 million cases per year, with a mortality rate of nearly 160,700 deaths per year in children younger than five years[1]. Developing countries account for 95% of cases[2,3,4]. Reported cases of pertussis in Nigeria in 2015, were 6,592 cases and Nigeria is noted to bear 4.5% of the global burden of pertussis[4]. Although, the growing majority of cases are above 6years, 10-15% of all cases of pertussis occur in infants younger than 6 months and more than 90% of deaths occur in this age group[5].

The World Health Organization (WHO) recommends that countries with high pertussis burden in those too young to be vaccinated consider implementing pertussis maternal immunization, as it is the most efficient additional control strategy beyond

routine infant immunization[6]. However, this is not yet part of the pertussis control strategies employed in Nigeria. Our paediatric respiratory unit managed 2 cases of severe pertussis contracted in the neonatal/early infantile period, within a year (January –December 2017). This report aims to highlight their clinical presentations and management, raise awareness about the disease and advocate for greater attention to its diagnosis and control.

Case Report

Case One:

A 6-week old male infant who presented with persistent cough of 3 weeks duration. Cough was said to be paroxysmal and worse at night. There was history of contact with an aunt with barking cough who spent a week at his residence prior to onset of symptoms. Patient was noticed to have cessation of breathing after bouts of cough with bluish discoloration of the lips and episodes of generalized tonic seizures, which lasted about 2-5minutes and subsided spontaneously. He had several episodes of these symptoms in a day.

He was delivered at term and had only received BCG, Oral polio vaccine (OPV) and hepatitis B immunizations. He had received different medications procured from patent medicine vendors and had also been managed at a private hospital prior to presentation in our facility. The caregivers could not ascertain details of treatment given.

Examination revealed a well-nourished infant, afebrile, not in obvious respiratory distress with oxygen saturation of 96% in room air and no lymph node enlargement. The chest was clear. He however had bouts of cough and apnoeic episodes while on admission, with oxygen saturation ranging between 90 and 96% in room air. The blood investigations revealed normal peripheral white cell count with relative lymphocytosis and normal erythrocyte sedimentation rate. The chest radiograph showed homogenous patchy opacities on both lung fields. Microbiological study of nasopharyngeal specimens could not be done because of lack of facilities for culture and polymerase chain reaction (PCR) analysis in our institution.

He was managed as a clinical case of pertussis on account of the classical history of the paroxysmal cough, paroxysm-induced cerebral hypoxia and apnoea, non-vaccination in the child and lymphocytosis. He received erythromycin syrup 40mg/kg/day in 4 divided doses for 14 days, intermittent supplemental oxygen and maintenance fluid, electrolyte and nutritional needs initially provided via intravenous fluids. Nasogastric and oral feeds were then commenced as symptoms subsided. He was discharged after 20 days on admission when apnoea resolved. The family members were also given erythromycin for 14 days and counselled on immunization of the index patient and booster immunization for the older sibling.

Case Two:

A 9-week old female, second of a set of triplets, presented to the emergency room with cough and intermittent cessation of breathing of two weeks duration.

Cough was paroxysmal, associated with bluish discoloration of the face and lips and difficulty in breathing during coughing bouts. Cough was sometimes associated with post-

tussive vomiting. The apnoeic episodes worsened progressively in frequency and severity. Patient was usually calm in between episodes. There was nasal congestion (catarrh) initially, which had resolved prior to presentation but no fever. History of exposure to person(s) with chronic cough could not be ascertained. She had an episode of tonic seizure during an apnoeic episode on the night prior to presentation, which lasted about 1 min and aborted spontaneously. Siblings were asymptomatic.

She was taken to a private hospital, where she was given some medications including antibiotics, which did not abort symptoms, prompting her presentation to our hospital.

