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# SARS-COV-2 IgG positivity in vaccinated and non-vaccinated Chilean children: a national cross-sectional study in Schools

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**Highlights**

- COVID-19 vaccination of children is gaining global support
- Scarce data is available for the inactivated vaccines
- We report IgG sero(+) in vaccinated/non-vaccinated Chilean school-aged children
- Seropositivity was >90% two weeks after a 2$^{nd}$ dose of inactivated vaccine
- IgG seropositivity surpassed 90% up to 10 weeks in the case of the mRNA vaccine

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SARS-COV-2 IgG positivity in vaccinated and non-vaccinated Chilean children: a national cross-sectional study in Schools

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## Introduction

COVID-19 vaccination of children is gaining global support (Committee on Infectious Diseases 2021) and data on immunogenicity and efficacy/effectiveness is increasing (Walter 2022; Frenck 2021; Han 2021). Chile has rapidly advanced in a national vaccination campaign for children: as of February 17 2022, 79% of children 3-17 years old had been fully vaccinated (Ministerio de Salud Chile 2022). Children 12-17 years old were vaccinated starting June 22nd 2021 with the mRNA Pfizer/BioNTech vaccine, followed weeks later by children 6-11 years old whom received the

inactivated Sinovac vaccine. We previously reported a national COVID-19 IgG seropositivity study in adults vaccinated with either vaccines demonstrating the utility of large cross-sectional immunologic surveys using lateral flow tests (LFT) (Sauré 2022). We report here IgG seropositivity in vaccinated and non-vaccinated Chilean school-aged children, receiving the inactivated vaccine from Sinovac (CoronaVac) or the mRNA vaccine from Pfizer/BioNTech (BNT162b2) within one to twenty weeks before sample collection, or no vaccine. Data on IgG seropositivity among vaccinated children with inactivated as compared to mRNA vaccines is currently non-existent, and can provide important information for decision makers worldwide.

**Methods**

We performed SARS-CoV-2 IgG testing using the Onsite (CTK Biotech Inc, US) LFT. This was the same LFT used in adults (Sauré 2022), with a reported sensitivity and specificity of 96.7% and 98.1% (CTK Biotech 2021). In conjunction with the Chilean Ministries of Education and Health, 24 schools located in the 3 most populated regions in Chile were invited to take part in the study. Briefly, all parent/children pairs were invited to participate through a letter sent by school authorities. Accepting parents signed informed consent and children over 8 years of age an assent. Children of every accepting parent were tested. Trained staff in each school obtained basic information from the parent/caregiver of the child participant including type of vaccine and vaccination dates, age, gender, country of origin, general medical history, previous Covid-19 IgG or PCR testing, home address and usual transportation method to school. A finger prick blood was obtained in the child as previously described (Sauré 2022). Tests were read on site and results (positive, negative, or not conclusive) as well as surveillance data were instantly uploaded through a web interface to a database harbored at the Instituto Sistemas Complejos de Ingeniería, as in

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previous reports (Sauré 2022). The study was approved by the Comité de Ética de Investigación en Seres Humanos (Universidad de Chile, Santiago, Chile).

**Results**

As of December 24, 2021, a total of 2302 children have been included as described in Table 1. While most Sinovac recipients were 6-11 years old (920), Pfizer/BioNTech recipients were almost exclusively 12-18 years old (647). IgG positivity was significantly higher for Pfizer compared to Sinovac recipients for all study variables except comorbidities (Table 1). For 670 children receiving the Pfizer/BioNTech vaccine seropositivity was 91.7% three to four weeks after the second dose, with figures above 90% by 20 weeks after full vaccination (Figure 1). For 1506 children receiving Sinovac, seropositivity was 91.8 % three to four weeks after the second dose, with a declining trend thereafter (Figure 1).

**Discussion**

In school-aged Chilean children, SARS-CoV-2 IgG seropositivity surpassed 90% two weeks after administration of a second dose in the case of the inactivated vaccine (Sinovac), and up to 10 weeks in the case of the mRNA vaccine (Pfizer/BioNTech). Compared to the adult population (Sauré 2022), children showed a slightly weaker response to the mRNA vaccine and a slightly stronger response to the inactivated vaccine, in terms of the overall proportion of seropositive individuals in the short-term period after vaccination. Yet, as for the case of adults, the seropositivity for the inactivated vaccine declines over time, suggesting that a booster dose will most likely be required

for children, however by 22-24 weeks after inmunization, we reported a small sample size for the inactivated vaccine. LFTs do not differentiate IgG responses due to vaccination or infection, which may influence some of the responses observed; positivity in a small number of non-vaccinated children reached 27%". Self-reporting of child characteristics reduces robustness for the comparison of comorbidities.

