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Epidemic Investigation of Diphtheria Outbreak in Banaskantha District, Gujarat

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ABSTRACT

Background: Diphtheria is one of the vaccine printable diseases. With launch of successful vaccination program it has shown dramatic reduction in the cases but still sporadic outbreaks are reported. India is the major contributor in global burden of Diphtheria.

Methodology: In the northern district of Gujarat, six deaths due to suspected diphtheria was reported. A group of experts as a State Rapid Response Team visited the district. Team interacted with the district health officials, local treating paediatrician and microbiologist, families of cases and deceased and gathered information. Team had also collected detail of the 47 cases from district health authority and analysed the data received.

Results: Three cases were found laboratory confirmed diphtheria and rest of the cases were clinically diagnosed by the paediatrician. Cases were reported from 7 blocks out of 14 blocks and they could be linked temporally and geographically. Mean age of the reported diphtheria cases was 7 years. 82.1% of suspected cases of diphtheria was either unvaccinated or their vaccination status was not known. Case fatality rate was reported 17%.

Conclusions: Low immunization status with difficult terrain, vaccination hesitancy has resulted into the outbreak of diphtheria. District health team has initiated response as per the national guidelines. But for prevention of the outbreak in future, improvement of vaccination in highrisk groups/areas and effectively using data from surveillance system for early actions should be carried out.

Key words: Diphtheria, Outbreak, Vaccination status

INTRODUCTION

India's fight against six vaccine preventable diseases (VPDs) got better strategized with initiation of Expanded Program of Immunization (EPI) in 1978. EPI got further momentum by launch of Universal Immunization Program in the year 1985. Since the launching of immunization program, remarkable reduction in the cases of diphtheria has been reported in India.[1] Still India keeps on reporting high number of cases of diphtheria. It had reported total 41,672 cases of diphtheria with an average 4,167 cases per year between 2005–2014. Gujarat is among the 10 states which contribute 84% of total cases of diphtheria.[2]In the year 2018 India has reported 8788 cases, which is more than half of global cases.[3]

Diphtheria is an acute infectious disease affecting largely upper respiratory tract. Its infection leads to development of fever, sore throat, difficulty in swallowing and swelling in the neck of 2-10 days duration. It is characterised by the pseudomembranes usually in the upper respiratory tract. It produces exotoxin which affects the heart and kidney. This may result into the death of a person. Case fatality of diphtheria was higher during pre-

vaccination era but then after it is reported around 10 % where anti diphtheria toxin is available.[4]

Outbreaks of diphtheria continue to occur, in spite of the availability of effective vaccines. It is largely reported in the groups or areas with low immunization coverage. Weaker heath care delivery system, ineffective implementation of the immunization program and/or vaccine hesitancy and difficult terrains are underlining factors.[5] Gujarat is the western state of India, with well established health system. In the state sporadic cases of the diphtheria has been reported.[6]

METHODOLOGY

Till 17/10/19 six deaths due to suspected diphtheria were reported in the Banaskantha district, a northern district of Gujarat state. To investigate, and give recommendations to contain the outbreak, a state Rapid Response Team (RRT) consisting of experts from Community Medicine, Paediatrics and Microbiology visited the district on 18/10/2019.

The RRT Team reached Palanpur city, a capital city of Banaskantha and met district health officials. Detail of the cases and action taken were received through interactions with district health officials. After that, team went to civil hospital, Palanpur, where total 19 cases were reportedly admitted. At civil hospital detail about clinical presentation, their investigations and management protocol were gathered and interviews with the treating doctors and microbiologist were carried out.

In afternoon, RRT members divided into two teams, and visited two most affected blocks with local health teams. Families of the deceased cases and their contacts were interviewed and detailed history from the relatives was taken. Also, case papers, records and registers were reviewed. Clinical examination of few contacts was done. Also action taken by the local health team was assessed.

Actions by district health system: Investigation by the district Rapid Response Team was carried out. Outbreak response plan was prepared with the help of local Surveillance Medical Officer from WHO. Line list of all the cases and contact list of all cases were prepared. Tablet Erythromycin was given to all close contacts. Active case search was initiated. Cases with fever and throat pain and/or membrane were being referred to civil hospital, Palanpur where they were assessed and diagnosed. Outreach immunization session for all unimmunized children upto the ages of 15 years initiated. As per the record, out of 1109 eligible children 425 were vaccinated in the visited village of affected block till date of state RRT visit.

OBSERVATIONS

During field visits it was observed that past and current cases of Diphtheria and line list of all contacts were prepared. All contacts were provided tablet erythromycin for seven days. Also, with the support of local health team, active case searching and getting information of all the cases in prescribed Case Information Form (CIF) was initiated. Local team had recorded 47 cases, prepared the line list of 40 cases and filled CIF for 28 cases till 17/10/2019.

