

Original Article

Diphtheria Resurgence – A Prospective Study in a Tertiary Care Teaching Hospital

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ABSTRACT

Background: Diphtheria was one of the six killer diseases of childhood and was presumed to have been controlled if not eradicated through immunization programme. Emergence of diphtheria once again has challenged our health policies, immunization and public awareness campaign. Stringent measures need to be taken lest the disease is blown out of proportion and control measures fail. Hence, to highlight the resurgence of diphtheria, its repercussion, mitigation activities under taken by the government we have undertaken to pen down this paper. **Methods:** This prospective study was carried on n= 5 patients included in our study on the basis of inclusion and exclusion criteria. **Results:** Our approach to the diphtheritic patient should be multifaceted and thorough examination and investigation is required by team approach to counter the impact of the toxins released as it starts with Otorhinolaryngological manifestations and terminates with the cardiovascular and neurological complications. **Conclusions:** Three major measures are indicated to counter the resurgence of diphtheria i.e. high immunization coverage of target groups, prompt diagnosis and management of diphtheria cases, and rapid identification of close contacts with their effective management to prevent secondary cases.

Key words: resurgence, diphtheria, antitoxin

INTRODUCTION

Diphtheria was a disease of childhood. Diphtheria occurs worldwide. The incidence has decreased because of the universal immunization and expanded immunization programme of World Health Organization (WHO). The adults have been increasing affected in the countries where the childhood immunization has been interrupted as in Russia or Eastern Europe. In India too, people not immunized in childhood or lack of booster doses in adulthood, poor surveillance has resulted in the resurgence of this disease process^[1]. Developing countries account for


80–90% of the global burden of diphtheria.^[2]

Diphtheria is an acute, toxin-mediated contagious disease caused by bacteria called *Corynebacterium Diphtheria*. It lives in the mouth, throat and nose of an infected person and can be spread to others by coughing or sneezing. A child with diphtheria can infect others for two to four weeks. The incubation period of diphtheria is 2–5 days (range 1–10 days). Diphtheria is of following types –

- Anterior nasal diphtheria,
- Pharyngeal and tonsillar diphtheria,
- Laryngeal diphtheria,
- Cutaneous (skin) diphtheria.^[3]

Diphtheria usually starts with a sore throat, fever and chills. But if it is neglected, not properly diagnosed and treated, it produces a toxin (poison) that causes serious complications such as heart failure or paralysis. One out of every ten patients who gets diphtheria dies from it.

Here we describe five full blown cases of diphtheria to emphasize the resurgence of this disease in India as we prevail with the wrong notion that communicable disease is a history.

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METHODS

This prospective study was carried on n= 5 patients attending ENT department of Hind Institute of Medical Sciences, Safedabad, Barabanki, Uttar Pradesh were included on the basis of inclusion and exclusion criteria.

Case No 1 A student of 20 years' male presented in ENT OPD with difficulty in swallowing for 4 - 6 days. He had low grade fever and had a expressionless face. On examination of the oral cavity he had B/L enlarged tonsils almost kissing each other. Greyish white membrane was seen over the surface of the tonsils. Posterior pharyngeal wall was also covered by the slough. The neck was swollen more on the right side. The throat swab was sent immediately to microbiology lab for Alberts staining. This confirmed our suspicion of diphtheria, Chinese letter pattern and metachromatic granules were seen. Subsequently culture was also done for the same. Treatment was started without much delay. Diphtheria antitoxin was given in a dose of 80,000 IU IV. after sensitivity (5ml vial, 10,000 IU each, manufactured by Berna, Swiss Serum and Vaccine Institute, Benra Switzerland), Crystalline Penicillin 10 lac, IVI four times a day was given for 14 days after sensitivity. All the contacts who turned out to be positive after Alberts staining for throat swab were kept in isolation and were given prophylaxis and diphtheria antitoxin (DAT).