She was delivered (together with her siblings) at 31weeks gestational age at a private hospital. Patient's birth weight was 1.3kg (biggest of the 3). Baby cried spontaneously immediately after birth. They had to be admitted in the hospital from birth for 3 weeks, on account of prematurity and neonatal jaundice. She had received BCG, Oral polio vaccine (OPV), Hepatitis B vaccine and one dose of pentavalent vaccine (DPT, HIB and HBV).

Patient had been attending the ophthalmology clinic of our institution for about 6weeks, for weekly screening and follow-up for retinopathy of prematurity.

The triplets were the only children of their parents. Patient resided with parents, siblings, and grandmothers in a 2-bedroom apartment, with well-ventilated rooms. Cooking in the home was done with gas, and there was no cigarette smoker in the home. There was no family history of asthma or any other respiratory illness.

On examination, she had an episode of paroxysmal cough, with associated cyanosis and apnoea, which resolved with tactile stimulation. She was not pale, anicteric, afebrile, not dehydrated. Her weight was 3.05kg. The anterior fontanel was patent and soft; tone was normal in all limbs. She was not dyspnoeic; respiratory rate was 56cpm with normal vesicular breath sounds. The Sp02 was 97% in room air, in between episodes, with desaturation during cough/apnoeic episodes. Her pulses were full volume and regular, heart rate was 148 beats per minute, first and second heart sounds were heard with a grade 3/6 systolic murmur, maximal at the left upper sternal border.

A clinical diagnosis of pertussis was made, to rule out a background acyanotic congenital heart disease (patent ductus arteriosus). Patient was admitted in an isolation room, and commenced on oral azithromycin 10mg/kg/day with intra-nasal oxygen. Three hourly oral feeds via cup and spoon were continued and regular monitoring of the oxygen saturation and other vital signs was done. Chest radiograph was normal, and she was booked for an echocardiogram to be done on discharge. Prophylactic azithromycin was prescribed for the siblings at 10mg/kg/dose daily for five days.

Investigation results were as follows: Full blood count and Erythrocyte sedimentation rate (ESR); PCV=42%, WBC= 18,600 cells/mm3, Neutrophils= 34%, Lymphocytes= 58%, ESR of 15mm in 1st hr.

In the first 24 hours of admission, she had repeated episodes of prolonged bouts of

cough with apnoea, which did not respond to tactile stimulation; requiring oxygen therapy and intermittent positive pressure ventilation using a bag and mask. Patient's symptoms gradually improved as her; vital signs stabilized frequency of cough paroxysms reduced and apnoeic episodes stopped. She was tolerating both formula and expressed breast milk and was gaining weight adequately. She was discharged home after 8 days on admission. Parents were adequately counselled on the importance of continuation and completion of vaccination schedule.

DISCUSSION

Pertussis is a re-emerging disease worldwide despite its high vaccination coverage[2].The incidence is highest in unvaccinated babies and increases among teens[5]. Several epidemiological surveys suggest a high incidence of the disease in adolescents and adults due to the waning effect of the vaccine after 4-12 years[7]. In USA, data collected over a period from 1990-2010, showed that the incidence (per inhabitants) had a peak in 2004 and that there has been an increasing trend since 2007[5]. A hospital based 5-year review of pertussis cases carried out between 2007 and 2011 at Uyo, Nigeria by Oloyede *et al* (2011) revealed an increasing trend, with 54.7% of cases occurring in 2011 alone[8].

Pertussis is a human respiratory disease caused by a gram-negative bacillus and transmitted through Flugge's droplets[5]. It is a highly contagious infection developing in approximately 80-90% of susceptible individuals who are exposed to the aerosolized droplets[5]. The droplets colonize the respiratory epithelium and form an exudate which compromises the small airways especially in infants and predisposes to cough, cyanosis and pneumonia. The exudative toxin causes direct toxic effect on the lung parenchyma and immune regulation.

