DOI: https://doi.org/10.53350/pjmhs02024182.cr1

CASE REPORT

Re-emergence of Diphtheria. A Case Report in a Pediatric Emergency at a Tertiary Care Hospital in Karachi

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SUMMARY

Diphtheria, caused by Corynebacterium diphtheria, is an acute bacterial infection that primarily affects the respiratory system. With the availability of diphtheria vaccines, the incidence of the disease has significantly decreased globally. However, in recent times, there has been a concerning resurgence of diphtheria in various parts of the world, including Pakistan, and hence presents a unique and pressing public health challenge, as evidenced by our case study exclusively reported from the pediatric emergency department. The study highlights the importance of early recognition and management of diphtheria cases and the need for booster doses in the EPI program to prevent this deadly disease re-emergence.
Keywords: Diphtheria, immunization, re-emergence, Pakistan.

INTRODUCTION

Diphtheria is a serious infection caused by a type of bacteria called Corynebacteriumdiphtheriae. It can spread through the air when someone who has it or carries it coughs or sneezes. Before vaccines were available, diphtheria was a major cause of death among children. The diphtheria-tetanus-pertussis (DTP) vaccine greatly reduced the number of diphtheria cases, especially in developed countries where the vaccine is widely used[1]. However, diphtheria is still a problem in Pakistan, where the number of cases went up by half in one year[2]. Following the introduction of the diphtheria-tetanus-pertussis (DTP) vaccine, there was a decline in the occurrence of diphtheria. Despite this, in Pakistan the number of reported cases has increased by 50% compared to the previous year[1,2].

The rise in diphtheria cases in Pakistan has been attributed to various factors, including increased migration from diphtheria-endemic countries, leading to the transmission of pathogens to recipient countries[3].

Here, this case report highlights a confirmed instance of diphtheria in three siblings, emphasizing the urgent need for attention and preventive measures to curb potential transmission to contacts and the importance of booster dose.

CASE HISTORY

We evaluated and analyzed the applicable demographic features for each of the three cases. These included age, gender, hospitalization status, immunization status, clinical history, other investigations, treatment, and outcome. All these details are presented in Table 1. The diagnosis of diphtheria was initially based on the clinical examination of the throat and the detection of a membrane on the tonsils in all three cases. To confirm the diagnosis, we collected two throat swabs from each case and sent them for microscopic examination and aerobic culture, respectively**.** We obtained informed consent from the patients or their guardians before collecting the throat swabs and conducting the laboratory tests.

DISCUSSION

Diphtheria is a persistent public health issue in Pakistan. It mainly affects the upper respiratory tract and spreads through air droplets from infected or carrier individuals. Carriers are also a significant source of infection, as there are 95 carriers for every 5 clinical cases[4]. In Pakistan, under the Extended Immunization Program (Table 2). Three doses of the Diphtheria, Pertussis, and Tetanus (DPT) vaccine are administered at the ages of 6, 10 and 14 weeks, but no booster dose of diphtheria, tetanus and pertussis is included in the EPI program of Pakistan to date. Studies indicates that immunization is extremely effective in preventing the manifestation of symptoms in diseases, but it does not prevent infection[5]. Asymptomatic infections still transmit the disease, but at a lower rate of 24% compared to symptomatic cases[6]. Vaccination continues to be a significant hurdle in Pakistan for several reasons, including the public's limited knowledge about diseases, parental oversight, misconceptions spread by some religious groups that vaccines could lead to sterility and are Western creations intended to undermine specific communities, and interruptions in the vaccination schedule due to the COVID-19 pandemic and recent floods within the nation[7]. All these factors may lead to the persistence of the disease in Pakistan despite the government's efforts[7].

Our case study highlights the importance of maintaining a watchful eye for clinically suspecting diphtheria and promptly confirming cases with membranous tonsillitis through laboratory microbiological diagnosis[8]. All the 3 cases were reported from the pediatric emergency department, which also underscores the importance of thorough examination of a child with sore throat and fever. Pediatric emergency departments are meant to deal with acute life-threatening conditions, but our past experiences have shown that in case of any pandemic or outbreak of infectious disease, emergency departments should have the capacity in terms of resources to be prepared. Moreover, emergency departments can be a hub for national surveillance of many infectious diseases, as they can assist in data collection and also identify the need for any new demand in the vaccination program of the national immunization. The absence of routine booster vaccinations in our region poses a significant challenge, contributing to the resurgence of diphtheria[9]. This emphasizes the need for targeted vaccination campaigns and strategies to bridge immunization gaps, especially in pediatric populations. Emergency healthcare providers play a pivotal role in managing any outbreaks of diseases. Our findings shed light on the challenges faced in emergency departments, emphasizing the need for rapid diagnosis, availability of treatment resources, and effective communication between other healthcare professionals, such as infection disease control department and national reporting to notifiable disease authority, to ensure timely and appropriate care for patients with diphtheria[10]. The protection provided by the diphtheria toxoid wanes over the years, therefore, administering booster doses at 10-year intervals and ensuring they are recorded promptly in the national registry can enhance community immunity[9].

