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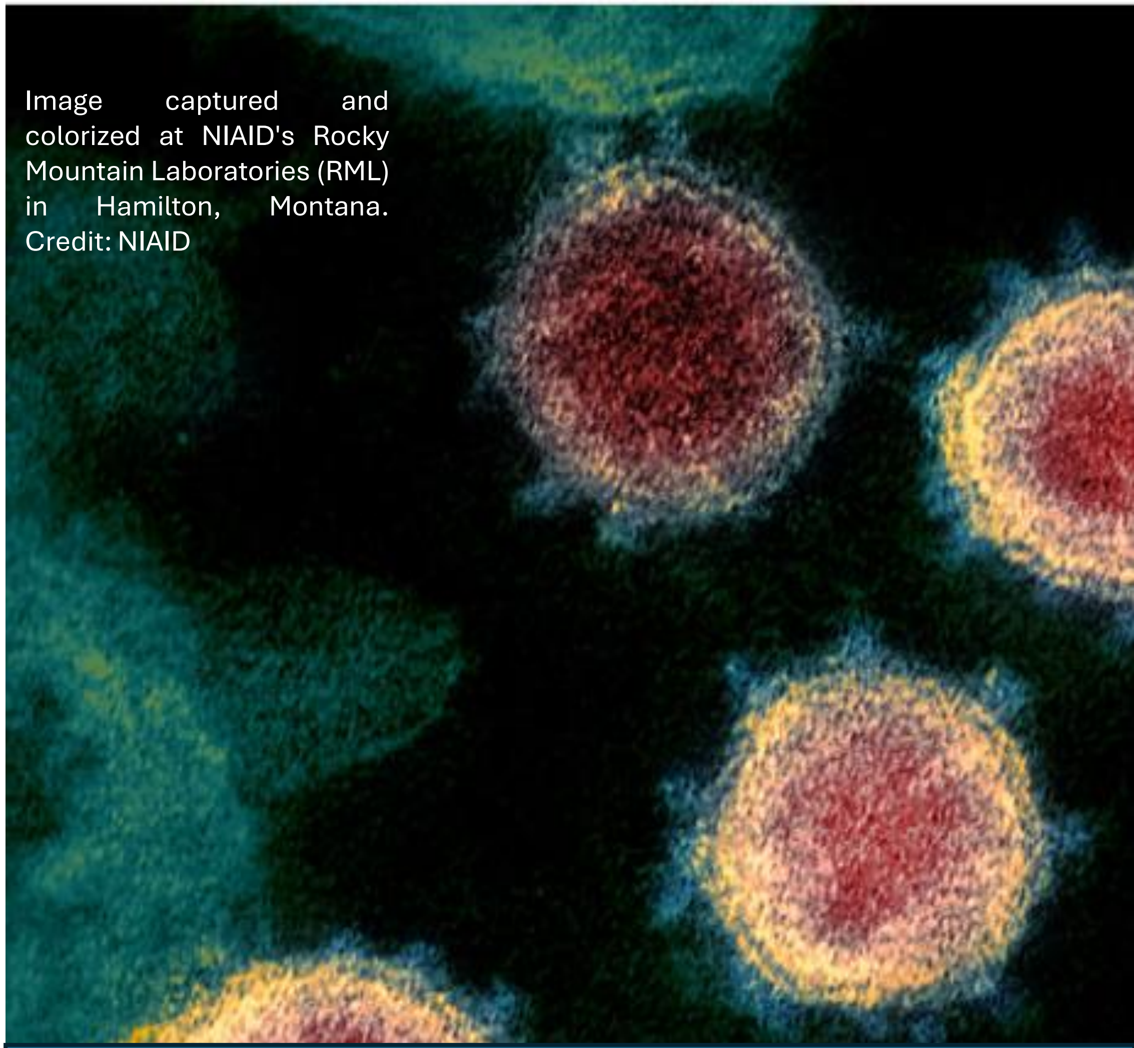

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Coronavirus, a latent risk of pandemics

by Porfirio Felipe Hernández Bautista*

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At the beginning of the 21st century, severe acute respiratory syndrome (SARS) appeared in China, serving as the first warning about the risk of coronaviruses. The causative virus was SARS-CoV-1, which was identified in November 2002 in Guangdong province. The most widely accepted hypothesis for the outbreak's emergence was zoonosis caused by wildlife vendors, especially those dealing in palm civets (a mammal similar to felines). The disease subsequently spread to other countries in South Asia. In North America, Canada reported the most cases, while in Europe, patients were few. A controversy arose regarding the delay in reporting the outbreak by the Chinese government, as well as the fact that the WHO envoy, Dr. Calo Urbani, was among the fatalities.

MERS-CoV (Middle East Respiratory Syndrome) was subsequently identified in June 2012 in Jeddah, Saudi Arabia. This novel coronavirus originated from the sputum of a patient with pneumonia. The virus spread to several countries, with a fatality rate of 60%. Phylogenetically, the virus was related to the bat coronaviruses HKU4 and HKU5.

Other human coronaviruses include 229E, OC43, NL63, and HKU1, which occur cosmopolitanally and seasonally. OC43 has been the most frequently reported, although the highest fatality rate, up to 6.4%, has been described for type 229E. According to the Chinese Center for Disease Control and Prevention, on December 29, 2019, four cases of pneumonia were reported at Xinhua Hospital among workers at the local market. Subsequently, on December 31, the World Health Organization was notified of 27 cases of pneumonia of unidentified etiology. This marked the beginning of the emergence of SARS-CoV-2, which spread rapidly worldwide, causing the first pandemic of the 21st century.

In conclusion, coronaviruses have emerged as a persistent global health risk, and along with influenza, have represented the greatest threat to the human population.

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Complications associated with SARS-Cov-2 infection in hospitalized patients with diabetes mellitus

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Abstract

Introduction: In populations where type 2 diabetes mellitus is a highly prevalent condition and adequate glycemic control is lacking, such as in Mexico, further investigation into its relationship with COVID-19 is warranted.

Objective: To identify complications associated with SARS-CoV2 infection in hospitalized patients with diabetes mellitus at IMSS Regional General Hospital No. 1, Ciudad Obregón, Sonora.

Materials and methods: A cross-sectional, observational, and descriptive clinical epidemiological study was conducted at the IMSS Regional General Hospital No. 1, Ciudad Obregón, Sonora, from March 23, 2020, to March 23, 2021.

Results: For the study, 286 patients were analyzed, organized into a study group (n = 176) and a control group (n = 110), using the Mann-Whitney U test, it was found that there is a relationship between Diabetes Mellitus and the appearance of complications ($p = 0.002$) such as pneumonia ($p = 0.00002$), severe acute respiratory syndrome ($p = 0.0003$) and death ($p = 0.015$). Hyperglycemia greater than 164 mg / dL is related to the appearance of complications ($p = 0.001$) and greater than 234 mg / dL is associated with death ($p = 0.0003$).

Conclusions: An association between complications and SARS-CoV-2 infection was identified in hospitalized patients with diabetes mellitus; based on the results, it can be inferred that these may apply to the general population. Glycemic control plays a key role in the development of complications, so glycemic control should be a cornerstone of COVID-19 treatment.

Keywords: Diabetes mellitus, complications, SARS-CoV2, COVID-19.

INTRODUCTION

Diabetes mellitus (DM) is a chronic-degenerative condition[1] in which the pancreas is unable to synthesize insulin or occurs when the body is unable to use this hormone.[2] In the long term, the resulting hyperglycemia can cause damage to various organs, causing serious complications, such as cardiovascular disease, increased susceptibility to infections [3] diabetic neuropathy, diabetic nephropathy, diabetic retinopathy, among others.[4] The SARS-CoV-2 disease called COVID-19,8 is a disease9 that was identified after an outbreak of pneumonia of unknown etiology in Wuhan, China at the end of 2019;10 which on March 11, 2020 was declared a pandemic by the WHO,11 so that as of November 8, 2020, 49.7 million cases have been reported worldwide, with more than 1.2 million deaths associated with this disease since the beginning of the pandemic.[12] As a result of this information, the identification of complications associated with SARS-CoV-2 infection in patients with diabetes mellitus, specifically in hospitalized patients, is considered relevant.

The SARS-CoV-2 virus, belonging to the Coronaviridae family,[13] is a virus that contains a single strand of ribonucleic acid (RNA),14 whose family has the ability to infect humans, like those that cause Middle East Respiratory Syndrome (MERS-CoV) and Severe Acute Respiratory Syndrome (SARS-CoV),[11] both with the ability to develop into epidemics.[13] It has been studied that SARS-CoV2 has the ability to be transmitted from person to person through respiratory droplets,[15] including transmission from asymptomatic cases,[14] and due to the lack of treatment and specific prevention measures, it has become a major public health problem worldwide.[11]

Patients with COVID-19 disease usually present symptoms similar to a respiratory tract illness,[8] the most common symptoms being fever and cough,9 as well as headache, dyspnea, myalgia, arthralgia, anosmia, dysgeusia, chest pain and, to a lesser extent, diarrhea and vomiting.[11,14] The disease may not manifest itself, as in asymptomatic cases;[15] and may also have a mild presentation with symptoms that do not endanger the patient's life[8] or present with severe acute respiratory syndrome due to SARS-CoV-2, where the lung condition is severe,[13] with an increase in cytokines and chemokines, known as a cytokine storm,[5,9,16] which increases the proinflammatory state of patients.[9,16]

Multiple therapeutic trials have been carried out to try to identify an effective treatment against COVID-19, however these have been unsuccessful and there is no approved medication for its management,[15] however it has been verified that the use of steroids has helped reduce mortality in hospitalized patients with invasive mechanical ventilation;[17] Likewise, in order to better understand this new disease, certain conditions such as advanced age, presence of systemic arterial hypertension (SAH), obesity, chronic obstructive pulmonary disease (COPD), asthma, smoking and DM have been identified as risk factors associated with a worse prognosis,[14] including death in patients with COVID-19.[18]

According to certain publications, it has been suggested that patients living with diabetes who develop COVID-19 present an inflammatory process enhanced[18] by the pathophysiology of both diseases, in which an increase in blood glucose levels is observed secondary to the same inflammatory process.[5,15,19] Therefore, there is a consequent high risk of complications secondary to SARS-CoV-2 infection such as pneumonia, severe acute respiratory syndrome, septic shock, acute kidney injury, multiorgan failure, or death.[16,19,20]

Due to the recent introduction of COVID-19 and the lack of understanding of it, it is important to continue studying SARS-CoV-2 infection, specifically in immunocompromised patients such as those living with diabetes, as well as its complications and possible risk factors.[16]

Therefore, in this study, we did not propose to identify complications associated with SARS-CoV-2 infection in hospitalized patients with diabetes mellitus.

MATERIALS AND METHODS

For the purpose of this research, a cross-sectional, descriptive, observational study was designed at IMSS Regional General Hospital No. 1 in Ciudad Obregón, Sonora. The study was conducted from March 23, 2020, to March 23, 2021.

Data were obtained through review of medical notes and clinical records during the study period. Data were supplemented with information from the laboratory results platform used at the same hospital and data obtained through the SINOLAVE platform.

Cases were confirmed with RT-PCR for COVID-19, reported by IMSS Regional General Hospital No. 1 in Ciudad Obregón, Sonora, during the study period, and information was available.

A sample size calculation was performed for a proportion of a finite population of confirmed COVID-19 cases using RT-PCR for SARS-CoV-2 at IMSS Regional General Hospital No. 1, Ciudad Obregón, Sonora, during the study period. The result was 225.

The independent variables were: pneumonia, severe acute respiratory syndrome, invasive mechanical ventilation, septic shock, acute kidney injury, multiple organ failure, tertiary referral, diabetes mellitus, blood glucose, glycemic control, confirmed COVID-19 case, age, gender, comorbidities, and the dependent variable was hospital discharge or death.

The inclusion criteria were: patients of both sexes, of any age, including pediatric patients, IMSS beneficiaries, patients considered confirmed cases of COVID-19, notified by IMSS Regional General Hospital No. 1, Ciudad Obregón, Sonora, and patients hospitalized at IMSS Regional General Hospital No. 1, Ciudad Obregón, Sonora.

The exclusion criteria were: patients referred to another secondary care hospital, with a record of pregnancy or postpartum, with a hospital stay of less than 24 hours, and with missing blood glucose or capillary glucose laboratory results in a medical note, clinical record, or on the laboratory platform.

The elimination criteria were: duplicate cases on the SINOLAVE platform, discharge for reasons other than improvement or death, death from causes not associated with COVID-19, incomplete data in medical notes, clinical records, the SINOLAVE platform, or the laboratory platform that prevented adequate data collection. The study was authorized by the local health research committee. The data was collected using a specially designed format, which allowed for the necessary information to be obtained, eliminating data that would identify the cases, thus ensuring patient anonymity and confidentiality.

Data were collected retrospectively from medical notes, clinical records, laboratory results issued by the same hospital's platform, and the institutional SINOLAVE platform, according to the calculated sample size. Data were entered into a database created with Excel version 365. Data analysis was performed using IBM SPSS version 24. Statistical tests were applied to perform univariate and bivariate analyses, using complications associated with SARS-CoV-2 infection as the dependent variable. Hypothesis testing was performed using the Mann-Whitney U test, the median test for independent samples, and Spearman's Rho. A p value < 0.05 was considered statistically significant.

RESULTS

Due to the number of reported cases, a sample of 286 patients was obtained, exceeding the sample calculated for greater statistical significance. Of these 286 cases, 176 with a history of DM and 110 without were selected, forming the study group (SG) and control group (CG), respectively.

