Indian Journal of Microbiology Research 2021;8(3):256–259

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Indian Journal of Microbiology Research

Journal homepage: https://www.ijmronline.org/

Short Communication

A short communication: Diphtheria outbreak, Tdap vaccination for adults

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ARTICLE INFO

Article history:
Received 23-07-2021
Accepted 02-09-2021
Available online 22-09-2021

Keywords:
Diphtheria outbreak
Older children and adults
Tdap vaccine

ABSTRACT

Diphtheria cases continue to occur also in Madurai, Tamil Nadu despite a national vaccination program targeting the disease. Outbreaks of diphtheria are noted in areas of low immunization coverage. Last week our nephews came with swollen cheeks etc so forth and so on. Disease manifesting among older children and adults as in of the recent outbreaks from the Indian states of Andhra Pradesh, Karnataka, Delhi and Assam.

Of these, immunized children, 88% were above 10 years of age.

A booster second doses of Adacel is for person 8 years and above along with tetanus prophylaxia is given in addition to maintaining a high immunization coverage in the routine immunization program, with special emphasis on areas of low vaccination coverage is essential for preventing then emergence of diphtheria.

1. Introduction

Diphtheria is an acute bacterial disease caused by the toxins of bacterium *Corynebacterium diphtheria*, which primarily infects the throat and upper airways, name derived from greek diphtheria, meaning ''leather hide" The exotoxin produced by the bacteria causes a membrane of dead tissue to build up over the throat and tonsils, making breathing and swallowing difficult. The toxin affects organs like the heart and nervous system causing myocarditis or peripheral neuropathy in severe cases. The disease is characterized by sore throat, low-grade fever and cervical lymphadenopathy. Death can occur due to circulatory failure during the first 10 days of the illness. In 1990, epidemics began in the Russian Federation and by 1994 and all 14 of the newly independent states of the former Soviet Union were affected with 157 000 reported cases by 1997. In 2015, WHO reported that there were 4778 cases worldwide and the immunization coverage globally was 86%. [1]

A majority of the diphtheria cases occurring in the world each year is from India. There has been a declining trend in new cases after the introduction of the (Universal Immunisation Program) in India. In the last decade, there have been reports of emergence of diphtheria from several states: Andhra Pradesh, Delhi, Maharashtra, Assam, Karnataka, Chandigarh, Gujarat [2] and many of them presenting as outbreaks. Most of the outbreaks were characterized by cases in low immunization areas, Madurai, Tamil Nadu, the southernmost state of India has high immunization coverage of 72% and better health indices when compared to the rest of India. The outbreak began in the district north Kerala in 2015 and spread and later to other states of Tamil Nadu and, Karnataka.

2. Materials and Methods

Edwin Klebs (1834–1913) described the bacterium that causes diphtheria. Diphtheria and the "Desert Fox" German general Erwin Rommel, the "Desert Fox," led the North African tank warfare during World War II, seen in newsreels

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https://doi.org/10.18231/j.ijmr.2021.052

with a handkerchief pressed to his nose, not because of desert dust. He periodically returned to Berlin for treatment, leaving his troops without his brilliant and charismatic leadership. In Berlin, Rommel joined other generals in a plot to assassinate Hitler, plot failed; Rommel's role was discovered, he died of a heart attack, been the result of a heart weakened by years of exposure to diphtheria toxin. Had Rommel never contracted diphtheria, would the outcome of World War II be different! It is thought that George Washington may have died from diphtheria.[3]

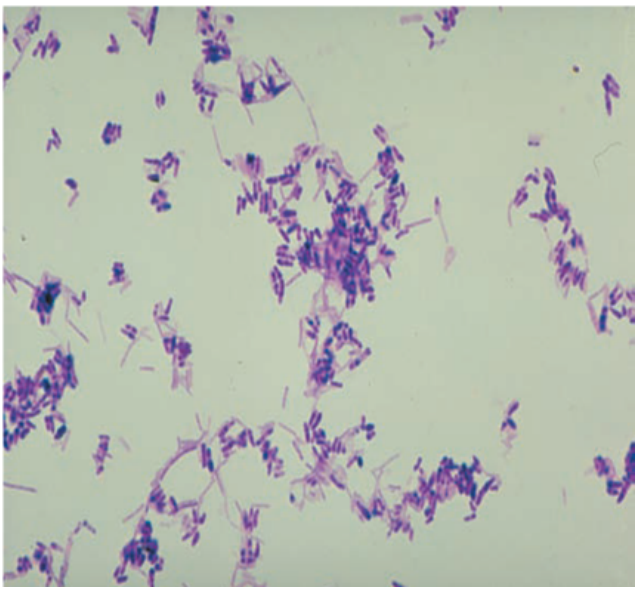

Fig. 1: *Corynebacterium diphtheria,* Gram-stained *Corynebacterium diphtheriae*. The characteristic arrangement of the cells results from the type of binary fission called snapping division[4]

Phyllum Actinobacteria, Order (Actinomycetales). Six families will be covered: Corynebacteriaceae, Mycobacteriaceae, Micrococcaceae, Nocardiaceae, Propionibacteriaceae, and Streptomycetaceae. High G+C%. aerobe, found in soil and plant material. Irregularly shaped rods that form "V" shapes as a result of "snapping division**.** Fermentative with acid, but no gas, facultative anaerobes and are catalase positive, negative for urease, pyrazinamidase, and alkaline phosphatase.

