

# CARTAS AL EDITOR

## Superspreading event of Covid-19 in adolescents and vaccination: correspondence

*Dear editor:* We would like to discuss "Superspreading event of Covid-19 in adolescents: is there a difference between the vaccinated and the unvaccinated?"<sup>1</sup> Although Perelman and colleagues observed that vaccinations reduced the chance of spreading the illness, once an adolescent contracted Covid-19, the symptoms were the same for both groups.<sup>1</sup> According to Perelman and colleagues, spreading episodes have increased in frequency as people (vaccinated or unvaccinated) interact with one another during social gatherings with essentially no safety precautions in place.<sup>1</sup>

The effectiveness of the Covid-19 immunization may be significantly influenced by a wide range of factors. There are several dosages and administration methods available. Patients who utilize prescription drugs or have underlying medical issues may be more vulnerable to vaccinations than a typical, healthy vaccine receiver. We can all agree that giving the Covid-19 vaccine is a smart idea. A role for the relatively frequent precursor Covid-19 without symptoms is conceivable.<sup>2</sup> To rule out a previous, asymptomatic Covid-19 infection, testing is typically forgone. An indi-

vidual's underlying immunological problems may be better understood by routine blood tests. By routinely monitoring people's underlying immunological diseases, it is feasible to more accurately predict how the Covid-19 immunization will perform. When assessing the effectiveness or safety of a vaccination, this is a crucial factor to take into account. Numerous studies have shown the efficacy, safety, or clinical significance of the Covid-19 vaccine, despite the fact that there is frequently little information available regarding pre-vaccination immunological or health status and the possibility of confounding with non-symptomatic SARS-CoV-2 infection cannot be effectively ruled out.

Last but not least, a recent study discovered a connection between vaccine recipients' genetic variance at birth and their immune response to immunization.<sup>3</sup> The ramifications of the genetic polymorphism should be assessed if more study is anticipated.

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## Acute abdomen in MIS-C. Case series from a pediatric center in Mexico

*Dear editor:* Multisystem Inflammatory Syndrome in children (MIS-C) is a hyperinflammatory disorder characterized by fever and multi-organ affection. Gastrointestinal involvement has been observed in 80 to 90% of the reported series; severe MIS-C present with abdominal symptoms, elevated inflammatory

markers, and often require admission to the intensive care unit (ICU) for cardiovascular shock.<sup>1</sup>

We describe seven patients with acute abdomen (AA) and acute appendicitis who underwent surgery, two of which showed histopathological findings of appendicitis, while the other five reported vascular congestion and appendicular lymphoid hyperplasia, with a final diagnosis of MIS-C (table 1).

A total of 31 cases have been registered in our center. Gastrointestinal manifestations represent 77%, abdominal pain 58%, vomiting 61%, and diarrhea 40%. Seven cases underwent surgery for AA (22.5%) of which 100% had abdominal pain (McBurney, psoas and rebound sign positives). Ultrasound was consistent with appendicitis in three of five, and CT in two of seven patients. All patients were older than five years of age, and require admission ICU. One patient died 36 hours after admission, complicated by macrophage activation syndrome. The diagnosis of MIS-C was made after the sixth day from the onset of the first symptom.

Laboratory tests showed lymphopenia, CRP > 10 mg/dL, procalcitonin > 10 ng/mL, hypoalbuminemia (albumin 2.4 g/dL), D dimer > 500 mg/mL and elevated NT-proBNP. All patients showed positive IgG antibodies and family contact with Covid-19 at least four weeks prior.

In MIS-C, the viremia and high expression of the ACE2, predominantly in the terminal ileum enterocytes, plays a relevant role in the passage of SARS-CoV-2 through the intestinal mucosa causing lymphoid follicular hyperplasia, which favors obstruction of the colonic-appendicular lumen, inflammation and ischemia with or without data of appendicular artery vasculitis.<sup>2</sup>

To our knowledge, there is a single Latin-American study by Yock-Corrales and colleagues of a total of 1 010 children, reported 6.8%

of MIS-C, of which 8.7% had an AA (2.9% underwent surgery).<sup>3</sup> In a systematic review that included 385 patients with MIS-C, gastrointestinal manifestations have been reported in 60.5%, AA was observed in 18.7% and laparotomy was performed in 9%, being unnecessary in 51.4% of cases.<sup>4</sup>

Severe MIS-C with acute abdomen are presumably due to the reluctance to go to the hospital for care, conditioned by the risk of acquiring Covid-19 (one of the cases we reported and had a fatal outcome). A diagnostic algorithm should be established for the pediatric patient with an AA upon arrival at the emergency department with fever persistent, mucocutaneous symptoms, complemented by increased inflammation and cardiovascular markers may indicate MIS-C, and implement timely treatment and avoid fatal outcomes.

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## Nutrition education reduces sleep disorders through eating quality

*Dear editor:* An article published in this journal analyzed relationships between disordered eating behaviors (DEB) and depression symptoms. The authors concluded that “public policies should include DEB prevention from a socioecological perspective encompassing individual, relational, community, and social aspects”.<sup>1</sup> Nutritional education was not remarked. Yet, the value of nutrition education to good sleep has been emphasized and this is relevant to depression considering the role of insomnia in the symptomatology. Here we present evidence that nutrition education improves nutrition practices and, through it, enhances good sleep.

Two-hundred and twenty female students of nutrition and related careers of three private universities in Lima, Peru, participated in a wider study designed as a doctoral dissertation by the first author of this letter (from November 2020 to April 2021). They were aged  $19.9 \pm 3.2$  and provided written informed consent. The research protocol was approved by the institutional review board of *Universidad Peruana Cayetano Heredia* (IRB No. 6060-01-20).<sup>2</sup> Data collection took place at class hours in virtual face-to-face encounters of the first author with the students during the first wave of the Covid-19 pandemic.

A pre-2015 version of the Health Eating Index was utilized; the criteria of score assignment considered the need for (a) daily eating of cereals; milk or its products; greens or

**Table I**  
**CLINICAL AND LABORATORY FEATURES OF MIS-C WITH ACUTE ABDOMEN AND APPENDICITIS.**  
**PEDIATRIC HOSPITAL OF SINALOA DR. RIBOGERTO AGUILAR PICO.**  
**CULIACÁN, SINALOA, MÉXICO, MAY 2022**

