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Review article

Patterns of influenza B circulation in Brazil and its relevance to seasonal vaccine composition☆

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ABSTRACT

Data on the burden of disease and circulation patterns of influenza B lineages for Brazil are limited. This review aims to describe the pattern of influenza B occurrence in Brazil to have a better understanding of its epidemiology and its relevance when considering seasonal influenza vaccine composition.

A review of the data including analysis of international and local surveillance data as well as information from online search of databases using Medical Subject Headings terms in conjunction with screening of abstracts from scientific events was performed.

Based on international epidemiologic surveillance data, moderate levels of influenza B disease (19%; 2006–2014) were observed. Of these nine years, it was possible to compare data from three years (2007, 2008 and 2013) which have information on the circulating influenza B lineage. Co-circulation of influenza B lineages was observed in all these three influenza seasons, of which, during one season, a high degree of mismatch between the vaccine lineage and the predominant circulating lineage (91.4% [2013]) was observed. Local surveillance data reveal a distinct and dynamic distribution of respiratory viruses over the years. Data from published literature and abstracts show that influenza B is a significant cause of disease with an unpredictable circulation pattern and showing trends indicating reemergence of the B/Victoria lineage. The abstracts report notable levels of co-circulation of both influenza B lineages (2000–2013). Mismatch between the Southern hemisphere vaccine and the most prevalent circulating viruses in Brazil were observed in five influenza seasons.

The evidence on co-circulation of two influenza B lineages and mismatched seasons in Brazil indicates the benefit of quadrivalent influenza vaccines in conferring broader seasonal influenza protection. Additionally, improving influenza surveillance platforms in Brazil is important for monitoring disease trends and the impact of introducing seasonal influenza vaccination.

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Introduction

Influenza is a highly infectious acute viral illness resulting in significant morbidity as well as healthcare resource utilization. In healthy individuals influenza is generally self-limiting, but can often cause complications.[1,2] There are 3 types of seasonal influenza viruses – A, B, and C. Influenza A causes moderate to severe illness and affects individuals of all age groups. Influenza B can cause disease of similar severity as influenza A, and even though the morbidity is higher in children, all age groups can be affected.[3,4] The influenza B virus is more stable than influenza A, with less antigenic drift and consequent immunologic stability, and does not undergo the process of antigenic shift. Influenza C is rarely reported as a cause of human illness, probably because most cases are subclinical.[5] Both influenza A and B cause annual epidemics worldwide and are estimated to result in 3–5 million cases of severe illness, and 250,000–500,000 deaths.[6]

Influenza vaccination is the most important prophylactic intervention against infection. Until the 2012–2013 influenza season, use of trivalent inactivated influenza vaccines, containing two influenza A strains (A[H1N1] and A[H3N2]) and one influenza B lineage (B/Yamagata or B/Victoria) was recommended for use in immunization programs by the World Health Organization (WHO).[6] As influenza viruses undergo frequent changes in their surface antigens, new influenza vaccines are designed annually to match the circulating virus subtype expected for the next influenza season.[7] The selection of the influenza B lineage is considered critical in determining the effectiveness of vaccination programs.[7] Unfortunately, the correct prediction of the predominating circulating B lineage is quite difficult, often leading to inaccuracies in prediction, causing a mismatch between the recommended vaccine lineage and the circulating influenza B lineage. Prior studies have raised concerns that mismatches can result in lower vaccine effectiveness, due to the absence of cross-protection between antigenically distinct influenza B lineages, leading to more influenza cases,[8,9] and an increase in influenza-related medical resource utilization and costs.[2,10] In addition to this, Matias et al.[11] have found that influenza B-associated mortality could serve as a surrogate marker of disease severity.

In the Latin America and Caribbean region, seasonal influenza causes high morbidity placing a substantial economic burden on healthcare systems and society.[12] Data on the burden of influenza disease for Brazil are limited, most likely due to underreporting.[12] Between 2000 and 2008, data from the influenza surveillance system in Brazil revealed that influenza-like illness (ILI) led to a total of 4.39–16.92% of hospital consultations, and in 2008, of all positive reported influenza cases, 43.29% (95% CI: 37.59–49.13) were influenza B.[12]

The Ministry of Health (MoH, "Ministério da Saúde") of Brazil promotes annual national influenza vaccination campaigns. Over the years, there has been a gradual expansion of the recommended groups for annual influenza immunization in Brazil.[13] Since 1999, influenza vaccination was introduced for elderly people aged above 65 years and other groups vulnerable to complications (patients with co-morbidities). In the year 2000, individuals 60 years or older were included for vaccination.[14,15] During 2011–2012, in addition to elderly people, vaccination was extended to children aged six months to those aged below two years, pregnant women, healthcare professionals, and indigenous people. In 2013, women after child birth, individuals with chronic disease and transplant, and individuals in detention facilities were included for annual influenza vaccination. In 2014, children aged 2–4 years were also included in the recommended target at-risk groups for vaccination. The information system of National Immunization Program for Brazil ("Programa Nacional de Imunização")[13] reported that across all target vaccination groups, overall mean vaccination coverage of 86.8% was reached in 2014.[13] During all influenza vaccination campaigns in Brazil, trivalent vaccines were used according to WHO recommended vaccine composition for South hemisphere.[16]

Although high vaccination coverage levels have been reached in these target vaccination groups, little is known about the effectiveness of vaccination programs in Brazil.[14,17] A number of factors, in particular vaccine coverage, is known to influence the effectiveness of influenza vaccination programs. However, the Brazilian MoH data shows vaccine coverage to be high in almost all years since the introduction of vaccination. Importantly, the extent to which the vaccine recommended influenza B virus lineage matches the influenza virus lineage circulating in the population during an influenza season is known to impact the effectiveness of seasonal influenza vaccination programs.[14] Data on laboratory surveillance of the influenza B virus in Brazil are limited, specifically data on the burden of disease and circulation patterns of influenza B lineages. The present integrative review of publicly available data aims to consolidate findings on the pattern of influenza B occurrence in Brazil to have a better understanding of influenza B epidemiology and its relevance to seasonal vaccine composition.

Material and methods

Information sources and search strategy

Epidemiological surveillance systems

Different sources were used to retrieve information on epidemiological surveillance. We referred to international data sources to check WHO recommendations on the vaccine composition in the Southern hemisphere,[18] and information on circulating influenza lineages for Brazil, the South America region and globally from the WHO/FluNet database which provides data through its network – Global Influenza Surveillance and Response System (GISRS) laboratories.[19] Consolidation of available national epidemiological information on Influenza in the Epidemiological Bulletins of the Brazilian MoH was also performed. Bulletins available from 2009 to Epidemiological Week 35 of 2014 were considered.[15] In Brazil, two types of surveillance exist: Sentinel surveillance of ILI and Universal Severe Acute Respiratory Syndrome (SARS) surveillance. ILI is defined as fever followed by cough or sore throat and symptoms onset within the last seven days. SARS is defined