Case no 2

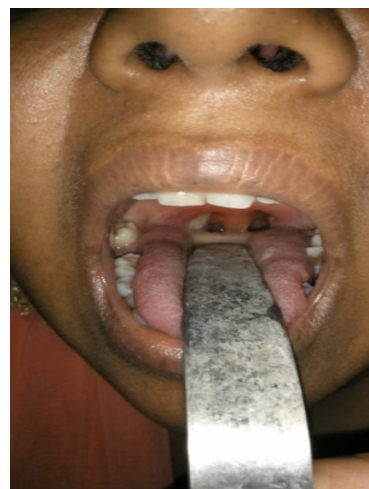
A young boy of about five years presented in emergency for difficulty in breathing and swallowing. On examination, the boys general condition was poor and had pain in throat. Oral cavity examination showed white slough covering both the tonsils and extending into hypopharynx. Patient was having very severe inspiratory stridor. He was immediately moved to emergency operation theatre where he was tracheostomised. The oxygen saturation went up to hundred percent. We send the throat swab culture which was positive for diphtheria on Alberts staining. The patient was kept in isolation. We tried to procure the antidiphtheric serum but was not available. We gave penicillin injections after allergic testing and other supportive treatment was rendered. After twelve days, the patient's tracheostomy tube was plugged and was kept for observation overnight. Next day his stoma was closed. Luckily patient was saved and was discharged without complications.

Case no 3 A young boy of seven years presented in OPD and had difficulty in swallowing and breathing. The boy was irritable and his general condition was also grim. His orally cavity was having whitish material covering the tonsils bilaterally. The patient was admitted in the isolation ward and we send the throat swab culture. We got the result as negative. We send all the relevant investigations including the X-ray cervical spine lateral view. The x-ray depicted 'Thumb sign' and we suspected epiglottitis. The patient was fine, improving, breathlessness and dysphagia had vanished but still he was sick, so we send the patient to

pediatric department for thorough evaluation. He was under treatment when after five days he developed weakness of lower limbs and was unable to stand without support. After two days, he started having nasal regurgitation and next day he had severe chest pain and collapsed. He was intubated and put on ventilator but could not survive.

Case no 4 A young boy of ten years presented in the OPD with the complains of the nasal regurgitation of the food and water. On examination, the tonsils were swollen with whitish slough on it. He gave history of upper respiratory infection and difficulty in swallowing. He got treated by the local doctor but could not get any benefit. He was later referred to the medical college when he had developed nasal regurgitation. His swab culture was positive for diphtheria. He was admitted in isolation ward and referred to the pediatric department for thorough neurologic evaluation. There was no history of booster vaccination.

Case No 5 A young girl of ten years presented with difficulty in swallowing and respiration. She was suffering from last five days with fever, sore throat, chills etc. On examination, she was looking quite sick, had congested oral cavity with pseudomembrane formation on both the tonsils which extended posteriorly. Throat swab and other investigations were carried out and patient was positive for



Diphtheria patient



Diphtheria patient



Diphtheria patient



Treated diphtheria patient

diphtheria, culture was carried out. The patient was admitted in the isolation ward with extensive monitoring and DAT along with antibiotics were given. Patient improved and contacts were given prophylaxis. Patient was discharged after seven days but treatment was given for fourteen days.

RESULTS & DISCUSSION

Diphtheria is caused by *Corynebacterium diphtheriae*, a gram-positive bacillus. Transmission is through droplet infection & incubation period is 2 - 7 days. Strains carrying the tox gene are capable of toxin production. Toxin has two subunits A and B.



Diphtheria patient (paralytic)



Diphtheria anti-toxin



Diphtheria anti-toxin (Berna)



Diphtheria anti-toxin

A is responsible for clinical toxicity and B serves as carrier to specific receptors located on myocardium and peripheral nervous system. Diphtheria can be either respiratory or cutaneous. Regional lymphadenopathy gives rise to "bull neck" appearance. Membrane presence is not essential for diagnosis. Alberts staining if positive is sufficient to start therapy.

