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COVID-19 during the third wave in Mexico: symptoms and vaccination as protective factor in Durango

Edgar Olivas-Calderón[1], Francisco Javier García-Alvarado[2], Héctor Alberto Delgado-Aguirre[2], Rolando Adair Facio-Campos[1*].

[1]Universidad Juárez del Estado de Durango. Facultad de Ciencias Químicas. Durango, México. [2]Instituto Mexicano del Seguro Social Hospital de Especialidades UMAE N°71. Torreón, México.

RESUMEN

COVID-19 durante la tercera ola en México: síntomas y vacunación como factor protector en Durango

Introducción. El Coronavirus del Síndrome Respiratorio Agudo 2 (SARS-CoV-2) fue responsable de la pandemia por la Enfermedad por Coronavirus del año 2019 (COVID-19) declarada en marzo de 2020. A nivel mundial la vacunación contra el SARS-CoV-2 ha tenido mucha importancia.

Objetivo. Evaluar la frecuencia de la infección por SARS-CoV-2, los síntomas relacionados a la infección y el impacto de la vacunación.

Material y métodos. De octubre del 2021 a enero del 2022 se evaluaron 917 participantes. Se diagnosticó SARS-CoV-2 por RT-PCR.

Resultados. La incidencia total de casos positivos fue de 41.66% (n=382). La aplicación previa de la vacuna y el presentar contacto con sujetos positivos 14 días antes al diagnóstico arrojó un efecto protector con respecto al virus (OR = 0.60 y 0.50, respectivamente) ($p< 0.05$).

Discusión. Observamos asociación entre fiebre, tos, anosmia y disgeusia con la enfermedad, lo anterior corresponde a lo reportado en la literatura, además un factor protector atribuible a la vacunación como era lo esperado.

Conclusión. La vacuna contra SARS-CoV-2 es eficaz, independientemente del fabricante.

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*Autor para correspondencia:
MsC Rolando Adair Facio-Campos, Universidad Juárez del Estado de Durango. Facultad de Ciencias Químicas. Av. Articulo 123 S/N, Fraccionamiento, Filadelfia, C.P. 35010, Gómez Palacio, Durango, México.
E-mail: rfaciocampos@gmail.com
https://revistabiomedica.mx.

ABSTRACT

Introduction. Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) was responsible for the pandemic Coronavirus

Disease 2019 (COVID-19) declared in March 2020. Worldwide, vaccination against SARS-CoV-2 has been very important.

Objective. To evaluate the frequency of the infection of SARS-CoV-2, symptoms related to the infection and the impact of vaccination.

Materials and Methods. From October 2021 to January 2022 917 subjects were evaluated. SARS-CoV-2 was diagnosed by RT-PCR.

Results. The total incidence of positive cases was 41.66% (n = 382). Previous application of the vaccine and being in contact with positive subjects 14 days prior to diagnosis deliver a protective with regard the virus (OR = 0.60 and 0.50, respectively) ($p < 0.05$).

Discussion. We observed an association between fever, cough, anosmia, and dysgeusia with the infection, which corresponds to what has been reported in the literature, as well as a protective factor attributable to vaccination, as expected. Conclusion. The vaccine against SARS-CoV-2 is effective, regardless of the manufacturer.

INTRODUCTION

The new Acute Respiratory Syndrome CoronaVirus-2 (SARS-CoV-2) was reported in late December 2019 in Wuhan, China. The disease caused by this virus is officially known as COVID-19 (1). By January 2022, more than 4.8 million cases and nearly 300,000 deaths had accumulated in Mexico (2). The symptoms of this disease are fever, fatigue, and a dry cough, which usually appear 2-14 days after exposure to SARS-CoV-2 (3). In other cases, these include symptoms such as pain, nasal congestion, runny nose, sore throat, or diarrhea, as well as loss of taste and smell, and repeated tremors with chills (4, 5). Some persons may be asymptomatic, become infected, but do not develop any symptoms or pain (6). Having a vision of the social and health problems caused by SARS-CoV-2 in Mexico is important in order to guide future decisions, directions, and interventions that mainly impact the population's behavior for preventing this infection and its most serious consequences. The objective of our work was to analyze the frequency of SARS-CoV-2, its symptoms, and the impact of the vaccination against COVID-19 during the period from October 2021 to January 2022, in Durango State, northern Mexico.

