

Clinical recovery time for Sars-Cov-2 Infection in healthcare workers with full and booster vaccination

Ana María Espinoza-Centeno¹; Darío Alcívar-Zambrano²; Kenny Escobar-Segovia³

(Recibido: febrero 27, Aceptado: mayo 23, 2023)

<https://doi.org/10.29076/issn.2602-8360vol7iss12.2023pp73-78p>

Abstract

The increase of infections at the end of 2021 and January 2022 due to the Omicron variant in Ecuador, raises doubts regarding the effectiveness of booster vaccination, which questions the protection provided by booster vaccination and how often to apply it. A sample of 419 cases is taken and compared with the personnel that have complete (58% with third dose) and incomplete (42%) immunization schedules as of December 2021 and January 2022, and the time of symptomatic recovery after SARS infection is determined afterwards. The results show no difference in the recovery time in patients within the two groups and similar symptoms were observed. It is concluded that, given the results, there is no evidence of the need for a third dose in general, but rather, it would be reasonable to focus the efforts of a second booster only in specific vulnerable populations, thus avoiding unnecessary adverse effects that are becoming more frequent, and even allowing the existing vaccines available in countries where they are really needed.

Keywords: booster; Covid-19; healthcare workers; SARS-CoV-2; vaccines.

Tiempo de recuperación clínica de la infección por Sars-Cov-2 en trabajadores del sector sanitario con vacunación completa y de refuerzo

Resumen

El incremento de infecciones a finales de 2021 y enero de 2022 por la variante Ómicron en Ecuador, plantea dudas sobre la eficacia de la vacunación de refuerzo, lo que cuestiona la protección que proporciona la vacunación de refuerzo y la frecuencia con la que debe aplicarse. Se toma una muestra de 419 casos y se compara con el personal que tiene calendarios de vacunación completo (58% con tercera dosis) e incompleto (42%) a diciembre de 2021 y enero de 2022, y se determina posteriormente el tiempo de recuperación sintomática tras la infección por SRAS. Los resultados no muestran diferencias en el tiempo de recuperación de los pacientes de los dos grupos y se observan síntomas similares. Se concluye que, a la vista de los resultados, no hay evidencia de la necesidad de una tercera dosis en general, sino que sería razonable centrar los esfuerzos de un segundo refuerzo sólo en poblaciones específicas vulnerables, evitando así efectos adversos innecesarios cada vez más frecuentes, e incluso permitiendo disponer de las vacunas existentes en países donde realmente se necesitan.

Palabras clave: refuerzo; Covid-19; personal sanitario; SARS-CoV-2; vacunas.

¹ Universidad Espíritu Santo, Samborondón, Ecuador. Email: amespinozac@uees.edu.ec. ORCID: <https://orcid.org/0000-0001-5373-7151>

² Universidad Espíritu Santo, Samborondón, Ecuador. Email: dalcivarz@uees.edu.ec. ORCID: <https://orcid.org/0000-0002-5498-6886>

³ Escuela Superior Politécnica del Litoral, ESPOL, Guayaquil, Ecuador. Email: kescobar@espol.edu.ec. ORCID: <https://orcid.org/0000-0003-1278-7640>

INTRODUCTION

Since its emergence in December 2019, the Covid-19 has presented many clinical manifestations, where most patients (85%) report only mild symptoms (1) and a considerable amount of acute and chronic illness (15%), putting enormous pressure on healthcare systems worldwide (2) with early detection being critical. However, despite improvements in screening tests and vaccine efficacy, genetic variants, potential reinfections, and lack of evidence on long-term immune responses to SARS-CoV-2 (3), threaten the progress of both protections from primary infection (2), and therefore, a public health system effort is required to maintain biosecurity measures, accelerate vaccination worldwide, and thus prevent morbidity and mortality from Covid-19 (3).

Most licensed Covid-19 vaccines use a two-dose (homologous) strategy (primary and booster), except for the single-dose Ad26-Cov2.S adenovirus vector vaccine (Janssen). Evidence suggests (4) that the immune response following the full (two-dose) schedule in persons infected before vaccination (natural immunity) may be like or even stronger than that of persons not exposed to the full schedule (5), so the general strategy of two doses and even a third booster has been questioned.

At the same time, people working in high-risk settings (e.g. health care workers) are eligible for a booster vaccination (in countries such as the USA, UK, Germany, and Italy), however, the efficacy of the third dose has not been demonstrated in studies of 16–39-year age groups (6), but it has been in those aged 40–69 years who presented reduced rates of hospital admission, severe illness and death (7), corroborating that the difference is more due to the characteristics of specialized cases. Likewise, in a study in 2020 of a hospital in Guayaquil, a similar trend was observed for both hospital health personnel and the non-hospital population, concluding that the spread of this disease is linked to the social behavior of people in their socio-family environment and the relaxation of biosecurity measures (8) and

not to work activity (high-risk personnel).

