



Review

An overview of meningococcal disease in India: Knowledge gaps and potential solutions

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ABSTRACT

The Global Meningococcal Initiative (GMI) consists of an international group of scientists and clinicians, with expertise in meningococcal immunology, epidemiology, public health and vaccinology that aims to prevent meningococcal disease worldwide through education, research, cooperation and vaccination. In India, there is no national policy on routine meningococcal vaccination to control the disease. The GMI convened a meeting in India, with local medical leaders and public policy personnel, to gain insight into meningococcal disease burden and current surveillance and vaccination practices in the country. *Neisseria meningitidis* is the third most common cause of sporadic bacterial meningitis in children <5 years, with higher incidence in temperate northern versus tropical southern India. Incidence is not reliably known due to suboptimal surveillance and insufficient microbiological support for diagnosis. Since 2005, there have been a number of outbreaks, all attributable to serogroup A. Outbreak responses were ad hoc and included mandatory case reporting by hospitals in Delhi, temporary strengthening of laboratory diagnostics, chemoprophylaxis of close contacts/high-risk groups and limited reactive use of polysaccharide vaccine. Although a conjugate serogroup A vaccine (MenAfriVac™) is manufactured in India, it is not presently used in India. Epidemiological data on meningococcal disease in India are sparse. Meningococcal disease control efforts should focus on establishing systematic surveillance and educating physicians and officers of the Immunization Division of the Ministry of Health on the importance of *N. meningitidis* as a cause of morbidity and mortality. Conjugate vaccine should be used for outbreak control and the immunization of high-risk persons.

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Abbreviations: CSF, cerebrospinal fluid; GMI, Global Meningococcal Initiative; Hib, *Haemophilus influenzae* type b; IAP, Indian Academy of Pediatrics; IDSP, Integrated Disease Surveillance Project; NCDC, National Centre for Disease Control; NGOs, nongovernmental organizations; PBM, Pediatric Bacterial Meningitis; PCR, polymerase chain reaction; RT-PCR, real-time polymerase chain reaction.

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1. Introduction

Meningococcal disease is caused by *Neisseria meningitidis*, of which humans are the only known reservoir [1]. Meningococcal disease may present as pyogenic meningitis and/or a rapidly progressive septicemia. It has a high case-fatality rate unless promptly diagnosed and appropriately treated. Among those who recover, permanent brain damage and physical disability may occur. *N. meningitidis* may colonize the upper airways without invading the mucosa. Individuals in whom this occurs serve as a reservoir for the bacterium. Whether or not disease manifests in carriers of *N. meningitidis* is dependent upon microbial, environmental, and host genetic and behavioral factors [2]. Of the 12 *N. meningitidis* serogroups, six cause the majority of disease: A, B, C, W, X and Y. Globally, the epidemiology of meningococcal disease is highly variable and dynamic, with differences seen in the relative distribution of bacterial serogroups in both time and place [2]. In general, the largest burden of meningococcal disease is borne by infants and young children [2,3].

In an effort to prevent meningococcal disease worldwide, the Global Meningococcal Initiative (GMI) was formed in 2009. It consists of a multidisciplinary group, whose mission is to bring about change through education, research and international cooperation. As part of its efforts, the GMI has published global recommendations aimed at reducing the burden of meningococcal disease (Table 1) [3]. In recognition of geographic disparities in disease epidemiology, surveillance, vaccine availability and resourcing, the GMI has convened roundtable meetings with local representatives in Latin America and in India to tailor its global recommendations to local needs. The outcomes of the Indian meeting are here presented.

2. Methods

A roundtable meeting was held in Gurgaon, National Capital Region, India, in January 2012, with seven local experts and five GMI members. Indian participants included pediatricians and physicians from selected institutions in Mumbai, New Delhi and Vellore; the Ministry of Defense; and the National Centre for Disease Control (NCDC). They presented on different aspects of meningococcal disease in India, including existing surveillance, outbreaks and outbreak management and immunization practices. Following a discussion of this information, the group developed country-specific recommendations.

3. Results

3.1. Surveillance

In India, disease surveillance is not enforced, as there is no public health infrastructure within the central Ministry of Health. Data on meningococcal disease stem from two main sources. The first is the network of government healthcare centers, which send case reports on a monthly basis to the central Ministry of Health via state ministries. However, because the majority of Indians use private

healthcare, the data are incomplete and poorly representative. The second is through regional sentinel hospitals. Laboratory support for the government network is fragmented. As a consequence, diagnostic specificity is low. Diagnostic specificity is better for regional sentinel hospitals. However, only a fraction have in-house laboratory capabilities or solicit the assistance of reference laboratories. Regional sentinel hospitals use definitions for both probable and confirmed cases of meningococcal disease as summarized in Table 2 [4]. According to statute, meningococcal disease is a notifiable disease in India, but reporting is not enforced (passive surveillance). The focus is more on healthcare and disease management than the deployment of staff to collect and act upon surveillance data.

3.2. Meningococcal diagnosis

In many hospitals, bacterial culture is the most commonly used diagnostic method. However, prior antibiotic use, which is prevalent in India, decreases the likelihood of isolating *N. meningitidis* via culture. Culture is generally performed in all tertiary care hospitals but is not commonly performed in the primary or secondary healthcare clinic where the diagnosis is usually restricted to clinical confirmation or at the most antigen detection. Non-culture-based methods, such as polymerase chain reaction (PCR), are used in only a few hospitals in India, primarily at the tertiary care level. Some hospitals in the private sector (and some in the public sector) employ antigen detection (e.g., latex agglutination). Multiple diagnostics kits are available. These kits lack standardization and quality control, resulting in varying specificities and sensitivities for *N. meningitidis*. Clinical samples can be sent from the private and public sectors to government reference laboratories, but because of resourcing constraints, government hospitals will not always accept them. As a consequence, data on meningococcal disease, particularly endemic disease, are sparse [5].

Serogroup A is the most common cause of meningococcal disease in India [5–9], with rare reports of disease attributable to serogroup C [5]. One fatality due to infection with serogroup B has been documented in India [10].

3.3. Epidemiology

Although many Indian outbreaks are reported in the lay press [11,12], small outbreaks, such as those in rural areas, are likely to go unreported and the true magnitude of even large-scale outbreaks is underestimated [5,7].

The existence of endemic disease is recognized [7,13,14], but much of the epidemiological data that are available were collected during outbreaks. Outbreaks have been reported more in temperate northern than tropical southern regions of the country (Fig. 1) [5]. During epidemics, case reporting and disease monitoring activities are enforced and adhered to in National Capital Region, but are discontinued once the epidemic has resolved.

Available information on the epidemiology of meningococcal disease in India has recently been exhaustively reviewed [5]. Briefly, *N. meningitidis* is the third most common cause of bacterial meningitis in India in children less than 5 years of age and is

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