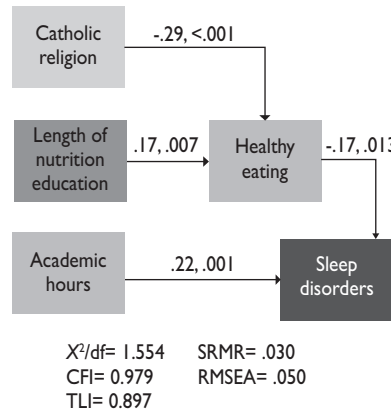
Cases	Age (m)	Sex	Fever days	Clinical features	Laboratory tests	Treatment	Echocardiogram findings	SARS-CoV-2	Histopathology
1	60	F	5	Fever, abdominal pain, hyporexia, vomiting, diarrhea and she had emergency operation for suspected appendicitis	Hemoglobin 8.1g/L, CRP 8.3 mg/dL, fibrinogen 446 mg/dL, procalcitonin 1.88ng/mL, DD 3 836 ng/mL, NT-proBNP 1 634 pg/mL	IVIG 2g/kg, methylprednisolone pulse 30mg/kg, Ceftriaxone, amikacin, metronidazole	LEVF 53%	Close contact with suspected case	Vascular congestion of the cecal appendix with sinus mesenteric hyperplasia
2	71	M	6	Malaise general, asthenia, adynamic, headache, pain abdominal and vomiting, he had emergency operation for suspected appendicitis	Hemoglobin 8g/L, lymphocytes 1.46 x 103/mcL, CRP 30.5 mg/dL, ESR: 65 mm/h, procalcitonin 10.3 ng/mL, fibrinogen 324 mg/dL, NT-proBNP 6,860pg/mL and serum albumin 2.3 g/dL	IVIG 2g/kg, methylprednisolone pulse 30mg/kg, Enoxaparin, vancomycin, azithromycin, cefotaxime	LEVF 65%	RT-PCR (+)	Acute necrotic-hemorrhagic appendicitis
3	72	F	6	Odynophagia, fever, hyporexia, vomiting, diarrhea, generalized abdominal pain. She had emergency operation for suspected appendicitis	Hemoglobin 10.7g/L, WCB 16.34 x 109/L, PMN 92%, lymphocytes 0.520 x 109/L, procalcitonin 12.5 ng/mL, CRP 31.3 mg/dL, ESR: 55 mm/h, fibrinogen 488 mg/dL, NT-proBNP 6180 pg/mL, albumin serum 2.4g/dL and pyuria	IVIG 2g/kg, methylprednisolone pulses (30 mg/kg), ceftriaxone, metronidazole, vancomycin	LEVF 67%	RT-PCR (-) Antigen test (+)	Vascular congestion of the cecal appendix
4	80	F	4	Abdominal pain, hyporexia, nausea and she had emergency operation for suspected appendicitis that was ultimately diagnosed as mesenteric lymphadenitis  On the 3th day, Hypotension, delayed capillary refill, annular erythema, conjunctival injection, strawberry tongue and lip peeling, Pleural effusions bilateral ascites	Lymphocytes 1.39 x 103/mcL, CRP 14.4 mg/dL, ESR 34 mm/h, procalcitonin 6.34 ng/mL, DD 1.47 ng/mL, fibrinogen 476.5 mg/dL, ferritin 581 ng/mL, serum albumin 2.1 g/dL and pyuria	IVIG 2g/kg, methylprednisolone pulse 30mg/kg, aspirin, adrenaline, azithromycin, cefepime and vancomycin. Second dose IVIG (2g/kg) and methylprednisolone (30mg/kg) bolus. Enoxaparin	Mild bilateral pericardial effusion, severe tricuspid regurgitation, LVEF 60%	Antibody test IgG (+) / IgM (-)	Vascular congestion and lymphoid follicular hyperplasia
5	108	F	7	Abdominal pain and vomiting, he had emergency operation for suspected appendicitis	WCB 23.72 x 103/uL, lymphocyte 1.15 103/uL, PMN 20.46 x 103/uL, procalcitonin 35.17 ng/dL, CRP 19.4 mg/dL, ESR 48 mm/hr, fibrinogen 362 mg/dL, ferritin 3307 ng/dL, DD 3563.7 ng/dL, albumin serum 2.2 g/dL, AST 371.8 U/L, ALT 138.3 U/L, total bilirubin 1.57 mg/dl, bilirubin direct 1.04 mg/dl, bilirubin indirect 0.53 mg/dL	IVIG 2g/kg, Methylprednisolone bolus (30mg/kg), Enoxaparin, adrenalin and milrinone	Mild pericardial effusion left coronary dilatation, LVEF 64%	Antibody test IgG (+), IgM (-), RT-PCR (+)	Vascular congestion of the cecal appendix with lymphoid hyperplasia

6	118	M	5	Headache, malaise general, abdominal pain, hyporexia, nausea and he had emergency operation for suspected appendicitis  On the 2nd day. Hypotension delayed capillary refill, rash, conjunctival injection, strawberry tongue and palm and soles edema – erythema	Lymphocytes 1.46 x 10 <sup>3</sup> /mL CRP 30.5 mg/dL, ESR 65 mm/hr, procalcitonin 2.4 ng/mL, fibrinogen 544 mg/dL, DD 3.05 ng/mL, NT-proBNP 2,174 pg/mL, serum albumin 2.85g/dL and LDH 728 U/L	IVIG 2g/kg, methylprednisolone pulse 30mg/kg, Ceftriaxone, metronidazole, azithromycin, adrenalin, enoxaparin, aspirin	LEVF 76%	RT-PCR (-) Antigen test (+)	Acute appendicitis and Enterobius vermicularis cysts
7	132	F	6	Fever, abdominal pain, hyporexia, altered mental status and she had emergency operation for suspected appendicitis Bone marrow aspirate: Hemophagocytic cell	Platelets 12 x 10 <sup>3</sup> /mL neutrophils 16.56 x 10 <sup>3</sup> /mL CRP 18 mg/dL, procalcitonin 32.7 ng/mL, ferritin 7540 ng/mL, DD > 10000 ng/mL, troponin I 402 ng/mL, NT-proBNP 69 530 pg/mL, serum albumin 2.8 g/dL and pyuria	IVIG 2g/kg, methylprednisolone pulse, adrenaline, norepinephrine, levosimendan, milrinone, Vancomycin, meropenem, metronidazole and enopararin	LEVF 30%, mild pericardial effusion	Close contact with suspected case	Mesenteric adenitis Enterobius ssp

RT-PCR: Real time polymerase chain reaction; IVIG: Intravenous immunoglobulin; ERS: Erythrocyte rate sedimentation; CRP: C-reactive protein; LDH: Lactate dehydrogenase; LVEF: Left ventricular ejection fraction; DD: D-dimer; NT-proBNP: N-terminal pro-Brain natriuretic peptide.

vegetables; and fruits; (b) weekly eating of legumes; meats; and (c) occasional eating of sausages or cold cuts; sweets; and sugary drinks. The Pittsburgh Sleep Quality Index was utilized in the measurement of subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medications, and daytime dysfunction. Both measures showed satisfactory internal-consistency reliability.

Figure 1 depicts results of mediation analysis which show direct and indirect effects of several ecological variables on the extent of sleep disorders. The number of hours of study were directly related to the presence of sleep disorders. The other exogenous variables affected sleep through eating quality. Being Catholic increased the probability of unhealthy eating compared to being Adventist; the Adventist minority of Peru places a strong value on healthy eating as a divine mandate. Most importantly, being in a more advanced cycle, from year 1 to year



CFI: comparative fit index.  
 TLI: Tucker Lewis Index.  
 SRMR: standardized root mean square residual.  
 RMSEA: root mean square error of approximation.