Complications of the disease might include conjunctival haemorrhages, facial petechiae, dehydration, hypoxia, pneumonia, seizures, encephalopathy, metabolic disturbances such as hypoglycaemia, failure to thrive, pulmonary hypertension and death. Our cases had hypoxia and seizures, one had pneumonia. Oloyede *et al* reported bronchopneumonia as the commonest complication in 52.9% of cases[8]. Nasopharyngeal specimens for culture, PCR and ELISA serology are the mainstays of laboratory diagnosis[2, 5], which are not readily available in developing countries. Furthermore, clinical diagnosis in the early stages of the disease is particularly difficult in infants as the symptoms are non-specific, mimicking upper respiratory tract infections and also because of the absence of the classical 'whoop' seen in older children.

A clinical case of pertussis is described as acute cough lasting at least 14days in a person with at least one characteristic pertussis symptom or cough lasting at least 14 days in an outbreak setting[5]. A confirmed case is any cough in which Bordetella pertussis organism is isolated and cultured or a case consistent with the clinical case definition and confirmed by PCR assay or epidemiologic linkage to a laboratory confirmed case[5]. Supportive care is the primary goal of treatment with close attention to hydration status, nutritional status, treatment of hypoxia and respiratory

distress.

Prevention through immunization remains the best defence in fighting the disease. The Centre for Disease Control (CDC) in the US, recommends vaccination as follows[1]; DTaP vaccine at ages of 2, 4, 6 and 15-18 months and at age 4-6 years. Tdap vaccine is recommended for children aged 7-10 years who are not fully vaccinated; as a single dose for adolescents 11-18 years, adults 19 years or older and for pregnant women. Prognosis for full recovery is good in children above 3 months of age[5]. Ten per cent of survivors sustain neurodevelopmental problems and <10% have subsequent respiratory diseases[5].

In developing countries where there is a large concentration of people with extreme poverty, living on less than 1 dollar 90 cents a day[9], the importance of prevention cannot be over-emphasized.

With the poor access to health care in developing countries, most infants who would usually have the severe forms of the disease requiring monitoring and intensive care, would not survive like our patients did. Infants, who also represent one of the most vulnerable groups for this disease and are also prone to mortality, need to be protected[6]. In Nigeria, the National programme on immunization schedule for pertussis commences at 6weeks, leaving these neonates and infants vulnerable to the disease prior to this age. There is also no routine immunization beyond infancy, thereby creating a large pool of un-immune adolescents and adults as reservoirs of the disease. Our first case was exposed at 3 weeks of age to an adult who was a probable case of pertussis, which is the typical scenario like in other studies[7].The cultural practice in the country of carrying young infants on their mothers' back to the market, church, mosque, etc. also offers opportunity for the child to be exposed to infection by droplets at an early age.

There is a need to scale up our immunization services to cover children above one year, adolescents, postpartum women (cocooning strategy) and adults, in order to increase herd immunity and reduce reservoirs of infection. However, evidence that these boosters given to adults and adolescents reduce severe pertussis in infants is not very strong[6]. Success has however been recorded in countries such as United Kingdom, Canada and Australia that have adopted the approach of maternal immunization with dTaP during the 3rd trimester, as it provides coverage for these neonates from birth through the transplacental passive transfer of maternal antibodies and lasts until they are able to receive their own active immunization[10-12].

This can easily be incorporated into our routine antenatal immunization programme in Nigeria, where our mothers are already receiving tetanus toxoid vaccine (TT). The cost of this would be prohibitive, but current efforts are being made by the WHO to assess the cost effectiveness of this intervention[11]. The issue of low antenatal services utilization among pregnant women in Nigeria would also pose a challenge to the effectiveness of this strategy[13].

A review by Sadoh *et al*[13] in 2009, alluded to the high risk of epidemics arising from the disease if attention is not given to its prevention and control. We therefore

advocate for and recommend the review of pertussis prevention strategies in Nigeria, in order to reduce the morbidity and mortality from this forgotten disease.

CONCLUSION

Pertussis should be considered in any infant presenting with cough and apnoea, as it can be associated with severe illness requiring aggressive supportive care and mortality. The management of pertussis in developing countries urgently needs scale up of diagnostic capacity and prevention strategies.

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