Physical signs of diphtheria are distinct swelling of the neck that is called a "bull neck." and is characterized by the formation of a leathery pseudomembrane in the upper airway.

2.1. Treatment

Penicillin G Procaine or erythromycin may be used.

2.2. Diagnosis

Diagnostic tests include throat culture.

Fig. 2: A pseudomembrane[4]

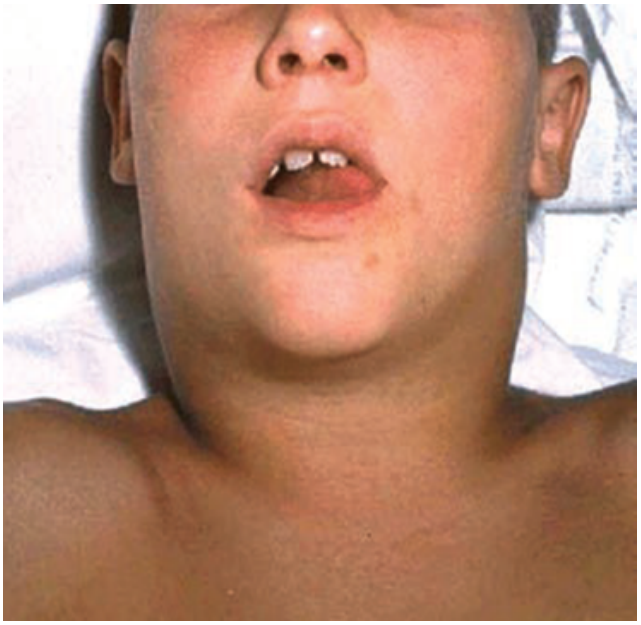

Fig. 3: Marked swelling of the lymph nodes in the neck[5]

2.3. Toxins

They are Type III Intracellular cytotoxin blocks protein synthesis.

2.4. Target cancer cells

Several clinical trials on engineered forms of diphtheria toxin effective at killing a variety of leukemia cells.

2.5. Toxoid vaccines

Introduction of diphtheria toxoid in the early 1920s was not used until early 1930s and is finally used in the 40s. However, diphtheria is still a significant child health problem in countries with poor immunization coverage. The disease occurs mostly as small outbreaks. Aluminum salts are used as adjuvants in vaccines that protect against diphtheria/ tetanus/pertussis (DTaP, Tdap. Diphtheria, tetanus, and acellular pertussis (DTaP and Tdap) vaccines.

Many bacteria make protein toxins. These naturally occurring toxins can be purified and inactivated to make a class of subunit vaccine called toxoid vaccines. The tetanus and diphtheria components of the DTaP and Tdap vaccines are routine toxoid vaccinations. A number of recombinant toxoid vaccines are also in development.

2.6. Frequency/intramuscular injection

Due to resurgence of whooping cough, it is recommended that people age 11 or older get a one-time adolescent/adult tetanus/diphtheria/acellular pertussis (Tdap) vaccine. Pregnant women also get the Tdap in the third trimester of each pregnancy. This boosts antibodies that are passed to the baby to protect it. One reason more adolescents and adults are developing whooping cough is that immunity from the routine childhood DTaP vaccine (which protects against diphtheria, tetanus, and pertussis) is not long lived; by age 12 the immunity originally conferred by the DTaP vaccination series declines. As a result, adolescents and adults are encouraged to get a booster shot (called the Tdap) to renew their immunity to pertussis. Routine vaccination of all pregnant women recommended. [NB: should not administer acellular pertusis- containing vaccines to patients who developed encephalopathy [eg., coma, decreased level of concious ness, prolonged seizures]not attributable to another identifiable cause within 7 days of DTP, DTaP, OR Tdap should administer acellular pertusis- containing vaccines to patients with following condition has stabilized.-progressive or unstable neurologic disorder [including infantile spasms for DTaP]. Uncontrolled seizures. Progressive encephalopathy, has ever had Guillain-Barré Syndrome (also called GBS), may decide to postpone Tdap vaccination to a future visit. Has had severe pain or swelling after a previous dose of any vaccine that protects against tetanus or diphtheria.

