



Prevalence of meningococcal carriage in children and adolescents aged 10–19 years in Chile in 2013



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Risk factors

Summary In 2011, Chile experienced an increase in the number of cases of IMD caused by *Neisseria meningitidis* group W. This epidemiological scenario prompted authorities to implement prevention strategies. As part of these strategies, the Institute of Public Health of Chile conducted a cross-sectional study to determine the prevalence of pharyngeal carriage of *N. meningitidis* in a representative sample of healthy children and adolescents aged 10–19 years.

The identification of presumptive *N. meningitidis* strains was performed by testing carbohydrate utilization in the National Reference Laboratory at the ISP. Association of meningococcal carriage with risk factors was analyzed by calculating the Odds Ratio. Selected variables were included in a logistic model for risk analyses.

The prevalence of carriage of *N. meningitidis* was 6.5% (CI: 5.7–7.3%). Older age (carriers: 14.2 ± 0.29 vs. non-carriers: 13.8 ± 0.08 years old; $p=0.009$), cohabitation with children (carriers: 0.9 ± 0.13 vs. non-carriers: 0.7 ± 0.03 ; $p=0.028$), number of smoking cohabitants (carriers: 0.55 ± 0.13 vs. non-carriers: 0.44 ± 0.03) and frequent attendance to crowded social venues (carriers: 49% vs. non-carriers:

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37%; $p=0.008$) were determined to favor carriage. Statistical modeling showed that meningococcal carriage was associated with older age (OR: 1.077, p -value: 0.002) and cohabitation with children (OR: 1.182, p -value: 0.02).

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Introduction

Invasive meningococcal disease (IMD) is a public health priority worldwide as a major cause of morbidity and mortality and its potential to cause outbreaks [1]. The epidemiology of IMD is dynamic in time and presents geographic variations. The implementation of a comprehensive surveillance system that includes laboratories capable of carrying out a wide range of microbiological and molecular diagnostic and characterization techniques is essential for an accurate identification and characterization of the etiological agent in clinical samples and to assess the magnitude of the problem.

The causative agent of IMD, *Neisseria meningitidis*, is found exclusively in the human nasopharynx [2]. A number of studies have associated meningococcal carriage with age, where adolescents present the highest carriage rates. In Europe and North America, the prevalence of meningococcal carriage ranges from 10% to 35% [3–6], but the duration of carriage and the factors that result in an individual developing the disease remain controversial [7,8].

Surveillance data collected in Chile show that group B was responsible for most of the IMD cases. However, in 2011, the epidemiological surveillance systems detected an increase in the number of cases of group W disease. Prior to the occurrence of these cases, the surveillance systems registered the lowest incidence rate, 0.4 per 100,000 inhabitants. In contrast, the case-fatality rate showed a rising trend that peaked at 15.1% in 2011. In 2012, incidence rates of IMD increased to 0.8 per 100,000 inhabitants, and case fatality rates reached 25.4%. Additionally, group W was identified in 56% of all registered cases, placing this group as the most prevalent [9].

Given this new epidemiological scenario, the Ministry of Health released a health alert and designed strategies to address the emergency [10]. Vaccination was implemented in a sequential manner throughout Chile during a period that lasted three months, from October to December 2012. On October, this process began in districts that

had the most number of cases, and by the end of December, infants between 9 months and 5 years of age were covered. In Chile, the conjugated vaccine has never been used; only a clinical phase II/III study was performed with vaccine B (Novartis applied to adolescents between 10 and 18 years of age). The plan (“*Plan de Acción W*”) also considered strengthening surveillance systems and conducting epidemiological studies.

Because little information was available regarding circulating strains among asymptomatic carriers in Chile, and in the light of the implementation of a vaccination campaign with the tetravalent conjugate vaccine against groups A, C, W & Y among children up to 5 years and high-risk populations, the ISP, in collaboration with the Ministry of Health, Regional Ministerial Secretaries of Health (SEREMI) and Regional Secretaries of Education decided to conduct a carriage study among children and adolescents not targeted by the vaccination campaign. This carriage study was realized in adolescents 4 months after implementing vaccination by means of the established program.

The objectives of the study were (i) to determine the prevalence of pharyngeal carriage of *N. meningitidis* in healthy children and adolescents aged 10–19 years, (ii) to obtain the distribution of groups from pharyngeal samples, and (iii) to explore factors associated with meningococcal carriage.

Methods

Population

A cross-sectional study was designed and a representative sample of healthy Chilean children and adolescents aged 10–19 years old was selected. Sample size was calculated with an estimated prevalence (proportion) of meningococcal carriage of 20% among this age group, 0.01 accuracy, 95% confidence level and considering 10% loss [11,12]. The study was conducted in the three most populated regions in Chile: Metropolitana, Valparaíso, and Biobío. The estimated sample size was 4120

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