Chile was one of the first Western countries to begin vaccinating children (Ministerio de Salud Chile 2021), a decision that may be relevant given the scenario of circulation of more transmissible variants. With the Omicron variant, SARS-CoV-2 infections and hospitalizations reached high levels in children, but severe clinical outcomes were less frequent than with Delta variant in this population (Wang 2022). The impact on protection against infection and especially severe disease of the COVID-19 vaccines has yet to be elucidated in children. However, immunization of children could have an impact on both direct and indirect effects of SARS-CoV-2 infection, favoring school attendance, mental health and cognitive learning, especially in vulnerable children (Fore 2020).

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**Conflict of interest**

The authors have no conflicts of interest relevant to this article to disclose.

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**Funding source**

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**Ethical Approval**

This study was approved by the Ethics Committee for Clinical Investigation in Humans, from the Faculty of Medicine, Universidad de Chile.

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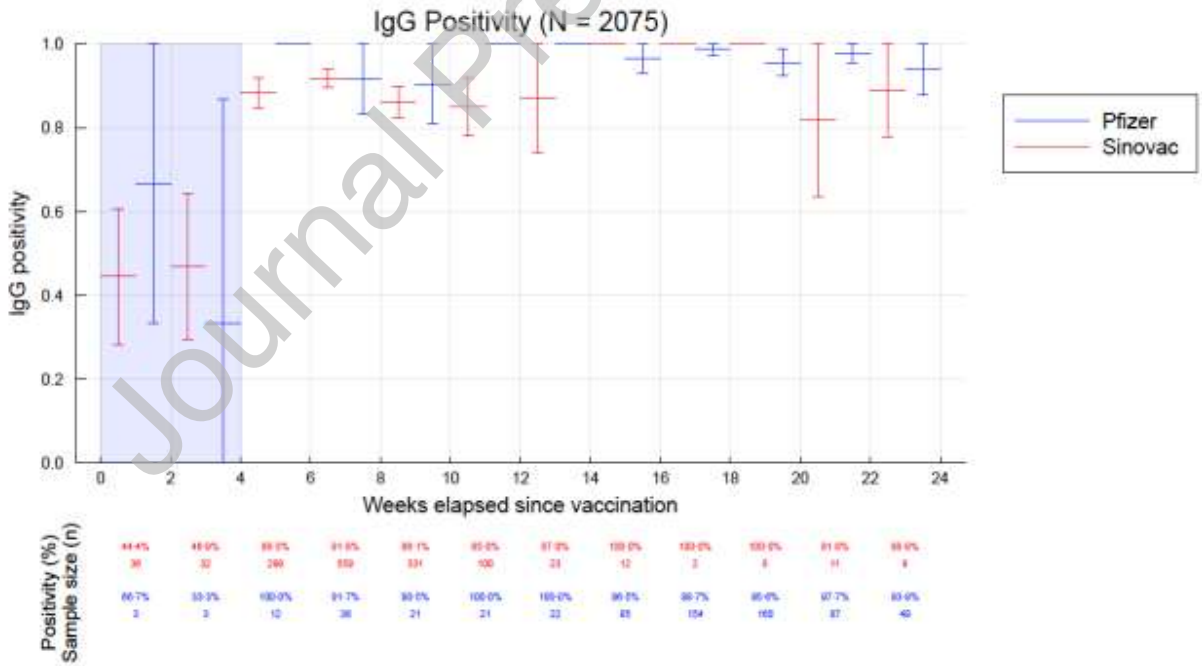
**Figure 1.** Seropositivity 1 to 4 weeks after first dose (light blue-shaded region) or after second dose for recipients of Sinovac or Pfizer vaccines with no prior positive PCR result. Error bars represent 95% confidence intervals.



