

Diphtheria: Time to Introspect our Immunization Practices

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ABSTRACT

Objectives: Despite good DPT vaccination coverage diphtheria is down but not out. Herein we proposed to study the clinical profile and outcome of diphtheria in children in recent time.

Methods: This was a retrospective study done at department of paediatrics, KIMS, Hubballi from January 2016 to December 2016. Patients admitted with history suggestive of diphtheria were enrolled and categorised into probable and confirmed cases. All enrolled children's demographic data including age, sex, region, religion, immunization status, mean time of presentation to hospital from onset of illness, use of inotropes and mechanical ventilation were recorded in a predesigned proforma. Regarding Throat swab smear for C. Diphtheria and culture, complete blood count, Renal Function Tests (RFT) with serum electrolytes, Chest X-ray, ECG and 2D Echo were recorded in the proforma.

Results: A total of 14 cases fulfilled inclusion criteria. Among which 09 cases were confirmed and 05 cases probable. M: F ratio 6:8, The mean age of presentation was 9.08 years. The most common age group was 10-12 yrs (50%). Out of 14 patients 06 (42%) were unimmunised, 06 (42%) were completely immunised and 02 (16%) were partially immunised. Mean time of presentation to hospital after the onset of symptoms was 5.35days. All children received appropriate antibiotics and anti diphtheric serum. Four (28%) children expired and 4 (28%) children had complications, 2 with toxic cardiomyopathy and 2 with palatal palsy among them one had associated polyneuropathy.

Conclusion: This series unmasks the fact that the disease is equally prevalent in immunized and older children and high mortality in acute phase due to respiratory involvement.

INTRODUCTION

The use of DPT vaccines has had significant impact on the burden of diphtheria in India. Diphtheria is down BUT NOT OUT!! This age old disease is still persisting in few states of India and published reports of the disease do exist in Indian literature indicating outbreaks, secular trends and a shifting epidemiology over the years¹⁻². Herein we are reporting a case series of diphtheria with occurrence of the disease in immunised children comparable to that of unimmunized children.

MATERIALS AND METHODS

This was a retrospective descriptive hospital based study done at department of paediatrics, KIMS, Hubballi from January 2016 to December 2016. Patients admitted to paediatric ward with history suggestive of diphtheria, like fever, sore throat, dysphagia with greyish white membrane in throat were included in the study.

The cases were categorised as probable and confirmed cases of diphtheria based on the following definitions. Probable diphtheria is an upper respiratory tract illness characterized by sore throat, low grade fever, and an adherent membrane of the tonsils, pharynx, and/or nose, and confirmed diphtheria is a probable case supported by laboratory evidence either by (i) isolation of the organism from a clinical specimen or (ii) demonstration of a four-fold or greater rise in serum antibody titres in paired sera samples (only if both serum samples are obtained before the administration of diphtheria toxoid or antitoxin) [1].

Demographic data including age, sex, region, religion, parental education and economic status were recorded in a predesigned Performa. Detailed clinical history including immunization status, mean time of presentation to hospital from onset of illness, use of inotropes and mechanical ventilation were recorded in a pre-designed Performa. Immunization cards, health cards or any available previous medical records were also sought for. Children who had received three primary doses of DPT vaccine at 4–6-week intervals starting at 6weeks of age, followed by booster doses at 18 months and 5 years were recorded as "Immunized". Those who had not received any dose were considered "Unimmunized". Patients who had missed one or more of the three primary doses or booster doses were included as "Partially immunized". Detailed history of immunization from parents was taken followed by confirmation from records.

Throat swab smear for Albert staining and culture, complete blood count, Renal Function Tests (RFT) with serum electrolytes were done for all patients. Further Chest X-ray, ECG and 2D Echo were done as and when indicated as per respective unit protocols. Details about antibiotics given and Anti Diphtheritic Serum (ADS) administration were recorded for analysis. The ethical clearance obtained from institute ethical committee.

RESULTS

A total of 14 cases fulfilled inclusion criteria during the study period. Out of 14 cases 09 cases were confirmed to have Albert stain positivity and labelled as confirmed cases and 05 cases were labelled as probable diphtheria. Out of 14 patients enrolled in the study 08 were female (57.2%) and 06 were male (42.8%). The mean age of presentation was 9.08 years. The highest incidence was seen in the age group 10-12 yrs (50%). Majority were from rural area 09 (64%) and remaining patients from urban area belonged to a single locality in Hubballi. All patients belonged to lower socioeconomic status according to modified Kuppuswamy classification. Out of 14 patients, 06 (42%) were unimmunised, 06 (42%) were completely immunised and 02 (16%) were partially immunised.

Most common clinical presentation was fever 13 (92.8%) followed by sore throat 08 (64.2%), neck swelling 06 (42.8%), dysphagia 05 (35.7%). Examination revealed tonsillar hypertrophy and pseudomembrane in all patients (100%), whereas 13 (92.8%) had cervical lymphadenopathy, 04(28.5%) had bull neck and 03 (21.4%) had halitosis. Mean time of presentation to hospital after the onset of symptoms was 5.35days. Only 05 (35.7%) patients presented within 3 days of onset of symptoms.