On the other hand, in relation to SARS-COV-2 variants, the first case of Omicron was confirmed on November 11, 2021, in Botswana, South Africa and currently (2022) it is the predominant variant worldwide due to its high transmission capacity (9). In the case of Ecuador, on December 27, the Ministry of Public Health (MPH) confirmed that the Omicron variant was already community-acquired; therefore, the present study aims to determine whether there is a difference in the days of recovery from Covid-19 infection between workers who had a booster dose (3 doses) and those who had only a full dose (2 doses).

METHODOLOGY

Descriptive study, mixed observational retrospective, study population, health workers of a hospital in Guayaquil-Ecuador (n=1247) of which 419 tested positive in January 2022. The "RT-PCR for Covid-19" and "Anti- SARS-CoV-2 nasopharyngeal Covid-19 antigen" tests were used to determine the positive status of the disease. In addition, the number of days of symptomatic evolution of hospital personnel is recorded to determine medical discharge according to the absence of symptoms.

A database was created with the following information: type of position (administrative-hospital); grouped position (doctor, nurse, technologists, etc.); age, sex, previous history of covid-19 determined by "RT-PCR" test and vaccination card of the last dose verified in the MPH system (<https://certificados-vacunas.msp.gob.ec/>), type of vaccine and date of application of the last dose.

The data were analyzed in SPSS, obtaining frequency and percentage of the different variables, in addition to the relationship between a quantitative variable (symptomatic count of Covid-19 days) and a qualitative variable (complete vaccination and booster vaccination) to determine whether there is a difference in symptomatic recovery as a protective factor for the vaccination variables.

The Student's T-test for independent samples was used, establishing as null hypothesis that

there is no difference between recovery times with complete or booster vaccination, with a confidence level of 95%.

RESULTS

Between December 2021 and January 2022,

there was an increase in the number of Covid-19 cases in healthcare workers with upper airway symptoms without pulmonary involvement attributable to the Omicron variant, with a total of 419 people infected, representing 34% of the total study population (n=1247).

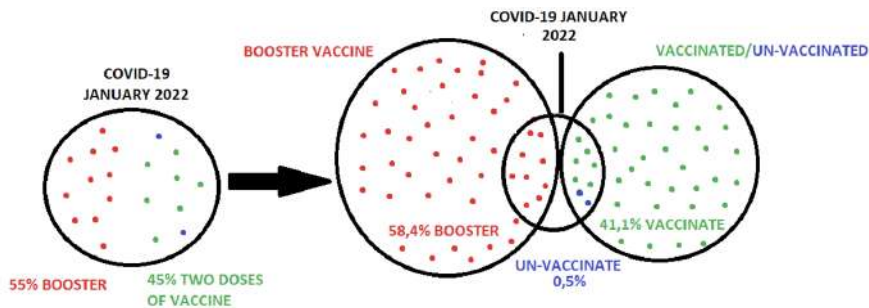


Figure 1. Presentation of Covid-19, 2022 cases in vaccinated health care personnel.

There was a higher number of infections in the population with no history of previous Covid-19 (20%), compared to those with a history of previous Covid-19 (14%).

In the case of complete and booster vaccination we obtained a slightly higher percentage in that population that had the 1st booster (18%) against Covid-19, compared to those who had complete vaccination (15%). Table 1.

Table 1. Covid-19 presentation in January 2022 in healthcare personnel with a history of previous Covid and booster vaccination.

| | | Covid-19 January 2022 | | | |
|---------------------|-----|-----------------------|----|-------|----|
| | | Yes | | Not | |
| | | Count | % | Count | % |
| History of Covid-19 | Yes | 171 | 14 | 415 | 33 |
| | Not | 248 | 20 | 413 | 33 |
| Boost Vaccination | Yes | 229 | 18 | 499 | 40 |
| | Not | 190 | 15 | 329 | 26 |

#: Percentage

A difference in days of recovery can be observed between the population with complete and incomplete vaccination; however, when Student's t-test was performed, no differences were found (p value => .05). This is due to the

fact that 99.3% of the population under study was fully vaccinated and only two cases with incomplete vaccination presented Covid-19 in January, which is not a sufficient sample to determine the existence of differences (Figure 2).