A total of 286 patients were analyzed as confirmed cases of COVID-19, of which 53.1% (n=152) were male and 46.9% (n=134) were female. Their ages ranged from 16 to 93 years, with a median age of 65 years (IQR=55–74). Of these patients, 176 had a history of DM and COVID-19, of whom 44.9% (n=79) were male and 55.1% (n=97) were female. Their ages ranged from 24 to 88 years, with a median age of 67 (IQR=58–74) (Table 1). Regarding glycemic control, it was found that, of the 176 patients in the EG, 21% (n=37) were controlled, while 78.9% (n=139) had glycemic dyscontrol; of the latter, 31.6% (n=44) were in moderate dyscontrol and 68.3% (n=95) in severe dyscontrol. A median glucose level of 232 mg/dL (IQR= 162–304) was identified in this group. In the CG, it was found that 75.5% (n=83) were in adequate glycemic control, while 24.5% (n=27) presented hyperglycemia (Table 2); this group presented a median glucose level of 128 mg/dL (IQR= 100–150).

Table 1. Sociodemographic characteristics of patients with Diabetes Mellitus confirmed for SARS-CoV-2 hospitalized at Regional General Hospital No. 1, IMSS, Obregón, Sonora.

	History of DM		No history of DM	
	N 176	Percentage (%)	N 110	Percentage (%)
Sex				
Male	79	44.9	73	66.4
Female	97	55.1	37	33.6
Age (Middle)	67 (IRQ= 58 -74)		62 (IRQ= 53 - 72)	

N = number; % = percent; IQR: Interquartile range. Source: Study protocol developed at Regional General Hospital No. 1, IMSS, Obregón, Sonora.

Table 2. Description of glycemic control in patients with Diabetes Mellitus hospitalized at Regional General Hospital No. 1, IMSS, Obregón, Sonora.

	History of DM		No History of DM	
	N 176	Percentage (%)	N 110	Percentage (%)
Glycemic control				
In control	37	21	83	75.5
Out of control	139	79	27	24.5
Moderate disorder*	44	25	0	0
Severe lack of control*	95	54	0	0

*N = number; % = percent; * Disaggregated cases of the variable Glycemic imbalance. Source: Study protocol developed at the General Regional Hospital No. 1, IMSS, Obregón, Sonora.*

Regarding the reported complications, pneumonia was found in 98.3% of the study group (n=173), death in 60.2% (n=106), severe acute respiratory syndrome in 59.1% (n=104), requirement for invasive mechanical ventilation in 31.8% (n=56), septic shock and multiple organ failure in 23.3% (n=41) each, acute kidney injury in 22.2% (n=39) and referral to third level in 5.7% (n=10). In the control group, pneumonia was found in 85.5% (n=94), death in 45.5% (n=50), severe acute respiratory syndrome in 37.3% (n=41), invasive mechanical ventilation in 30% (n=30), septic shock and multiorgan failure in 19.1% (n=21) each, acute kidney injury in 15.5% (n=17), and no referrals to tertiary care were reported (Table 3).

Table 3. Complicaciones asociadas a infección por SARS-CoV-2 en pacientes con Diabetes Mellitus hospitalizados en el Hospital General Regional No.1, IMSS, Obregón, Sonora.

	History of DM		No History of DM	
	N 176	Percentage (%)	N 110	Percentage (%)
Complications				
Pneumonia	173	98.3	94	85.5
Death	106	60.2	50	45.5
Severe Acute Respiratory Syndrome	104	59.1	41	37.3
Invasive Mechanical Ventilation	56	31.8	33	30
Septic Shock	41	23.3	21	19.1
Multiple organ failure	41	23.3	21	19.1
Acute Kidney Injury	39	22.2	17	15.5
Reference to third level	10	5.7	0	0

N = number; % = percent. Source: Study protocol developed at Regional General Hospital No. 1, IMSS, Obregón, Sonora.

Table 4. Complications associated with SARS-CoV-2 infection in patients with Diabetes Mellitus hospitalized at Regional General Hospital No. 1, IMSS, Obregón, Sonora.

	History of DM		No History of DM	
	N 176	Percentage (%)	N 110	Percentage (%)
Comorbidities				
Without other comorbidities	39	22.2	53	18.5
Other comorbidities	137	77.8	57	19.9
Systemic Arterial Hypertension	128	72.7	51	46.4
Obesity	24	13.6	2	1.8
Chronic Kidney Disease	15	8.5	0	0
Bronchial Asthma	6	3.4	4	3.6
Hypothyroidism	6	3.4	1	0.9
Rheumatological Disease	3	1.7	0	0
Hemato-Oncological Disease	3	1.7	2	1.8
Heart Disease	3	1.7	0	0
COPD	2	1.1	1	0.9
Anemia, unspecified	2	1.1	2	1.8
Epilepsy	1	0.6	0	0

N = number; % = percent; COPD: Chronic Obstructive Pulmonary Disease. Source: Study protocol developed at Regional General Hospital No. 1, IMSS, Obregón, Sonora.

A statistically significant difference was found regarding the presence of complications in patients with diabetes and SARS-CoV-2 infection (p=0.002). It was also found that glycemic control was related to the development of complications (p=0.0001); however, there was no relationship between moderate and severe glycemic control (p=0.928) (Table 5). Age is associated with the presence of complications in these patients (p=0.0003). A history of DM is associated with the following complications: pneumonia in patients with SARS (p=0.0002), presence of SARS (p=0.003), referral to a third level (p=0.0004), and death (p=0.01). Furthermore, the latter is related to glycemic control (p=0.004) (Table 5 and Table 6). Gender is not associated with the occurrence of complications (p=0.756). Blood glucose levels (SD=164.5) and complications are associated (p=0.001) (Table 7), as is the case for blood glucose levels (SD=249.34). On the other hand, it was found that the presence of two comorbidities is associated with the appearance of complications in these patients (p= 0.045) (Table 5).

Table 5. Statistics of complications in patients with Diabetes Mellitus with SARS-CoV-2 infection, hospitalized at the Regional General Hospital No. 1 IMSS, Obregón, Sonora.

	N	Statistical test	Significance
History of DM			
Si	176	76711	0.002
No	110		
Glycemic control			
In control	37	1394.51	<0.001
Out of control	139		
Moderate disorder	71	3345.51	0.928
Severe lack of control	95		
Sex			
Male	79	37301	0.756
Female	97		
Age	672	87.023	0.001
Comorbidities			
Without other comorbidities	39		
Two or more comorbidities	137	7606.51	0.026

Statistical significance was assigned based on a p value < 0.05.

N = number; DM: Diabetes Mellitus; 1 = Mann-Whitney U test; 2 = Median; 3 = Median test for independent samples.

Source: Study protocol developed at Regional General Hospital No. 1, IMSS, Obregón, Sonora.

Table 6. Statistics of complications in patients with Diabetes Mellitus with SARS-CoV-2 infection, hospitalized at the IMSS Regional General Hospital 1, Obregón, Sonora.

Variable	N	U de Mann-Whitney	Significance
Pneumonia			
History of DM	76	8437	<0.001
No history of DM	110		
Severe Acute Respiratory Syndrome			
History of DM	104	7568	<0.001
No history of DM	41		
Septic Shock			
History of DM	41	9273	0.402
No history of DM	21		
Acute Kidney Injury			
History of DM	39	9031	0.165
No history of DM	17		
Multiple organ failure			
History of DM	41	9614	0.748
No history of DM	21		
Death			
History of DM	106	8250	0.015
No history of DM	50		
Reference to third level			
History of DM	10	9130	0.011
No history of DM	0		
Invasive Mechanical Ventilation			
History of DM	56	21109	0.654
No history of DM	33		

Statistical significance was assigned based on a p value < 0.05.

N = number; DM: Diabetes Mellitus; SARS: Severe Acute Respiratory Syndrome. Source: Study protocol developed at the Regional General Hospital No. 1, IMSS, Obregón, Sonora.

Table 7. Correlation statistics between complications and glycemia in patients with Diabetes Mellitus with SARS-CoV-2 infection, hospitalized at the Regional General Hospital No. 1 IMSS, Obregón, Sonora.

		Blood glucose	Complications
Blood glucose	Spearman's Rho correlation coefficient	1	0.25
	Significance		<0.001
	N	176	176
Complications	Spearman's Rho correlation coefficient	0.25	1
	Significance	<0.001	
	N	176	176

Statistical significance was assigned based on a p value < 0.05. N = number. Source: Study protocol developed at the General Regional Hospital No. 1, IMSS, Obregón, Sonora.

DISCUSSION.

Due to the evolution of the COVID-19 pandemic and the clinical relevance of this disease, numerous but insufficient research studies have emerged to determine risk factors, prognostic factors, as well as clinical trials to evaluate treatments and even vaccine safety studies that allow mitigating and controlling the pandemic.

Accordingly, it was important to identify the complications associated with SARS-CoV-2 infection in hospitalized patients with Diabetes Mellitus at the IMSS Regional General Hospital No. 1, Ciudad Obregón, Sonora, as the main objective of this research work. Therefore, by obtaining a significant sample, it was possible to achieve statistical significance and internal and external validity in this research work. After conducting the study, it was found that the main complications in patients living with DM who are hospitalized after SARS-CoV-2 infection are pneumonia, death, and severe acute respiratory syndrome. Likewise, it was found that there is a relationship between the presence of Diabetes Mellitus and the development of complications in these same patients with COVID-19, which is consistent with studies conducted by Huang I et al.[18]

For the variables septic shock, acute kidney injury, multiple organ failure, and the need for invasive mechanical ventilation, no statistically significant relationship was found; therefore, it is advisable to continue searching for the factors that influence the development and prevention of these complications.

It is important to note that social and demographic factors of the population do play an important role in the development of complications in these patients. This research protocol demonstrated that age is related to the development of complications; however, sex is not associated with their occurrence. According to the study "Coronavirus Infection in Patients with Diabetes" by Torres-Tamayo M. et al., the importance of advanced age is mentioned, considering it a promoter of morbidity and mortality in patients with DM and COVID-19.[5]

Regarding glycemic control, it was found that only 21% of patients with DM had blood glucose levels below 140 mg/dL, while 25% had moderate dyscontrol (140–199 mg/dL) and 53.9% had severe dyscontrol (greater than 200 mg/dL). Of these patients, 65.9% had more than two complications. In addition, it was observed that blood glucose levels above 164.5 mg/dL are related to the onset of complications and the need for management by a third level of medical care. Blood glucose levels above 234 mg/dL are associated with the variable death. According to Bellido V. in his research work, it is mentioned that hyperglycemia is related to a greater number of complications and an increase in mortality; however, the cut-off level for glucose they used was 180 mg/dL.6 According to this research work, there is no statistically significant difference between moderate and severe glycemic control, so it would be advisable to continue investigating this finding to dictate therapeutic guidelines and control goals in the future.

In the context of population health in Mexico and specifically in the state of Sonora, it is impossible to dismiss the role of other comorbidities. When obtaining the necessary data for the sample, it was impossible not to notice the existence of two or three comorbidities, so although they could have been taken as confounding agents, it was decided in this study to categorize them as effect modifiers and even analyzed the importance and effect of this variable on the appearance of complications in patients with DM hospitalized for COVID-19 in the hospital. Of the patients analyzed, in addition to having a history of Diabetes Mellitus, it was found that 77.8% presented other comorbidities, of which systemic arterial hypertension, obesity, and chronic kidney disease stand out. It was found that the coexistence of DM and another comorbidity has no relationship with complications, however, the coexistence of DM and two or more comorbidities does have a statistically significant relationship with the appearance of complications; according to Pinos-Robalino J.A.; The coexistence of comorbidities such as systemic arterial hypertension, heart disease, respiratory diseases, among others, can increase the risk of mortality. [29]

Therefore, it is pertinent to mention that the objectives of this research work were met, finding relevant information consistent with the current literature concerning complications arising from SARS-CoV-2 infection in hospitalized patients with Diabetes Mellitus. As Hussain A. mentions in his research work, future research is necessary to promote progress in the understanding of the DM and COVID-19 binomial. [15]

COVID-19 has become a disease of great global significance due to its ongoing pandemic. The implications and impact on the population, economy, and health services have been monumental. Therefore, research into all related factors has been of great importance and a source of work for the scientific community.

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Comparison of the effectiveness of the BNT162b2 vaccine vs the ChAdOx1 vaccine in reducing the severity of COVID-19

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Abstract

Introduction: One of the challenges posed by the COVID-19 pandemic was the early development of a vaccine to reduce the severity of the disease. In Mexico, more than nine vaccines from different laboratories have been used; eventually, it will be necessary to continue acquiring batches only from laboratories whose vaccines have demonstrated the greatest effectiveness in the Mexican population.

Objective: To determine which of the BNT162b2 and ChAdOx1 nCoV-19 vaccines is more effective in reducing the severity of COVID-19.

Materials and methods: A cross-sectional, retrospective, analytical, observational study was conducted on the severity of COVID-19 in two groups of patients: one previously immunized with the BNT162b2 vaccine and the other with ChAdOx1, both treated at Regional General Hospital No. 1 in Ciudad Obregón, Sonora.

Results: Of the patients who developed severe illness, the largest proportion was in the group immunized with ChAdOx1 nCoV-19; this difference was statistically significant (p=0.03). Significant differences were also found in the frequency of pneumonia, Intensive Care Unit admission, and prolonged hospital stay.

Conclusions: Our study suggests that the BNT162b2 vaccine is more effective in preventing severe COVID-19 than the ChAdOx1 nCoV-19 vaccine.xt

Keywords: COVID-19, severe illness, effectiveness, BNT162b2, ChAdOx1 nCoV-19.