MATERIALS AND METHODS

From October 2021 to January 2022, we recruited 1,050 subjects from the Comarca Lagunera (Durango and Coahuila States), of whom 133 stated that they were residents of the state of Coahuila. Only 917 subjects suspected to have COVID-19 were studied, all being residents of the municipalities of Gómez Palacio, Lerdo, Mapimí, Cuencamé, Nazas, and Tlahualilo. Samplings and interviews were carried out in the dependent units of Sanitary Jurisdiction No. 2. We assigned a distribution by age group as follows: group I: <14 years ($n = 74$); group II: 15-19 years ($n = 75$); group III: 20-24 years ($n = 90$); group IV: 25-44 years ($n = 377$); group V: 45-49 years ($n = 85$); group VI: 50-59 years ($n = 129$); group VII: 60-64 years ($n = 39$), and group VIII: >65 years ($n = 48$), according to Mexico Single Information System for Epidemiological Surveillance (7).

Determination of SARS-CoV-2

Samples from nasopharyngeal and oropharyngeal swabs were collected according to the standard protocol. RNA was isolate from clinical samples using the QIAsymphont DSP virus/pathogen Mini Kit (*QIAGEN, Hilde, Germany*). The RT-PCR test was using molecular detection with primer for region of the viral nucleocapsid gene (N2) and also for the *P* gene of RNase through FLU-COVID RT-PCR (*Vitro, master diagnóstica*). The amplification condition was 1 cycle 25°C for 5 minutes, 1 cycle 50°C for 15 minutes, 1 cycle 95°C for 5 minutes, and 45 cycles 95°C and 60°C for 15 and 40 second respective. The test result is deemed to be positive when a rise in the amplification curve is observed by cycle ≤38. The reaction was run in the QIAGEN Model RotorGene™ brand real-time Thermal Cycler. Likewise, positive subjects were monitored by medical personnel (8).

Data analysis

We performed descriptive statistics with the variables of interest. In the bivariate analysis, Chi^2

and odds ratio (OR) were utilized for the variables related to infection (fever, cough, prior application of the vaccine, contact with positive subjects). Logistic regression analysis was also performed within a multivariate model (adjusted for age, sex, location, and occupation) employing STATA SE version 14.0. This project was approved by the Ethics Committee of the Faculty of Chemical Sciences, Gómez Palacio, Durango (UJED) with registration number R-2021-123301538X0201-02. All subjects agree to sign the informed consent and assent form.

RESULTS

The global frequency of positive population was 41.66% (*n* = 382), and the average age of the 917 subjects of both sexes was 36.68 ± 16.30 years, with a range of 0-84 years. Frequency of infection in urban and rural areas was 38.93% and 2.73%, respectively. Frequency of infection by age groups was distributed as follows: group I = 3.49% (*n* = 32); group II = 3.27% (*n* = 30); group III = 3.93% (*n* = 36); group IV = 16.79% (*n* = 154); group V = 4.91% (*n* = 45); group VI = 5.56% (*n* = 51); group VII = 1.85% (*n* = 17), and group VIII = 1.85% (*n* = 17). In the comparison between groups (positive and negative for SARS-CoV-2), it was observed that fever, cough, anosmia, and dysgeusia are significantly associated with the infection ($p < 0.05$) (Table 1). We found that 66.2% (*n* = 607) of the subjects were vaccinated with two doses, 5.34% (*n* = 49) with one dose, and 28.46% (*n* = 261) were not vaccinated against COVID-19.

Table 1. Comparison of the characteristics and symptoms between positive and negative subjects

Variable	COVID-19 Positive		COVID-19 Negative		
	N	%	n	%	*p
Sex					
Men	155	16.90	236	25.74	0.28
Women	227	24.75	299	32.61	
Location					
Urban	357	38.93	495	53.98	0.58
Rural	25	2.73	40	4.36	
Fever					
Yes	118	13.83	113	13.25	<0.05*
No	240	28.14	382	44.78	
Cough					
Yes	252	27.48	263	28.68	<0.05*
No	130	14.18	272	29.66	
Myalgia					
Yes	118	12.87	138	15.05	0.09
No	264	28.79	397	43.29	
Anosmia					
Yes	54	5.89	26	2.84	<0.05*
No	246	26.83	394	42.97	
Unknown	82	8.94	115	12.54	
Dysgeusia					
Yes	51	5.56	25	2.73	<0.05*
No	248	27.04	393	42.86	
Unknown	83	9.05	117	12.76	

Variable	COVID-19 Positive		COVID-19 Negative		
	N	%	n	%	*p
Previous application of the vaccine (At least one dose)					
Yes	**296**	**32.31**	**360**	**39.3**	<0.05*
No	**86**	**9.39**	174	19.0	
Contact with positive subjects (14 days prior to diagnosis)					
Yes	**216**	**28.09**	**362**	**47.07**	<0.05*
No	**103**	**13.39**	**88**	**11.44**	
Type of vaccine applied					
Pfizer-BioNTech	207	69.93	220	61.11	0.15
AstraZeneca	40	13.51	52	14.44	
Sinovac	28	9.46	49	13.61	
Other	21	7.09	39	10.83	

* χ^2 test, p <0.05.

