

Original research article

**A CROSS SECTIONAL STUDY ON CLINICAL AND
LABORATORY PROFILE OF DIPHTHERITIC PATIENTS
ADMITTED IN INFECTIOUS DISEASE HOSPITAL,
HYDERABAD, TELANGANA**

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Abstract

Background: Diphtheria is a contagious bacterial infection caused by *Corynebacterium diphtheriae* with a fatality rate of 5 - 10%. In 2020, there were about 1991 cases and 28 deaths due to diphtheria in India. Sore throats, fever, swollen glands, thick gray colored pseudo membrane over the throat are the common clinical features of Diphtheria. Environmental factors like overcrowded houses and poor socio-economic conditions lead to higher transmission of disease.

Objective: To assess the clinical and laboratory profile of patients admitted in infectious disease hospital with symptoms of diphtheria.

Materials and Methods: A Hospital record based cross sectional study, was carried out at an infectious disease hospital which is a tertiary care center in Hyderabad, Telangana from November 2014 to October 2015. A total of 1140 patients admitted with the symptoms and signs of Diphtheria during the period 2006 - 2010 were taken.

Results: Female preponderance was noted (60.53%) and majority (24.44%) of cases were in the age group of 6 -10 years. The most common presentation was sore throat (62%), fever (60%), cough (46.3%) and dysphagia (40%). Around 2.11% patients reported myocarditis and 37.89% had positive throat swab for Klebsiella Loeffler's Bacilli. Anti-diphtheritic serum was administered to 12.8% of patients.

Conclusion: Primary immunization with all 3 doses of DPT vaccine can reduce disease burden, morbidity and mortality. There is need for emphasis on effective surveillance of the disease and early detection of cases so as to promote timely initiation of treatment and prevent complications.

Keywords: Diphtheria, myocarditis, anti-diphtheritic serum

Introduction

Diphtheria is a vaccine preventable, contagious and acute infectious upper respiratory tract disease caused by the exotoxin, which is produced by the gram-positive bacterium called *Corynebacterium diphtheriae*. Diphtheria is considered as endemic disease in India as it contributed to half of the global burden from 2001 to 2015. A total of 4167 cases were registered with a fatality rate of 2.2% annually from 2005 to 2014 ^[1]. In 2020, there were about 1991 cases and 28 deaths due to diphtheria in India. A total of 254 cases were reported from the state of Telangana without any fatality ^[2]. The disease is transmitted from person to person through respiratory droplets, discharges from skin lesions and at times through fomites. Environmental factors which are responsible for higher transmission rates of this infection are overcrowded houses and poor socio-economic conditions ^[3].

As per National Family Health Survey (NFHS) - 5 report of Telangana State conducted in 2019 -2020, 79% of children aged 12 - 23 months had received primary vaccination against diphtheria. The preceding survey (NFHS- 4) conducted in 2015 -16 showed a vaccine coverage rate of 67.5% among 12 - 23 months old children, A declining trend is observed in Diphtheria due to increasing immunization coverage ^[4].

The virulence of this bacterial infection is mainly exerted due to its exotoxin which causes tissue necrosis. This exotoxin has affinity to myocardium leading to Carditis, arrhythmias and heart block. Neurological involvement of diphtheria leads to demyelination of nerves, nerve weakness or paralysis. Other complications of diphtheria include acute kidney injury and thrombocytopenia ^[5,6].

Though the prevalence of diphtheria has reduced drastically, the disease is still prevalent among children who are partially immunized and unimmunized. Late presentation of the disease, can lead to progression of disease to severe complications. The present study was taken to describe the clinical and laboratory profile of diphtheria patients attending a tertiary care institute, Hyderabad, Telangana.

Objective

1. To describe the socio demographic profile of patients attending infectious disease hospital with symptoms of diphtheria.
2. To describe the clinical and laboratory profile of patients attending infectious disease hospital with symptoms of diphtheria.

Materials and Methods

Study design: Hospital based retrospective cross-sectional study.

Study area: Tertiary care center for infectious diseases, Hyderabad, Telangana

Study duration: November 2014 to October 2015.

Study population: All the patients admitted with the symptoms and signs of Diphtheria during the period 2006 - 2010.