**FIGURE 1. PATH COEFFICIENTS, THEIR PROBABILITIES, AND INDICATORS OF FIT TO THE DATA FOR MODEL THAT RELATES NUTRITION EDUCATION TO SLEEP DISORDERS. LIMA, PERU, 2020-2021**

5 of the career, was associated with a reduction of sleep disorders.

These results strongly suggest that sleep quality improves as the stu-

dent acquires information on healthy eating throughout his 5-year career at the university regardless of the level of stress imposed by demanding study hours. Policy makers should be aware of the difficulties posited by translation of the findings to practical applications to adolescents. Since nutrition education cannot be equally intensive at high school, the improvement of sleep quality in this population may require recurrence to emotional factors in addition to cognitive interventions.

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## Should we administer postexposure rabies prophylaxis to a rabid human?

*Dear editor:* In the interesting article recently published in *Salud Pública de México*,<sup>1</sup> the authors described a fatal rabies encephalitis case who suffered from bat bite three months prior to his presentation. However, I want to contribute an important point about this case.

The incubation period of rabies is approximately one to three months. Rabies is almost always fatal when the virus reaches the central nervous system (CNS). Postexposure prophylaxis should be administered as soon as possible after the exposure. It is of no benefit when the CNS symptoms appear which is indicative of the virus arriving the CNS.<sup>2,3</sup> Their patient showed CNS symptoms and signs suggestive of clinical rabies, then he was administered rabies immunoglobulin and a Vero-cell rabies vaccine. He died despite medical support and postmortem rabies diagnosis was made. It should be clarified whether postexposure rabies prophylaxis was indeed necessary in this patient, because he was already rabid at that moment.

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## Fiebre de las montañas rocosas con linfocitosis hemofagocítica en paciente de terapia intensiva pediátrica: reporte de caso

*Señor editor:* En México existe un aumento de incidencia de Rickettsiosis.<sup>1</sup> Monterrey, Nuevo León, es una zona endémica y puede cursar con una letalidad alta si esta enfermedad no se diagnostica ni recibe manejo antibiótico dentro de los primeros cinco días de evolución.<sup>2-4</sup> Existen pocos reportes a nivel mundial (ninguno a nivel nacional) del manejo de Rickettsiosis en pacientes críticos pediátricos asociado con linfocitosis hemofagocítica.

El caso es un masculino de cinco años que ingresa en noviembre de 2022 a unidad de cuidados intensivos pediátricos en el Hospital Universitario José Eleuterio González con antecedente de habitar en zona endémica de Rickettsiosis y convivir con perros no desparasitados.

El menor llega con fiebre de seis días de evolución y cuatro días de erupción maculopapular generalizada (figura 1); a su ingreso integra choque séptico, acidosis metabólica e hiperlactatemia, hepatomegalia, hipoalbuminemia, transaminacemia, trombocitopenia, bandemia, hiperferritinemia, hipertrigliceridemia e hiponatremia. Por todo lo anterior, el infante inicia tratamiento con doxiciclina (considerado el tratamiento de elección)<sup>5</sup> y soporte hemodinámico con amins vasoactivas e inotrópicas. Al octavo día de inicio de cuadro clínico el menor presenta deterioro neurológico, por lo que es intubado como medida de protección de vía aérea. Al noveno día presenta deterioro hemodinámico con choque refractario a amins. Se agrega antibiótico levofloxacino y cloranfenicol.

Persiste con fiebre, esplenomegalia, hepatomegalia, hipertrigliceridemia (422 mg/dL), hiperferritinemia (1250 ng/ml), hipofibrinoginemia (89 mg), anemia (5.9 gr/dL), trombocitopenia (22000 k/uL) e integra síndrome hemofagocítico. Le realizamos aspirado de médula ósea, procedimiento en el que se encuentran datos de linfocitosis hemofagocítica, por lo que iniciamos metiprednisona, ya que en casos graves el manejo referido es con antibiótico en combinación con inmunoglobulina o esteroide sistémico.<sup>5</sup>

24 horas después se presenta mejoría clínica. Posteriormente se retira apoyo hemodinámico y ventilatorio, suspendemos antibioticoterapia al cumplir 10 días y el paciente egresa. Resultado confirmatorio: PCR Rickettsiosis.

La presentación del caso resalta la importancia de sospechar esta complicación para realizar un tratamiento dirigido y oportuno.

*Declaración de conflicto de intereses.* Los autores declararon no tener conflicto de intereses.

Arturo Gerardo Garza-Alatorre, *Ped Intens*,<sup>(1)</sup>  
Verónica Rodríguez Martínez, *Ped Intens*,<sup>(1)</sup>



Fuente: Datos obtenidos por la pediatra Gloria Estéfany Esquivel Elías en el Hospital Universitario Dr. José Eleuterio González. Monterrey, Nuevo León, México, 1 de noviembre de 2022.

**FIGURA 1. IMAGEN DE CARACTERÍSTICAS CLÍNICAS DE FIEBRE DE LAS MONTAÑAS ROCOSAS SEVERA, EN PACIENTE EN TERAPIA INTENSIVA PEDIÁTRICA EN EL HOSPITAL UNIVERSITARIO DR. JOSÉ ELEUTERIO GONZÁLEZ, MONTERREY, NUEVO LEÓN, MÉXICO, 1 DE NOVIEMBRE DE 2022. SE OBSERVAN PETEQUIAS EN PALMAS Y PLANTAS, ASÍ COMO EN TÓRAX Y EXTREMIDADES SUPERIORES E INFERIORES**

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## HELLP syndrome predictors in two hospitals in Honduras, January 2020-December 2021

Dear Editor: HELLP syndrome (characterized by hemolysis, elevated liver enzymes, and a low platelet count) is a pathological condition that is categorized within the hypertensive disorders of pregnancy and can be present early or late during pregnancy or in the postpartum period.<sup>1</sup> Although its pathophysiology is not fully understood and it is relatively rare, HELLP syndrome is one of the most serious hypertensive disorders of pregnancy. It appears in 5-9 out of every 1 000 pregnancies and in 10 to 20% of cases with severe preeclampsia.<sup>2</sup> In 70% of cases it occurs before delivery, 80% developing before the 37th week of gestation and 10% before the 27th week of gestation.<sup>3</sup>

Given the need for an early diagnosis, this study was carried out on the identification of predictive factors for HELLP syndrome in patients with preeclampsia treated in labor and delivery rooms of two hospitals in Honduras through a retrospective study with a stratified probabilistic sampling of cases (95% confidence interval and 5% margin of error). For the *Hospital Materno Infantil* (HMI), which had a population of 279 cases, the sample was 163 + 16 (10% due to possible losses) with a total of 179 cases, and for the *Instituto Hondureño de Seguridad Social* (IHSS) a population of 243 and a sample of 150 + 10 (10% for possible losses) that represented 160 cases. The exclusion criteria were: 1) gestational age less than 22 weeks; 2) suspected congenital malformations; and 3) incomplete records. The research protocol was evaluated by the IHSS ethics committee registered under code No.023-GNDI-HE/IHSS-2022.

