Original Research Article

Persistence of Diphtheria around Shillong, Meghalaya – A retrospective study

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Abstract: Diphtheria is a potentially fatal infectious disease caused by *Corynebacterium diphtheriae.* Though incidence and mortality rate have reduced significantly after widespread immunization practices, cases and outbreaks continue to exist owing to deficiency in vaccination strategies and existence of mutations / variant epidemic clones of *C. diphtheria.* High immunization coverage of target groups, prompt diagnosis and management of diphtheria cases are very essential to reduce the morbidity and mortality caused by diphtheria. The present study was conducted to assess the clinico-microbiological profile of diphtheria cases presented to our institute. The institutional data from the years 2015-16 was analyzed retrospectively. This study showed twelve cases of diphtheria with a case fatality rate of 25%. Our study indicates that persistence of diphtheria in our area despite implementation of vaccination programs and necessitates continuous surveillance along with improvement of vaccination strategies.

Keywords: Diphtheria, *Corynebacterium diphtheriae,* vaccination, persistence, fatality

INTRODUCTION

Diphtheria is a potentially fatal infectious disease caused by *Corynebacterium diphtheriae.* Before the introduction of vaccination, diphtheria was one of the leading causes of mortality in children. Diphtheria is fatal in 5 - 10% of cases, with a higher mortality rate in young children. After widespread usage of immunization against diphtheria, both case incidence and mortality due to diphtheria have decreased markedly.[1]

A total of 4,530 cases have been reported to World Health Organization (WHO) during the year 2015. Though there was a sharp decline in diphtheria cases from 1980 to 2000, the incidence have not decreased in the past 2 decades [2] Despite implementation of extensive immunization programs, many outbreaks of diphtheria have been reported from developing countries [3] In India, most of the vaccine preventable diseases have seen a decline with the advent of Expanded Program on Immunization (EPI) and Universal Immunization program (UIP). However, Diphtheria is still endemic in many regions of our country and many outbreaks have been reported over the past years [4–7] High immunization coverage of target groups, prompt diagnosis and management of diphtheria cases are very essential to reduce the morbidity and mortality caused by diphtheria.

The present study was conducted to assess the clinico-microbiological profile of diphtheria cases presented to our institute.

MATERIALS AND METHODS

The present study on diphtheria is based on the retrospective analysis of the records in our department. The analysis was done for the years 2015 and 2016. All the cases admitted with suspicion of diphtheria during this period were included and their clinico-microbiological profile was analyzed. The diagnosis of diphtheria was made mainly on clinical findings, as microbiological confirmation was available in only 25% of cases.

Inclusion: Throat swabs taken from the cases which presented with laryngitis or pharyngitis and adherent membranes on tonsils and pharynx without other obvious diagnosis were included. A total of 12 such patients were admitted to our hospital with strong

clinical suspicion of diphtheria during this period and all of them resided in various districts of our state.

Exclusion: Throat swabs taken from cases presenting with acute streptococcal membranous tonsillitis, non-bacterial membranous tonsillitis / pharyngitis, thrush, chronic pharyngitis / tonsillitis and post-tonsillectomy faucial membranes were not included.

Microbiological confirmation:

Paired-swabs were received from all these cases. The swabs were processed according to the standard guidelines for diagnosing diphtheria. Microscopic examination of one swab using Albert's stain was done and another swab was used for cultural examination. Loffler's serum slope, 5% Sheep's blood agar and Potassium tellurite blood agar (PTBA) were primarily used for isolating *Corynebacterium diphtheriae*. Typical colonies growing on blood agar and tellurite medium were selected after 24 and 48 hr incubation respectively at 37°C and stained by Gram's, Albert's and Loeffler's methylene blue stains. After

staining, standard tests were used to identify till species level. Antibiotic sensitivity testing was done using 5% lysed sheep blood agar.

Clinico-epidemiological profile:

To understand the profile of these infections, the data was analyzed in terms of age, sex, seasonality, vaccination status, clinical presentation and case fatality during the study period.

RESULTS

A total of 12 clinically probable cases were found during the 2 years of study duration. The mean age of presentation was 7.83(±5.31) with an M: F ratio of 1.4. Among these 12 cases, three (25%) were bacteriologically confirmed. The mean age of the bacteriologically confirmed cases was 12.75(±5.07) with an M: F ratio of 3. The case fatality rate among these cases was found to be 25%. A brief summary of the cases is shown in Table 1 and Table 2. Seasonal distribution of the cases during the study period was shown in Figure 2.

Table 1: Summary of twelve clinically probable diphtheria cases included in our study

S.No	Age (in years)	Sex	DOA[a]	Culture result	Expired	Fever	Sore Throat	Membrane in throat	Days since onset of first symptom	Neck Oedema	Stridor	Complications	Immunisation	Tracheostomy
1	2	M	13/05/15	Neg	**Yes**	Y	Y	N	7	Y	Y	N	N	Y
2	7	F	18/11/15	Neg	No	Y	Y	Y	7	Y	Y	N	N	Y
3	20	F	02/01/16	**Pos**	No	Y	Y	N	3	N	Y	Y	U	Y
4	14	M	03/06/16	**Pos**	**Yes**	Y	Y	Y	5	Y	Y	N	Y	N
5	6	M	28/05/16	**Pos**	No	Y	Y	Y	5	N	N	N	N	N
6	12	M	06/06/16	Neg	No	Y	Y	N	7	N	N	N	Y	N
7	11	M	30/05/16	**Pos**	No	Y	Y	Y	7	N	Y	Y	U	N
8	3	M	01/06/16	Neg	No	N	N	N	1	N	N	N	U	N
9	3	F	20/08/16	Neg	No	N	Y	N	4	Y	Y	N	N	N
10	3	F	20/08/16	Neg	**Yes**	Y	Y	Y	7	N	Y	N	N	N
11	4	F	31/10/16	Neg	No	Y	Y	Y	7	N	N	N	Y	N
12	9	M	15/11/16	Neg	No	Y	Y	Y	3	Y	Y	N	U	N