Received on 07-07-2023
Accepted on 17-12-2023

Table 1: Relevant demographic characteristics of three cases.

Age	Gender	Immunization	History	Throat examination	DAT antitoxin	Antibiotic Inj penicillin	Throat culture	outcome
4	Male	Vaccinated	Fever & cough	Membrane on tonsills	yes	yes	Diphtheria toxin production detected	Recovery without any complications
8	Female	Vaccinated	Fever & vomiting	Membrane on tonsills	yes	yes	Diphtheria toxin production detected	Recovery without any complications
12	Male	Vaccinated	Fever, sore throat	Membrane on tonsills	yes	yes	Diphtheria toxin production detected	Recovery without any complications

Table 2: Current Extended Immunization Program (EPI) in Pakistan

Disease	Causative agent	Vaccine	Doses	Age of Administration
Diphtheria	Bacteria	Pentavalent Vaccine (DTP+HepB+Hib)	3	Penta 1: 6 Weeks Penta 2: 10 Weeks Penta 3: 14 Weeks
Tetanus	Bacteria			
Pertussis	Bacteria			
Hemophilus Influenza type B	Bacteria			
Hepatitis B	Virus			

CONCLUSION

To prevent the re-emergence of diphtheria, a serious and potentially fatal infection, it is essential to ensure adequate immunization of the population, especially children. This includes taking booster doses of the DPT vaccine at regular intervals, as well as raising awareness among pediatric emergency physicians about the clinical and microbiological features of the disease. Moreover, the availability of diphtheria anti toxin, which is the main treatment for diphtheria, should be ensured in all health facilities. Finally, universal immunization should be promoted and implemented across the country, regardless of geographic, social or economic barriers.

Call for Urgent Action: Our case report reveals a worrying trend of diphtheria resurgence in Pakistan, which is likely to be influenced by the vaccination gap in the population. This gap is further exacerbated by external challenges, such as the COVID-19 pandemic and the recent flooding, that disrupt the delivery and uptake of vaccination services. These factors create a strong case for urgent action to address the diphtheria threat and protect the public health.

Contribution to Global Understanding: The impact of external factors on vaccination programs is not unique to Pakistan, but a global concern that affects many countries and regions. Our case report contributes to the global understanding of how pandemics and natural disasters can affect the epidemiology and control of vaccine-preventable diseases, such as diphtheria. This can inform international discussions on how to prepare and respond to such situations, and how to develop effective and resilient vaccination strategies in similar contexts worldwide.

Recommendations: Based on our findings, we recommend the following actions to improve the prevention and management of diphtheria in Pakistan and beyond:

- Strengthen the surveillance and reporting system for diphtheria and other notifiable diseases, and ensure timely and accurate data collection and analysis.
- Enhance the capacity and training of emergency healthcare providers, especially pediatric emergency physicians, to recognize and diagnose diphtheria cases, and to provide appropriate and prompt treatment with diphtheria anti toxin and antibiotics.
- Increase the availability and accessibility of diphtheria anti toxin and other essential medicines and supplies in all health facilities, and establish a contingency plan for emergency situations.
- Implement targeted vaccination campaigns and outreach activities to increase the coverage and uptake of the DPT vaccine, especially among high-risk groups and hard-to-reach populations.
- Introduce a booster dose of diphtheria, tetanus and pertussis in the EPI program of Pakistan, and ensure its up-to-date entry in the national database.
- Educate and engage the public and the communities about the benefits and safety of vaccination, and address any myths, misconceptions or rumors that may hinder vaccination acceptance.

Funding: This is a self-funded study

Ethics approval and consent to participate: verbal consent has been taken from the parents

Competing interests: There are no conflicting interests to declare.

Authors' contributions: US: Madecontributions to the conception and design of the study, the acquisition and analysis of data, prepareand revising of the manuscript.

MAB: Madecontributions to the design and implementation of the research, the analysis of data, and the critical revision of the manuscript.

SL: Made contributions to the data collection or experiments, the interpretation of results, and the drafting and revising of the manuscript.

UK: Participated in the research project, contributed to the data collection or analysis, and drafted and revised the manuscript.

Acknowledgments: Not applicable.

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This case report may be cited as: Khurram U, Bashir MA, Laila s, Kazi U: Re-emergence of Diphtheria. A Case Report in a Pediatric Emergency at a Tertiary Care Hospital in Karachi. Pak J Med Health Sci, 2024;18(2):31-33.