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Short Communication

High seroprevalence for SARS-CoV-2 infection in South America, but still not enough for herd immunity!

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ABSTRACT

Herd immunity is considered to be a relevant aspect of COVID-19 epidemiology. In this regard, seroprevalence studies are essential for understanding how far countries and regions are from that potential point. This study analyzed seroprevalence data in nine studies from South America, which is a region that has been badly affected by COVID-19. Seroprevalence values were high, with percentages up to 70.0% (95% CI 67.0-73.4%) in Iquitos, Peru. A meta-analysis of such data enabled a pooled seroprevalence to be obtained, estimated at 33.6% (95% CI 28.6-38.5%). Despite this, the COVID-19 pandemic in South America continues to significantly affect countries such as Brazil, Colombia, and Peru.

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Introduction

There has been intense discussion about the importance of reaching herd immunity to achieve global population protection status against SARS-CoV-2/COVID-19. For that reason, vaccination coverage and seroprevalence studies are increasing around the world; some of them have shown an increase in the seroprevalence of different populations. For example, a recent study in Jordan (Sughayer et al., 2021) stated the importance of seroprevalence studies for SARS-CoV-2 infection among healthy blood donors. The current study analyzed some seroprevalence data in South America, which is a region that has also been badly affected by coronavirus disease 2019 (COVID-19).

Since it was first identified, COVID-19 has caused millions of people to be infected and thousands of deaths to occur worldwide. Therefore, to better manage the disease, health authorities need to know the prevalence. Although the RT-qPCR is the gold standard for its diagnosis, serological methods have the advantage of detecting the actual extent of the disease, due to the permanence of anti-IgM and IgG immunoglobulins and because they also enable asymptomatic and subclinical infections to be captured (Xu et al., 2020).

Seroprevalence has already been determined in many countries (Rostami et al., 2021); there have been a few studies carried out at a population level in South America, including Argentina, Brazil (Hallal et al., 2020; Silva et al., 2020; Silveira et al., 2020), Colombia (Mattar et al., 2020), and Peru (Álvarez-Antonio et al., 2021; Diaz-Velez et al., 2021; Reyes-Vega et al., 2021). Therefore, the current study aimed to select relevant studies and assess the pooled seroprevalence of the region.

Methods

Studies about seroprevalence from Scielo, medRxiv/bioRxiv, and PubMed from South America were identified and selected. The studies included populations from regions (more than from institutions) with >500 inhabitants, carried out between April and September 2020. Information was included about the location, setting, period of study, used serological method (ELISA, LFIA, chemiluminescence, rapid tests), size of the study, and the value of the seroprevalence found, with their 95% confidence intervals (95% CI).

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Table 1
SARS-CoV-2 seroprevalence in South American populations.

#	Location	Setting	Period	Method	N	Seroprevalence (95% CI)	Ref.
1	Iquitos, Peru	Province	July 2020	Rapid test	716	70.0% (67.0-73.4)	(Álvarez-Antonio et al., 2021)
2	Monteria, Colombia	City	August 2020	ELISA	1,308	55.3% (52.5-57.8)	(Mattar et al., 2020)
3	Buenos Aires, Argentina	Communities	June 2020	ELISA	873	53.4% (52.8-54.1)	(Figar et al., 2020)**
4	Maranhao, Brazil	State	July-August 2020	LFIA	3,156	40.4% (35.6-45.3)	()(Silva et al., 2020)
5	Cuzco, Peru	Province	September 2020	Chemiluminescence	1,924	33.1% (30.1-36.4)	(Huamani et al., 2020)**
6	Lambayeque, Peru	Region	June-July 2020	LFIA	2,010	29.5% (27.6-31.5)	(Diaz-Velez et al., 2021)
7	Lima, Peru	Province	June-July 2020	LFIA	3,212	20.8% (17.2-23.5)	(Reyes-Vega et al., 2021)
8	133 cities (26 states), Brazil	Country	June 2020	LFIA	31,165	2.8% (2.5-3.1)	(Hallal et al., 2020)
9	Rio Grande do Sul, Brazil	State	May 2020	LFIA	4,500	0.2% (0.1- 0.4)	(Silveira et al., 2020)
Pooled seroprevalence*					48,864	33.6% (28.6-38.5)	-

95% CI, 95% confidence interval; ELISA, enzyme-linked immunosorbent assay; LFIA, lateral flow immunoassay
* Random-effects model meta-analysis; τ^2=0.006; Q=8968.13; I^2=99.9; p<0.001.
** Preprints:Figar S, Pagotto V, Luna L, Salto J, Manslau MW, Mistchenko AS, et al. Community-level SARS-CoV-2 Seroprevalence Survey in urban slum dwellers of Buenos Aires City, Argentina: a participatory research. medRxiv 2020: 2020.07.14.20153858.Huamani C, Velásquez L, Montes S, Mayanga-Herrera A, Bernabé-Ortiz A. Population-Based Seroprevalence of SARS-CoV-2 Antibodies in a High-Altitude Setting in Peru. SSRN 2020: 3760458 doi 10.2139/ssrn.3760458

Using the open software OpenMetaAnalyst®, a random-effects model meta-analysis was run to estimate a pooled seroprevalence.