At civil hospital, Palanpur, total 24 paediatric cases of suspected diphtheria were admitted from September 2019 till 18/10/19. Out of the 24 throat swabs one specimen was positive in gram and albert stain and three specimens for Corynebacterium diphtheriae were isolated in culture. Out of the 3 culture positive cases, one was under treatment at General Hospital Palanpur. Rest all cases were clinically confirmed diphtheria cases by paediatrician. One case was referred to Civil Hospital Ahmedabad and one patient has gone to in private hospital Deesa.

As per the report received from CDHO office, total 47 suspected/clinically confirmed cases of diphtheria were found in last 1 month till date of the visit. Based on the available detail of 40 cases out of reported 47 cases, primary case was found on 16th September 2019 and total 8 deaths were noted till 17th October 2019. Out of them 27 cases were reported in last eight days of visit. (Figure 1)

There are total 14 blocks in the Banaskantha District. Cases of Diphtheria were reported from seven blocks with maximum 29 (61.7%) at Dhanera followed by Deesa with 8 cases (17%). Thus around 80% of the cases were found in the two blocks of the districts only. (Table 1). Out of total 8 deaths, 5 deaths were reported from DhaneraTaluka (62.5%) only.

Around 75% cases had taken treatment in the government civil hospitals (58.5% at Civil Hospital Palanpur and 17.1% at Civil Hospital Ahmedabad) (Table 2)

Mean age of the cases reported was 7 years. Out of 47 cases reported, 36 (76.6%) cases were between 3 to 10 years of age. Within this age group 22 (46.8%) cases were reported between 6-10 years and 14 (29.8%) cases were between 2 to 5 years (Table 3). Slightly higher no. of cases was reported in females.

Case Information Form (CIF) with detail history was available for 28 cases. On analysis based on details of these 28 cases, 23(82.1%) children were found not immunized for DPT/Pentavalent 3rd dose and DPT booster.

Graph 1: Time distribution cases admitted (n=40) and occurrence of deaths (n=8)

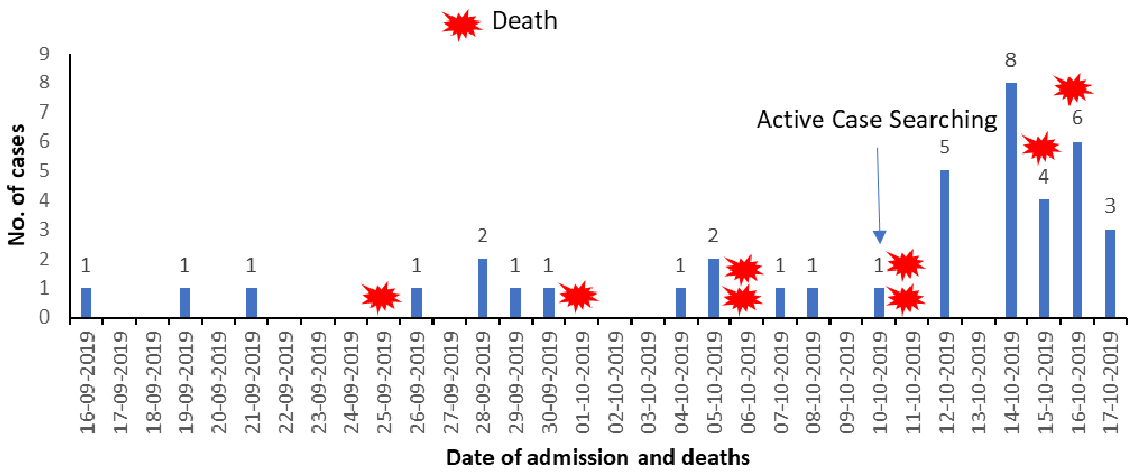

Table 1: Geographical distribution of the cases

Name of Taluka	Cases (N=47) (%)
Dhanera	29 (61.7)
Deesa	8 (17)
Palanpur	4 (8.5)
Amirgadh	2 (4.3)
Tharad	2 (4.3)
Bhabhar	1 (2.1)
Lakhni	1 (2.1)

Table 2: Place and type of facilities where treatment sought

Name Hospital	Cases (N=41)* (%)
Civil Hospital Palanpur	24 (58.5)
Civil Hospital Ahmedabad	7 (17.1)
Private	10 (24.4)

* Information for 6 cases was not available.