Among the results, the study patients had a mean age of 27 years in the HMI and 30 years in the IHSS (p 0.073). Table I details the vital signs and sociodemographic factors that were found to be associated with the Hellp syndrome as potential predictors.

Although sociodemographic factors did not influence the development and presentation of the pathology (such as age, origin and schooling), it was possible to observe various clinical signs that occurred quite frequently: edema 202 (59.6%),

epigastric pain 158 (46.6%), headache 142 (41.9%), blurred vision 90 (26.6%) and nausea 40 (11.8%). In addition, laboratory markers such as platelets, creatinine, TGO (AST), ALT (TGP), LDH, and qualitative proteinuria were found altered and associated in the patients who developed Hellp syndrome in this study, so they can give a pattern of the onset or the course that the disease will take (for its early identification).

*Declaration of conflict of interests.* The authors declare that they have no conflict of interests.

**Table I**  
**ASSOCIATED SIGNS AND BIOMARKERS ACCORDING TO THE HOSPITAL CENTER IN PREDICTORS OF HELLP SYNDROME IN TWO HOSPITALS IN HONDURAS. JANUARY 2020-DECEMBER 2021 (HMI N = 179, IHSS N = 160)**

	HMI			IHSS			p value
	Mean	DE	n	Mean	DE	n	
<b>Vital signs</b>							
Systolic blood pressure	156	17	179	151	16	160	0.003*
Diastolic blood pressure	103	12	179	97	13	160	<0.001‡
<b>Biomarkers</b>							
Platelets	177.65	91.67	179	226.16	74.69	160	<0.001‡
Glycemia	86.68	23.37	165	89.7	20.86	159	0.002*
BUN	9.71	9.37	156	9.97	10.16	154	0.03*
Creatinine	0.8	0.61	178	1.06	5.17	160	<0.001‡
AST	129.95	199.2	178	39.46	75.07	160	<0.001‡
ALT	123.48	193.33	178	30.44	45.07	160	<0.001‡
LDH	511.8	557.25	178	309.83	198.55	139	<0.001‡
Uric acid	6.53	1.72	90	5.86	1.67	156	<0.001‡
Total bilirubin	2.26	3.11	14	0.37	0.34	34	<0.001‡
<b>Qualitative proteinuria</b>							
	HMI		IHSS		p value		
	n	%	n	%			
Negative	7	3.91	33	20.63			
Trace	16	8.94	15	9.38			
+	17	9.5	39	24.4			
++	84	46.93	35	21.88	<0.001‡		
+++	54	30.17	38	23.75			
++++	1	0.56	0	0			
Total	179	100	160	100			

HMI: Hospital Materno Infantil, IHSS: Instituto Hondureño de Seguridad Social, BUN: blood urea nitrogen, AST: aspartate aminotransferase, ALT: alanine transaminase, LDH: lactate dehydrogenase.

Association of variables with Hellp Syndrome classification using Kruskal-Wallis was made for all the variables in this chart, except for platelets, where Student's T was used. \* P value <0.05; ‡ P value <0.001.

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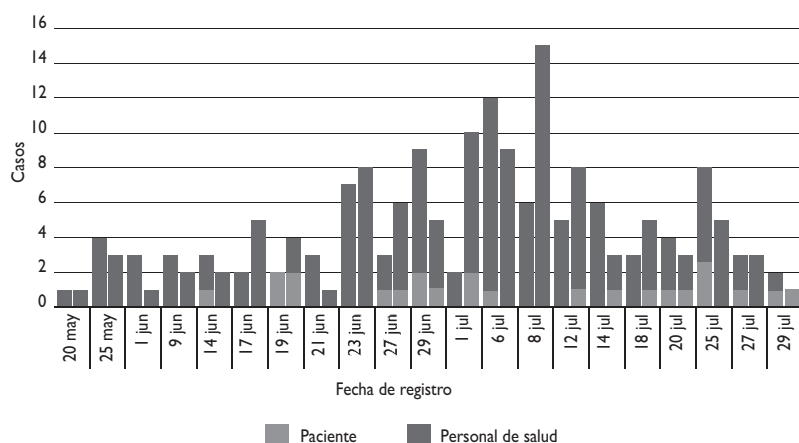
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## Estudio de brote de Covid-19 en un instituto nacional de tercer nivel de México en 2022

Señor editor. De acuerdo con la Organización Mundial de la Salud (OMS), las infecciones asociadas con la atención de la salud tienen una prevalencia de entre 5.7 y 19.1% a nivel mundial, lo que genera un incremento en la morbilidad, mortalidad, estancia hospitalaria y costo de atención.<sup>1</sup>

Durante el mes de junio de 2022 se reportó un incremento de casos de Covid-19 en pacientes y personal de salud de un instituto de tercer nivel de México. El objetivo es describir este brote y establecer recomendaciones para prevención futura.

Del 15 de mayo al 30 de julio de 2022 se detectaron 191 casos de Covid-19 (24 pacientes hospitalizados y 167 trabajadores de salud) (figura 1). En los pacientes, la mediana de



Fuente: Elaboración propia con información de las bases de datos de pacientes y personal de salud del Instituto Nacional de Ciencias Médicas y Nutrición Salvador Zubirán y registros del Sistema de Vigilancia Epidemiológica de Enfermedades Respiratorias.

**FIGURA 1. CURVA EPIDÉMICA GENERAL DE CASOS DE COVID-19 EN EL INSTITUTO NACIONAL DE CIENCIAS MÉDICAS Y NUTRICIÓN SALVADOR ZUBIRÁN. MÉXICO, 15 DE MAYO AL 31 DE JULIO DE 2022**

edad fue de 54.5 años; la mediana de estancia hospitalaria previa a la prueba positiva fue de 17 días y 100% tuvo esquema completo de vacunación. La especialidad en la que se detectó la mayor cantidad de casos fue en oncología (n=8). En el personal de salud, la mayoría de los casos se detectó en el servicio de urgencias, principalmente en el sexo femenino y en el grupo de 20 a 29 años. La mayor cantidad de casos, en cuanto al personal de salud, ocurrió en personal de enfermería (n=80), residentes (n=36), afanadores (n=20) y camilleros (n=13).

Todos los casos fueron leves y las comorbilidades más frecuentes fueron obesidad (n=33), hipertensión (n=27) y diabetes mellitus (n=13). Del personal de salud, 153 casos tenían el esquema de vacunación completo, incluyendo dosis de refuerzo, seis tenían esquema incompleto y ocho no estaban vacunados. La vacunación del personal fue mayormente con vacuna de ARN mensajero (BNT162b2).

Este brote ocurrió durante la segunda ola por la variante ómicron, lo que coincide con una disminución en

el apego de las medidas de precaución para la transmisión por virus respiratorios y demuestra la capacidad del SARS-CoV-2 para afectar a personal de salud previamente inmunizado, así como a pacientes hospitalizados. Si bien no se puede comprobar que la transmisión ocurrió de personal de salud a pacientes, los datos sí indican fuertemente que los pacientes fueron infectados dentro del hospital.