Results

Nine studies from four countries were included: Argentina, Brazil, Colombia, and Peru, ranging from 716 individuals (Peru) to 31,165 (Brazil). Some areas, such as Iquitos (Peru) and Monteria (Colombia), had the highest peak of infection worldwide in July-August 2020. Table 1 shows that the seroprevalence values were high, with percentages reaching up to 70.0% (95% CI 67.0-73.4%) in Iquitos, Peru; Monteria (Colombia) and Buenos Aires (Argentina) showed seroprevalence above 50%. With the exception of Maranhao, Brazil, that showed the lowest values of seroprevalence (Table 1). The meta-analysis of such data enabled a pooled seroprevalence to be obtained, estimated at 33.6% (95% CI 28.6-38.5) (Table 1).

Discussion

Without a doubt, seroprevalence of South American populations during the first wave were higher than those reported by European cities, where the highest seroprevalence was in the northern zone at 5.27% (95% CI 3.97-6.57%). Rates in South America were even higher than that initially reported by Iran with 22.16% (95% CI 18.7-26.0%) (Rostami et al., 2021). It is worth mentioning that the highest values , such as in Peru, Colombia, Argentina, and Brazil, came from low-income populations. The relationship with poverty has already been demonstrated in different studies. Beyond this, recent publications have suggested that herd immunity may not necessarily be enough to suppress the COVID-19 pandemic (Tkachenko et al., 2021). The idea of herd immunity via natural infection rather than vaccination is a bit controversial, as it is unclear how long antibodies will last, and whether re-infection or reactivation of the virus can occur after the antibodies begin to lower in the body (Sharma et al., 2021). Antibody titers can wane within weeks after infection and the magnitude of antibody neutralization in asymptomatic people decreases faster than in symptomatic people (Blasi et al., 2021; Seow et al., 2020).

The data in all the studied regions were taken during the months where the highest infection peaks were reported. Therefore, it was expected that herd immunity would have been achieved, as expected for Maranhao (Brazil), during that time. However, they could have been overestimated, as expected, which apparently happened in Manaus (Brazil) and Iquitos (Peru) (Sabino et al., 2021), since until that moment it was unknown that new variants could appear, which would later refute this claim. Although many inhabitants had already been infected, a second wave appeared and even reinfections (1-2%) were reported, although are still under study. Furthermore, there is no clear definition of the proportion of a population vaccinated and infected at a given time, which is necessary for reaching “herd immunity”. Some publications have indicated that this may be as low as 10-25% (Kaushal et al., 2020), while others as high as 60-70% (Gomes et al., 2020; Silva et al., 2020). Beyond that, given the high levels of seroprevalence found, no further cases should be in those areas; however, COVID-19 transmission and cases have still occurred.

A limitation of these analyses is that retrospective data were used, ranging from May to September 2020. This is an important limitation, as the seroprevalence almost a year later, when vaccination had already begun in all of the studied countries, probably had an impact on the current situation. Another limitation is that databases that included some studies not peer reviewed (preprints) were used. Further analyses are expected after vaccination in the region, which is still slow, as in most countries, with <15% of people being fully vaccinated (July 8, 2021). Studies in the same areas after vaccination would be useful for comparison purposes. Additionally, although the mortality rates and their potential relationship with seroprevalence in the different countries were analyzed during the same period, is known that herd immunity can only be achieved with vaccination, as the natural course of infection would yield an enormous fatality rate; this has been the case in South America, with significant mortality.

It has also been postulated that developed immunity does not last long, probably more than a year. The application of vaccines could be an alternative to achieve herd immunity; however, continuous modifications will have to be developed against the new SARS-CoV-2 variants, and the vaccination process accelerated before cases increase again. Knowing the prevalence of COVID-19 in South America will still take time, as transmission of the Brazilian variant (Gamma, P.1) that is currently the most contagious lineage in this region is preventing herd immunity (although also Alpha and Delta variants are currently circulating, July 2021); in the meantime, continued use of masks, hand washing and social distancing in order to stop the transmission of the SARS-CoV-2 virus are required, and certainly increased vaccination. Variants are a growing concern for the potential compromise and reduction of efficacy of available vaccines (Focosi et al., 2021).

Conflict of Interest

Dr. Rodriguez-Morales, report being medical advisor of Abbott Diagnostics for Latin America, outside the submitted work. The rest of the authors declare no conflict of interest..

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Ethical Approval

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