[a]Date of admission (Abbreviations used : M – Male, F-Female, Y – Yes, N-No, U-Unknown)

Table 2 : Summary statistics of the included cases for the two years 2015 and 2016

Year	No. of cases	Microbiologically confirmed cases	Mean age[a]	M:F Ratio	CFR[b]
2015	2	0 (0%)	4.5(±2.5)	1	50%
2016	10	4 (40%)	8.5(±5.46)	1.5	20%
Total	12	4 (25%)	7.83(±5.3)	1.4	25%

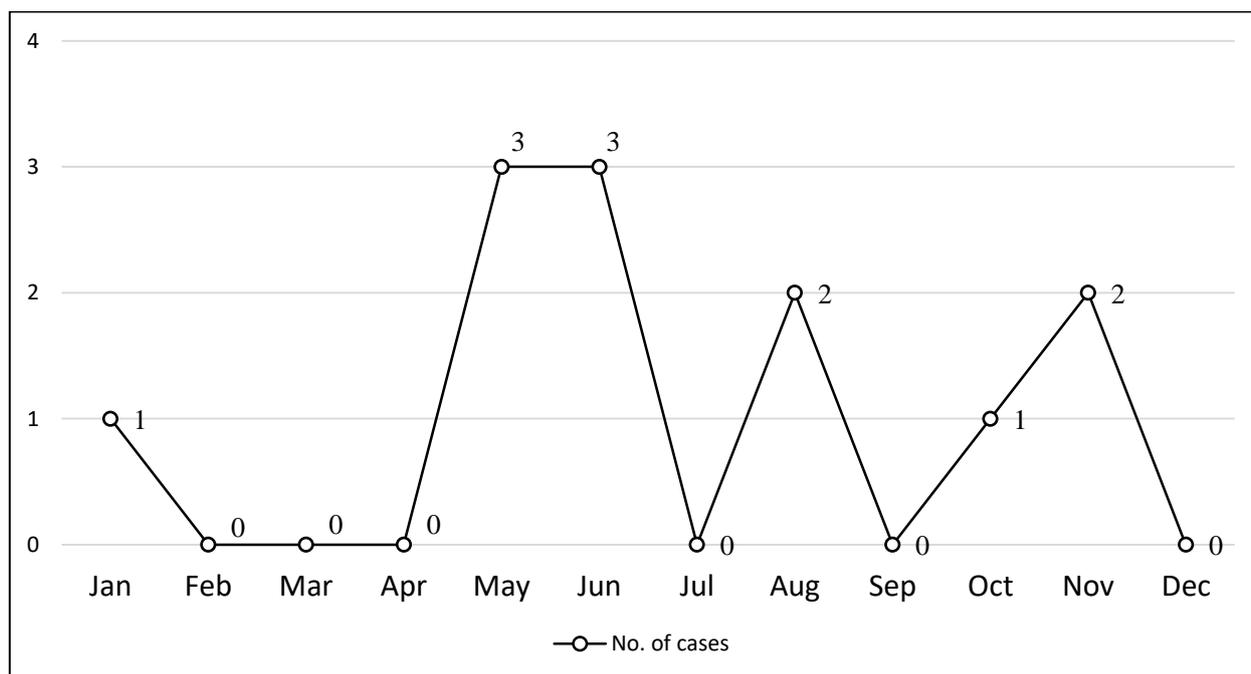[a]Mean age of cases with standard deviation in closed brackets. [b]Case fatality rate

Fig 1 : Seasonal distribution of diphtheria cases during the study period 2015-16.

DISCUSSION

Epidemiological and microbiological surveillance for diphtheria is very essential for adequate control of diphtheria. Inspite of widespread vaccination practices in our country; there are lots of pockets where the vaccination strategies have not reached. Continuous monitoring and reporting of such cases aids in recognizing them and implementing effective control measures.

In our study 25% of the cases were microbiologically confirmed, whereas different studies over the country reported different bacteriological positivity rates ranging from 7-50% [8–11]. The mean age of these cases were found to be 7.85 years and it was much higher (12.75 years) in the bacteriologically confirmed cases. This trend of increasing number of cases in older children in recent years in contrast to the previous years has been noted down by many recent studies.[6,11,12] This has been seen in various developing countries where the primary doses were given properly and later lost to booster doses. The immunity wanes away and the children become susceptible again in their later childhood and early adolescence.[6,13] The gender distribution and seasonal variation cannot be compared in a significant way with other studies as the number of cases were very low during the study period.

The case fatality rate (25%) in our study was relatively lesser than the other similar studies where they have reported rates ranging from 30 to 60%. [10,11,14]

CONCLUSION

Our study indicates that persistence of diphtheria in our area despite implementation of vaccination programs. Proper monitoring of primary vaccination along with improvement of booster vaccination strategies is a prime need of the hour. Continuous surveillance and prompt reporting of diphtheria cases (and deaths) should be done effectively to recognize and control outbreaks at the earliest.

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