El anuncio reciente del fin de la emergencia sanitaria por parte de la OMS<sup>2</sup> no es equivalente al relajamiento de las medidas preventivas en las áreas de atención clínica. Este reporte sirve para recordar que el SARS-CoV-2 puede evadir el sistema inmune y causar enfermedad clínica, con el potencial de agravar el estado de salud de los pacientes más susceptibles. Por ende, deben mantenerse buenos sistemas de vigilancia y prevención de infecciones dentro de los hospitales que incluyan a todo el personal de salud que tiene contacto con los pacientes.

*Declaración de conflicto de intereses.* Los autores declararon no tener conflicto de intereses.

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## Seroprevalencia a SARS-CoV-2 en trabajadores de los sectores esencial (comercio) y no esencial (educativo) durante 2021 en México

*Señor editor:* En 2021 el Instituto Mexicano del Seguro Social (IMSS) realizó encuestas de seroprevalencia a SARS-CoV-2 en dos organizaciones: una *esencial* del sector comercio (A) y otra *no esencial* del educativo (B). El levantamiento se realizó en ciclos semanales independientes mediante muestreo por conveniencia. En A, ubicada en la Zona Metropolitana del Valle de México y el Área Metropolitana de Guadalajara, se reclutaron n=626 y n=702 empleados durante los ciclos C1 (semana epidemiológica SE-



22) y C2 (SE-42). En B, con sedes en Chiapas, se reclutaron n=652 (SE-33) y n=495 (SE-46) trabajadores. En ambas se midieron anticuerpos contra la Covid-19 mediante inmunoensayos de micropartículas quimioluminiscentes. En A se estudió la prevalencia de anticuerpos anti-nucleocápside (N) y antiespícula (S); en B, sólo antiespícula. El historial de vacunación fue autorreportado y complementado buscando en *MiVacuna* la Clave Única de Registro Poblacional. El estudio fue aprobado por el Comité de Ética de Investigación en Salud del IMSS (registro R-2020-785-065).

El cuadro I reporta la prevalencia de anticuerpos por organización, fecha y tipo de vacuna. Entre los vacunados, la prevalencia de anticuerpos fue alta con 64-68% en mayo (A), 76-77% en agosto (B), 98-100% en octubre (A) y 100% en noviembre (B). La proporción de vacunados en agosto-noviembre es superior a la nacional: 73.8%.<sup>1</sup> En B todos tuvieron mínimo una dosis de vacuna (excepto 7 en agosto). En A, 35% en mayo y 87% en octubre tuvieron mínimo una dosis. La presencia de anti-S sin anti-N entre los no vacunados (21-24%) sugiere que algunos vacunados no reportaron vacuna ni fueron hallados en *MiVacuna*.

Las vacunas más comunes fueron aquellas sin virus de SARS-CoV-2: 89% de los vacunados en A en C1 y 92% en C2 (96 y 97% en B, respectivamente). Como estas vacunas no inducen anti-N,<sup>2,3</sup> se deduce que 39% de los participantes de A tuvieron Covid-19 antes de mayo 2021 y 65% antes de octubre (sobrepasando la media nacional de 57.9%).<sup>1</sup>

En conclusión, los datos muestran consistencia entre presencia de anticuerpos y estrategia de vacunación. Los trabajadores de B (educativo) tuvieron anticuerpos antes de su retorno presencial en 2022; los de A (comercio), al ser esenciales, jamás interrumpieron actividades y permanecieron en riesgo. Esto subraya

la necesidad de considerar a los trabajadores esenciales en las estrategias de vacunación y ante la aparición de brotes pandémicos.

Declaración de conflicto de intereses. Los autores declararon no tener conflicto de intereses.

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**Cuadro I**  
**SEROPREVALENCIA (POR TIPO DE ANTICUERPO) A SARS-CoV-2 EN TRABAJADORES DE LOS SECTORES ESENCIAL (COMERCIO) Y NO ESENCIAL (EDUCATIVO) DURANTE 2021 EN MÉXICO**

Tipo de anticuerpo	Vacunados con al menos una dosis de virus SARS-CoV-2 atenuado o inactivo*		Vacunados exclusivamente con vacunas que no contienen el virus de SARS-CoV-2‡		No vacunados	
	N	%	N	%	N	%
Sector comercio (A)						
Total	22	100	195 <sup>§</sup>	100	409 <sup>#</sup>	100
Mayo 2021						
Anti-S	14	64	131	68	226	56
Anti-N <sup>&amp;</sup>	6	27	76	39	144	35
Ninguno	8	36	62	32	177	44
Octubre 2021						
Total	47	100	561	100	94	100
Anti-S	47	100	552	98	84	89
Anti-N	47	100	364	65	61	65
Ninguno	0	0	9	2	10	11
Sector educativo (B)						
Agosto 2021						
Total	21	100	604 <sup>¶</sup>	100	7	100
Anti-S	16	76	464	77	4	57
Ninguno	5	24	140	23	3	43
Noviembre 2021						
Total	11	100	479 <sup>¶</sup>	100	0	100
Anti-S	11	100	476	100	0	No aplica
Ninguno	0	0	3	0	0	No aplica

\*Vacunas de virus SARS-CoV-2 atenuadas o inactivas en la muestra: Sinovac. Generan anti-S y anti-N por lo que no puede inferirse infección previa.

‡Vacunas que no contienen virus de SARS-CoV-2 en la muestra: Cansino, Sputnik V, Pfizer, Astra Zeneca, Moderna. Dichas vacunas generan anti-S pero no anti-N por lo que puede inferirse que los individuos con anti-N presentaron infección previa.

§ De las 195, hubo dos personas para quienes no se reportan resultados de anti-S.

# De las 409 hubo tres personas para quienes no se reportan resultados de anti-S y dos personas con anticuerpos anti-N pero sin anticuerpos anti-S.

& En general todos los individuos que tuvieron anti-N tuvieron anti-S excepto por dos individuos no vacunados en mayo que teniendo anti-N no presentaron anticuerpos anti-S.

¶ Hubo 20 (agosto) y cinco (noviembre) personas vacunadas con vacunas que no contienen virus de SARS-CoV-2 para quienes no se reportó el resultado de la prueba de anticuerpos.