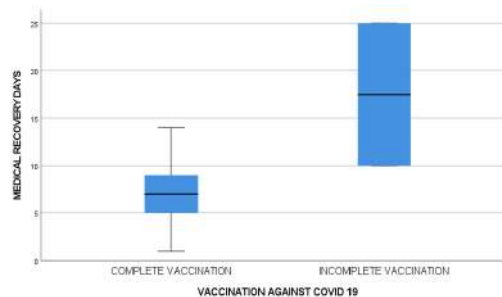


Figure 2. Difference in symptomatic recovery in workers with complete and incomplete vaccination. Simple box diagram of the medical recovery days for vaccination against Covid-19

The results show that of the 419 cases of SARS-CoV-2 attributable to the Omicron variant, 55% of the positive cases had 3 doses of vaccine with a time of application of the third dose greater than 15 days, 92% of them, only 8% with a time of application less than 15 days prior to the positive result for SARS-CoV-2, and only 0.5% of the infected personnel had only one dose of vaccination (Figure 3).

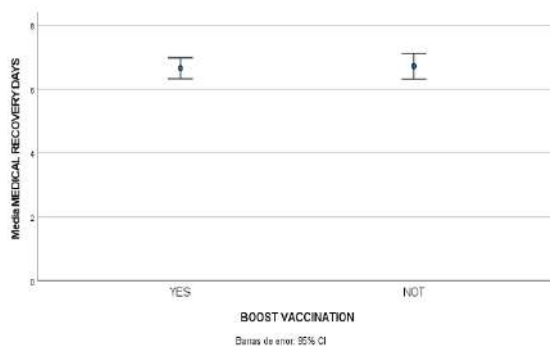


Figure 3. Simple error bar, mean of days of medical recovery with booster vaccination

The T-test for independent samples indicates that the null hypothesis is accepted, i.e., there is no difference in the average number of days of symptomatic symptoms between the

population with complete vaccination and the booster vaccination. ($t = -0.242$; $gl = 547$; $p > 0.05$) Table 2.

Table 2. Test of independent samples

| | | t test for equality of means | | | |
|-----------------------|--|------------------------------|---------|-------|---------------------|
| | | t | gl | Sig. | Difference of means |
| Medical recovery days | Equal variances are assumed | -0.242 | 547 | 0.809 | -0.062 |
| | Variiances are not assumed to be equal | -0.240 | 512.348 | 0.811 | -0.062 |

DISCUSSION

Some studies have demonstrated persistence of antibodies in healthcare personnel for more than six months after a primary infection, a finding that may confirm long-term protection against SARS-CoV-2infection. (10) Thus, a history of previous illness generates natural immune protection, in addition to the acquired protection afforded by a complete vaccination schedule. Where in a fully vaccinated hospital population presenting with Covid-19, the majority presented with mild symptoms with uncomplicated recovery. (11) In addition, having natural antibodies to Covid-19 is a very important factor.

In addition, having natural and acquired antibodies did not generate a complete barrier to a new SARS-Cov-2 infection, and it was proven in the study population that the spread of this disease is linked to the social behavior of people in their socio-familial environment and relaxation of biosecurity measures; Therefore, it is possible that health personnel, despite the occupational risk of Covid-19, can remain

undefeated from massive contagion, as long as they comply with all biosecurity measures, are provided with personal protective equipment and evaluated on the correct use of the same. (8)

The present study has some limitations, one of them being the sequencing of the Covid-19 test to determine the type of variable that predominated at the end of 2021 and January 2022 in the hospital population. However, epidemiological studies in Ecuador show the predominance of the omicron variant between the end of 2021 and the beginning of 2022 (6).

Moreover, it is known that clinical symptoms were mild to moderate, demonstrating that even three doses of mRNA vaccines were not sufficient to prevent infections and symptomatic disease with the Omicron variant. However, protection against severe disease is likely to remain intact in persons who have received full or booster doses (6).

Vaccination in the health care workers in this study mostly presents two doses; only a low

number had incomplete vaccination and only two of them were infected in January 2022, so the difference in symptomatic recovery days could not be demonstrated because of the low number; however, these workers required hospitalization for Covid-19 of moderate characteristics and pulmonary involvement. Vaccination against Covid-19 has been available for more than a year. It can be observed in most of the underdeveloped countries a low vaccinated population who represent a higher risk before the appearance of new variants, such as omicron which was identified for the first time in South Africa on November 9, 2021. African countries have the lowest vaccination rates compared to other countries (11). The boosters have already sparked a debate on issues of equity and the prioritization of limited vaccine resources. Scientists are concerned that rich countries will rush to provide more Omicron boosters, which will exacerbate the global vaccine imbalance that many health researchers believe contributed to the emergence and rapid spread of Omicron (6).