INTRODUCTION

The SARS-CoV-2 coronavirus has caused widespread economic and social devastation globally, and countries are engaged in an unprecedented vaccination campaign to contain it. By the end of 2021, 23 COVID-19 vaccines had been approved worldwide, exhibiting varying levels of efficacy, safety, and cost. [1]

Eight COVID-19 vaccines have been authorized for emergency use in Mexico; however, studies of these vaccines in the Mexican population are still inconclusive. In this unprecedented pandemic, it is essential to have short- and medium-term information on the effectiveness of these vaccines in our population to guide public health decisions. [2,3]

Since the emergence of the coronavirus, documented cases of COVID-19 have reached approximately 247 million worldwide, and recorded deaths exceeded 5 million by October 2021. Given this situation, it is not surprising that by early November 2021, the WHO had authorized the emergency use of up to seven COVID-19 vaccines.[4,5,6]

The development of COVID-19 vaccines and their mass application in less than two years since the emergence of this new pathogen has opened the possibility of achieving control of this pandemic. However, the reported effectiveness of the two vaccines mentioned has varied.[15]

The BNT162b2 COVID-19 vaccine is an mRNA-based vaccine produced by Pfizer Inc. and BioNTech; the ChAdOx1 nCoV-19 vaccine is a vaccine based on a replication-deficient simian adenovirus vector from the University of Oxford and AstraZeneca. Both contain nucleic acid that encodes the surface glycoprotein (spike protein) of SARS-CoV-2.[8]

Two doses of BNT162b2 are 95% effective (95% CI 90–98) at least 7 days after the second dose against symptomatic infection. In early 2021, research reported that BNT162b2 was 73% effective (95% CI: 62–82) 21–27 days after the first dose against symptomatic disease in people aged 70 years and older in Israel. After two doses, ChAdOx1 nCoV-19 has an efficacy of 70% against symptomatic infection.[9,10,11]

In a case-control study in England, the results show a relative risk of hospitalization of 0.57 (95% CI 0.48–0.67) for BNT162b2 and 0.63 (95% CI 0.41–0.97) for ChAdOx1 nCoV-19. In a study in Canada, the vaccine effectiveness against severe outcomes after 1 dose of BNT162b2 and ChAdOx1 nCoV-19 was 78% (95% CI, 65-86%) and 88% (95% CI, 60-96%), respectively.[8, 12]

An Israeli case-control study found that the estimated effectiveness of BNT162b2 against symptomatic disease in adults aged at least 70 years was 44% (95% CI: 49-64) at 14-24 days post-dose and 64% (37-83) at 21-27 days post-dose. In the same cohort, one dose of BNT162b2 had an estimated effectiveness against hospitalization of 74% (95% CI: 56-86) at 14-24 days after the first dose and 78% (61-91%) at 21-27 days after the first dose.[13]

A relevant factor to consider is the possible greater effectiveness of the ChAdOx1 nCoV-19 vaccine in the Mexican population compared to other populations; Trials of the vaccine showed a 63.9% protection rate against symptomatic SARS-CoV-2 infections, while in the case of a Mexican national, its effectiveness is 90%, according to the director of the Center for Research on Infectious Diseases (CISEI) of the INSP.[14] In this research, we will focus on the study of two of them, BNT162b2 and ChAdOx1 nCoV-19, since they are two of the vaccines that have been administered in the largest numbers to the Mexican population, and because they are among those with the highest reported effectiveness.[7]

MATERIALS AND METHODS

This was a cross-sectional, retrospective, analytical observational study conducted at the Mexican Social Security Institute's Regional General Hospital No. 1 in Ciudad Obregón, Sonora. The dependent variable was the severity of COVID-19, and the independent variables were the brand of COVID-19 vaccine, age, sex, occupation, and comorbidities.

Patients with a complete SARS-CoV-2 immunization schedule using either the BNT162b2 or ChAdOx1 nCoV-19 vaccines prior to having COVID-19 confirmed by SARS-CoV-2 RT-PCR or SARS-CoV-2 Rapid Antigen Test at the General Regional Hospital No. 1 of the Mexican Social Security Institute (IMSS), Ciudad Obregón, Sonora, from January 5, 2021, to January 5, 2022.

The sample size was calculated for two proportions, based on a patient population with an alpha of 0.05 and a statistical power of 80%, resulting in a minimum of 71 patients.

Data was obtained from the epidemiological surveillance system for viral respiratory diseases of the Ministry of Health, using the SINOLAVE platform during the study period. This study included a review of physical (medical notes) and electronic medical records, as well as epidemiological studies and notes on suspected COVID-19 cases at Regional General Hospital No. 1. Inclusion criteria were patients of both sexes, 18 years of age or older, who had received at least two doses of immunization with the BNT162b2 or ChAdOx1 nCoV-19 vaccine between 30 and 270 days prior to symptom onset. COVID-19 was confirmed by RT-PCR or Rapid Antigen Test, with samples taken within the first 7 days of symptom onset, and who were treated at Regional General Hospital No. 1 IMSS, Ciudad Obregón, Sonora.

Exclusion criteria were patients classified by clinical assessment, those under 18 years of age, those with a hospital stay of less than 24 hours, patients without a final classification on the SINOLAVE platform, and those whose second vaccine dose had been administered less than 30 days or more than 9 months prior to receiving medical attention.

The information was collected using a format specifically designed to gather research variables of interest. Microsoft Excel software was used for data collection, and SPSS software was used for analysis.

The Kolmogorov-Smirnov test was used to assess normality of distribution for the scale variables. Additionally, the Mann-Whitney U test was used to compare the age distribution between the two study groups.

Measures of central tendency and dispersion were calculated for the scale variables, and proportions were calculated for the categorical variables.

Pearson's chi-square test was used to determine if there were statistically significant differences in the frequency of comorbidities and complications between the two groups.

To evaluate the association between vaccine brand and disease severity, odds ratios (OR) with 95% confidence intervals (95% CI) were calculated. A p-value of 0.05 or less was considered statistically significant.

The research was authorized by the local health research committee. It was considered to be of minimal risk because the studies used data risk in common procedures, in psychological or physical examinations for diagnosis or treatment.

RESULTS

A total of 340 patients diagnosed with and confirmed to have COVID-19 at the General Regional Hospital No. 1, Ciudad Obregón, Sonora, were studied. They were divided into two groups of 170 subjects each, depending on the brand of COVID-19 vaccine with which they were immunized. In both groups, females were more frequent: 90 (53%) in the BNT162b2 group and 93 (55%) in the ChAdOx1 nCoV-19 group; while males were more frequent, with 80 (47%) and 77 (45%) respectively (Table 1). The patients' ages ranged from 19 to 79 years, with a mean of 49.3 years ± 15.4. In the group immunized with BNT162b2, the mean age was 49.8 years (SD 15.3 years), while in the group immunized with ChAdOx1 nCoV-19, the mean age was 48.7 years (SD 15.5 years).

The main occupations in the Pfizer group were similar in both groups: in the Pfizer group, they were employees (33%), homemakers (13%), nurses (12%), physician (12%), and retired (10%). In the Astra group, there were: employees (51%), homemakers (12%), retired (9%), physicians (6%), and nurse (6%) (Table 1).

Table 1. Sociodemographic characteristics of patients immunized with Pfizer (BNT162b2) who had COVID-19 treated at Regional General Hospital 1, Cd. Obregón, Sonora.

		n_1(170)	n_2(170)
Gender (BNT162b2)		**Frequency**	**%**
	Male	80	47
	Female	90	53
Gender (ChAdOx1 nCoV-19)			
	Male	77	45
	Female	93	55

Occupation (BNT162b2)	**Frequency**	**%**	Occupation (ChAdOx1)	**Frequency**	**%**
Employee	56	32.9	Employee	87	51.2
Homemaker	22	12.9	Homemaker	20	11.7
Nurse	21	12.4	Retired	15	8.8
Doctor	20	11.8	Doctor	11	6.5
Retired	17	10.0	Nurse	11	6.5
Other occupations	11	6.5	Other occupations	8	4.7
Other healthcare workers	6	3.5	Unemployed	6	3.5
Unemployed	5	2.9	Worker	4	2.4
Physician's Assistant	3	1.8	Junior	2	1.2
Driver	2	1.2	Formal worker	2	1.2
Formal worker	2	1.2	Informal worker	2	1.2
Informal worker	2	1.2	Student	1	0.6
Farmer	1	0.6	Driver	1	0.6
Self-employed	1	0.6			
Laborer	1	0.6			

Source: SINOLAVE Platform. Cutoff date: 03/03/2022 for thesis project developed at Regional General Hospital No. 1, Cd. Obregón, Sonora.

No statistically significant differences were found in the frequency of comorbidities between the two groups. Table 2 describes the proportions of each comorbidity, first for the BNT162b2 group and then for the Astra group, followed by the significance value of the Pearson chi-squared test. Hypertension 0.28 and 0.34 (p=0.29). Nephropathy 0.02 and 0.01 (p=0.65). Cancer 0 and 0.02 (p=0.08). COPD 0.01 and 0.03 (p=0.25). Diabetes mellitus 0.12 and 0.15 (p=0.43). Asthma 0.03 and 0.02 (p=0.73). Immunosuppression

0.01 and 0.01 (p=1). Smoking 0.06 and 0.05 (p=1). Obesity 0.14 and 0.12 (p=0.62). Pregnancy 0.01 and 0.01 (p=1).

Table 2. Contrast of comorbidities in fully immunized patients who had COVID-19 treated at Regional General Hospital 1, Cd. Obregón, Sonora..

Variable			*x2 de Pearson*	*x2 (p)*	Fisher's exact test (*p*)
Comorbidity					
ChAdOx1	91	79	0.47	0.82	
BNT162b2	93	77			
Hypertension			1.16	0.29	
ChAdOx1	113	57			
BNT162b2	122	48			
Nephropathy			0.203	0.65	1
ChAdOx1	168	2			
BNT162b2	167	3			
Cancer					
ChAdOx1	167	3	3.02	0.82	0.24
BNT162b2	170	0			
COPD			1.31	0.25	0.44
ChAdOx1	165	5			
BNT162b2	168	2			
Diabetes					
ChAdOx1	144	26	0.61	0.43	
BNT162b2	149	21			
Asthma			0.11	0.73	1
ChAdOx1	166	4			
BNT162b2	165	5			
Immunosuppression					
ChAdOx1	168	2	0	1	1
BNT162b2	168	2			
Smoking					
ChAdOx1	159	11	0	1	
BNT162b2	159	11			
Obesity			0.24	0.62	
ChAdOx1	150	20			
BNT162b2	147	23			
Pregnancy			0	1	1
ChAdOx1	168	2			
BNT162b2	168	2			

Source: SINOLAVE Platform. Cutoff date: 03/03/2022 for thesis project developed at Regional General Hospital No. 1, Cd. Obregón, Sonora.

No statistically significant differences were found between the two study groups for hospitalization, mechanical ventilation, or death (Table 3).

Table 3. Contrast of complications in the groups vaccinated with BNT162b2 and ChAdOx1 Zeneca who had COVID-19 treated at HGR 1, Cd. Obregón, Sonora.

			x2 de Pearson	*p*
	Hospitalization			
ChAdOx1	127	43	3.45	0.063
%	47.4%	59.7%		
BNT162b2	141	29		
%	52.6%	40.3%		
	Assisted Mechanical Ventilation			
ChAdOx1	168	2	0.33	0.563
%	49.9%	66.7%		
BNT162b2	169	1		
%	50.1%	33.3%		
	Pneumonia			
ChAdOx1	135	35	*7.35*	*0.007*
%	46.9%	67.3%		
BNT162b2	153	17		
%	53.1%	32.7%		
	ICU admission			
ChAdOx1	166	4	*4.04*	*0.044*
%	49.4%	100%		
BNT162b2	170	0		
%	50.6%	0.0%		
	Long stay			
ChAdOx1	162	8	*5.59*	*0.018*
%	48.9%	88.9%		
BNT162b2	169	1		
%	51.1%	11.1%		
	Death			
ChAdOx1	150	20	0.12	0.732
%	49.7%	52.6%		
BNT162b2	152	18		
%	50.3%	47.4%		
	Serious Illness		*4.38*	*0.036*
ChAdOx1	131	39		
%	47.3%	61.9%		
BNT162b2	146	24		
%	52.7%	38.1%		

Source: SINOLAVE Platform. Cutoff date: 03/03/2022 for thesis project developed at Regional General Hospital No. 1, Cd. Obregón, Sonora.

Among patients with pneumonia, 67.3% had been vaccinated with Astra and 32.7% with BNT162b2 (χ^2 test, p = 0.007, OR = 2.33, 95% CI: 1.2–4.35). None of the patients admitted to the ICU had a history of BNT162b2 vaccination; 100% had been immunized with ChAdOx1 nCoV-19 (χ^2 test, p = 0.044, OR = ∞) (Table 4).

Table 4. Risk of immunized patients with severe COVID-19 disease treated at Regional General Hospital 1, Cd. Obregón, Sonora

	SI	NO	*OR*	IC 95% L. inf	(p)
	Hospitalization		1.64	0.97 - 2.79	0.08
ChAdOx1	43	127			
BNT162b2	29	141			
	Assisted Mechanical Ventilation		2	0.18 - 22.4	0.31
ChAdOx1	2	168			
BNT162b2	1	169			
	Pneumonia		**2.33**	1.25 - 4.35	**0.003**
ChAdOx1	35	135			
BNT162b2	17	153			
	ICU admission		**8**	8	**0.03**
ChAdOx1	4	166			
BNT162b2	0	170			
	Long stay		**8.34**	1.03 - 67.47	**0.01**
ChAdOx1	8	162			
BNT162b2	1	169			
	Death		1.12	0.57 - 2.21	0.36
ChAdOx1	20	150			
BNT162b2	18	152			
	Serious Illness		**1.81**	1.03 - 3.17	**0.01**
ChAdOx1	39	131			
BNT162b2	24	146			

Source: SINOLAVE Platform. Cutoff date: 03/03/2022 for thesis project developed at Regional General Hospital No. 1, Cd. Obregón, Sonora.

