Hypertension and risk of severity in COVID-19 patients

Hipertensión arterial y riesgo de gravedad en pacientes COVID-19

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Abstract

Emerging infectious diseases such as COVID-19 have had a great impact on public health, with economic and social consequences. Most cases are mild or asymptomatic and about 20% are severe forms, particularly pneumonia and in some cases multiple organ failure. Recent reports have shown a high prevalence of hypertension among COVID-19 patients, the evidence is still insufficient; the epidemiological relationship between hypertension and COVID-19 has shown a high incidence; although, it has not been confirmed that it is a risk factor for acquiring the disease. The impact of hypertension on the severity and mortality of COVID-19; with severe symptoms can be used to assess whether hypertension is a risk factor for exacerbating the disease. Objective: To analyze the relationship between the presence of arterial hypertension and the risk of severity in confirmed Covid-19 patients. Material and methods: A clinical, analytical, cross-sectional research study was carried out in the population aged 20 and over, confirmed for Covid-19, in a sample of 254 patients from March to September 2020. Contribution: confirm the hypotheses of this research, where arterial hypertension presents a statistically significant relationship, with a higher risk of severity in confirmed COVID-19 patients, the most prevalent comorbidity being type 2 diabetes mellitus; presenting a high risk of severity.

Resumen

Las enfermedades infecciosas emergentes como COVID-19, han ocasionado gran impacto en salud pública, con consecuencias económicas y sociales. La gran mayoría de casos son leves o asintomáticos y cerca de 20% son formas graves, en particular neumonías y en algunos casos falla orgánica múltiple. Informes recientes han demostrado una alta prevalencia de hipertensión entre los pacientes con COVID-19, la evidencia aún es insuficiente; la relación epidemiológica que guarda la hipertensión arterial y el COVID-19, ha demostrado una alta incidencia; aunque, no se ha confirmado que sea un factor de riesgo para adquirir la enfermedad. El impacto de la hipertensión en la gravedad y mortalidad de COVID-19; con síntomas graves se pueden utilizar para evaluar si la hipertensión es un factor de riesgo de agravamiento de la enfermedad. Objetivo: Analizar la relación entre la presencia de hipertensión arterial y el riesgo de gravedad en pacientes confirmados de Covid-19. Material y métodos: Se realizó un estudio de investigación tipo clínico, analítico, transversal, en la población de 20 y más años, confirmados de Covid-19, en una muestra de 254 pacientes de marzo a septiembre del 2020. Contribución: Se comprueban las hipótesis de esta investigación, donde la hipertensión arterial presenta una relación estadísticamente significativa, con mayor riesgo de gravedad en pacientes confirmados de COVID-19, siendo la comorbilidad más prevalente la diabetes mellitus tipo 2; presentando un alto riesgo de gravedad

COVID-19, Hypertension, Human development

COVID-19, Hipertensión, Desarrollo humano

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Introduction

During the 21st century, the presence of emerging infectious diseases have caused epidemic outbreaks of great impact on public health, with economic and social consequences, most with pandemic capacity: SARS, influenza H5N1, H1N1, H7N9, MERS and currently COVID-19 (Ramos, 2020).

A new virus from the betacoronavirus family, now known as Covid-19, with high genetic similarity and causing mild respiratory infections and with SARS and MERS, emerges in Wuhan, Hubei province in China in December 2019. To date, humans do not have immunity and we are all susceptible to infection (Government of Mexico, COVID-19., 2020).

It has been documented that most cases are mild or asymptomatic and about 20% are severe forms, particularly pneumonia and in some cases multiple organ failure. The fatality rate is 2-3%, and it predominates in individuals with chronic diseases and in those over 70 years of age; fortunately this virus is less lethal than SARS and MERS (Alpuche, 2020).

The World Health Organization (WHO) declares the Covid-19 outbreak on January 30, 2020 as a "public health emergency of international importance", indicating that all countries of the world should prepare not only for timely detection of imported cases, but for the potential autochthonous transmission (González, et al., 2020).

On February 28, 2020, the first confirmed case is registered in Mexico, on March 18, 2020 the first death, his case was of local transmission, although Mexico would not enter a transmission phase until March 24, 2020, for which it begins with strategies to try to control outbreaks, one of the actions that was taken into account was the closure of educational institutions, which considered the preschool level to university (SINAVE, 2020).

In the last 24 hours of November 4, 479 thousand 578 infections and seven thousand 706 deaths were registered at the international level (Ministry of Health, 2021) accumulating in the world 247 million 968 thousand 227 infections and five million 020 thousand 204 deaths (SINAVE, 2021).

In Mexico until November 4, 2021, 3 million 818 thousand 216 accumulated cases have been confirmed since the beginning of the pandemic, with a total of 289 thousand 131 deaths; Regarding sex, in confirmed cases, a prevalence of 50.1% is shown in women. The overall median age of contagion in Mexico is 39 years (SINAVE, 2021).