Albert stain was positive in 9 cases (64.2%), of which culture was positive in 4(44.4%) cases. All 14 children had pharyngeal/tonsillar involvement and 2 (14.2%) of them also had laryngeal involvement. Table 1

Table1: Comparison of profile of diphtheria in immunized and unimmunized/partially immunized children (N=14)

	Immunized (6)	Unimmunized/Partially immunized (8)
Laryngeal involvement	01(16%)	01(12%)
Dysphagia	02(33%)	03(37%)
Respiratory distress	01(16%)	02(25%)
Bull neck	01(16%)	03(37%)
Confirmed cases (Albert stain positive)	04(66%)	05(62%)
Culture positive (throat swab)	02(33%)	02(25%)
Sequel	01(16%)	03(37%)
Deaths	02(33%)	02(25%)

pharyngeal/tonsillar involvement and 2 (14.2%) of them also had laryngeal involvement. Table 1 showed comparison of profile of diphtheria in immunized and unimmunized/partially immunized children. Blood investigations revealed that 4 patients had thrombocytopenia and 2 had deranged renal function tests. Mean time of administration of ADS from onset of symptoms was 5.9 days. Among the survivors complications/sequel occurred in 4 (28%) patients, two children had toxic cardiomyopathy (in 3rd week of illness), one had palatal palsy (in 4th week of illness) and one had palatal palsy with associated polyneuropathy.

Table 2

Table 2: Comparison of profile of diphtheria in children who survived and died (N=14)

	Survivors (10)	Deaths (4)
Mean age (years)	8.28	11.075
Mean time of presentation(days)	4.84	6.625
Laryngeal involvement	0	2
Bull neck	01	03
Confirmed cases (Albert stain positive)	06	03
Culture positive (throat swab)	02	02
Mechanical ventilation	00	04

showed comparison of profile of diphtheria in children who survived and died. All patients had received appropriate antibiotics. Inotropes were used in 4 patients, 3 needed respiratory support/mechanical ventilation. None of the children requiring respiratory support survived. Four patients expired in the study group out of which 3 were confirmed cases of diphtheria. Case fatality rate was 28%.

DISCUSSION

Diphtheria mainly affects children aged between 1 to 5 years, however due to good vaccine coverage worldwide, a shift in age incidence has been observed from preschool to school age (5-15 yrs) with more and more cases being reported in adolescents and adults. Estimates of coverage of DPT vaccination have ranged from 29% to 61%, depending on area of residency [3].

Though diphtheria is on the verge of being eliminated in a few developed countries, 4530 cases were reported worldwide in 2015. Unfortunately 2365 (52.2%) of these were from India. The reported incidence for diphtheria in India has been 4233 and 2525 cases in the years 2011 and 2012, respectively as compared to 39231, 8425, 5125 in 1980, 1990, 2000 respectively [4].

Present study shows higher incidence of diphtheria in the age group of 10-12 years. Similar observations were made by other studies, about change in epidemiology of diphtheria that the disease which was common among under five children was now more prevalent in older children [5-7]. This change may be owing to the fact that immunity against all three components of DPT vaccine wanes over the next 6-12 years and thus emphasizing the need for regular booster doses.

All the patients in our series belong to lower socioeconomic status and most of them are from rural areas with parents being illiterates. Patients from urban area clustered from a single locality in Hubballi, which is densely populous with one community, predominantly unimmunized.

It was interesting to note as well as frightening to learn from our observations that 42% of patients developed diphtheria despite being fully immunized. Earlier we have reported diphtheria with ocular manifestations in a fully immunised child [8]. In a clinico-epidemiological study by Meera et al, on a large sample in Andhra Pradesh revealed that 41% of parents gave history of complete immunization among Diphtheria patients [9]. The possible explanation could be individual variations in immune response to vaccines or failure of vaccine response [10]. However, failure to get children immunized vaccine ineffectiveness (due to non maintenance of cold chain) at the time of use and improper technique of administration can also contribute to the disease burden.

At an individual level, each one of us can play an important role in the journey towards elimination of diphtheria in India. The immunization status of each child we encounter in our daily practice should be actively enquired about, and primary and catch-up immunization should be promoted [12].

Four children (28%) died in this series during acute phase. Probably due to late presentation to hospital (mean time of presentation from the day of onset of symptoms = 6.625days) leading to delay in administration of ADS. The factors contributing to mortality include patient's immunization status, age at infection, clinical type, and time of intervention and time of administration of antitoxin. It has been shown that use of antitoxin significantly reduced the mortality (3.3% in treated compared to 12.2% in untreated patients) [11]. Studies also showed that early administration of antitoxin also very crucial for better outcome, there was sharp increase in mortality from 4% in those treated with antitoxin within 24-48 hours to 16.1% in those treated on the third day of illness [8]. During follow up we noticed 4 children with complications/sequel, 2 had cardiomyopathy during 3rd week of their illness, 1 had palatal palsy and 1 had palatal palsy with polyneuropathy in 4th week of their illness. All four children with these complications recovered completely with supportive care alone.

This series unmasks the fact that the disease is equally prevalent in immunized and older children with the changing epidemiology of diphtheria in the era of vaccines. Creating awareness among general population about the disease and preparedness among health care givers to fight the disease including accessibility to ADS should be prioritized. To conclude, it is high time to introspect on our immunization practices and emphasize the need for "routine immunization" practices before diphtheria hits mankind like never before.

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