Sample size: A total of 4528 diphtheria case sheets were available and study was conducted in 25% of the available case sheets. Hence the sample size for the present study was calculated as 1132, which was rounded to 1140.

Sampling Methods: Systematic random sampling technique was used and every 4th case sheet was selected. First case of diphtheria reported in the month of January, 2006 was taken as first case sheet. If the fourth case sheet was found to be absconding/ left against medical advice / case sheets not filled completely then the next case sheet was taken.

Data Collection: After obtaining permission, case sheets were reviewed from the Medical Record Section. Case sheets were bundled in month wise and disease wise. Then the bundle of diphtheria case sheets belonging to the month of January, 2006 was identified and screened. Then the first case sheet belonging to the first patient admitted was taken and numbered as no.1, from then every 4th case sheet was taken, screened and information was entered in the proforma.

Ethical Clearance: Ethical clearance was taken from the Institutional Ethical Committee. Personal identification data was not collected to maintain study subjects' confidentiality.

Data analysis: Data was analyzed using Microsoft excel and Epi info version 7. Descriptive statistics are mentioned and tests of significance - chi square test was applied wherever required.

Results

In this study, the mean age of study subjects was 20.3±11.7 years. Males were 39.4% of study population and females were 60.6%. Around 69.1% of population were partially immunized and 11% were unimmunized. Around 19.9% were completely immunized and yet presented with the disease.

Table 1: Distribution of study subjects according to clinical features

Symptoms*	Male		Female		Total	
	No.	%	No.	%	No.	%
Fever	406	40.00	611	60.00	1015	89.04
Sorethroat	348	37.58	578	62.42	926	81.23
Dysphagia	335	40.07	501	59.93	836	73.25
Cough	82	46.33	95	53.67	177	15.53
Greyish white membrane in throat	387	86	609	88.26	996	87.37

*Some patients have more than one complaint

Around 64.5% of study subjects presented within 3 days of onset of symptoms and the most common clinical feature was fever (89%), greyish white membrane in throat (87.3%), sore throat (81.2%) followed by dysphagia (73.2%) and cough (15.5%).

Table 2: Distribution of study population according to laboratory parameters

	Male		Female		Total	
	No.	%	No.	%	No.	%
Klebsiella loeffler’s bacilli positive	180	40.00	252	36.52	432	37.89
Ketone bodies in urine	242	53.78	366	53.04	608	53.33
Culture positive for diphtheriae	21	4.6	66	9.5	87	7.63

Among the study subjects, 37.89% were positive for throat swab for KLB but majority 62.11% were negative for throat swab for KLB. Around 53.33% had urinary ketone bodies and only 7.63% of study subjects showed culture positivity for *Corynebacterium diphtheriae* organism. L-carnitine was given to 84.65% of total study subjects and 13.07% were given antidiphtheritic serum.

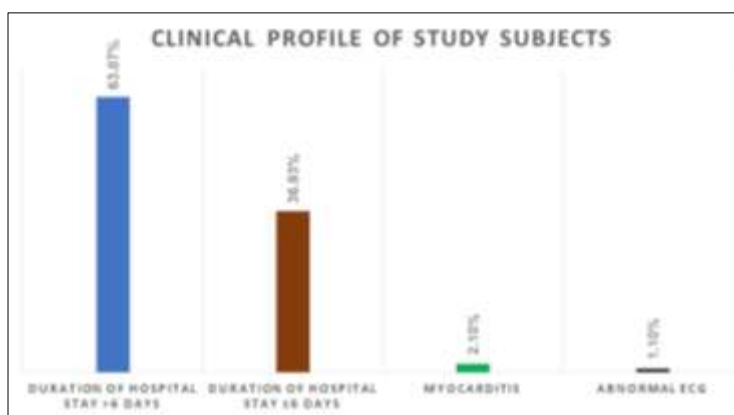


Fig 1: Distribution of study subjects as per clinical profile

Around 63.07% patients had a hospital stay of >6 days and 36.93% had a stay of ≤6 days. Almost 2.1% had complication of myocarditis and 1.1% had abnormal baseline ECG. Myocarditis was significantly commoner among children <15 years of age group (Chi square - 39.2; p - 0.001)

Table 3: Distribution of study subjects according to Immunization Status and Anti Diphtheric Serum treatment

Immunization	Given		Not given		Total	
	No.	%	No.	%	No.	%
Complete	13	8.72	213	21.49	226	19.82
Partial	117	78.52	671	67.71	788	69.12
Unimmunized	19	12.75	107	10.80	126	11.05
Total	149	13.07	991	86.93	1140	100

$\chi^2 = 13.29, df = 2, p = 0.0013$

It was observed that necessity of treatment with ADS was higher in partial (78.52%) and unimmunized (12.75%) than completely immunized (8.72%) subjects. This

difference was found to be statistically significant ($p<0.001$).

