

# Adult diphtheria in Malaysia: A case report

Tharani Loganathan, DrPH<sup>1</sup>, Mohamed Paid bin Yusof, MPH<sup>2</sup>

<sup>1</sup>Centre for Epidemiology and Evidence-based Practice, Department of Social and Preventive Medicine, Faculty of Medicine, University of Malaya, Kuala Lumpur, Malaysia, <sup>2</sup>Petaling District Health Office, Ministry of Health, Malaysia

### SUMMARY

In November 2016, a 28-year-old Malay man presented to the emergency department in respiratory distress, with a history of fever and sore throat. A clinical diagnosis of acute diphtheria was made and the patient was isolated and ventilated in the intensive care unit, and received diphtheria antitoxin and intravenous antibiotics. Initial laboratory findings failed to confirm diphtheria, leading to discontinuation of antibiotics and quarantine. Public health measures were reinstated after a reference laboratory cultured *Corynebacterium diphtheriae*. Although there was no contact with ill persons, investigation revealed incomplete immunisation history, and injection of high dose steroids prior to onset of symptoms.

### INTRODUCTION

#### Background

Diphtheria is a rare, potentially fatal disease caused by infection of the bacteria *Corynebacterium diphtheriae*. Symptoms range from mild to life-threatening. The release of exogenic toxins increases risk of mortality, with potential airway obstruction due to pseudo-membrane formation on the upper respiratory tract, as well as damage to the myocardium and central nervous system.

Since diphtheria is highly infectious and has a high case-fatality rate, even one case of diphtheria is considered an outbreak. As such, the administration of the life-saving antitoxin is based on clinical diagnosis, and not laboratory confirmation.

#### Chronology of events

A 28-year-old Malay man presented to the emergency department at Shah Alam Hospital with a four-day history of sore throat, fever, difficulty in swallowing and hoarseness of voice.

On presentation, the patient was in respiratory distress, with poor oxygen saturation and stridor. Laryngoscopy revealed oedematous vocal cords and swollen epiglottis with pseudo-membranes. The patient was electively intubated and isolated at the intensive care unit (ICU). Diphtheria antitoxin and intravenous erythromycin were administered. Throat and nasopharyngeal swabs were taken.

Initial laboratory cultures were negative for diphtheria, likely due to the unavailability of tellurite media at the hospital. These findings resulted in discontinuation of intravenous

antibiotics and quarantine measures. Four days later, the national reference laboratory confirmed a positive culture of *C. diphtheriae*, while PCR detected *C. diphtheriae* toxin gene (Toxin A and B). This prompted resumption of public health measures, quarantine for 7 days (until two consecutive cultures were negative) and completion of antibiotics. The patient was intubated for 12 days and was discharged well after 30 days of admission.

Five days prior to onset of symptoms, the patient had received high dose intramuscular steroids for skin rashes at a private clinic. He was otherwise well. He had no contact with ill persons. The patient's immunisation records revealed three completed doses of diphtheria vaccines, but no booster vaccinations.

#### Public Health Management

A public health investigation was conducted to describe the outbreak, identify the source of infection and contributing factors, and recommend preventive and control measures. Close contacts were those in close proximity with the patient over the past 14 days, including those living in the same household, visiting the home, sexual or kissing partners and healthcare workers exposed to nasopharyngeal secretions of the patient.

Contact tracing and active case detection were initiated shortly after notification. The patient was the only laboratory confirmed case of *C. diphtheriae*. No other symptomatic cases were detected. We identified 61 contacts: eight household contacts, 51 healthcare workers, and two social contacts.

All children encountered during active case detection had completed immunisation. Throat swabs were taken from contacts and prophylactic antibiotics given. An alert was issued to all nearby health facilities and health education materials distributed.

### DISCUSSION

In Malaysia, the diphtheria vaccine enjoys good national coverage (99% in 2015).<sup>1</sup> Diphtheria incidence is low, with less than 0.1 cases per 100,000 persons since 1990.<sup>2</sup> However, despite the well-established vaccination programme, sporadic diphtheria outbreaks still occur.

In the case reported here, there was no identifiable source of infection. The patient was a partially immunised adult, and likely immunosuppressed due to a recent intake of steroids.

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Corresponding Author: Tharani Loganathan

Email: drtharani@gmail.com

While these may have predisposed our patient, several other factors may have influenced a diphtheria infection among an adult.

Prior to the introduction of childhood immunisation, diphtheria was predominantly a childhood illness. Nevertheless, recent outbreaks have demonstrated a shift in age distribution of diphtheria towards adults. Five main reasons have been suggested for the re-emergence of this previously rare disease among adults: a decrease in immunisation coverage among children, waning immunity among adults, recent population migration, late recognition of the epidemic and an irregular supply of vaccines.<sup>3</sup>

Immunity conferred by diphtheria vaccination wanes with time, and lasting ten years on average. Consequently, the World Health Organization (WHO) recommends that a booster diphtheria vaccine be given every 10 years, in combination with anti-tetanus toxoid.<sup>4</sup> As diphtheria infection does not confer immunity against reinfection, the WHO recommends booster doses as part of containment activities for cases after completing antimicrobial treatment and close contacts.<sup>4</sup> Our patient was not administered a booster diphtheria vaccination, as the Ministry of Health, Malaysia does not provide booster diphtheria vaccinations for adults. In Malaysia, primary diphtheria immunisation is given at ages of two, three and five months, while booster doses administered at 18 months and seven years.<sup>2</sup> As diphtheria is on the rise in Malaysia, an economic analysis would inform policy on the public provision of booster diphtheria vaccination in adults.

As diphtheria vaccines are part of the childhood immunisation programme, the occurrence of diphtheria in this country signals a break in vaccine coverage that needs to be addressed. Raising public awareness on diphtheria and the benefits of childhood vaccination would improve vaccine uptake. Early administration of diphtheria antitoxin based on clinical suspicion is lifesaving. Healthcare workers should be trained to recognise the clinical features of diphtheria and initiate early response. Culture is confirmatory, and it is important that swabs of the pharyngeal region are taken, especially from areas of discolouration or ulcers. Tellurite media is a selective media, recommended for the culture of *C. diphtheria*, as the bacteria produces characteristic black colonies.<sup>5</sup> Unfortunately, tellurite media is not available at

Shah Alam Hospital, as it is more expensive and not routinely stocked. We suggest hospital and regional laboratories build capacity for tellurite media preparation and quality control. All isolates should be sent to national reference laboratories for confirmation of identification and toxigenic testing (PCR and ILEK tests).

## CONCLUSION

Diphtheria outbreaks among adults although rare, are often fatal. The occurrence of sporadic diphtheria outbreaks reinforces the importance of vaccination. Currently, the national immunisation program in Malaysia only provides childhood diphtheria vaccination, and not the WHO recommended ten-yearly boosters for adults. This case report seeks to remind the medical community on the importance of childhood immunisation, early management of a potentially fatal infection and to advocate for the introduction of booster diphtheria vaccinations for adults in Malaysia.

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## ETHICAL CONSIDERATION

Detail has been removed from this case report to ensure anonymity. The authors have the patient's permission to publish.

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