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## Unexpected high prevalence of hepatitis C virus infection in couples of liver transplant patients

*Dear editor:* Prevalence of chronic infection with hepatitis C virus (HCV) in general population ranging from 0.5 to 6.5% affecting around 71 million people worldwide.<sup>1,2</sup> The main objective of our work was to determine the prevalence of HCV infection in couples of patients who underwent orthotopic liver transplantation (OHT) for liver cirrhosis secondary to HCV. We performed a cross-sectional and descriptive study with 50 participants >18 years old, couples of patients who attended the liver transplant outpatient clinic of the *Instituto Nacional de Ciencias Médicas y Nutrición Salvador Zubirán* (INCMNSZ) in the period from 2000 to 2019 and agree to participate by informed consent. The study was approved by the research committee and the research ethics committee of the center. All participants underwent a qualitative rapid test for HCV in capillary blood (Advanced Quality Rapid Anti HCV, InTec Products, INC). If the rapid test was positive, we performed confirmation using polymerase chain reaction (Abbott Real Time HCV test kit, Abbott Molecular) and genotype determination before initiation of HCV treatment. Median age of participants was 57 years (RIQ: 49-64 years), with an equitable distribution between men (50%) and women (50%). We found that 6% (3/50) of the couples were positive for HCV, regarding

the determination of the genotype all corresponded to the genotype of the OHT patient. Two couples (66.66%) had genotype 1a and one (33.33%) had genotype 1b. To date, Mexico does not have, according to our knowledge, prevalence studies in sexual partners, or the systematic evaluation of these within eradication programs.<sup>3</sup> In conclusion, the prevalence of HCV infection in couples of patients transplanted for HCV is higher than that reported in the general population in México around 0.4%.<sup>4,5</sup> This could force us to carry out screening tests in couples of transplanted and non-transplanted patients for HCV.

## Acknowledgments

To AbbVie for sponsoring the rapid tests for this study.

*Declaration of conflict of interests.* PhD García-Juárez has received continuing medical education scholarships from Abbvie and Gilead. The rest of the authors declare that they have no conflicts of interest.

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## Isolation and characterization of nontuberculous mycobacteria in drinking water of Monterrey, Mexico

*Dear editor:* Nontuberculous mycobacteria (NTM) infections have been associated with different medical and esthetical procedures such as mesotherapy, abdominoplasty, breast augmentation, facial or gluteal fat grafting, liposuction, and filler injections. *Mycobacterium abscessus*, *M. fortuitum*, and *M. chelonae* are the most frequently responsible microorganisms.<sup>1</sup> It is widely acknowledged that environmental exposure, particularly to water, is the primary cause of most nontuberculous mycobacterial infections in humans.<sup>2</sup> Therefore, we decided to isolate and characterize species of NTM present in the drinking water system in the city of Monterrey, Mexico, and the Metropolitan Area.

A total of 95 samples were analyzed from 10 different municipalities in Monterrey and the Metropolitan Area. NTM were isolated in 8/95 cultures, equivalent to 7.6%. We present both, PRA-RFLP and MALDI-TOF species identification (table I). These findings demonstrate the presence of

NTM species potentially pathogenic for humans in the drinking water system, particularly *Mycobacterium fortuitum*, and *Mycobacterium abscessus*.

The drinking water distribution system in Monterrey, Mexico, is supplied by surface and complex sources that consist of the El Cuchillo, La Boca, Cerro Prieto, and La Estanzuela dams; the water is extracted and pumped to multiple treatment plants, from where it is sent to two transfer rings that cross the entire city and its Metropolitan Area, and then through various pumping stations until it reaches users. Six distinct species of NTM were isolated from the drinking water system. Our results showed a relatively low isolation rate of NTM (7.6%) compared to other studies where the isolation of these species was higher; such as Bahía Blanca, Argentina (51.6%), and Mexico City (16%).<sup>3,4</sup>

Water, despite being a vital resource, can be a potential source of atypical mycobacteria infections.

To our knowledge, this is the first investigation that demonstrates the isolation and identification of NTM species in the drinking water distribution system in Nuevo León, Mexico. Additional research is required to enable further sampling of diverse water sources in the state.

*Declaration of conflict of interests.* The authors declare that they have no conflict of interests.

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**Table I**  
**NTM SPECIES ISOLATED BY MUNICIPALITY IN MONTERREY AND THE METROPOLITAN AREA. DERMATOLOGY DEPARTMENT, HOSPITAL UNIVERSITARIO DR. JOSÉ ELEUTERIO GONZÁLEZ. MEXICO, SEPTEMBER 2022**

Municipality	Number of isolated species	PRA-RFLP	MALDI-TOF
General Escobedo	2	NTM1: <i>M. chelonae</i> subespecie abscessus	NTM1R: <i>M. iranicum</i>
		NTM2: <i>M. chelonae</i> subespecie bollesi	NTM2R: <i>M. abscessus</i>
Guadalupe	1	NTM3: no isolated by this method.	NTM3R: <i>M. canariensis</i>
San Nicolás de los Garza	1	NTM4: <i>M. fortuitum</i>	NTM4R: <i>M. fortuitum</i>
San Pedro Garza García	2	NTM6: <i>M. vaccae</i>	NTM6R: <i>M. porcinum</i>
		NTM7: <i>M. triviale</i>	NTM7R: <i>M. iranicum</i>
		NTM8: <i>M. vaccae</i>	NTM8R: <i>M. iranicum</i>
Monterrey	2	NTM9: <i>M. kommosensesense</i>	NTM9R: <i>M. mucogenicum</i>
Total	8	7	8

NTM: Nontuberculous mycobacteria.

**A missing opportunity to alleviate suffering: the case of vulvar cancer**

*Dear editor:* Vulvar cancer (VC) incidence is low around the world, squamous cell carcinoma (SCC) is the most common subtype. Treatment depends on histology and staging, surgery being the cornerstone.<sup>1,2</sup> Most women with vulvar cancer experience severe physical, psychological, social, and spiritual suffering; however, palliative care, is rarely considered.<sup>3,4</sup> We did a retrospective analysis of vulvar cancer patients seen at the palliative care service (PC) between 2011 and 2021 at the *Instituto Nacional de Cancerología* (INCan). During this period, 49/125 patients (39.2%) with advanced/recurrent VC were referred to PC. Advanced SCC was the most frequent diagnosis (75.5%), 10 patients had metastatic melanoma (20.4%), 63.3% did not have a partner (n= 31); 69.3% of the patients lived in extreme poverty (<2.19 US Dollars/day).<sup>5</sup> Access to health care services was difficult, 69% of them had to travel for at least 90 min to arrive to the INCan (table

**Table I**  
**GENERAL CHARACTERISTICS OF PATIENTS WITH ADVANCED VULVAR CANCER. REFERRED TO THE PALLIATIVE CARE SERVICE BETWEEN 2011 AND 2021 AT THE INSTITUTO NACIONAL DE CANCEROLOGÍA. MEXICO**

Characteristics	n(%)
Age	68 (IQR 58-78.5)
Education (years)	3 (IQR 1-9)
Illiterate	22%
≤ 6	68%
≥ 7	10%
Monthly income*	177.7 (IQR 111.00-305.00)
≤ \$ 2.19 US/day	69%
Frequent visits to ER (%)	40
Median number of visits to ER	2.9
Referral time to PC	307 (IQR 42.5-528)
Median time at PC (days)	34 (IQR 10-145)
≤ 30 days	48.9%
Outcome	
Alive	7 (14%)
Dead	18 (37%)
Hospital	2
Home	16
Lost on follow-up	24 (49%)
Physical suffering	
Pain /moderate or severe	65.3%
Neuropathic component of pain	61.2%
Fatigue	53%
Bleeding	27%
Malodorous vaginal discharge	27%
Psychological suffering	
Anxiety	38.7%
Depression	38.7%
Insomnia	40.8%
Social suffering	
Financial difficulties	81.6%
Other	30.6%

IQR: interquartile range.  
ER: emergency services.  
PC: palliative care service.  
\* USD-peso exchange rate \$18.00 pesos.