Prolonged hospital stays occurred in 9 patients, of whom 88.9% were immunized with Astra and 11.1% with BNT162b2 (χ^2 test, p=0.018; OR=8.34, 95% CI: 1.03-67.47). Severe disease occurred in 63 patients, of whom 61.9% were immunized with ChAdOx1 nCoV-19 and 38.1% with BNT162b2 (χ^2 test, p=0.036; OR=1.81, 95% CI: 1.02-2.57).

DISCUSSION.

The complications of SARS-CoV-2 infection are heterogeneous and depend on multiple variables, such as age, sex, ethnicity, and comorbidities.[20] In this study, both groups were homogeneous in age, gender, comorbidities, and occupation, so these factors did not affect the validity of the results.

Other authors have described that antibody concentrations increase more slowly and to a lower level with the ChAdOx1 nCoV-19 vaccine than with the BNT162b2 vaccine.[21] This could also be a possible reason why severe illness occurred more frequently in the group vaccinated with ChAdOx1 nCoV-19.

In this study, no statistically significant differences were found between the two groups in terms of hospitalization risk reduction. International research differs on this point. While some authors found no difference between the two vaccine brands in reducing the risk of hospitalization,⁸ other studies describe differences in the hospitalization rate, with results favoring the BNT162b2 vaccine.[22] This may be because hospitalization criteria vary significantly depending on geographic location, hospital unit, or even the stage of a COVID-19 wave, where factors such as the standard of care or bed availability can affect hospital admission thresholds.[27]

No greater benefit of one vaccine over the other was identified with respect to preventing death, which is consistent with what was described by Sheikh A. (2021), "the vaccine efficacy against death […] 14 days or more after the second dose of the vaccine, was 90% (95% CI, 83 to 94) for BNT162b2 and 91% (95% CI, 86 to 94) for ChAdOx1 nCoV-19".25 These results should be interpreted with caution because death may not be a specific consequence of SARS-CoV-2 infection, especially during the Omicron variant wave, which had high infection rates.

A possible misclassification of the cause of death should be considered, particularly among older adults with comorbidities who are at higher risk of dying from other causes.[27] When analyzing death as a complication, the cause of death should be validated as being due to COVID-19 and not merely associated with COVID-19.

The risk of requiring mechanical ventilation was similar in both groups; however, a significant difference (p=0.04) was found for ICU admission, favoring the BNT162b2 group. In the international literature, the reported effectiveness of ChAdOx1 nCoV-19 in preventing ICU admission was 89.9%, and in reducing the need for mechanical ventilation (MV) by 96.5%;23 while the effectiveness of BNT162b2 was 98% against ICU admission and the need for MV in a case-control study,24 however, a double-blind, randomized, placebo-controlled trial reported 100% effectiveness of ChAdOx1 nCoV-19 in preventing ICU admission.

A significant difference was found in favor of the BNT162b2 vaccine in the occurrence of pneumonia, OR=2.33 (p=0.003). No data were found in the international literature on the effectiveness of vaccines in reducing the risk of pneumonia; this could be because pneumonia is not traditionally considered a criterion for defining severe COVID-19. It is also possible to make the mistake of assuming that a hospitalized patient inherently has some degree of pneumonia, and therefore it is not studied as a complication. However, this is not always the case. In fact, many patients with confirmed COVID-19 may be hospitalized for non-respiratory reasons, and some who are present with respiratory symptoms may never develop pneumonia. For this reason, pneumonia, whether clinically defined or confirmed by laboratory testing, should be considered a complication or a criterion for defining severe COVID-19.

Among the complications studied in this research, prolonged hospital stay showed the highest odds ratio (OR) = 8.34 (p = 0.01) in favor of the BNT162b2 vaccine. Considering that both study groups were homogeneous with respect to sex, age, comorbidities, and occupation, we consider it unlikely that this difference is not due to the vaccine brand.

This research has some limitations. One of them is that the effectiveness reported in clinical trials of the BNT162b2 and ChAdOx1 nCoV-19 vaccines is expressed as a percentage obtained from the relative risk calculation, where it was possible to calculate the incidence of severe disease in immunized subjects versus non-immunized subjects. Our study is similar to a case-control study, so the effectiveness analysis is performed by calculating the odds ratio of subjects immunized with one brand versus subjects immunized with another brand. This creates a limitation if a direct comparison of effectiveness with international literature is intended; however, the main objective of the research is achieved.

According to the information analyzed in this study, severe COVID-19 occurred less frequently in the group of patients immunized with BNT162b2 compared to the group of patients immunized with ChAdOx1 nCoV-19. This difference was statistically significant, thus allowing us to answer the researcher's questions and accept the working hypothesis. This finding raises concerns about whether the effectiveness of the ChAdOx1 nCoV-19 vaccine in preventing severe COVID-19 is truly as reported by the Oxford-AstraZeneca laboratory. According to official reports, it should have similar results to the Pfizer vaccine; however, the results of this study suggest it is much lower, creating a precedent for larger, more controlled studies to clarify this issue and inform future COVID-19 vaccination policies in Mexico.

A slight predominance of females was found in both groups, although this difference was not statistically significant. The mean age, standard deviation, and age distribution were similar. Systemic hypertension and diabetes mellitus were the most frequent comorbidities in both groups. Thus, both groups were homogeneous in their sociodemographic and epidemiological characteristics.

One of the study's objectives was to quantify the magnitude of this difference. Finding that the risk of developing severe illness is 1.81 times higher when vaccinated with ChAdOx1 nCoV-19 compared to BNT162b2, this is an important finding as it contradicts official information on ChAdOx1 nCoV-19, which indicates that it has the same effectiveness as BNT162b2 in reducing the risk of severe COVID-19. This should be considered in public health decision-making regarding future contracts with laboratories.

When analyzing hospitalization rates between the two study groups, we found no statistically significant differences. However, when defining severe illness considering factors such as the need for mechanical ventilation, ICU admission, prolonged hospital stays, etc., we found significant differences between the two groups. This finding highlights the importance of following the current WHO recommendation not to consider hospitalization as the sole criterion for defining severe COVID-19 disease, but to use more specific definitions, since currently a large proportion of hospital admissions are associated with, but not caused by, SARS-CoV-2 infection, so these definitions probably better assess the protection of vaccines against COVID-19 disease.

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Effect of social determinants of health in patients with COVID-19

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Abstract

Introduction: The SARS-CoV-2 virus has caused an increase in mortality and its consequences have been studied little in the context of the social determinants of health in Hermosillo, Sonora.

Objective: To evaluate the effect of social determinants on patients confirmed with COVID-19.

Materials and methods: A cross-sectional study was conducted. Classified as observational, analytical, and retrospective, it characterized patients diagnosed with COVID-19 by assigned unit, level of marginalization, occupation, age group, and sex. The association between the severity of COVID-19 and the level of marginalization was estimated, adjusting for potential confounders.

Results: For the outcome variable of death, logistic regression showed that the probability of occurrence was 1.73 and 1.90 times higher for medium and high levels of marginalization, respectively, compared to low levels of marginalization (1.25-2.37, 95% CI, P=0.001; 1.18-3.07, 95% CI, P<0.001). Multiple logistic regression showed that the probabilities of experiencing a death outcome were 1.30 and 1.21 times higher for medium (0.90-1.8, 95% CI, P=0.15) and high (0.69-2.01, 95% CI, P=0.45) levels of marginalization, respectively, compared to low levels of marginalization, adjusted for age, sex, and vaccination status.

Conclusions: This study concludes that COVID-19 patients treated in the unit, who belong to an area with a higher degree of marginalization, are more likely to be hospitalized and to die from COVID-19 than those with a lower degree of marginalization.

Keywords: SARS-CoV-2, social determinants of health, marginalization index, COVID-19.

INTRODUCTION

The SARS-CoV-2 virus has caused an increase in mortality (1), and its consequences have been studied little in the context of the social determinants of health in Hermosillo, Sonora (2). The health system in Mexico must take the necessary measures to guarantee the right to health and effective access for all people in the face of the serious risk of contracting COVID-19. It must also prepare for the increased demand for care and, in particular, identify the populations with the greatest vulnerability (3)

The social determinants of health model addresses the social factors that influence the health status of a population. These include social class, occupation, place of residence, gender, indigenous status, and whether one lives in a rural or urban area with high levels of marginalization, as well as access to healthcare resources (5,6). In this theory, facilitating conditions are those that specifically, objectively, and externally enable people to seek care (7). Explanatory variables are identified for certain external constructs based on the assumption that they influence behavior through factors such as knowledge, social influence, social experience, and access. Examples include national regulations, the implementation of local public policies to address the problem, the availability of sufficient resources and capacity to care for critically ill patients, and sociodemographic characteristics (7,8).

Marginalization Index and Degree: This indicator, developed by the National Population Council (CONAPO), considers the population's basic education, housing type (differentiating amenities and infrastructure), localities by size, dispersion, and isolation, and the perception of low monetary income (9)(10). These estimates of the marginalization index for municipalities, localities, and urban areas were obtained from the 2020 Population and Housing Census (11). They will allow us to estimate regional and local inequality in social opportunities for the population of Hermosillo, Sonora (12). COVID-19 Severity: Measuring severity depends on the criteria established for each disease and on epidemiological surveillance systems and their capacity to detect cases. With an unknown disease like COVID-19, severity criteria are not defined or standardized at the beginning of the epidemic. A commonly used criterion is the need for hospital admission and/or ICU admission (13). Other indicators include mortality determined by death certificate data (14).

As cases multiply, in a context of high transmission, the hospital system may become overwhelmed. This could lead to care being provided in other settings, such as homes or paramedical areas, and therefore these cases could be classified as non-severe according to the adopted criteria (15).

Information Systems (IS): Any health information system for epidemiological surveillance must meet the minimum requirements established by NOM-017-SSA2-2012 for establishments that provide public services (16). Furthermore, to measure morbidity, the following characteristics must be considered: time, place, and person; whether patients are being treated for the first time; the time or date of diagnosis; and the relative proportion by vaccination status (COVID-19 and seasonal influenza vaccination) (16).

Mexico has made progress in developing an Information System (IS) for the standardized recording of variables of interest related to COVID-19. The Mexican Social Security Institute (IMSS) uses the Online Notification System for Epidemiological Surveillance (SINOLAVE)(17). The Single Epidemiological Surveillance Information System and databases are also useful for registering and monitoring new cases and recurrences, respectively (17).

This information system aims to collect, consolidate, and record data on patients treated by IMSS institutions with suspected or confirmed respiratory illness to ensure data quality, which will support the comparison of health interventions (17). In Hermosillo, this data is collected by healthcare personnel in family medicine units and at General Zone Hospital #14 with a Burn Unit (HGZ #14 c/UQ). This is where systematically recorded information is collected on variables such as: sociodemographic (age, birth status, place of residence, indigenous status), occupation, assigned family medicine unit, date of symptom onset, clinical data at the time of collection, and place of care, “Suspected Viral Respiratory Disease Case Study Form” (18). Additionally, the results of rapid antigen tests for SARS-CoV-2 and RT-PCR tests for SARS-CoV-2 are recorded, along with their corresponding dates of performance and result delivery (19). Manual procedures, such as user data entry, generate expected errors in a large database, and patients can also introduce bias when providing registration information (20).

Relationship between health inequities and COVID-19: There is international evidence of how health inequities can affect people's health and increase their susceptibility to COVID-19 and death from it. For example, in an urban area of Spain, an increase in cases was found among the poorest groups compared to the wealthiest, mainly during the second pandemic peak, with a risk of 1.67 (95% CI: 1.41-1.96) in the highest income quintile for men and 1.71 (95% CI: 1.44-1.99) for women (21). Income inequalities at the area level in the incidence of COVID-19 were present to varying degrees in all four waves. In the second wave (October 1, 2020 to December 6, 2020), the relative risk (RR) for census tracts in the poorest income quintile compared to the richest was 1.43 (95% confidence interval [CI]: 1.22–1.67) for men and 1.58 (95% CI: 1.35–1.83) for women. Subsequently, inequalities in vaccination coverage also emerged (22). Equity-oriented policy responses included “health hotels” or home delivery of essential goods for people with COVID-19 who lacked adequate conditions for isolation (22).

Some articles discuss the winter season and the different waves to distinguish peak moments during the COVID-19 pandemic, as well as different characteristics of the virus and its impact on the population (23, 24, 25).

Other variables, such as occupation, were also considered. Studies conducted in California compared the incidence and mortality rates of the COVID-19 outbreak and found them to be higher in the public transportation industry compared to all other industries combined. This finding may be due to the fact that many transit workers have jobs that involve close and frequent contact with coworkers and the public. For example, in New York City, among transit workers who died from COVID-19 early in the pandemic, 57% worked in public-facing positions. Furthermore, taxi and bus drivers had the highest COVID-19 mortality rates among all occupational groups (26,27).

