CASE REPORT

DIPHTHERIA, YET TO BE CONQUERED

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Abstract

Objectives: Diphtheria had been a major cause of childhood mortality until the advent of an effective vaccine. India accounted for 18-94% of global burden of diphtheria. However, in a recent report we noted an increase in incidence of diphtheria. We present the mortalities from diphtheria to highlight the need for full immunization coverage, failing which an increased chance that the disease may return.

Methods: Review of the case notes of patients managed for diphtheria between July 2012 and July 2013 was done and relevant data extracted.

Results: Nine cases of diphtheria were seen and three mortalities were recorded giving a mortality rate of 33.3%. Two deaths were from myocardial involvement. The third mortality could not be assessed as the child died after being discharged from the hospital.

Conclusion: Diphtheria, with high mortality need to be prevented with complete immunization and also treating diphtheria cases with diphtheria antitoxin, as the disease is socio-economic burden to the society.

Keywords: Diphtheria, Mortality, Immunization, Resurgence, Antitoxin

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Introduction

Diphtheria, a disease caused by Corynebacterium diphtheria and its exotoxin is characterized by high case fatality [1-3]. Diphtheria commonly affects the tonsils, pharynx and larynx. Diphtheria exotoxin, a potent 62 kd polypeptide inhibits protein synthesis leading to local tissue necrosis. The necrotic epithelium becomes embedded in exuding fibrin and red and white cells, resulting in a dense necrotic coagulum of organisms, epithelial cells, fibrin, leukocytes, and erythrocytes [2, 3]. This advances—commonly over the tonsils, pharynx, or larynx, and becomes a gray brown, leather-like adherent pseudomembrane (Diphtheria in Greek means leather).

In the pre-vaccination era, diphtheria was a leading cause of childhood mortality with 15% children being symptomatic and the rest subclinical, along with naturally acquired immunity [4]. Diphtheria in India has shown to be endemic in certain areas [5]. As per report of WHO/UNICEF, 2004 the estimated DPT-3 coverage among children in India has dropped from 71% in 1990-1995 to 64% every year from 2000 to 2004 [6]. India accounted for 18-94% of global burden of diphtheria [7]. According
to WHO/UNICEF estimates [8] DPT-3 coverage was 66% in 2008 as per NFHS [9-11] DPT-3 coverage during 1992-2006 was 52-55%. Diphtheria situation in India certainly warns of longer term potential re-emergence similar to the one in Former Soviet Union in 90’s [12]. In 2008, India contributed 6081 (86.66%) of the 7017 diphtheria cases reported globally [13]. The reported incidence of diphtheria in India during 1980 was about 39231 and it reduced to 5685 cases in 1985. In the year 2012 the incidence of diphtheria was 2525 [14]. Coverage with 3 doses of the whole cell vaccine DPT stands at 55%. Vaccine induced immunity does not last for life and various serological studies conducted in developed countries have shown adults being potentially susceptible, especially with incomplete immunization. Low levels of adult immunity and gradual increase in number of children not receiving three doses of DPT vaccine poses an imminent threat to resurgence.

Case Report

We hence discuss nine cases of diphtheria who presented to us within past one year in the age group of 4 to 11 yrs of which 55.5% are males and 45.5% females. 66.6% had received primary immunization and none had received booster doses of the vaccine and majority belonged to low socio-economic status. Out of the nine cases 33.3% presented with stridor, 55.5% with neck swelling, 66.6% with myocarditis and post diphtheritic paralysis on ventilator, 44% had tonsillar membrane, albert stain and culture were negative for all the cases, with 66.6% showing ECG changes for myocarditis and 33% showing elevated cardiac enzymes. The children were immediately started on Penicillin and given diphtheria antitoxin.