**T**able 1. Covid-19 IgG positivity according to population characteristics and vaccine received*.

| Characteristics | Total | | Unvacinnated | | Sinovac | | Pfizer | |
|---|---|---|---|---|---|---|---|---|
| | **n/N** | **IgG positivity (95% CI)** | **n/N** | **IgG positivity (95% CI)** | **n/N** | **IgG positivity (95% CI)** | **n/N** | **IgG positivity (95% CI)** |
| **Age range** | | | | | | | | |
| 6-11 years | 837/1033 | 81.0% (78.6%, 83.4%) | 25/90 | 27.8% (18.5%, 37.0%) | 792/920 | 86.1% (83.9%, 88.3%) | 20/23 | 87.0% (73.2%, 100%) |
| 12-18 years | 1136/1269 | 89.5% (87.8%, 91.2%) | 7/31 | 22.6% (7.9%, 37.3%) | 505/591 | 85.4% (82.6%, 88.3%) | 624/647 | 96.4% (95.0%, 97.9%) |
| **Gender** | | | | | | | | |
| Male | 866/1001 | 86.5% (84.4%, 88.6%) | 15/62 | 24.2% (13.5%, 34.9%) | 598/678 | 88.2% (85.8%, 90.6%) | 253/261 | 96.9% (94.8%, 99.0%) |
| Female | 1107/1301 | 85.1% (83.2%, 87.0%) | 17/59 | 28.8% (17.3%, 40.4%) | 699/833 | 83.9% (81.4%, 86.4%) | 391/409 | 95.6% (93.6%, 97.6%) |
| **Region** | | | | | | | | |
| Metropolitan | 1301/1459 | 89.2% (87.6%, 90.8%) | 19/72 | 26.4% (16.2%, 36.6%) | 920/1021 | 90.1% (88.3%, 91.9%) | 362/366 | 98.9% (97.8%, 100%) |
| Valparaiso | 374/461 | 81.1% (77.6%, 84.7%) | 12/36 | 33.3% (17.9%, 48.7%) | 238/292 | 81.5% (77.1%, 86.0%) | 124/133 | 93.2% (89.0%, 97.5%) |
| Biobio | 298/381 | 78.2% (74.1%, 82.4%) | 1/13 | 7.7% (0%, 22.2%) | 139/197 | 70.6% (64.2%, 76.9%) | 158/171 | 92.4% (88.4%, 96.4%) |
| **Prev. pos. PCR**** | 35/45 | 77.8% (65.6%, 89.9%) | 3/6 | 50.0% (10.0%, 90.0%) | 20/27 | 74.1% (57.5%, 90.6%) | 12/12 | 100% (100%, 100%) |
| **Comorbid** | | | | | | | | |

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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **ities** | | | | | | | | |
| Obesity | 50/56 | 89.3% (81.2%, 97.4%) | 1/6 | 16.7% (0%, 46.5%) | 38/39 | 97.4% (92.5%, 100%) | 11/11 | 100% (100%, 100%) |
| Chronic disease pulmonary | 82/94 | 87.2% (80.5%, 94.0%) | 1/4 | 25.0% (0%, 67.4%) | 33/40 | 82.5% (70.7%, 94.3%) | 48/50 | 96.0% (90.6%, 100%) |
| cardiovascular | 13/14 | 92.9% (79.4%, 100%) | 0/0 | - | 6/7 | 85.7% (59.8%, 100%) | 7/7 | 100% (100%, 100%) |
| Other*** | 8/9 | 88.9% (68.4%,100%) | 0/0 | - | 0/0 | - | 8/9 | 88.9% (68.4%, 100%) |
| None identified | 1820/2129 | 85.5% (84.0%, 87.0%) | 30/111 | 27.0% (18.8%, 35.3%) | 1220/1425 | 85.6% (83.8%, 87.4%) | 570/593 | 96.1% (94.6%, 97.7%) |
| **Total** | **1973/2302** | 85.7% (84.3%, 87.1%) | **32/121** | 26.4% (18.6%, 34.3%) | **1297/1511** | 85.8% (84.1%, 87.6%) | **644/670** | 96.1% (94.7%, 97.6%) |

*The data exclude participants with incomplete information (n=6), inconsistent vaccination status information (n=86), region other than those listed (n=1), and vaccinated with vaccines other than Sinovac or Pfizer (n=11).

** PCR previously obtained which resulted positive

***Includes 4 cases of Hypertension, 4 cases of Diabetes and one case of Cancer

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