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REVIEW ARTICLE

MENINGOCOCCAL DISEASE AND CARRIAGE IN THE PHILIPPINES: A REVIEW OF RECENT DATA

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ABSTRACT

This article reviews recent data on meningococcal disease and carriage in the Philippines. It aims to provide information on the epidemiology of meningococcal disease, its carriage, data on prevention, and the impact of vaccination on disease and carriage. The World Health Organization considers the Philippines as having low endemicity for meningococcal disease. However, current data underestimates the true burden in the country due to many factors. In recent years, data from the Philippines show a high case-fatality rate since only the septicemic form is being reported. Studies on asymptomatic meningococcal carriage rates are sparse, with one study by Gonzales, et al. investigating the prevalence of meningococcal nasopharyngeal carriage in Filipinos aged 5-24 years old living in an urban setting. The study showed that the overall prevalence of carriage was 3.7% and was highest (9%) among the 10-14 age group. Serogroup B was the most common isolate. Effective meningococcal vaccines are available. Although not included in the National Immunization Program, medical societies recommend giving vaccines to individuals at high risk of infection. Data on local epidemiology accounting for the disease and asymptomatic carriage are important to strengthen future programs on immunization and prevention of meningococcal disease.

KEYWORDS: *Meningococcal disease, Meningococcal vaccine, Meningococcemia*

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The author declares that the data presented are original material and has not been previously published, accepted or considered for publication elsewhere; that the manuscript has been approved by all authors, and all authors have met the requirements for authorship.

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INTRODUCTION

Neisseria meningitidis (meningococcus) is a gram negative obligate human pathogen with no other reservoir. Thirteen serogroups have been identified, of which six (A, B, C, W-135, X and Y) cause almost all worldwide life-threatening disease.[1]

The virulence of *N. meningitidis* is thought to depend on several factors, such as the circulating strain, the environment, and host factors. Although colonization may not necessarily lead to illness, the microbe can cause invasive disease, for reasons not yet fully understood.[2]

Infection requires nasopharyngeal carriage as a prerequisite. Carriage of the microbe, therefore, is important in disease transmission. Asymptomatic colonization is estimated to affect between 10% to 35% of human populations.[3]

METHODOLOGY

A literature search on the local and regional epidemiology of meningococcal disease, prevalence of asymptomatic carriage, and data on vaccination was done.

DISCUSSION

Epidemiology of meningococcal disease

A wide range of clinical presentations are associated with the meningococcus. Invasive meningococcal disease (IMD) in the form of meningitis and meningococcemia are the most common.[4] Although meningococcal disease affects all ages, peak incidences are observed among infants less than 1 year old, among adolescents and the elderly.[4]

The World Health Organization classifies the Philippines as having low endemicity for meningococcal disease (<2 cases/100,000 per year).[4] Despite being a reportable disease, data on the incidence and prevalence of meningococcal disease in the Philippines is sparse.[5]

The Philippine Integrated Disease Surveillance and Response Report is cited in a publication authored by The Global Meningococcal Initiative, stating that the number of meningococcemia cases increased from 73 in 2008 to 182 in 2013.[6]

In 2016 and 2017, there were 183 and 197 cases of meningococcal disease respectively with a case fatality rate (CFR) of 57.38% in 2016[7,8] and 52.79% in 2017.[8] The number of reported meningococcal cases from 2018 to 2019 were mostly from the National Capital Region (NCR) (n=50) and Region IV-A (n=38).[9] From January to June 2019, 130 cases of meningococcal disease were reported. Of these, 68 died (CFR = 50%), with a median age of 3 years old (range 1 month to 63 years).[9]

Thirty-two cases were reported between January to April 2020, representing a decrease of 66% compared to the same period in the previous year. Many of the reported cases (18%) came from region 4A and were between one to four years old. The case fatality rate for this period was 53%. Of the 17 deaths, the majority likewise belonged to the age group between one to four years.[10]

The Global Meningococcal Initiative estimates the incidence of meningococcal disease in the country at 0.02 to 0.1/100,000 population/year, with the greatest number among infants and young children. However, this incidence likely does not reflect the true burden, because only the septicemic form of disease (meningococcemia) is reported. As such, local data may be skewed to reflect high CFRs. *N. meningitidis* serogroup A predominates as the cause of meningococcal disease although serogroup B has also been reported.[6]

Nasopharyngeal carriage

In invasive meningococcal disease (IMD), nasopharyngeal carriage is a prerequisite for infection and has been considered an immunizing process that results in a protective antibody response.[2]

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It is estimated that as many as 350 million to 1 billion people are asymptomatic carriers worldwide.[1] Across the world, it has been established that asymptomatic carriage plays a major role in disease transmission.[5] A recent literature review by Serra, et al. estimates carriage prevalence in Asia to range between 1.4-14.2% based on limited data,[12] compared to rates ranging from 3-30% reported in the African meningitis belt.[11]