Globally, there are population groups whose exercise of rights is systematically compromised and where lower levels of well-being exist, along with a high prevalence of inequities and inequalities in access to healthcare, which significantly contributes to morbidity, disability, and premature mortality (28). In the Americas, issues related to social gradient, inequalities, and inequities in health increase the risk of dying from communicable diseases, non-communicable diseases, and injuries (5).

In Mexico, the COVID-19 pandemic was faced under vulnerable conditions, despite being a middle-income country; four out of ten people live in poverty (41.9%) (28). In areas with higher concentrations of poverty, there is a lower probability of receiving quality hospital care and higher mortality rates (29). Other prominent factors include gaps in access to social rights: food, education, housing, and social security (30).

In Mexico, the country faced the COVID-19 pandemic under vulnerable conditions, despite being a middle-income country; four out of ten people live in poverty (41.9%) (28). In areas with higher concentrations of poverty, there is a lower probability of receiving quality hospital care and higher mortality rates (29). Other factors that stand out are gaps in access to social rights: food, education, housing, and social security (30).

COVID-19 resulted in a phenomenon of great impact and social significance (31). It was recognized as a public health emergency of international concern and subsequently declared a pandemic by the WHO in 2020, when it spread to numerous countries, including Mexico (32).

The health system in Mexico must take the necessary measures to guarantee the right to health and effective access for all people in the face of the serious risk of contracting COVID-19. It must also prepare for the increased demand for care and identify the most vulnerable populations. To this end, it is essential to contribute to and utilize population-based diagnostic measures and impact assessments at the local level (28).

At the Mexican Social Security Institute (IMSS), the study, based on the work carried out by the National Population Council (CONAPO) on health inequities, serves to explore social equity using sociodemographic variables in the population affected by COVID-19. Thus, evaluation measures are established to improve the quality of care at the institution that serves more than 45% of the population (3). First, the vulnerable groups most affected by severe COVID-19 in the study population are identified. This provides a starting point and justification for research with greater investment (34). With this evidence, targeted strategies can be proposed, for example: adherence to and improvement of action algorithms for patients with COVID-19 in the area of medical care (35,36). For the IMSS, this research contributes to measuring and fulfilling the objective of health equity. Finally, it contributes elements to the public discussion to identify points of conflict and support decision-making in the organization of health care (35).

Finally, the objective of the study was to evaluate the effect of social determinants of health in patients confirmed with COVID-19 at General Hospital of Zone 14 with Burn Unit, Hermosillo, Sonora.

MATERIALS AND METHODS

The study was conducted at General Hospital Zone #14 with a burn unit, located in Hermosillo, Sonora. This secondary-level unit serves the northern region of Hermosillo and is the referral hospital for patients covered by the Mexican Social Security Institute (IMSS) with severe respiratory illness.

The study design was cross-sectional, observational, analytical, and retrospective, covering the period from April 11, 2020, to October 31, 2022. The dependent variable was the severity of COVID-19, as measured by hospital discharge. The independent variables were the degree of marginalization, used to measure socioeconomic status based on housing conditions, education, population size (less than 5,000 inhabitants), and employment with a salary exceeding two minimum wages. This information is detailed in a public database compiled by INEGI and calculated by CONAPO in quintiles: very low, low, medium, high, and very high degree of marginalization.

The study population consisted of patients diagnosed with COVID-19 confirmed by RT-PCR and rapid antigen tests, diagnosed by COVID-19 and by epidemiological association at General Hospital Zone #14 with Burn Unit, from April 7, 2020, to October 31, 2022.

The sample size was calculated using the EPI-TOOLS program (47) based on the proportion of cases from 2020 to 2022 in the population of Hermosillo, Sonora, up to week 48, according to the epidemiological report (references 37, 38). With a 95% confidence level and a power of 0.80% (48), a sample of 84 individuals was obtained.

The protocol was submitted to the ethics and research committee for review and approval, as it did not represent a risk and the data was kept confidential.

Patients treated at General Hospital Zone #14 with a Burn Unit and diagnosed with COVID-19 who had a confirmatory COVID-19 test (patients with a positive RT-PCR test, SARS-CoV-2 antigen test, clinical diagnosis, or epidemiological link) were included. Patients diagnosed with COVID-19 and treated at General Hospital Zone #14 with a Burn Unit who lacked information on their usual residence were excluded. Patients whose outcome was unknown due to transfer or abandonment of the unit, or loss to follow-up, were also excluded.

A univariate analysis of the main measurements was performed. Measures of central tendency such as mean, mode, and median were obtained, as well as frequencies, proportions, and percentages. Subsequently, a bivariate analysis was performed with the dependent variables (death and recovery; outpatient vs. inpatient management) compared with the independent variables (degree of marginalization). To analyze the study hypothesis, the difference between groups was demonstrated using Fisher's chi-square test for unrelated dichotomous qualitative variables. Finally, a multivariate analysis was performed on the variables that were significant within the 95% confidence interval. The free software packages Excel and STATA were used for this purpose.

RESULTS

During the period from April 7 to October 31, 2022, at General Hospital Zone No. 14 with Burn Unit in Hermosillo, Sonora, a total of 5,354 patients with suspected COVID-19 were enrolled in the following study. Of these, 3,221 (60.16%) were confirmed and 2,133 (39.83%) were ruled out using RT-PCR testing (1,595). 438 (28.46%) were managed on an outpatient basis, and 1,157

(72.53%) were hospitalized. Additionally, 1,540 (28.76%) were diagnosed using rapid antigen tests; of these, 867 (57.14%) were treated on an outpatient basis and 672 (42.86%) were hospitalized. It was found that less than 2% (87 cases) were confirmed by clinical diagnosis; all of these were hospitalized and died in the unit (TABLE 1). Of the 3221 confirmed patients, the outcome or death was described as part of the first objective, resulting in a total of 980 deaths: 540 (29%) were confirmed by laboratory testing (RT-PCR), 353 (22.93%) by rapid antigen test, and 87 (1.62%) by clinical diagnosis (Table 1).

Table 1. Percentage of patients diagnosed with COVID-19 according to diagnostic test, HGZ 14 with UQ Hermosillo 2020-2022

	Total		COVID-19 confirmed								
					CONF ASO		CONF Ag		CONF OP		p Value[b]
Variables	N	%	n	%	n	%	n	%	n	%	
Clinical Severity											
Outpatient	2,633	49.18	438	28.46	0	0	867	56.33	0	0	p<0.001[b]
Hospitalized	2,721	50.82	1,157	72.53	0	0	672	43.66	87	100	
Outcome Severity	2,133	39.84									
Improvement	4,145	77.42	1,055	66.14	0	0	1,186	77.06	0	0	p<0.001[b]
Death	1,209	22.58	540	33.85	0	0	353	22.93	87	100	
Total	5,354	100	1,595	29.79	0	0	1,539	28.74	87	1.62	
Degree of Marginalization [a]											
Very Low	1,899	83.83	977	61.25	0	0	871	56.59	51	58.62	p=0.005[b]
Low	1085	13.37	489	30.65	0	0	569	14.74	27	31.03	
Medium	167	2.07	93	5.83	0	0	70	1.95	4	4.59	
High	50	0.43	27	1.69	0	0	19	0.26	4	4.59	
Very High	20	0.30	9	0.56	0	0	10	0.45	1	1.14	
Total	3,221	100	1,595	49.51	0	0	1,539	47.78	87	2.61	
Female	2,882										
Male	2,472	46.17	834	51.17	0	0	673	42.34	58	64.2	p<0.001[b]
Age											
0-19	390	7.28	42	2.63	0	0	115	7.47	0	0	p<0.001[b]
20-59	3,245	60.61	865	54.23	0	0	989	64.26	28	32.18	
60 and over	1,719	32.11	688	43.13	0	0	435	28.27	59	67.82	
Total	5,354	100	1,595	29.79	0	0	1,539	28.74	87	1.62	
IMSS Worker											p<0.001[b]
YES	418	21.2	265	38.8	0	0	418	27.16	0	0	
NOT	1121	78.8	1,330	52.4	0	0	1,121	72.83	87	100	
Total	3221	100	1595	49.52	0	0	1539	47.78	87	2.7	
Pregnancy											
YES	90	8.58	17	1.07	0	0	73	4.74	0	0	
NOT	958	91.41	440	98.93	0	0	601	95.26	7	100	
COVID -19 Vaccination											
Complete	822	25.52	186	11.66	0	0	634	41.2	2	2.3	p<0.0001[b]
Incomplete	138	4.28	43	2.7	0	0	94	6.11	1	1.15	
Not Vaccinated	2,261	70.2	1,366	85.64	0	0	811	52.7	84	96.55	
Influenza Vaccination											
YES	330	10.25	176	11.03	0	0	154	10.01	0	0	p=0.004[b]
NOT	2891	89.75	1419	88.97	0	0	176	11.03	87	100	

Source: Study protocol developed at General Hospital Zone #14 with bum unit, Hermosillo, Sonora (2020-2022). SINOLAVE database (2020-2022).
ASO= Associated, Ag=Amtigen, OP = Opiniom
a: CONAPO marginalization index database by postal code (2020);
b: Chi square test.

Patients with COVID-19 were characterized according to socioeconomic level. It was found that 92.64% (2984) had “Very Low” and “Low” levels of marginalization; 167 patients (5.18%) had “Medium” levels; and 70 (2.17%) had “High” and “Very High” levels (Table 2). Subsequently, for each level of marginalization—“Very Low” and “Low,” “Medium,” and “High” and “Very High”—the percentage of patients requiring hospitalization was 57.84%, 79.04%, and 82.86%, respectively, showing a proportional relationship between hospitalization and increasing levels of marginalization (Chi2 P<0.001) (Table 2).

Table 2. Percentage of patients diagnosed with COVID-19 according to management and evolution, HGZ 14 with UQ Hermosillo 2020-2022

	Total		COVID-19									
			Ambulatory		Hospitalization		p^b	Improvement		defunción		Valor p^b
Variables	n	%	n	%	n	%		n	%	n	%	
Marginalization index	3221	0.02	0.97	0.01	0.97	0.01	**$p^b<0.001$**	0.97	0.00	0.97	0.00	**$p^b=0.0006$**
Degree of marginalization[a]												
Very low	1,899	58.96	813	62.3	1,086	56.68	**$p^b<0.001$**	1,335	59.57	564	57.55	$p^b = 0.001$
Low	1,085	33.69	445	34.1	640	33.40		770	34.36	315	32.14	
Medium	167	5.18	35	2.68	132	6.89		97	4.33	70	7.14	
High	50	1.55	8	0.61	42	2.19		26	1.16	24	2.45	
Very high	20	0.62	4	0.31	16	0.84		13	0.58	7	0.71	
SEX												
Female	1,656	51.41	809	61.99	847	44.21	**$p^b<0.001$**	1,258	56.14	398	40.61	**$p^b<0.001$**
Male	1,565	48.59	496	38.01	1,024	54.53		983	43.86	582	59.39	
Middl e ages	50.26	21.16	34.91	15.17	60.71	18.06		43.23918	19.57588	66.31	15.00547	**$p^c<0.001$**
median	48	32-67	33.00	15.00	63	25.00	**$p<0.001^d$**	39	29 -55	68	56 -77	$p^d<0.001$
0-19	157	4.87	112	8.58	45	2.35	**$p^b<0.001$**	153	6.83	4	0.41	
20 a 59	1,882	58.43	1,105	84.67	777	40.55		1,589	70.91	293	29.9	
60 and over	1,182	36.7	88	6.74	1,094	56.98		499	22.27	683	69.69	
ASSIGNMENT												
UMF 02	1,165	36.555	477	40.8	688	59.2		816	36.72	341	35.34	
UMF 37	677	21.243	261	38.5	416	61.45		459	20.66	218	22.59	
HGMFS 68	346	10.857	97	28.03	249	71.97		219	9.86	127	13.16	
UMF 63	331	10.386	146	44.11	185	55.89		236	10.62	93	9.64	
UMF 65	322	10.104	202	62.73	120	37.27		259	11.66	63	6.53	
HGMF 6	84	2.6357	11	13.1	73	86.9		48	2.16	36	3.73	
Total	3,187	100	1,295	41	1,892	59		2,222	100	965	100	
IMSS worker												
YES	683	21.2	670	51.34	13	0.68	**$p^b<0.001$**	678	30.25	5	0.51	**$p^b<0.001$**
NO	2,538	78.8	635	48.66	1,903	99.32		1,563	69.75	975	99.49	
Influenza vaccination												
SI	330	10.25	225	17.24	105	5.48	**$p^b<0.001$**	283	12.63	52	5.31	**$p^b<0.001$**
NO	2,891	89.75	1,080	82.76	1,811	94.52		1,963	87.59	928	94.69	
COVID-19 vaccination												
Complete	822	25.52	515	62.65	307	37.35	**$p^b<0.001$**	671	29.94	151	15.41	**$p^b<0.001$**
Incomplete	138	4.28	25	18.12	113	81.88		88	3.93	50	5.1	
Not applied	2,261	70.2	765	33.83	1,496	66.17		1,482	66.13	779	79.49	
Total	3221	100	1305	40.52	1916	59.48		2241	68.57	980	30.43	

Source: Study protocol developed at General Hospital Zone #14 with burn unit, Hermosillo, Sonora (2020-2022). SINOLAVE database (2020-2022),
a: CONAPO marginalization index database by postal code (2020)
b: Chi-square test
c: Student's t-test
d: Mann-Whitney U test

In the outcome variable (death or improvement) in patients with COVID-19 according to their degree of marginalization: it was observed that as the degree of marginalization increased, so did the percentage of deaths among the groups, being less than 30% in the very low and low degree of marginalization with a statistically significant difference (Pearson Chi2= 18.09, P<0.001) (Table 2). Other variables were characterized and summarized in Table 3.