CONCLUSIONS

This study demonstrates that although a large percentage of the hospital population with a booster dose and a prior history of Covid-19 did not provide a protective barrier to re-infection, there was no difference with respect to the severity of symptoms, which is determined by recovery time following SARS-Cov-2 infection in healthcare personnel who had a booster dose (3 doses). Furthermore, there was no difference in the severity of symptoms, which is determined by the recovery time following SARS-Cov-2 infection in healthcare personnel who had a booster dose (3 doses) vs. full vaccination (2 doses).

This reaffirms even more that contagion is linked to social behavior and relaxation of security measures, which until now has been the best protection mechanism and should be maintained until the pandemic continues.

As well as establishing equitable vaccination worldwide, because it is in those countries that do not have immune coverage, where

new mutations of the virus are being born. Therefore, it would be reasonable for efforts to be administered only to specific populations where the evidence shows that they are likely to be needed.

On a global scale, this would avoid millions of unnecessary adverse effects that are increasingly common and, more importantly, make these vaccines available to the countries where they are most needed. A pandemic, after all, requires a global strategy.

REFERENCES

1. PAHO/WHO | Pan American Health Organization/World Health Organization. COVID-19 Situation Reports. Disponible en <https://www.paho.org/en/covid-19-situation-reports>
2. Milne G, Hames T, Scotton C, Gent N, Johnsen A, Anderson RM, et al. Does infection with or vaccination against SARS-CoV-2 lead to lasting immunity? *Lancet Respir Med.* 2021; 9(12):1450–1466. [https://doi.org/10.1016/S2213-2600\(21\)00407-0](https://doi.org/10.1016/S2213-2600(21)00407-0).
3. Townsend JP, Hassler HB, Wang Z, Miura S, Singh J, Kumar S, et al. The durability of immunity against reinfection by SARS-CoV-2: a comparative evolutionary study. *Lancet Microbe.* 2021; 2(12): e666–e675. [https://doi.org/10.1016/S2666-5247\(21\)00219-6](https://doi.org/10.1016/S2666-5247(21)00219-6).
4. Bhattacharya A, Ranjan P, Ghosh T, Agarwal H, Seth S, Maher GT, et al. Evaluation of the dose-effect association between the number of doses and duration since the last dose of COVID-19 vaccine, and its efficacy in preventing the disease and reducing disease severity: A single centre, cross-sectional analytical study from India. *Diabetes & Metabolic Syndrome: Clinical Research & Reviews.* 2021; 15(5):102238. <https://doi.org/10.1016/j.dsx.2021.102238>.
5. Milne G, Hames T, Scotton C, Gent N, Johnsen A, Anderson RM, Ward T. Does infection with or vaccination against SARS-CoV-2 lead to lasting immunity? *Lancet*

- Respir Med. 2021; 9(12):1450-1466. doi: 10.1016/S2213-2600(21)00407-0.
6. Alba JMG, Pérez-Martínez Z, Boga JA, Rojo-Alba S, de Oña JG, Alvarez-Argüelles ME, et al. Emergence of new SARS-CoV2 Omicron variants after the change of surveillance and control strategy. *Microorganisms*. 2022; 10(10):1954. <http://dx.doi.org/10.3390/microorganisms10101954>
 7. Cirillo N. Do health-care workers need a COVID-19 vaccine booster? *Lancet Infect Dis*. 2022; 22:20. [https://doi.org/10.1016/S1473-3099\(21\)00782-9](https://doi.org/10.1016/S1473-3099(21)00782-9).
 8. Alcívar Zambrano D, Espinoza Centeno A, Escobar Segovia KF. Impacto de la pandemia por SARS-CoV-2 en los trabajadores de un Hospital de Guayaquil en el año 2020. *Rev San Gregor*. 2022; 1:63–73. <https://doi.org/10.36097/rsan.v0i49.1958>
 9. GISAID. Tracking of hCoV-19 Variants. Global Initiative on Sharing All Influenza Data. Disponible en: <https://gisaid.org/hcov19-variants/>
 10. Al-Naamani K, Al-Jahdhami I, Al-Tamtami W, Al-Amri K, Al-Khabori M, Sinani SA, et al. Prevalence and persistence of SARS-CoV2 antibodies among healthcare workers in Oman. *Journal of Infection and Public Health*. 2021; 14(11):1578–1584. <https://doi.org/10.1016/j.jiph.2021.09.006>
 11. Chau NVV, Ngoc NM, Nguyet LA, Quang VM, Ny NTH, Khoa DB, et al. An observational study of breakthrough SARS-CoV-2 Delta variant infections among vaccinated healthcare workers in Vietnam. *EClinicalMedicine* 2021; 41:101143. <https://doi.org/10.1016/j.eclinm.2021.101143>