I). Symptom control was poor, 49% of the patients were seen in average 16.8 days; 20% of the patients were seen during their last hospitalization (at the end of life); 80% were seen at the outpatient palliative care clinic. Presence of spiritual suffering was

not specifically recorded; however, the patients characteristics may suggest being important.

The prevalence of health related suffering has been documented.<sup>6</sup> This work highlights the vulnerability of this population. Clinical experience

shows us that the scenario described above occurs frequently in women with vulvar cancer, and looking back on it highlights a tremendous opportunity for a holistic approach in managing both physical and emotional signs and symptoms, as well as the accompaniment and advice in decision-making offered by the palliative care service; however, the short time available to intervene (34 days) represented a limitation to carry out interventions considering the diversity of the spheres affected in the lives of these patients.

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### Validation and application of outcome prediction model in Covid-19 patients

*Dear editor:* This study validated four algorithms that had already been trained with patients with Covid-19,<sup>1</sup> to examine the possibility of applying these models in-hospital, so better management can be given to patients depending on their possible outcome.

We prospectively studied a longitudinal cohort of patients with a confirmed diagnosis of Covid-19 by RT-PCR from December 2020, to March 2021. Patients >18 years with known outcome and the necessary data for the evaluation were included. The outcome classification of this study was defined as "discharge" if the patient was discharged or "death" if the patient died.

To obtain the validation results from four algorithms previously trained,<sup>1</sup> a software was created for which Eel was used. The models used were logistic regression (LR), k-nearest neighbors (KNN), support vector machine (SVM) and neural network (NN). We studied 181 patients, of whom 79 were discharged and 102 died. Metrics were obtained to compare them with those obtained from the training of the models (table I).

The NN model (AUC 0.911) was the most accurate of those validated in this study, different studies have used NN and obtained good results, AUC 0.92<sup>2</sup> and 0.968.<sup>3</sup> Different algorithms have been used to make predictions or classifications on Covid-19 patients. Among the most common have been used random forest,<sup>4</sup> and Classification and Regression Trees,<sup>2</sup> to name a few.

In conclusion, it is possible to obtain the classification of patients diagnosed with Covid-19 using ma-

chine learning models. In this study, the best-performing model was NN. This validation opens new doors for more investigation and tools for better patient management.

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### The Covid-19 pandemic as a complex dynamical nonlinear system. Overcoming the Argentinean experience

*Dear editor:* The 2019 Covid-19 pandemic represented a major health challenge. Its general and Argentinean management offered aspects to be analyzed in anticipation of an unwanted future pandemic since exceeding some positive consequences (i.e., the creation and/or administration of new design vaccines together with an increase in home-office and in-home working), negative ones prevail.

**Table I**  
**METRICS OF MODELS AFTER VALIDATION OF CENTRAL HOSPITAL PATIENTS FROM DECEMBER 2020 TO MARCH 2021**

		Metrics of models after validation			
		KNN	SVM	LR	NN
Accuracy		0.74	0.83	0.78	0.82
	Death	0.83	0.81	0.74	0.82
Precision	Discharge	0.66	0.88	0.88	0.83
	Death	0.68	0.92	0.94	0.88
Recall	Discharge	0.82	0.72	0.58	0.75
	Death	0.75	0.86	0.83	0.85
F1 score	Discharge	0.73	0.79	0.70	0.79

KNN: k-nearest neighbors; SVM: support vector machine; LR: logistic regression; NN: neural network

From a general standpoint, these undesirable effects may be grouped into different categories like medical (organic disturbances), epidemiological (one-dimensional approach), economic (intra-pandemic bankruptcies of small and middle enterprises, post-pandemic inflation, unemployment), political (autocratic government trends, legislative weakening), social (increased poverty), educational-cultural (school deficiencies at all educational levels) and psychological (depression).

Regretfully, the Argentinean management added another unwise features: a) a former undervaluation of Covid-19 as a moderate flu; b) the concentration of all pieces of advice and directives in an exclusive epidemiologist team falling not only in the mistake of using the reductionist method of tackling a complex problem by isolating its components but facing it as a simple and linear phenomenon; c) the absence of summons to its renowned national academy of medicine; d) the existence of a very long quarantine starting as preventive and mandatory social isolation (PMSI) from 03/20/20 to 01/31/21 being followed by a preventive and mandatory social distancing (PMSD) from 02/01/2021 to nearly the end of such year; e) the original replacement of most reliable vaccines (Pfizer and Moderna) by other vaccine platforms not approved by the World Health Organization, the Food and Drug Administration (FDA) and the European Medicines Agency (EMA), and f) the lack of preventive measures against the economic-social, political, psychological and educational-cultural impact of the pandemic.

Such weaknesses resulted in 130 527 deaths over 10 057 945 infected persons in Argentina<sup>1</sup> together with still enduring troublesome consequences: inflation, private unemployment, medical and psychological disturbances, and educational impoverishment.

Given these circumstances, this view points out the need of envisaging holistically any pandemic like Covid-19 was, as a complex dynamical nonlinear system.

This requirement is as understandable as welcome since that type of system is an ensemble of several interconnected parts whose links generate more information than the one yielded by every single constituent. Its elements are self-organized without central directives (own organization) gathering properties different from those constituent parts so that the whole exceeds the sum of the parts (emergence).<sup>2</sup> In turn, its nonlinear dynamical nature stems from these features: the output change (response) is not proportional to the stimulating input, and small changes in place or time in the initial conditions may produce large effects (butterfly effect). The influence of the baseline conditions renders studies hard to reproduce and the discontinuous and unpredictable events force changes, adaptation, and creative thinking.<sup>3</sup>

In this regard, this approach is highly congruent with that supported by Fineberg.<sup>4</sup> Furthermore, this method requires the training and intervention of interdisciplinary teams (clinicians, pediatricians, infectologists, immunologists, epidemiologists, biochemists, psychologists, economists, sociologists, political scientists, educators, ethicists, and cybernetic experts, at the least) for minimizing to the maximum the referred weaknesses.

Summarizing, this medical biophysical application for facing a relevant health challenge, raised from a holistic approach, may become potentially useful for developing countries and perhaps, for some developed ones aimed at solving, as said, an undesirable future pandemic.