Figure 1. Distribution of cases depending on the gender

![Figure 1](image_url)
Figure 2. Distribution of cases depending on clinical features

<table>
<thead>
<tr>
<th>Clinical Feature</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stridor</td>
<td>33%</td>
</tr>
<tr>
<td>Mandibular swelling</td>
<td>55.50%</td>
</tr>
<tr>
<td>Myocarditis</td>
<td>66.60%</td>
</tr>
<tr>
<td>Post diphtheretic paralysis on ventilator</td>
<td>66.60%</td>
</tr>
<tr>
<td>Tonsillar membrane</td>
<td>44%</td>
</tr>
</tbody>
</table>

Figure 3. Distribution of cases depending on lab parameters and other diagnostic modalities

<table>
<thead>
<tr>
<th>Diagnostic Modality</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Albert stain</td>
<td>0%</td>
</tr>
<tr>
<td>Culture</td>
<td>0%</td>
</tr>
<tr>
<td>ECG changes</td>
<td>66.60%</td>
</tr>
<tr>
<td>Elevated cardiac enzymes</td>
<td>33%</td>
</tr>
<tr>
<td>Chest X ray</td>
<td>55.50%</td>
</tr>
</tbody>
</table>
Discussion

Diphtheria is associated with high mortality and one of the prognostic factors is the speed with which the antitoxin is administered [2]. For those in whom the disease is recognized on the first day and appropriate treatment instituted mortality is 1% but those in whom such treatment is delayed till the fourth day mortality rises to 20%. In a series reported from Thailand, early recognition and prompt treatment reportedly decreased complications and mortality [15]. The high mortality was recorded in another report from India in which a case fatality rate of 30.8% was recorded during an outbreak of diphtheria in which none of the patients benefited from antitoxin since none was available [16]. A study from Nigeria reported nine patients were admitted over the two year period and three mortalities were recorded giving a mortality rate of 33.3% [17].

Diphtheria has a socioeconomic component; outbreaks are typically seen in marginalized groups. In the current economic climate, more socially deprived groups that are vulnerable to infection will emerge. The economic crisis may also threaten supplies of vaccine and antitoxin and delivery of immunization programs. Because reduction in finances can limit the capacity for surveillance, decreases in case reporting need to be interpreted with caution. Every effort must be made to maintain high diphtheria vaccination coverage [18]. The importance of maintaining adequate population immunity against diphtheria was highlighted when epidemic diphtheria re-emerged in several eastern European countries in the 1990s, with a high proportion of adult cases [19]. Rapid clinical and public health responses are required to control diphtheria. The two primary goals of investigation are; a) prompt diagnosis and management of case(s) and; b) rapid identification of close contacts with their effective management in order to prevent secondary cases.

A sudden upsurge in diphtheria like cases is a cause of concern. Cases have also been reported from the other parts of the country.
and world [19, 23]. Singhal et al., [20] observed 10 cases of diphtheria from September to October 1999, Nandi et al., [21] observed 101 cases of diphtheria over a period of five years (March 1997 - March 2002) and Bitragunta et al., [22] observed 2685 cases of diphtheria from 2003-2006 in Hyderabad.

Poor uptake of routine immunization as observed in this study is consistent with low protection against diphtheria in this state and country. Children aged 12-23 months who have received three doses of DPT vaccine in India are 55.3% [14]. Therefore a need to strengthen the immunization services as a means of prevention. However, as long as diphtheria is not eradicated diphtheria antitoxin should be available to treat clinical cases of diphtheria so as to reduce case fatality rates. The presence of diphtheria in any given community remains a potential risk for the rest of the world since the world has become a global village.

Conclusion

Diphtheria is one of the six killer diseases and hence included in our national immunization schedule. With three doses of diphtheria vaccine we are achieving 55% protection. This disease is associated with high mortality and morbidity and hence requires complete immunization coverage for its prevention. The booster doses are as important as the primary immunization to provide protection as the immunity weans off. We must also focus on the use of diphtheria antitoxin in diphtheria cases as it decreases the morbidity and mortality and helps thus improve the health status of the society.

Abbreviations

DPT (Diptheria, Pertusis, Tetanus)
WHO (World Health Organization)
UNICEF (United Nations International Children’s Emergency Fund)
NFHS (National Family and Health Survey)
ECG (Electrocardiogram)

References