2.7. Tdap vaccines

2.7.1. Adacel

Doctors give a single shot to preteens and teens, as well as adults who need it. Doctors give a shot to pregnant women during each pregnancy. Doctors also give it as part of a 3-shot series to people 7 years or older who have not previously gotten any tetanus, diphtheria, and whooping cough vaccines. Doctors may also use this vaccine to complete the childhood vaccine series for tetanus, diphtheria, and whooping cough in people 7 years or older. Doctors may use this vaccine in place of a Td vaccine every 10 years as a booster shot to people 7 years or older.

2.7.2. Boostrix

Doctors give a single shot to preteens and teens, as well as adults who need it. Doctors give a shot to pregnant women during each pregnancy. Doctors also give it as part of a 3-shot series to people 7 years or older who have not previously gotten any tetanus, diphtheria, and whooping cough vaccines. Doctors may also use this vaccine to complete the childhood vaccine series for tetanus, diphtheria, and whooping cough in people 7 years or older. Doctors may use this vaccine in place of a Td vaccine every 10 years as a booster shot to people 7 years or older.[6]

2.8. Mortality/morbidity

To qualify for compensation the petitioner must either show that the patient experienced an injury that is listed in the "Vaccination Injury Table" or, if their injury is not in the table, then they must either prove the vaccine caused it or prove that the vaccine significantly aggravated a pre-existing condition. So, if you see headlines publicizing awards through this program, don't assume that the vaccine was proven to cause the complication. Most petitions claim the patient suffered a "Table Injury" because in such a claim the petitioner does not have to definitively prove the vaccine was the cause of the injury.

2.9. National vaccination injury compensation program[7]

Usually side effects are limited to injection-site soreness and/or a lowgrade fever. The CDC estimates that 1 in 4 children who get the DTaP (diphtheria, tetanus, and pertussis) vaccine experience inflammation at the injection site and fully recover in a few days. A very small percentage of vaccinated patients— representing 1 in 1 million doses administered— experience potentially severe symptoms such as an allergic response. The National Vaccine Injury Compensation Program provides federal funds to defray medical costs for individuals who claim severe complications from the following vaccines: DTaP, MMR (measles, mumps, rubella), polio, hepatitis B, Haemophilus influenzae type b (Hib), varicella (chickenpox), rotavirus, and pneumococcal conjugate vaccine.

3. Discussion & Conclusion

3.1. Immunisation history

Details of immunization duly checked for children. Verbal history of immunization, for adults. Those

who had not received even one dose of the primary immunization series of DPT/Pentavalent vaccine were categorized as “unimmunized” and who could not recall their immunization status were also categorized as “unimmunized”.

Those who had received at least one dose of diphtheria toxoid either as DPT/Pentavalent vaccine but not completed the WHO recommended schedule of 5 doses were categorized as partially immunized. Those who had taken all 5 doses of the diphtheria toxoid were categorized as „fully immunized

3.2. Laboratory testing

Throat swabs for culture of Corynebacteria were taken soon after admission by trained medical officers and tested at the Microbiology Department of our institution. The throat swab isolates was identified by culture using 5% sheep blood agar and serum Tellurite agar. C. diphtheriae colonies were confirmed with the cystinase test growing black colonies on Tinsdale agar. Antibiotic sensitivity testing was performed using Kirby Bauer disc diffusion method on Mueller–Hinton blood agar plates. All isolates were sent to nearest State Lab, for Elek gel diffusion test [Immunodiffusion assay, called an Elek test[4] in which antibodies against the toxin react with toxin in a sample of fluid from the patient] and Tox gene demonstration by PCR. Diphtheria culture is done currently only one laboratory in the united states.

The outbreak began in a boy’s hostel at North Kerala[2] in 2015 are all the inmates in the age group 10-15 years and were either unimmunized or partially immunized. The outbreak which was evolved into a major outbreak involving the neighbouring district of Tamil Nadu. Outbreaks of diphtheria are usually associated with low immunization coverage. Acceptance of vaccination is an issue among certain sections of the community in North Kerala and neighbouring states during the time of this outbreak. Interventions targeted at these high-risk pockets by mobilizing the community especially the elder children and adults on Tdap vaccination can remove the fear of future outbreaks.

Unimmunised Cohorts, partially immunised are more at risk. The age observed in the current outbreak in Madurai and outbreaks in other states of India call for an urgent update in vaccination. In order to protect the adolescent population, the introduction of diphtheria toxoid during adolescence is essential to prevent emergence of diphtheria in future. Strategies to identify areas of low immunization coverage in addition to maintaining high routine immunization coverage is essential to maintain high herd immunity and prevention of outbreaks among children and adults.

4. Source of Funding

None.

5. Conflict of Interest

None.

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Cite this article: Jeevan P J S. A short communication: Diphtheria outbreak, Tdap vaccination for adults. *Indian J Microbiol Res* 2021;8(3):256-259.