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## SARS-CoV-2 immune response and reinfection in vaccinated Mayans and mestizos in Southeast of Mexico

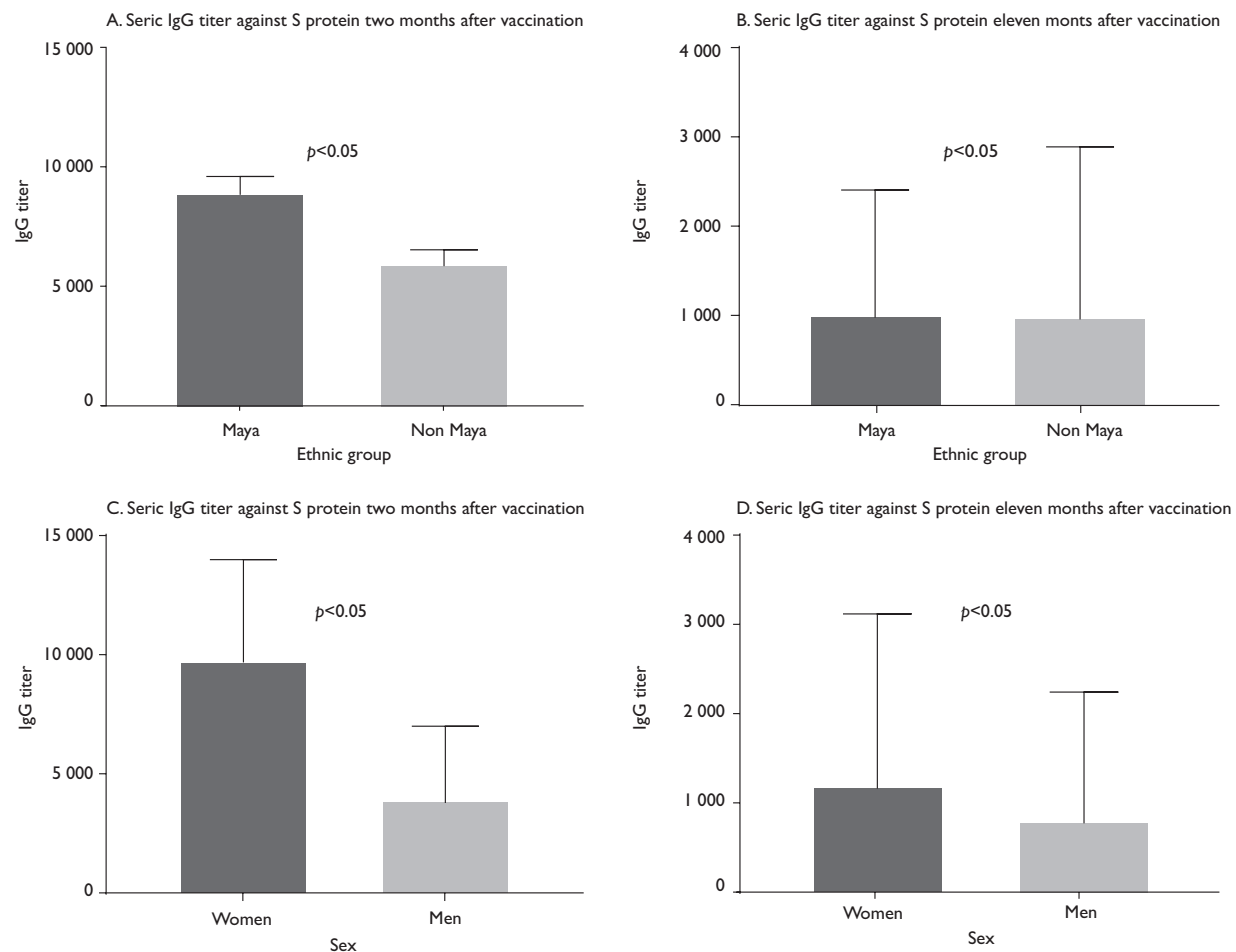
*Dear editor:* Immune response to pathogens, including coronaviruses, is influenced by HLA haplotypes.<sup>1</sup> The Maya ethnic group is predominant in Yucatan peninsula; this Amerindian group exhibits the allele frequencies HLA-G\*01:01:02, HLA-G\*01:01:01, HLA-G\*01:04:01, HLA-A\*68, not found in other Amerindians.<sup>2</sup> Immune responses to SARS-CoV-2 vaccination and reinfection, particularly after the Omicron variant appeared, was explored in 118 vaccinated subjects with complete 2-shot immunization in Maya ascendants and non-Maya mestizos during the period of april 2021 to march 2022 in the city of Campeche. In April 2022, an epidemiological survey was applied to 1 172 members of the university staff in the city of

Campeche, Mexico, in order to assess reinfection, comorbidities, virus variant, disease severity, aftermaths, clinical outcomes, age, sex, ethnicity, and vaccination shots. Multiple logistic regression, correspondence analysis, and association tests were used to analyze the data.

Sixteen percent of the vaccinated subjects became seronegative after 11 months. We found that vaccinated Maya subjects and women respond with a higher IgG immune response compared to no-Maya subjects ( $p < 0.05$ ) (figure 1). During an eleven-

month period and after two vaccination shots, 7% of the vaccinated subjects reported a confirmed positive infection; however, after the third shot, 23.7% reported reinfection. This data represents almost three times the reinfection rate reported when compared to previous third-dose shots. The increase of reinfection in vaccinated subjects by 71.5% was associated with the circulation of the Omicron variant. In order to understand Covid-19 severity after reinfection in vaccinated subjects and the associated variables, we carried out a multi-

ple logistic regression and found a strong association between less severe symptoms and the Alfa and Omicron variants (B 5.3; Error 0.39; Wald 0.00; Significance 0.00; OR201). However, subjects with severe symptoms and or hospitalization were individuals with multiplex comorbidities and Gamma SARS-CoV-2 variants (B 5.06; Error 0.97; Wald 26.8; Significance 0.00; OR 158). A follow-up survey of Covid-19-recovered patients experienced diverse digestive, respiratory, cardiac, neurological, or articular sequelae. We looked for the SARS-CoV-2 variant



Panel A and B compare serum titer between Maya and no-Maya at two and eleven months after vaccination. Panel C and D compare sex at two and eleven months after vaccination.

**FIGURE 1. COMPARATIVE SERIC IgG TITER AGAINST S PROTEIN IN COMPARISON TO SEX, MAYA AND MESTIZO SUBJECTS AFTER TWO AND ELEVEN MONTHS AFTER VACCINATION. UNIVERSIDAD AUTÓNOMA DE CAMPECHE, MEXICO, 2021 AND 2022**

and Covid-19 sequelae in a correspondence analysis. Our data suggest that the Beta and Delta variants are associated with respiratory and digestive symptoms, whereas Omicron was more closely associated with articular and digestive symptoms; finally, the Gamma variant displayed wider and more diverse symptoms.

Our results suggest that genetic background and gender influence IgG response to the SARS-CoV-2 vaccine; Maya ascendants have a higher immune IgG response to the vaccine than mestizos. Reinfection in our studied population fluctuates from 7 to 23.7%; however, it is higher when the

Omicron variant is involved, but the symptoms are less severe and more closely associated with articular and digestive symptoms.

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