Table 3. Percentage of patients diagnosed with COVID-19 according to management and evolution, HGZ 14 Hermosillo 2020-2022

	Total		COVID-19									Valor p^a
			Ambulatory		Hospitalization		p^a	Improvement		Death		
Variables	n	%	n	%	n	%		n	%	n	%	
OCCUPATION												
Farmers	3	0.09	1	0.08	2	0.1	**p=0.0001**	2	0.09	1	0.1	**p=0.001**
Drivers	18	0.56	1	0.08	17	0.89		9	0.4	9	0.92	
Merchants	33	1.02	1	0.08	32	1.67		16	0.71	17	1.73	
Unemployed	188	5.84	78	5.98	110	5.74		140	6.25	48	4.9	
Employed	771	23.94	278	21.99	484	25.26		590	26.33	181	18.47	
Nurses	297	9.22	190	22.22	7	0.37		293	13.07	4	0.41	
Students	65	2.02	45	3.45	20	1.04		63	2.81	2	0.2	
Managers/Owners	3	0.09	0	0	3	0.16		1	0.04	2	0.2	
Homeowners	617	19.16	102	7.82	515	26.88		348	15.53	269	27.45	
Retired/Pensioner	570	17.7	46	3.52	524	27.35		236	10.53	334	34.08	
Laboratory Technicians	17	0.53	17	1.3	0	0		17	0.76	0		
Teachers	4	0.12	0	0	4	0.21		4	0.18	0		
Doctors	177	5.5	168	12.87	9	0.47		174	7.76	3	0.31	
Workers	4	0.12	0	0	4	0.21		1	0.04	3	0.31	
Other	237	7.36	66	5.06	171	8.92		135	6.02	102	10.41	
Other Professionals	6	0.19	0		6	0.31		3	0.13	3	0.31	
Other Workers	211	6.55	203	15.56	8	0.42		209	9.33	2	0.2	
Total	3221	100	1305	40.52	1916	59.48		2241	68.57	980	30.43	

Source: Study protocol developed at General Hospital Zone #14 with burn unit, Hermosillo, Sonora (2020-2022). SINOLAVE database (2020-2022)

a: Chi-square test

A logistic regression was also performed to evaluate the association between socioeconomic level and its effect on COVID-19 patients. The results showed that, compared to patients with low and very low levels of marginalization, hospitalization was required 2.75 times more often in the subgroup with medium levels of marginalization and 3.52 times more often in the subgroup with high levels of marginalization (1.88–4.02, 95% CI, p < 0.001, 1.88–4.02, 95% CI, p < 0.001) (Table 4). Subsequently, adjustments were made for age, sex, and vaccination status in a multiple logistic regression, yielding hospitalization prevalence ratios of 2.47 and 2.60 for medium and high levels of marginalization, respectively, compared to low levels of marginalization (Table 4).

Table 4. Effect of social determinants on COVID-19 patients according to severity. Hermosillo, Sonora HGZ 14 (2020-2022). Simple and multiple logistic regression model

Variables		Simple			Multiple	
	β [b]	IC 95	p-value	β [c]	IC 95	p-value
Degree of marginalization [a]						
Low	1.00			1.00		
Medium	2.75	1.88 - 4.02	**p<0.001**	2.47	1.56 - 3.90	**p<0.001**
High	3.52	1.88 - 6.59	**p<0.001**	2.60	1.23 - 5.50	**p=0.013**
Age						
0-19	1.00			1.00		
20-59	1.75	1.22 - 2.50	**p<0.001**	2.96	2.04 - 4.29	**p<0.001**
60 and over	30.94	20.57 - 46.55	**p<0.001**	64.10	41.29 - 99.52	**p<0.001**
Sex						
Woman	1.00			1.00		
Man	2.06	1.78 - 2.38	**p<0.001**	2.17	1.81 - 2.60	**P<0.001**
Seasonal vaccine						
Vaccinated	1.00			1.00		
Not	3.59	2.82 - 4.58	**p<0.001**	3.16	2.32 - 4.30	**p<0.001**
COVID-19 vaccine						
Complete	1.00			1.00		
Incomplete	7.58	4.81 - 11.96	**p<0.001**	15.47	9.29 - 25.75	**p<0.001**
Not applied	3.28	1.92 - 3.87	**p<0.001**	2.39	3.71 - 5.81	**p<0.001**
Intercept	-					
	1460.23					
R^2	1428.18					
N	3221.00					

Source: Study protocol developed at General Hospital Zone #14 with burn unit, Hermosillo, Sonora (2020-2022). SINOLAVE database (2020-2022).
a: CONAPO postal code marginalization index database (2020);
b: simple logistic regression model;
c: multiple logistic regression model

For the outcome variable of death, logistic regression showed that the odds ratio (OR) was 1.73 and 1.90 times for medium and high levels of marginalization, respectively, compared to low levels of marginalization (1.25-2.37, 95% CI, P=0.001; 1.18-3.07, 95% CI, P<0.001) (Table 5). In multiple logistic regression, the probabilities of experiencing a death outcome were 1.30 and 1.21 times for medium (0.90-1.88, 95% CI, P=0.15) and high (0.69-2.01, 95% CI, P=0.45) levels of marginalization, respectively, compared to low levels of marginalization (Table 5).

Cuadro 5. Effect of social determinants on COVID-19 patients according to whether they died, HGZ 14 Hermosillo Sonora (2020-2022). Simple and multiple logistic regression model.

	Simple			Multiple		
Variables	**β [a]**	**IC 95**	**Valor p**	**β**	**IC 95**	**Valor p**
Grado marginación[a]						
Low	1			1		
Medium	1.73	1.258 - 2.37	**p=0.001**	**1.30**	0.90251 - 1.88029	**p=0.158**
High	1.90	1.18 - 3.07	**p=0.008**	**1.21**	0.698621 - 2.10342	**p=0.494**
Age						
0-19	1			1		
20-59	7.05	2.593 - 19.18	**p<0.001**	9.34	3.42 - 25.46	**p<0.001**
60 and over	52.4	19.27 - 142.23	**p<0.001**	66.33	24.34 - 180.76	**p<0.001**
Sex						
Woman	1			1		
Man	1.87	1.61 - 2.18	**p<0.001**	1.79	1.51 - 2.13	**p<0.001**
Seasonal vaccine						
Vaccinated	1			1		
Not	2.53	1.86 - 3.43	**p<0.001**	1.81	1.29 - 2.55	**p=0.001**
COVID-19 vaccine						
Complete	1			1		
Incomplete	2.52	1.71 - 3.73	**p<0.001**	3.31	2.132046 - 5.1325	**p<0.001**
Not applied	2.34	1.92 - 2.84	**p<0.001**	2.39	1.92 - 2.98	
Intercept	-1971					
R^2	824.64					
n	3221					

Source: Study protocol developed at General Hospital Zone #14 with burn unit, Hermosillo, Sonora (2020-2022). SINOLAVE database (2020-2022).

a: CONAPO postal code marginalization index database (2020); b: simple logistic regression model; c: multiple logistic regression model

DISCUSSION.

The most important finding of this research is the discovery that the degree of marginalization in the population of Hermosillo, Sonora, affects the mortality and hospitalization rates among COVID-19 patients.

Compared to other studies, such as that of Ortiz-Hernández et al., the population of Hermosillo, Sonora, has a lower percentage of people with high and very high levels of marginalization. Furthermore, their study used health insurance coverage as a confounding variable, resulting in greater variability. They used 252,761 observations of confirmed cases, all data being at the national level, and observed progressive percentages of pneumonia and intubation as the marginalization index increased by region (53). However, they only used data from the first and second waves (53). It is important to highlight that both articles contribute to supporting and confirming that a higher degree of marginalization is associated with a proportional increase in health complications (53). Meanwhile, for future studies, it would be interesting to explore Poison regression, as in the cited article (53).

The social determinants of health in the context of COVID-19 are structural, stemming from the lack of a unified health system in all countries, the shortage of healthcare units, services, and resources, and the inequalities in access to medical care (54).

Some limitations of the study lie in the power of association, as the sample size decreases in the highest levels of marginalization. This could reflect the difficulties in accessing health services as the level of marginalization increases. It is also related to the lower proportion of people in the highest levels of marginalization covered by the Mexican Social Security Institute (IMSS). However, this is a strength at the local level for identifying the most vulnerable population, and interventions targeting this population to improve access to health services would be beneficial.

Another important limitation is that the index and level of marginalization were obtained from an open-access database containing summary measures of socioeconomic status linked to patients' usual residence. It also represents a very important analytical strength, since information on the socioeconomic level of the population was gathered in a short time, but when interpreting the results, care must be taken to avoid falling into an ecological fallacy (55).

Throughout the course of this pandemic and its ongoing study to understand the evolution of SARS-CoV-2 disease, poor prognostic factors have been established (56). Among these, it has been observed that males and people over 60 years of age are at greater risk of a poor outcome. According to the results obtained in this study, cases were found to have a homogeneous distribution (men, 48.59% and women, 51.41%) and a median age of 48 years. In Mexico, where in the first year two men died for every woman, Hermosillo, particularly HGZ 14, saw 20% more deaths among men compared to women (53).

Regarding age, the 60 and over age group was the most affected (accounting for almost 70% of all deaths). We have noted the scarcity and disparity of disaggregated data on sex differences in disease severity, comorbidities, recovery rate, length of hospital stay, and number of tests performed (57).

Furthermore, in Mexico, it has been found that as socioeconomic level decreases, the probability of suffering from obesity (58), hypertension (58), and diabetes (59) increases.

This may reflect the indirect effect of socioeconomic level on outcomes of greater comorbidity and death in COVID-19. Finally, analyses of social inequality in natural disasters and the current pandemic suggest that the most marginalized populations suffer disproportionately. One possible intervention would be training healthcare personnel on these findings to significantly contribute to improving health by addressing its social problems and structural determinants (60). There is evidence that shows how in our country vulnerable population groups are suffering a disproportionate impact in terms of both infection and severity and mortality as a result of COVID-19 (61). The discrepancies in the incidence and mortality of COVID-19 in vulnerable populations could be related to a greater risk of exposure to SARS-CoV-2. For example, lack of health and economic services, overcrowding, family problems, unsanitary housing and environment, social insecurity, discrimination, and jobs that require in-person work (transport services, employees, medical care, among others) (26,27,61).

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Risk factors associated with poor prognosis in patients with cervical cancer at General Hospital No. 46

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Abstract

Introduction: Cervical cancer is a global public health problem, being the fourth most common type of cancer among women with an incidence of 13.3 per 100,000 in 2020 and a high mortality rate, especially in low- and middle-income countries. However, the need to identify risk factors to improve the prognosis and management of cervical cancer is imperative.

Objective: To analyze the risk factors associated with poor prognosis in patients with cervical cancer at General Hospital No. 46 in Villahermosa, Tabasco.

Materials and methods: Observational and analytical study, retrospective cohort, carried out at the General Hospital of Zone No. 46, with a total of 76 patients with histopathological diagnosis of cervical cancer from 2018 to 2023, applying a consecutive non-probabilistic sampling, obtaining the data from the electronic records of the patients.

Results: Most patients were diagnosed at advanced stages, which was associated with a higher risk of death, metastasis, and cancer recurrence. Factors such as the number of miscarriages, the type of treatment received, and occupation were significantly related to prognosis, and patients who did not undergo surgery or who received only chemotherapy or radiotherapy had a worse clinical course, likely due to being at more advanced stages.

Conclusions: The clinical stage at diagnosis is a key factor in prognosis, and early surgical intervention can significantly improve survival. Furthermore, the need to strengthen screening programs, ensure access to timely treatment, and design more effective follow-up strategies to reduce the impact of this disease on the most vulnerable women is emphasized.

Keywords: Cervical cancer, risk factors, recurrence, poor prognosis.

INTRODUCTION

Cervical cancer (CC) remains a leading cause of morbidity and mortality in women worldwide, despite being largely preventable through screening and vaccination strategies. In 2020, an estimated 604,000 new cases and 342,000 deaths were reported, making it the fourth most common cancer in women and one of the deadliest in low- and middle-income settings, where approximately 85% of deaths occur (1,2). This pattern reflects persistent inequalities in access to early diagnosis, timely treatment, and continuity of clinical follow-up.

In Latin America, the burden of CC remains high due to gaps in screening programs, institutional difficulties in ensuring continuous follow-up, and sociocultural factors that limit women's participation in preventive services (3). In Mexico, CC remains one of the most frequent cancers, with incidence and mortality rates higher than those observed in high-income countries. In response to this situation, the country has implemented various strategies: human papillomavirus (HPV) vaccination campaigns, improved Pap smear coverage, incorporation of HPV testing as primary screening, and increased funding for cancer treatments by the public system (4–6). These interventions have led to improved survival rates, reaching 68.5% in patients treated through public programs between 2006 and 2014 (5). However, a large proportion of cases continue to be diagnosed at advanced stages, which directly influences recurrence, metastasis, and mortality.

The progression of cervical cancer results from a complex interaction between viral, biological, gynecological-obstetric, sociodemographic, and healthcare access factors. The clinical stage at diagnosis, traditionally classified using FIGO, has been recognized as one of the most robust predictors of prognosis (7). The impact of factors such as the type of treatment received, the presence of lymph node metastases, therapeutic adherence, and delays in initiating cancer treatment—a frequent problem in overburdened healthcare systems—has also been documented (8–10). Recent studies also show the influence of characteristics such as age, parity, number of miscarriages, occupation, and education level on the risk of tumor progression and poor clinical outcome (11,12).