In America and Western Europe, adolescents and young adults have the highest rates of carriage[9], while studies from the African meningitis belt noted that peak carriage occurs in children and adolescents 5 to 14 years of age.[12] Limited studies in Asia show a wide range of carriage rates among close contacts of patients with IMD, from 5.7% (among household members) to 62.5% (among prisoners sharing the same cell).[10] However, according to Serra, et al., studies investigating nasopharyngeal carriage particularly in low to middle income Asian countries are difficult to compare due to differences in populations sampled, sampling techniques, and time variations.[12]

Risk factors identified for nasopharyngeal carriage in the African meningitis belt include smoking and exposure to wood smoke.[12] A systematic review identified endemicity in the country of origin as a factor in carriage among Hajj pilgrims, while smoking, male sex and frequent attendance at parties increased nasal carriage among university students.[13] Serra, et al. also included risk factors for nasopharyngeal carriage among low and middle income Asian countries in their review; they concluded that these were inconsistently assessed in the studies they included. In particular, the Asian studies did not reflect the usual associations drawn between smoking and carriage.[12]

A local cross-sectional carriage prevalence study done by Gonzales, et al. involving 937 healthy Filipinos, 5 to 24 years old, conducted in three different sites in Manila investigated the prevalence of meningococcal carriage in children and adolescents.[5]

Only 35 participants were found to be carriers, which translated to an overall carriage prevalence of 3.7%. The most common isolate was serogroup B (65.7%), but serogroups C, Y and W were also found. Two individuals were discovered to be carrying multiple serogroups, while capsular serogroups were unidentified in five (probably reflecting unencapsulated strains).

Carriage prevalence was shown to be highest in the 10 to 14 age group; the rate was higher among those with more siblings and those living in larger households. The authors suggest that older children and young teens play a key role in the local transmission of the disease.[5]

Prevention

Currently, meningococcal vaccination is not included in the country's National Immunization Program but is recommended by professional medical societies for high-risk children.[15,16] In the Philippines, tetravalent (ACYW-135) meningococcal vaccines conjugated to different protein carriers such as diphtheria toxoid (MCV4-D), tetanus toxoid (MCV4-TT) and modified cross-reacting material (MCV4-CRM) are available. Tetravalent meningococcal polysaccharide vaccine (MPSV4) is also available. These vaccines are indicated for those at high risk of invasive disease, including individuals with complement component deficiencies, anatomic or functional asplenia, HIV, and travelers or residents in areas where meningococcal disease is hyperendemic or epidemic. Those who belong to a defined risk group during a community or institutional meningococcal outbreak are also indicated to receive these vaccines as well.[16]

Impact of vaccination on disease and carriage

The first effective vaccines against meningococcal disease contained purified capsular polysaccharide; these formulations provided short-term protection. The subsequent development of conjugate vaccines addressed this problem, providing both long-term protection as well as herd immunity.[2]

De Oliveira, et al. reviewed the literature on meningococcal vaccination to evaluate the evidence supporting immunization programs. The studies reviewed showed that both polysaccharide and conjugate vaccines were effective and had a positive impact on vaccine-serogroup meningococcal disease. The conjugate vaccines showed higher impact and effectiveness (VE 66%-100%) with longer-lasting protection, compared to polysaccharide vaccines (VE 65%-83.7%).[17]

A 2018 review by Balmer, et al. investigated available data on the impact of vaccination on meningococcal nasal carriage. The authors noted that only few clinical trials assessing the role of carriage as a pre-defined study endpoint have been established, compared to observational studies assessed. The review concluded that while carriage studies for other serogroups were often not sufficiently powered to provide robust statistical evidence, carriage of serogroups A and C significantly decreased 1 to 2 years after vaccination with MenA and MenC vaccines.[2]

In the local setting, data from the study of Gonzales, et al. may assist in the formulation of vaccination strategies against meningococcal disease. The authors suggested that for reduction of carriage rates and achieving herd immunity, immunization may be required before the peak carriage age of 10 years.[5] Furthermore, knowledge of prevalent serogroups among carriers is an important aspect of planning vaccination strategies. Although serogroup B was the most common strain identified in this study, other strains, also associated with invasive forms of the disease were likewise isolated.

CONCLUSION AND RECOMMENDATIONS

It is difficult to determine the true burden of meningococcal disease in the Philippines due to many factors. Pioneering studies show that a small percentage of the study population are carriers of the meningococcus, with the rates highest in older children and with serogroup B prevailing.

Since asymptomatic carriage is an important driver of transmission and disease, more extensive data on its prevalence is needed to support programs on prevention. Data on local epidemiology accounting for the disease and asymptomatic carriage are important to strengthen future programs on immunization and prevention of meningococcal disease. Its high case-fatality rate should lead physicians to explore ways to prevent IMD.

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