Diphtheria in India accounted for 19-84% of the global burden from 1998 to 2008.^[4] A shift in age incidence has been observed from preschool to school age (5-15 years) with more and more cases now being reported in adults.^[5] The resurgence in India reminds us of the Soviet Union of

nineties and in India the cause behind this was attributed to decreased childhood immunization, increased susceptibility among adults and high population movement.^[4] Common clinical features observed were throat pain in 74% cases and fever in 56% cases. Complications observed were myocarditis in 68% cases, neuropathy in 15% cases, and respiratory compromise in 7% cases. Death occurred in 2.5% patients.^[6]

The disease is subdivided into three stages – early, late and severe. In the early stages, manifestations are localized to either the skin or the upper respiratory tract which can lead on to the severe stage associated with toxic circulatory collapse, edema of the neck, skin petechiae and acute renal failure. The late stages can involve cardiac and nervous system such as myocarditis, respiratory paralysis and limb paralysis. All stages are associated with a pseudomembrane formation which bleeds on removal. Cardiac involvement with arrhythmias occurs in one-quarter of patients who have late and severe disease, increasing the mortality to three to four times.^[7]

Complications in form of acute circulatory failure due to myocarditis or neurological manifestation like CN palsies, paresthesia or polyneuropathy or encephalitis can be manifested. Cutaneous diphtheria can present a punched-out ulcer with undermined edges and covered with greyish white adherent membrane.

Diphtheria although is a vaccine preventable disease and is a part of universal immunization programme but it still occurs in various countries especially developing. In India, the disease does occur but in areas of lower socioeconomic groups, overcrowding, lower awareness level and recently the trend of involving higher age group is alarming.

In 2014 India's National Health Profile released by the health ministry witnessed 4,071 cases of diphtheria and 104 deaths, while among the states, Delhi had the highest number of cases at 1,418 and also the highest number of deaths with 60 mortalities. Haryana recorded the second highest diphtheria cases at 663. However, it was West Bengal that saw the second highest number of deaths with 10. Assam recorded the third highest figure of cases at 506, followed by Maharashtra at 444. Our study highlights the persistence of diphtheria in Delhi and NCR from 2012 to 2014. Various States of India have reported the persistence and resurgence of diphtheria.^[5]

The alarming trend detected was increasing involvement of the older age group,^[5] under coverage of the UIP, lack of boosters, altered clinical picture because of rural quackery, reluctance of the people to get immunized because of certain myths, different branches of medicine which discourage vaccination, improper cold chain maintenance and lastly lack of availability of anti-diphtheric serum (ADS) and medications.

Our approach to the diphtheritic patient should be multifaceted and thorough examination and investigation is required by team approach to counter the impact of the toxins released as it starts with Otorhinolaryngological manifestations and terminates with the cardiovascular and neurological complications. Otolaryngologically,

diphtheritic emergency is to ensure airway and counter dysphagia. Neurological complications are serious complication and patient need to be followed.^[8] Any child diagnosed with diphtheria should be followed for 3-6 months in anticipation of neurological complications. Diphtheritic polyneuropathy carries good prognosis hence timely diagnosis and differentiation from other neuropathies is a prerequisite for rational management.^[9] Diphtheritic polyneuropathy had 53% fatality.^[10]

Tracheostomy is required in few cases with respiratory distress. Primary identification of *Corynebacterium diphtheria* was done by standard culture, staining and biochemical tests followed by toxigenicity testing by Elek's test on samples positive for *C. diphtheria*.

Treatment is instituted with diphtherial antitoxin (DAT). Mild cases Antitoxins of 20,000 -30, 000 IV are given. Moderate to severe cases are given 40,000 - 1 lakh QTD for 14 days is given and stopped after two culture / throat swab are negative after 14 days therapy.

Prophylaxis is given to close contact or people positive for throat swab by giving erythromycin (500mg) twice daily or Penicillin along with antitoxin.

CONCLUSION

Three major measures are indicated to counter the resurgence of diphtheria i.e. high immunization coverage of target groups, prompt diagnosis and management of diphtheria cases, and rapid identification of close contacts with their effective management to prevent secondary cases.^[11] Apart from treatment and vaccination proper education and awareness programs can help the country and community to evade this public problem.^[12]

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