Table 3: Age and sex wise distribution of the cases

Age group	Male (%)	Female (%)	Total (%)
0 to 2	1 (20)	4 (80)	5 (10.6)
3 to 5	9 (64.3)	5 (35.7)	14 (29.8)
6 to 10	8 (36.4)	14 (63.6)	22 (46.8)
11 to 15	4 (80)	1 (20)	5 (10.6)
>15	0 (0)	1 (100)	1 (2.2)
Total	22 (46.8)	25 (53.2)	47 (100)

Table 4: Age & sex wise distribution of Death & Case Fatality rate

Age (yrs)	Total cases	Deaths			CFR (%)
		Male	Female	Total	
0-2	5	0 (0)	1 (100)	1 (12.5)	20.00
2-5	14	1 (100)	0 (0)	1 (12.5)	7.10
5-10	22	2 (33.3)	4 (66.7)	6 (75)	27.30
>10	6	0 (0)	0 (0)	0 (0)	0
Total	**47**	3 (37.5)	5 (62.5)	8 (100)	**17.00**

Figure in parenthesis indicate percentage.

As per the review of records and interview with the relatives of two deceased it was inferred that they were all likely cases of diphtheria, though throat swab and stain report were negative (Private laboratory). Also, it was found that treatment initiated timely and was as per protocol. Both cases visited, expired after first week of onset of symptoms due to non respiratory complications like acute kidney injury and myocarditis. Children who died/suspected diphtheria were unvaccinated. Interaction was done with Parents of children in few of the families in the villages. It was found that their children were also not vaccinated. They were unaware about the vaccination session and not willing for vaccination as well.

DISCUSSION

Diphtheria is conventionally diagnosed clinically and confirmed by the laboratory testing. In this study, though large number of the cases reported negative in laboratory examination but positivity of the three cases, clustering of the cases in two blocks, history of absence of vaccination and clinically compatible features with diphtheria pointed towards outbreak of diphtheria. Most of the cases were below 10 years. This finding was consistent with other studies. Out of these, two studies were from Gujarat, one from Banakantha District itself[7] and another from Rajkot district.[8]Also two studies, one from Meghalaya[9] and another from North Karnataka[10] observed majority of the cases below 15 years of age. However, in Assam[11] and north Kerala[12] an outbreak study reported majority of the cases above 15 years of age. World Health Organization (WHO) has mentioned in its position paper that in the countries with high incidence of diphtheria majority of the cases reported below 15 years and which is largely linked with poor immunization coverage.[5]This age shiftcould be explained

with the higher immunity in the children against diphtheria. Global epidemiological studies of Diphtheria noted that higher percentage of case reported >15 years of age in countries with higher DTP3 coverage and vice versa.[13]

Outbreak of the diphtheria is linked with low vaccination coverage, same was found in the present study. 81% of the reported cases of diphtheria were either not vaccinated or status was not known. This observation was consistent with studies carried out at Meghalaya, Rajkot, Banaskantha. In majority of the diphtheria outbreak studies and hospital based surveillance studies; affected cases were found largely unvaccinated or partially vaccinated.[2]

District Level Household and Facility Survey carried out during year 2007-08,[14] and National Family and Health Survey carried out during 2015-2016[15] showed 43.5% and 53.8% vaccination coverage of three doses of DPT respectively for Banaskantha district. This clearly points toward the high susceptibility to diphtheria. Additionally, team had observed that villages from where the cases were reported are remote and difficult terrain with large numbers of families living in farms; away from the fixed vaccine sites. High illiteracy and vaccine hesitancy were another two hurdles observed.
In current study, cases fatality rate (CFR) was as high as 17% with highest in the age group between 5 to 10 years (27.3%) (Table 4). Study from Assam reported 3.3% case fatality rate.[11]

Though most of the cases were clinically diagnosed but all cases could not be epidemiologically linked. However, most of them could be temporally and geographically linked. Same was reported in the study of Meghalaya.[9]This indicates the role of carrier in the transmission of the infection.

CONCLUSION

Outbreak of Diphtheria was confirmed. Two important factors observed for occurrence of outbreak were; low immunization coverage and failure to pick up the early warning signs through routine disease surveillance system. No age shift suggested poor immunization in children in the area in previous five to ten years. District was reporting poor immunization in various studies. District health authorities had initiated actions following the reporting of cases/deaths due to diphtheria as per the national guidelines. Standard of treatment and laboratory testing were satisfactory. Preventive activities initiated shall be continued in the villages for minimum two weeks in the affected areas. For long term, high immunization coverage needs to be ensured and use of IDSP system for early detection of cases should be strengthen to restrict further spread and outbreak.

Limitation:

This is the study was carried out as a part of outbreak investigation and secondary data were used for analysis. Detailed study of each and every case by investigators can give better quality results.

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