Discussion

The mean age of study subjects was 20.3 ± 11.7 years and female preponderance was noted (60.6%). A total of 69.1% of population were partially immunized - i.e. they either did not take 3rd dose of DPT vaccine or missed the booster dose and 11% were unimmunized. This could be due to ignorance about the importance of completing the vaccination schedule, religious factors, fear of side effects or higher gap between primary dose and booster dose.

These findings coincided with a study by Boghani S *et al.* in which 95% of study subjects were <14 years of age and there was almost equal distribution of both sexes and M:F ratio was 1.06:1. Around 87% of subjects did not receive the booster dose of DPT [7]. Similar findings were observed in a study by Meshram RM *et al.* in which 55.32% were in the age group of 5-12 years and 48.94% were males. Only 4.25% were fully immunized, 57.45% were partially immunized and 38.3% were unimmunized [8]. Basavaraja JC *et al.* (74.1%), Bandichhode ST *et al.* (66.66%) also reported that disease was commoner among children more than 5 years of age and female preponderance. Around 11.1% were completely immunized, 30.55% were partially immunized and 58.3% were unimmunized [9, 10].

In this study, majority of study subjects presented within 3 days of onset of symptoms and 63.07% patients had a hospital stay of >6 days. Most common clinical feature was fever (89%), greyish white membrane in throat (87.3%) and sore throat (81.2%). Around 37.89% were positive for throat swab for KLB and 53.33% had urinary ketone bodies and only 7.63% of study subjects showed culture positivity for *Corynebacterium diphtheriae* organism. The very less positivity could be due to poor collection of throat swab and initiation of antibiotic prior to collection of swab sample. Almost 2.1% had complication of myocarditis which was significantly commoner among children <15 years of age group.

Similar findings were observed by Meshram RM *et al.* in which fever and membrane in throat was observed in all patients. Only 31.91% had KLB positivity and 14.89% had culture positivity [8]. Similar clinical presentation of fever, pseudomembrane and sore throat was reported in studies conducted by Bandichhode ST *et al.* and Singh SN *et al.* [10, 11]. Comparatively higher *Corynebacterium* positivity was reported in studies by Basavaraja *et al.* (16.1%), Bandichhode *et al.* (33.33%) and Singh SN *et al.* (30.63%) [9, 10, 11]. Prasad M S Durga *et al.*, reported that duration of illness before hospitalization was ≥ 5 days in 26.3% cases. [12] Meshram RM *et al.* and Gundam BR *et al.* reported a very high incidence of Myocarditis (42.55%) [8, 13].

It was observed that necessity of treatment with ADS was significantly higher in partial (78.52%) and unimmunized (12.75%) than completely immunized (8.72%) subjects. The present study findings were similar to a study by MM *et al.* in which also it was reported that lesser requirement of ADS was needed among fully immunized children [14].

Conclusion & Recommendations

1. Creating awareness about booster doses of DPT Vaccine and improving the immunization coverage to achieve “fully immunized status” should be emphasized as the age shift in Diphtheria signifies success of primary immunization and the lack of coverage with booster doses.
2. DT and dT booster doses which are already part of National Immunization schedule should be implemented more efficiently and stringently to combat the outbreaks and reduce the severity of illness.

Limitations of the study

1. The study was conducted based on secondary data and hence any reporting defect may impact study’s findings.
2. There was no detailed information on factors like the nutritional status of children and pre-existing diseases in the records which may have provided further evidence related to high infection of diphtheria in children.
3. Serological analysis for antibody estimation could not be taken up to know the immunological status.

Conflict of Interest: None.

Funding Support: Nil.

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