In a logistic regression model (Table 2), it was shown that the presence of fever is associated with the disease (p <0.05) in the non-adjusted model. In contrast, the presence of cough is related to SARS-CoV-2 infection in non-adjusted and adjusted models (p <0.05). On the other hand, administration of the vaccine (regardless of the number of doses) and having been in contact with positive subjects 14 days prior to diagnosis confer a protective effect (p <0.05).

Table 2. Logistic regression for variables associated with SARS-CoV-2

	Crude Odds Ratio	CI - 95%	*p*	Adjusted Odds Ratio	CI – 95%	*p*
Fever	**1.66**	**1.22 - 2.25**	**< 0.05**	1.24	0.86 – 1.79	0.23
Cough	**2.00**	**1.52 - 2.62**	**< 0.05**	**1.99**	**1.43 – 2.77**	**< 0.05**
Prior application of the vaccine	**0.60**	**0.44 - 0.81**	**< 0.05**	**0.58**	**0.40 – 0.85**	**< 0.05**
Contact with positive subjects (14 days prior to diagnosis)	**0.50**	**0.36 - 0.70**	**< 0.05**	**0.58**	**0.38 – 0.81**	**< 0.05**

Model adjusted for each variable presented in the table. In addition, the table was adjusted for age, sex, location, and occupation

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DISCUSSION

The global frequency of positive subjects was 41.66% (*n* = 382), considerably higher than that found by Fernández-Rojas *et al*. (9), in which the authors report 32.8% seropositivity to anti-SARS-CoV-2 antibodies in unvaccinated persons in Mexico during 2020. The highest frequencies in our study were observed in age groups V (45-49 years) and VII (60-64 years), with 52.94% and 43.59%, respectively. These data correspond to the final part of the third wave in our region. A similar study, conducted by Covantes-Rosales *et al*. (10) in Tepic, Nayarit, who reported frequencies of ~22% and ~13% in the age groups of 46-54 years and 55-63 years, respectively, during the period of August-September 2021, with higher frequencies registered in our study corresponding to similar periods and similar age groups. We found a positive association of fever and cough with SARS-CoV-2 infection, similar to that reported by Núñez (11), Anaya-Covarrubias (12), and Fernández-Rojas (9), in which the latter author demonstrates, through hazard ratio (HR) calculation, a significant association of fever and cough with infection (HR = 1.44, 95% CI, 1.24-1.68, and HR = 1.47, 95% CI, 1.27-1.70, respectively) (p <0.0001). Despite the vaccination campaigns carried out in Mexico, in this study, the proportion of subjects not vaccinated against SARS-CoV-2 was 28.3%, coinciding with that reported by Carnalla in 2021 (13), where the acceptability of vaccination in the Mexican population was evaluated, finding that rejection of the vaccine was 28.2%. As expected, in this study, we observed that prior application of the vaccine exhibits a protective effect against infection regardless of the number of doses (OR = 0.58; p <0.05). The results of a multi-state hospital network (14) reveal that receiving two or three doses of a SARS-CoV-2 mRNA vaccine confers 90% protection against infection. Strengthening the immune system through vaccines reduces systemic and thrombotic complications, which lead to severe respiratory symptoms and the possible death of patients (15). SARS-CoV-2 transmission occurs mainly through the air and saliva and is associated with a risk of transmission through contact with infected patients (16, 17). In our work, we show that contact with positive subjects 14 days prior to diagnosis confers a protective effect. However, it was difficult to assess in what disease phase the persons with whom these individuals had contact were in, and whether they were in an infectious stage or not.

CONCLUSION

Taking into account the extensive vaccination campaign carried out in Mexico, unvaccinated persons are susceptible to SARS-CoV-2 infection. The protection provided by having been vaccinated against SARS-CoV-2 is effective, regardless of the vaccine manufacturer involved.

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Conflict of interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

REFERENCES

1. Zhu N, Zhang D, Wang W, Li X, Yang B, Song J, *et al.* A novel coronavirus from patients with pneumonia in China, 2019. N Engl J Med. 2020;382(8):727-33. doi: 10.1056/NEJMoa2001017.
2. Dirección General de Información en Salud. COVID-19, México: Datos epidemiológicos: México: SINAVE 2020; 2022. Available at: https://covid19.sinave.gob.mx/
3. Cui J, Li F, Shi Z-L. Origin and evolution of pathogenic coronaviruses. Nat Rev Microbiol. 2019;17(3):181-92. doi: 10.1038/s41579-018-0118-9.