In Mexico, institutional research from the Mexican Social Security Institute (IMSS) has highlighted additional challenges, including the fragmentation of clinical records, loss to follow-up, and diagnostic delays resulting from administrative, logistical, and technological limitations (13,14). Although the IMSS has an Institutional Cancer Registry (RIC), the need to improve data collection and quality has been noted to strengthen epidemiological surveillance and the planning of cancer strategies (14). Early access to diagnostic and treatment services is a key factor in prognosis. Delays between cytology, colposcopy, biopsy, and the start of treatment have been linked to a higher risk of tumor progression, recurrence, and mortality (9,10). In vulnerable populations, factors such as occupation, socioeconomic status, and geographic barriers also have an additional impact, which can limit the use of health services (12,15). This is particularly relevant in areas like southeastern Mexico, where the incidence of cervical cancer is higher than in other regions of the country and where structural challenges in healthcare persist.

The General Hospital No. 46 of the Mexican Social Security Institute (IMSS) in Villahermosa, Tabasco, serves a heterogeneous population, predominantly working, with sociodemographic profiles that can influence access to prevention and timely care services. In this context, identifying the factors associated with poor prognosis in cervical cancer (CaC) is crucial for developing clinical, administrative, and community interventions aimed at improving survival. Understanding which risk factors—clinical, sociodemographic, and therapeutic—are related to adverse outcomes will not only strengthen medical decision-making but also guide institutional policies that reduce mortality and ensure comprehensive and continuous follow-up.

Consequently, this study arises from the need to evaluate, from an epidemiological perspective, the elements that contribute to poor prognosis in a local cohort of patients with cervical cancer, thus contributing to the generation of contextualized evidence that responds to the real needs of the region and the healthcare system, and supporting the improvement of screening programs, early diagnosis, timely treatment, and clinical surveillance. The objective of the study is to analyze the risk factors associated with poor prognosis in patients with cervical cancer at General Hospital No. 46 in Villahermosa, Tabasco.

MATERIALS AND METHODS

T The study was conducted at General Hospital No. 46 of the Mexican Social Security Institute (IMSS) in Tabasco. It employed a retrospective cohort observational design, covering patients with a first-time histopathological diagnosis of cervical cancer between January 1, 2018, and December 31, 2023 (with follow-up until June 30, 2025).

Eighty-four patients with a first-time histopathologically confirmed diagnosis of cervical cancer between January 1, 2018, and December 31, 2023, were included (this represents all patients with this diagnosis during the specified period). Female patients over 18 years of age who were IMSS beneficiaries and had a first-time histopathological diagnosis of cervical cancer issued by another healthcare institution or whose medical records were incomplete were excluded. The study was conducted at the IMSS General Hospital No. 46, located in Villahermosa, Tabasco. A 6.5-year follow-up period was established, beginning on January 1, 2018, and ending on December 31, 2023, for the cohort. However, individual patients will be followed until June 30, 2025. The study was approved by the local research committee.

For data collection in this research, secondary data analysis was used, based on information recorded in the medical records of patients with a first-time histopathologically confirmed diagnosis of cervical cancer.

Statistical analysis was performed using SPSS software, employing the chi-square test for qualitative values, as well as Cox proportional hazards, with 95% confidence intervals.

RESULTS

Eighty-one patients were included in the study, whose characteristics are described in Table 1.

The chi-square test was performed on the three outcome variables studied—Death, Recurrence, and Metastasis—against all covariates used in this study to assess whether there were significant differences between two categorical variables and to establish a relationship between them (Tables 2, 3, 4).

The relationship between occupational status and death was evaluated using a chi-square test. The results showed a statistically significant difference between the groups ($\chi^2 = 3.929$; $p = 0.047$), suggesting that occupation may be associated with mortality in the analyzed population.

The chi-square test showed a statistically significant difference between the groups ($\chi^2 = 8.132$; $p = 0.043$), suggesting a possible relationship between these variables within the analyzed sample. This finding indicates that the number of abortions may be associated with the occurrence of death.

The association between the variable "Clinical Stage at Diagnosis" and death was explored using the chi-square test. The results showed a statistically significant association between both variables ($\chi^2 = 22.661$; $p < 0.001$), indicating that the proportion of deaths varies significantly among the different groups. These results suggest that this variable is strongly related to mortality in the studied population.

The relationship between having received surgical treatment and the occurrence of death was evaluated. The chi-square test showed a statistically significant difference between the two groups ($\chi^2 = 32.706$; $p < 0.001$). This association suggests that patients who did not receive surgical treatment had a higher proportion of deaths compared to those who did.

Table 1. Characteristics of the studied population by age group

Variables		Grupos de edad n(%) 25 to 44	45 to 49	50 to 59	60 to 64	65 and over	Totals
Occupation	Currently employed	13 (48.1%)	4 (40%)	6 (35.8%)	2 (33.3%)	4 (19%)	29 (35.8%)
	Not currently employed	14(51.9%)	6 (1%)	11 (64.7%)	4 (66.7%)	17 (81%)	52 (64.2%)
Marital status	Single	2 (7.4%)	1(10%)	3 (17.6%)	0(0%)	2 (9.5%)	8 (9.9%)
	Married	10 (37%)	7 (70%)	8 (47.1%)	5 (83.3%)	11 (524%)	41 (50.6%)
	Common-law union	10 (37%)	1 (10%)	5 (89.4%)	0(0%)	3 (14.8%)	19 (23.5%)
	Divorced	4 (14.8%)	-10%	-5.90%	0(0%)	0(0%)	6 (74%)
	Widowed	(3,7%)	o (0%)	o (0%)	(16,N)	5 (238%)	7 (8.6%)
Comorbilidades	No comorbidities	19 (70.4%)	5(50.0%)	9 (52.9%)	3 (50.0%)	5 (23.8%)	41 (50.6%)
	Hypertension	1(3.7%)	1(10%)	3(17.6%)	1 (16.7%)	6 (28.6%)	12 (14.8%)
	Type 2 Diabetes	4 (14.8%)	1(10%)	2(11.8%)	2 (33.3%)	2(9.5%)	11(13.6%)
	Metabolic syndrome	0 (0%)	0(0%)	1 (59%)	0(0%)	7 (3.38%)	8 (9.9%)
	Obesity	3(11.1%)	3 (3%)	2 (11.8%)	0(0%)	1(4.8%)	9(11.1%)
Menarche	9 to 10 years	2 (7.4%)	0(0%)	6 (35%)	0 (0%)	1 (4.8%)	9(11.1%)
	11 to 12 years	15 (55.6%)	6 (60%)	6 (35.3%)	5 (83.3%)	10 (47.6%)	42(51.9%)
	>12 years	10 (37%)	4 (4%)	5 (29.4%)	1 (16.7%)	10 (47.6%)	30 (37%)
Menstrual cycle	3 to 5 days	20 (74.1%)	8 (8)%)	13(76.5%)	4 (66.7%)	15(71.4%)	60 (74.1%)
	5 to 7 days	1 (3.7%)	0 (0%)	1 (5.9%)	1 (161%)	2(9.5%)	5 (6.2%)
	>7 days	6 (22.2%)	2 (3%)	3(17.6%)	1 (16.7%)	4 (19%)	16 (19.8%)
Sexual activity	No sexual activity	0 (0%)	0 (0%)	1(5.9%)	0 (0%)	2 (9.5%)	3 (3.7%)
	<15 years	2 (7.4%)	1 (10%)	4 (23.5%)	0(0%)	4 (19%)	11(13.6%)
	>15 years	25(92.6%)	9(9%)	12(70.6%)	6(100%)	15(71.4%)	67 (82.7%)
Sexual partners	0	0(0%)	0(0%)	1 (5.9%)	0(0%)	2(9.5%)	3 (3.7%)
	1	5 (18.5%)	2 (20%)	5(29.4%)	2 (33.%)	7 (33.3%)	21 (25.9%)
	2 to 5	20 (74.1%)	7 (70%)	10 (58.8%)	4(66.7%)	12(57.1%)	53 (65.4%)
	>5	2 (7.4%)	1(10%)	1(5.9%)	0(0%)	0(0%)	4 (4.9%)
Pregnancies	0	2(7.4%)	0 (0%)	1(5.9%)	0 (0%)	2 (9.5%)	5(6.2%)
	1	4 (14.8%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	4 (4.9%)
	2 to 3	14 (51.9%)	6(60%)	8(47.1%)	1 (16.7%)	2 (9.5%)	31(38.3%)
	4 to 5	5 (185%)	3(30%)	7(41.2%)	4 (66.7%)	10 (47.7%)	29 (35.8%)
	>5	2(7.4%)	1(10%)	1(5.9%)	1 (16.7%)	7(33.3%)	12 (14.8%)
Deliveries	0	4 (14.8%)	0(0%)	3(17.6%)	1 (16.7%)	3(14.3%)	11(13.6%)
	1	4 (14.8%)	1(10%)	2(11.8%)	0 (0%)	0(0%)	7(8.6%)
	2 to 3	14 (51.9%)	6(60%)	6(35.3%)	3(50%)	4 (19%)	33(40.7%)
	4 to 5	4 (14.8%)	3(30%)	5(29.4%)	1 (16.7%)	7 (33.3%)	20(24.7%)
	>5	1(3.7%)	0(0%)	1(5.9%)	1 (16.7%)	7 (33.4%)	10(12.3%)
Abortions	0	21(77.8%)	8(80%)	10 (58.8%)	5 (83.3%)	16(76.2%)	60 (74.1%)
	1	5 (18.5%)	2 (20%)	5(29.4%)	1 (16.7%)	5(23.8%)	18(22.2%)
	2	0 (0%)	0 (0%)	2 (11.8%)	0 (0%)	0 (0%)	2 (2.5%)
	>3	1(3.7%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1(1.2%)
Cesarean sections	0	22(81.5%)	7 (70%)	15(88.2%)	3(50%)	15(71.4%)	62 (76.5%)
	1	4 (14.8%)	2(20%)	0(0%)	2 (33.3%)	5(23.8%)	13(16%)
	2	1(3.7%)	1(10%)	0(0%)	0 (0%)	0(0%)	2 (2.5%)
	>3	0 (0%)	0(0%)	2(11.8%)	1 (16.7%)	1 (4.8%)	4 (4.9%)
Clinical stage at diagnosis	Stage I	14 (51.9%)	5(50%)	6(35.3%)	2 (33.3%)	9(42.9%)	36 (44.4%)
	Stage II	8 (29.6%)	2 (20%)	7(41.2%)	3(50%)	5(23.8%)	25(30.9%)
	Stage III	5 (185%)	2 (20%)	1(5.9%)	1 (16.7%)	6(28.6%)	15(18.5%)
	Stage IV	0 (0%)	1(10%)	3(17.6%)	0 (0%)	1 (4.8%)	5(6.2%)
Type of treatment offered	No treatment	1(3.7%)	0(0%)	2(11.8%)	0 (0%)	0(0%)	3(3.7%)
	Surgery	16(59.3%)	4 (40%)	8(47.1%)	2 (33.3%)	7 (33.3%)	37(45.7%)
	Chemotherapy	1(l7%)	0(0%)	0(0%)	1 (16.7%)	3(14.3%)	5(6.2%)
	Radiation therapy	3 (11.1%)	2(20%)	2(11.8%)	0 (0%)	3(14.3%)	10(12.3%)
	Chemotherapy + Radiotherapy	3 (11.1%)	2(20%)	3(17.6%)	1 (16.7%)	3(14.3%)	12 (14.8%)
	Surgery + Chemotherapy	0 (0%)	1(10%)	0(0%)	0 (0%)	0(0%)	1(1.2%)
	Surgery + Radiotherapy	0 (0%)	0(0%)	1(5.9%)	0 (0%)	1 (4.8%)	2 (2.5%)
	Surgery + Chemotherapy + Radiotherapy	3 (11.1%)	1(10%)	1(5.9%)	2 (33.3%)	4 (19%)	11(13.6%)
Cancer recurrence	Yes	5 (18.5%)	0 (0%)	4 (23.5%)	1 (16.7%)	1(4.8%)	11(13.6%)
	No	22 (81.5%)	10 (100%)	13(76.5%)	5 (83.3%)	20 (95.2%)	70 (86.4%)
Metastasis	Yes	3 (11.1%)	1 (10%)	5 (29.4%)	1 (16.7%)	3(14.3%)	13 (16%)
	No	24 (88.9%)	9 (90%)	12(70.6%)	5 (83.3%)	18(85.7%)	68 (84%)
Death	Yes	5 (18.5%)	1 (10%)	4 (23.5%)	3 (50%)	5(23.8%)	18 (22.2%)
	No	22 (81.5%)	9 (90%)	13(76.5%)	3 (50%)	16(76.2%)	63(77.8%)

Source: Information from patient records of General Zone Hospital No. 46

Table 2. Risk of death for cervical cancer

Variable		Death yes	Death no	chi^2 Pearson	*p*
Occupation	Currently employed	10	19	3.929	0.047
	Not currently employed	8	44		
Abortions	0	11	49	8.132	0.043
	1	5	13		
	2	2	0		
	>3	0	1		
Clinical stage at diagnosis	Stage I	3	33	22.661	<0.001
	Stage II	5	20		
	Stage III	5	10		
	Stage IV	5	0		
Surgery	Yes	1	50	32.706	<0.001
	No	17	13		
Chemotherapy	Yes	13	16	13.355	<0.001
	No	5	47		

Source: Information from patient records of General Zone Hospital No. 46

Table 3. Risk of metastasis in cervical cancer

Variable		Metastasis yes	Metastasis no	chi^2 Pearson	*p*
Abortions	0	5	55	20.181	<0.001
	1	5	13		
	2	2	0		
	>3	1	0		
Clinical stage at diagnosis	Stadium I	0	36	34.291	<0.001
	Stadium II	6	19		
	Stadium III	2	13		
	Stadium IV	5	0		
Surgery	Yes	5	46	3.986	0.046
	No	8	22		
Chemotherapy	Yes	9	20	13.355	<0.001
	No	4	48		
Radiotherapy	Yes	9	26	4.232	0.039
	No	4	42		

Source: Information from patient records of General Zone Hospital No. 46

Table 4. Risk of recurrence in cervical cancer

Variable		Recurrence si	Recurrence no	chi^2 Pearson	*p*
Clinical stage at diagnosis	Estadio I	4	32	7.759	0.05
	Estadio II	7	18		
	Estadio III	0	15		
	Estadio IV	0	5		
Radiotherapy	Yes	9	26	7.732	0.005
	No	2	44		

Source: Information from patient records of General Zone Hospital No. 46

The possible association between having received chemotherapy treatment and the occurrence of death was analyzed. The chi-square test revealed a statistically significant association between the two variables ($\chi^2 = 13.355$; $p < 0.001$). The data show that the proportion of deaths was considerably higher in the group that received chemotherapy compared to those who did not. This finding suggests that chemotherapy administration is associated with a higher risk of mortality in the studied population, which could be linked to the severity of the clinical condition of those who received this type of treatment.

