Case Report

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Diphtheria outbreak in rural North Karnataka, India

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Introduction: The global incidence of diphtheria remained steady during 2007–2011 after a steady decline of over 95 % from 1980 to 2006. This was largely due to a resurgence of the disease in India, which alone accounted for 71–83 % of the total cases reported worldwide.

Case presentation: This article describes the identification of an outbreak of diphtheria in two very remote villages of northern Karnataka in South India in May 2011 and detection of further cases in as many as seven nearby villages in the 6 months that followed, which resulted in at least three deaths. The ineffectiveness of the Universal Immunization Programme in its present form in reaching the remote villages is highlighted, and one case of diphtheria with a non-toxigenic strain of *Corynebacterium diphtheriae*, which is very rare in India and has the potential to upset eradication strategies, is documented.

Conclusion: This article should provide a wake-up call for the health administrators for restructuring and strengthening immunization strategies and programmes.

Keywords: children; diphtheria; outbreak.

Introduction

After a progressive decline that continued until the year 2006, the incidence of diphtheria reached a plateau and has remained at 4000 to 5000 cases per year globally to date (WHO, 2012). India alone accounted for 71–83 % of these cases. This is despite a reported increase in the coverage of the DPT (diphtheria–pertussis–tetanus) vaccination which is presently given at 6, 10 and 14 weeks and 16–24 months after birth followed by a booster dose at 5 years of age, as part of the expanded programme of immunization now called the Universal Immunization Programme (UIP) in India. Although the National Health Profiles released by the Government of India reported 3812, 3977, 3529, 3123 and 3485 cases of diphtheria respectively from 2007 to 2011, detailed literature on the occurrence of the disease is limited to some studies reported from Delhi and adjoining states in North India, Assam in North East India, Mumbai and northern parts of Maharashtra in Western India, and Hyderabad and Pondicherry in South India (CBHI, 2011; Sharma *et al.*, 2007; Dravid & Joshi, 2008; Nath & Mahanta, 2010; Sashikala *et al.*, 2011). The recent report of National Health Profiles released by the Government of India (CBHI, 2012) in 2012 showed that the number of

reported cases of diphtheria in Karnataka increased from 0 in 2010 to 217 during 2012.

Apart from one case report, the only information available on diphtheria from Karnataka, one of the largest states in South India, is from the National Health Profiles, whereby two, five, five and zero cases of diphtheria were reported from 2007 to 2010, respectively, with no death (CBHI, 2011).

Case report

Six suspected cases of diphtheria were detected by the District Surveillance Office in May 2011 in the villages of Kakhandaki and Vasti, 36 km away from the district headquarters of Bijapur in North Karnataka, after a 4-year-old girl from the area died of suspected diphtheria on 12 May 2011 (Fig. 1). *Corynebacterium diphtheriae* showing the presence of the *tox* (indicating its toxigenic nature) gene (Nakao & Popovic, 1997) in PCR was isolated from five samples by standard microbiological techniques at the Nodal Integrated Disease Surveillance Programme (IDSP) Laboratory and the Regional Medical Research Centre (RMRC) of the Indian Council of Medical Research (ICMR) at Belgaum. One isolate of *C. diphtheriae* did not harbour any toxigenic gene. Typing of the *C. diphtheriae* to identify the biovar was not attempted. Ensuing strengthened surveillance on the part of the local health authorities in

Abbreviations: Abbreviations: ICMR, Indian Council of Medical Research; RMRC, Regional Medical Research Centre.

Fig. 1. Location of the Primary Health Centres (PHCs) that reported diphtheria cases: A, Kakhandaki PHC (which initially reported cases from two villages and later from another two villages); B, Indi PHC; C, Halasangi PHC; D, Basavena Bagwadi PHC; E, Kalkeri PHC; F, Talagi PHC. PHCs B–F reported cases from one village each. (Map © 2014 Google.)

the region identified another eight suspects from seven more villages in the district before 2 December 2011. Five of these yielded toxigenic *C. diphtheriae* and the remaining three were culture-negative. Verbal enquiries revealed that the majority of confirmed cases in our study were either unimmunized or immune drop-outs. Among these ten, six (60 %) were older children (age 5–12 years) and one was a young adult. There were two deaths. Active surveillance, prompt reporting and epidemic preparedness, coupled with the availability of anti-diphtheritic serum and well informed health workers, helped identify cases quickly and prevent more deaths.

Discussion

Our study highlights the resurgence of diphtheria in Karnataka. Ten confirmed cases infected with toxigenic strains of *C. diphtheriae* and two deaths that ensued are a matter of serious concern. With the chance of similar resurgences occurring elsewhere in rural India or in other developing nations, the lesson we learnt is that our battle against diphtheria is far from being over. Maintaining quality of vaccines, further strengthening of immunization programmes with stricter norms for documentation of vaccination histories, increasing vaccine coverage and providing life-long immunity are advocated.

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