4. Lechien JR, Chiesa-Estomba CM, De Siati DR, Horoi M, Le Bon SD, Rodríguez A, *et al.* Olfactory and gustatory dysfunctions as a clinical presentation of mild-to-moderate forms of the coronavirus disease (COVID-19): a multicenter European study. Eur Arch Oto-Rhino-L. 2020;277(8):2251-61. doi: 10.1007/s00405-020-05965-1.
5. Saniasiaya J, Islam MA, Abdullah B. Prevalence of olfactory dysfunction in coronavirus disease 2019 (COVID-19): a meta-analysis of 27,492 patients. Laryngoscope. 2021;131(4):865-78. doi: 10.1002/lary.29286.
6. Johansson MA, Quandelacy TM, Kada S, Prasad PV, Steele M, Brooks JT, *et al.* SARS-CoV-2 Transmission from people without COVID-19 symptoms. JAMA Netw Open. 2021;4(1): e2035057-e. doi: 10.1001/jamanetworkopen.2020.35057.
7. Dirección General de Epidemiología. Manual de procedimientos estandarizados para la vigilancia epidemiológica convencional. Secretaría de Salud. México. (2021). Available: https://epidemiologia.salud.gob.mx/gobmx/salud/documentos/manuales/32_ManualSuive.pdf.
8. World Health Organization. Laboratory testing for coronavirus disease (COVID-19) in suspected human cases Interim guidance 19 March 2020. Available: https://wwwwhoint/publications-detail/laboratory-testing-for2019-novel-coronavirus-in-suspected-human-cases-20200117.
9. Fernández-Rojas MA, Luna-Ruiz Esparza MA, Campos-Romero A, Calva-Espinosa DY, Moreno-Camacho JL, Mendlovic F, *et al.* Seroconversion dynamic and SARS-CoV-2 seropositivity in unvaccinated population during the first and second outbreaks in Mexico. Sci Rep. 2022;12(1):5241. doi: 10.1038/s41598-022-09395-3.
10. Covantes-Rosales CE, Barajas-Carrillo VW, Girón-Pérez DA, Toledo-Ibarra GA, Díaz-Reséndiz KJG, Navidad-Murrieta MS, *et al.* Comparative analysis of age, sex, and viral load in outpatients during the four waves of SARS-CoV-2 in a Mexican medium-sized city. Int J Environ Res Public Health. 2022;19(9): 5719. doi: 10.3390/ijerph19095719.
11. Núñez I, Caro-Vega Y, Belaunzarán-Zamudio PF. Diagnostic precision of local and World Health Organization definitions of symptomatic COVID-19 cases: an analysis of Mexico's capital. Public Health. 2022; 205:187-91. doi: 10.1016/j.puhe.2022.02.010.
12. Anaya-Covarrubias JY, Pizuorno A, Mirazo S, Torres-Flores J, Du Pont G, Lamoyi E, *et al.* COVID-19 in Latin America and the Caribbean region: symptoms and morbidities in the epidemiology of infection. COPHAR. 2022; 63:102203. doi: 10.1016/j.coph.2022.102203.
13. Carnalla M, Basto-Abreu A, Stern D, Bautista-Arredondo S, Shamah-Levy T, Alpuche-Aranda CM, *et al.* Acceptance, refusal and hesitancy of Covid-19 vaccination in Mexico: Ensanut 2020 Covid-19. Salud Publ Mex. 2021;63(5):598-606. doi: 10.21149/12696.
14. Monge S, Rojas-Benedicto A, Olmedo C, Martín-Merino E, Mazagatos C, Limia A, *et al.* Effectiveness of a second dose of an mRNA vaccine against SARS-CoV-2 Omicron infection in individuals previously infected by other variants. Clin Infect Dis. 2022; ciac429. doi: 10.1093/cid/ciac429.
15. Cueto-Robledo G, Navarro-Vergara D-I, Roldán-Valadez E, Garía-César M, Graniel-Palafox L-E, Cueto-Romero H-D, *et al.* Pulmonary embolism (PE) prevalence in Mexican-mestizo patients with severe SARS-COV-2 (COVID-19) pneumonia at a tertiary-level hospital: a review. Curr Probl Cardiol. 2022:101208. doi: 10.1016/j.cpcardiol.2022.101208.
16. Chu DK, Akl EA, Duda S, Solo K, Yaacoub S, Schunemann H. Physical sistancing, face masks, and eye protection to prevent person-to-person Transmission of SARS-CoV-2 and COVID-19: a systematic review and meta-analysis. Lancet. 2020; 395(10242), 1973–1987. doi: 10.1016/S0140-6736(20)31142-9.
17. Wiersinga WJ, Rhodes A, Cheng AC, Peacock SJ, Prescott HC. Pathophysiology, transmission, diagnosis, and treatment of Coronavirus Disease 2019 (COVID-19): a review. Jama. 2020;324(8):782-93. doi: 10.1001/jama.2020.12839.