A significant association was found between the number of miscarriages and the presence of metastases ($\chi^2 = 20.181$, $p < 0.001$). A higher number of miscarriages was associated with a higher frequency of metastases, although some categories had few cases.

A statistically significant association was identified between the clinical stage at the time of diagnosis and the presence of metastases ($\chi^2 = 34.291$; $p < 0.001$). This indicates that the groups defined by this variable show notable differences in the proportions of metastases. A statistically significant association was found between having received surgical treatment and the presence of metastases ($\chi^2=3.986$; $p=0.046$). This suggests that patients who did not undergo surgery had a higher proportion of metastases compared to those who did.

A statistically significant association was observed between the administration of chemotherapy and the presence of metastases ($\chi^2=13.355$; $p<0.001$), suggesting that chemotherapy may be related to a higher proportion of metastases.

The chi-square test applied to evaluate the association between having received radiotherapy and the presence of metastases showed a statistically significant difference ($\chi^2=4.273$, $p=0.039$). This suggests that there is an association between radiotherapy treatment and the presence of metastases in the patients in the study. The relationship between the stage at diagnosis and the occurrence of cervical cancer recurrence was examined using the chi-square test. The results show a statistically significant difference between the analyzed groups ($\chi^2=7.759$; $p=0.05$). This suggests that the distribution of recurrences differs between Stages I, II, III, and IV.

When analyzing the relationship between having received radiotherapy and cervical cancer recurrence, a statistically significant association was found ($\chi^2=7.732$, $p=0.005$). This indicates that patients who received radiotherapy are statistically different from those who did not.

The mortality rate in this cohort was calculated by following our n (81) patients for a total of 389 person-years, of whom 19 died, yielding a rate of 48.84 deaths per 1,000 person-years.

The recurrence rate was estimated from the follow-up of 372 patients with a total of 11 recurrences, giving a rate of 29.57 recurrences per 1,000 person-years.

Finally, the metastasis rate was obtained by following 369 person-years, during which 13 patients developed metastases, resulting in a rate of 35.23 metastases per 1,000 person-years.

The estimated mean survival was 72.701 months, with a standard error of 3.459 months and a 95% confidence interval between 65.922 and 79.480 months. This figure reflects the average time that patients in the cohort lived from the start of follow-up until death or until the time of censoring, in the absence of other adjustment variables.

According to the Cox proportional hazards model results, the type of treatment received did not show a significant association with survival (HR=0.96; 95% CI: 0.78–1.19; p=0.709). In contrast, the clinical stage at diagnosis was a determining factor. Patients with more advanced stages had an almost three-fold increased risk of death (HR=2.898; 95% CI: 1.77–4.76; p <0.001) compared to those with earlier stages.

The estimated median survival was 76,769 months, with a standard error of 3,203 months and a 95% confidence interval of 70,491 to 83,047 months. This figure reflects the average time patients in the cohort lived from the start of follow-up until the development of metastasis or until censoring, in the absence of other adjustment variables.

A Cox regression was performed to analyze the association between the type of treatment received and the clinical stage at diagnosis, along with the development of metastasis. The model is statistically significant overall (p < 0.001), indicating that the included variables (type of treatment and clinical stage at diagnosis) significantly contribute to explaining the risk of metastasis. Clinical stage at diagnosis acted as a powerful and independent predictor of metastasis risk. Patients in more advanced stages have an almost six-fold increased risk of developing metastases compared to those in early stages (HR = 5.841; 95% CI: 2.367–12.939; p < 0.001).

A final binary regression analysis was performed, identifying variables influential on the studied outcome of metastasis. Specifically, radiotherapy as the primary treatment and clinical stage at diagnosis showed statistically significant associations, suggesting their clinical relevance in the investigated context. The model suggests that the radiotherapy category was the only significant variable in the multivariate model (p = 0.007). The model explains between 12% and 21.9% of the variability in recurrence, representing low to moderate explanatory power. The non-significant value (p = 0.159) indicates that the model adequately fits the observed data.

The estimated mean survival was 80.391 months for recurrence, with a standard error of 2.516 months and a 95% confidence interval between 75.459 and 85.322 months. This figure reflects the average time that patients in the cohort lived from the start of follow-up until the onset of recurrence or until the time of censoring, in the absence of other adjustment variables.

A Cox regression was performed to analyze the association between the type of treatment received and the clinical stage at diagnosis with the occurrence of recurrence. The model is statistically significant overall (p=0.038), indicating that the variables of treatment type and clinical stage at diagnosis significantly contribute to explaining the risk of recurrence. Clinical stage at diagnosis acted as a strong and independent predictor of recurrence risk. Patients in more advanced stages had a 33.7% increased risk of recurrence compared to those in earlier stages (HR=1.337; 95% CI: 1.055–1.848; p=0.016), while the type of treatment was inconclusive.

DISCUSSION.

The findings of this study, focused on the population of General Hospital Zone No. 46 in Villahermosa, Tabasco, reveal a complex reality regarding the risk factors that influence the poor prognosis of cervical cancer.

One of the most consistent findings in the reviewed literature, and one that this study confirms, is the strong association between advanced clinical stage at diagnosis and poor prognostic outcomes, such as death, recurrence, and metastasis. Jina Li et al. (2022) reported a significantly higher risk of recurrence in patients with stage II and higher, as well as worse long-term survival in those who experienced recurrence. Consistently, in this cohort, clinical stage was identified as a robust predictor of poor prognosis for all three outcomes analyzed. Cox proportional hazards models showed an exponential increase in the risk of death, metastasis, and recurrence as the disease progressed from stage I to stage IV, reinforcing the importance of timely diagnosis as a cornerstone of cervical cancer care.

Regarding recurrence, this study found a rate of 13.6%, with a mean recurrence rate of 2–3 years, in contrast to the 8% recurrence rate at five years reported by Jina Li et al. These differences may be due to the local healthcare context, treatment adherence, or variations in available therapeutic regimens, which also suggests an opportunity to improve postoperative follow-up and recurrence detection.

Concerning treatment, the results of Lambert Matos et al. (2021) in Cuba highlight the protective role of chemotherapy, while, paradoxically, this study found a statistically significant association between chemotherapy administration and a higher risk of death and metastasis. This apparent contradiction could be explained by indication bias; that is, the patients who received chemotherapy likely already had more advanced disease and, therefore, a guarded prognosis from the outset. In contrast, surgery showed a significant protective effect in our sample, a finding that aligns with studies such as the clinical trial by Plante et al. (2024), which showed good results with hysterectomy in early stages.

Likewise, the study by Linhares Moreira et al. (2020) also found that lymph node involvement and FIGO stage are determinants of the type and timing of recurrence. In this thesis, although lymph node involvement was not directly addressed, clinical stage again emerged as a fundamental prognostic factor, reinforcing its value as a clinical predictive tool.

Another relevant point was the association between the number of miscarriages and adverse outcomes, particularly metastasis. In this regard, the study by Jina Li et al. It was also reported that patients with three or more miscarriages had a 65% higher risk of recurrence, coinciding with the finding that this history negatively influences disease progression.

On the other hand, studies such as those by De Mey et al. (2021) highlight the role of radioresistance linked to genetic alterations such as BRCA1 and ATM. Although this study did not include molecular analysis, a statistically significant association was identified between radiotherapy treatment and a higher risk of recurrence and metastasis. This could be related to biological resistance to the treatment, although, as with chemotherapy, it could also reflect cases in more advanced stages with a worse baseline prognosis. However, this cannot be confirmed, since this study did not specifically target radioresistance.

Regarding sociodemographic factors, our findings coincide with the studies by Mpachika-Mfipa et al. (2019) and Gates et al. (2021), who documented that advanced age, low educational level, and marital status negatively influence access to screening and, therefore, timely detection. In this study, a large proportion of patients did not have completed their studies, and many were not in the workforce, which may reflect difficulties in accessing preventive services, also coinciding with the pattern observed in Mexico by Terán Figueroa et al. (2018), where household occupation and lack of contraceptive methods were related to a higher risk of mortality.

Finally, although immunotherapy was not part of this study, research such as that by Dyer et al. (2019) underscores the potential of targeted therapies to improve the prognosis of recurrent or metastatic cervical cancer. While these therapies are not yet available through the Mexican public healthcare system, they represent a future avenue for improving outcomes in advanced cases.

This study comprehensively analyzed the risk factors associated with poor prognosis in patients with cervical cancer treated at General Hospital No. 46 in Villahermosa, Tabasco. Using a quantitative approach, the sociodemographic and clinical characteristics of the cohort were examined, identifying specific profiles that provide valuable information about the evolution of this disease in the local (state) context.

It was found that most patients were of working age, with a low level of education and a high rate of unemployment, which can represent a barrier to timely access to healthcare services. Clinically, early-stage diagnosis predominated; however, failure to identify cervical cancer promptly was significantly associated with a higher probability of death, metastasis, and recurrence. This finding highlights the importance of early diagnosis as a determining factor in patient prognosis.

When adverse outcome rates were established, a mortality rate of 48.84 per 1,000 person-years, a recurrence rate of 29.57 per 1,000 person-years, and a metastasis rate of 35.23 per 1,000 person-years were observed, underscoring the clinical burden of this disease even after initial treatment.

Statistical analysis revealed that variables such as clinical stage at diagnosis, occupation, type of therapy offered, and especially access to surgical treatment, influence a good prognosis. Conversely, radiotherapy and chemotherapy without surgical treatment showed significant associations with negative outcomes, along with a history of three or more miscarriages. Notably, patients who did not receive surgery had higher rates of mortality and metastasis, while chemotherapy and radiotherapy, frequently indicated in advanced stages, were associated with a worse prognosis, possibly due to the severity of the disease at the time of treatment initiation.

Finally, these findings reinforce the need for public health strategies focused on early detection, equitable access to comprehensive treatments, and close follow-up of patients with cervical cancer, particularly in areas with limited infrastructure. Identifying these factors not only contributes to understanding the clinical behavior of the disease but also lays the groundwork for interventions aimed at improving the survival and quality of life of affected women.

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Epidemiological surveillance of respiratory viruses in Mexico

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Since the 2023-2024 winter season, Mexico has changed its approach to respiratory virus epidemiological surveillance, shifting from universal surveillance to sentinel surveillance. Confirmation of SARS-CoV-2 is now exclusively through virus identification using reverse transcription polymerase chain reaction (RT-PCR). The Ministry of Health's report for epidemiological week 53 of 2024 highlights that newly confirmed cases have decreased over the past five years, making it necessary to consider this trend when asserting a downward trend. However, a comparison between 2025 and 2024 reveals a preliminary 49% decrease. Despite being a viral respiratory illness, the highest positivity rate for SARS-CoV-2 in 2025 was identified during epidemiological weeks 12 to 30, while the lowest positivity rates were recorded during the first and last weeks of the year. (1) Recently, the Pan American Health Organization issued an epidemiological alert in January 2026 regarding the simultaneous circulation of seasonal influenza and respiratory syncytial virus in the Americas region (Canada and the United States of America). (2) Regarding genomic surveillance, the health authority report shows information up to June 2025, where the most prevalent variant of interest during the year was LP.8.1. However, the information available in GISAID for Mexico, covering January to September 2025, reveals the circulation of multiple variants, with varying predominance throughout the year; in January, 40% were XEC and JN.1 in 33%, by March the change was observed with LP.8.1 predominating in 60% of the samples and XGF in 90% in September 2025 (3). This demonstrates the decreasing relevance of genomic surveillance of the virus in the country. Silva and colleagues published findings highlighting the effectiveness of wastewater-based epidemiology as a viable tool for monitoring community-level SARS-CoV-2 infection trends in Mexico City during 2021 and 2022 (4).

While sentinel surveillance had proven effective in Mexico prior to the COVID-19 pandemic (5-8), the first case of human infection with avian influenza A(H5N1) in a tertiary care hospital of the Mexican Social Security Institute (9) underscored the importance of surveillance outside of sentinel units. Therefore, it is essential to maintain epidemiological surveillance of respiratory viruses in Mexico's medical facilities to enable timely detection, monitor circulation, assess severity, and guide the response to acute respiratory infections.

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