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Fatal diphtheria cases in the vaccine era: Case series showing importance of early diagnosis in treatment of patient along with importance of booster doses in pre-school and school children

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Abstract
Diphtheria is acute toxin mediated disease caused by *Corynebacterium diphtheriae*. Although non toxigenic strains can cause infection but they are usually confined to cutaneous infection by bacteria itself and not toxin mediated. Early diagnosis and treatment is helpful in prevention of life threatening complications which directly affect the patient's outcome.

Keywords: toxin, non-toxigenic strains, cutaneous infection

Introduction
Diphtheria is infectious disease caused by toxigenic *Corynebacterium diphtheriae*. Despite widespread mass immunization, outbreaks are frequently encountered in our country [1]. Diphtheria has been eliminated from many developed countries by effective immunization, but it continues to be endemic in India [2]. The present case series points out cases of diphtheria that were reported from border area of Maharashtra and Karnataka which were referred to our hospital which is a tertiary care teaching hospital in Solapur Maharashtra in December 2018.

Case Series

Table 1

Case NO.	Case-1	Case-2	Case-3	CASE-3
Age/Sex	Male/5 years	Male/7 years	Female/ 6 years and 4 months	Female/6 years 4 months
Membrane over tonsils	Present	Present	Present	Present
ADS given Yes/No	Yes	Yes	Yes	Yes
Culture report & biochemical tests (+/-)	+	+	+	+
Immunization Status	Incomplete	Incomplete	Incomplete	Incomplete
Real time PCR results	Tox A gene detected	Tox A gene detected	Tox A gene detected	Tox A gene detected
Patient outcome	Stable	Died	Stable	stable

Anti-diphtheria serum (ADS) was given immediately after provisional report of Gram stain and Albert's stain.

Discussion
Corynebacterium diphtheriae is gram positive bacilli that exists in 4 biotypes (gravis, intermedius, mitis and belfanti). Severe disease is associated with gravis biotype but any strain can produce toxin. Major virulence factor of *C. diphtheriae* is potent exotoxin that inhibits protein synthesis [2].

As per National level health surveys coverage of three doses of diphtheria vaccine is about 80% during 2015-2016, however the information about booster doses is scares. So there is need to form government policies to keep track of booster doses as well, which may lead to decrease in the prevalence of diphtheria as there are many cases reported in our area where parents were not aware of booster doses, primary doses of DPT was given to the patient however booster doses were not given to them. In the present case series all the three cases primary 3 doses of DPT were given but booster doses were given which may be the reason for infection despite primary immunization of children as the antibody titer was not enough to confer immunity from the disease.

There is need to focus on improving coverage of not only primary but booster doses as well of diphtheria vaccine and introduction of diphtheria vaccine to school going children age group [4].

Diphtheria if not detected early and treated promptly can lead to significant morbidity and mortality due to life threatening complications so timely diagnosis and treatment is important for saving patients life.

Conclusion
Diphtheria is a fatal disease most likely to occur in partially immunized and non-immunized cases, so this signifies importance of immunization. We must encourage high uptake of scheduled immunization by increasing awareness among population. There is a need of active surveillance of booster dosage coverage which may help in decrease in the

cases. Clinical suspicion along with Microbiological confirmation will affect outcome of cases and lead to decrease morbidity and mortality.

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