In Coahuila as of November 4, 2021, there is a cumulative number of cases of 14,799, including 730 deaths, 3,191 assets, of which 451 belong to Saltillo, a total of 10,878 recovered, of which 1,349 belong to Saltillo. The IMSS Coahuila delegation has a number of 23 thousand suspected patients, of which 7,665 are confirmed COVID-19 patients, according to a report from the epidemiology area 293 patients belong to the UMF, including 27 deaths (Ministry of Health, 2021).

The virus is transmitted from person to person, with a strong suspicion that non-symptomatic individuals are the main vectors. Spreading through contaminated air droplets that come out of the mouth when infected people speak, cough or sneeze (Ministry of Health, 2020). The virus is known to survive from a few hours to a few days depending on surfaces and environmental conditions. When touching the affected surface and posteriorly the mouth, nose or the ocular mucosa, it seems to be the main route of transmission (Valentín, E., 2020; Sánchez-Duque, Arce-Villalobos, & Rodríguez-Morales, 2020).

The Government of Mexico (2020), establishes in the epidemiological surveillance of viral respiratory diseases such as COVID-19 that it is a suspicious case: people of undifferentiated age, in the last 10 days they have presented at least one of the following signs: cough, fever, dyspnea (serious condition) or headache. In addition to presenting at least one of the following minor signs: myalgia, odynophagia, arthralgia, rhinorrhea, anosmia, chills, chest pain, dysgeusia, conjunctivitis. In the case of children under 5 years of age, irritability can replace headache. The incubation and latency period is found to be between 3 to 7 days, with a maximum of 14 days. Unlike SARS, COVID-19 is contagious during the latency period (Government of Mexico, 2020).

Diagnosis is based on clinical picture, laboratory tests, imaging, nucleic acid detection. Accurate detection of COVID-19 RNA has diagnostic value (strong recommendation). Positive RNA in throat swab sampling or other respiratory tract sampling using the quantitative fluorescence PCR method is highly supportive for etiological diagnosis (Government of Mexico, 2020).

All suspected patients must be treated with personal protective equipment by health personnel, in an individual room, confirmed cases must be admitted to the same room and critical cases must be admitted to the ICU as soon as possible (Government of Mexico, 2020).

Regarding the treatment, a specific one has not been established, it will depend on the current physical state of the patient, taking into account their vital signs, laboratory report, at present there is not enough evidence about the medications that should be given to a patient. confirmed patient (Government of Mexico, 2020).

Biosafety measures continue to be: hand washing, application of alcohol gel, use of face masks, quarantine and voluntary confinement, social distancing, avoid crowds, ventilate closed spaces and go to the doctor in a timely manner, on suspicion of having been infected of COVID-19 (Government of Mexico, 2020).

In relation to Systemic Arterial Hypertension (SAH), it is known as a syndrome of multiple etiology characterized by persistent elevation, $\geq$ 140/90 ml / Hg (NOM-030-SSA2-1999). It is translated into systemic vascular damage, a product of the increase in peripheral vascular resistance (Johns Hopkins. Coronavirus resource center, 2020).

In Mexico, the prevalence of SAH is 31.5%, being higher in adults with obesity and diabetes. More than 47.3% of the patients were unaware that they suffered from SAH. The distribution by older and younger age groups in the prevalence of SAH is 4.6 times lower in the group aged 20 to 29 years than in the group aged 70 to 79 years. On the other hand, pharmacological treatment is received only by 73.6% and less than half have the disease under control (IMSS, GPC Diagnosis and Treatment of Arterial Hypertension, 2014).

Lifestyle is the main risk factor in the development of hypertension, due to the high consumption of foods with fat and salt, sedentary lifestyle, obesity, overweight, family history, age, and tobacco and alcohol consumption (IMSS, La Hipertensión Arterial in Mexico, one of the highest in the world, 2020).

Most people are asymptomatic, which delays their diagnosis and treatment, until late in the disease, the most common symptoms may be: headache, ringing in the ears, blurred vision, chest pain, swelling of the lower extremities (AlAhamad , M., Beiram, R. & AbusRuz, S., 2021).

According to Huarancca & Curasma (2016), WHO (2020) & Health Secretariat (2020), they indicate that blood pressure in patients is staged in:

- Optimal: <120 / <80 (mm Hg).

- Normal: 120-129 / 80-84 (mm Hg).

- Normal high: 130-139 / 85-89 (mm Hg).

- Hypertension grade 1: 140-159 / 90-99 (mm Hg).

- Grade 2 hypertension: 160-179 / 100-109 (mm Hg).

- Grade 3 hypertension:> = 180 /> = 110 (mm Hg).

The diagnosis of SAH is established when there is a rise in systemic blood pressure with figures equal to or greater than 140/90 mm Hg, recorded by trained personnel. Patients who come to a sanatorium due to alarm data or hypertensive urgency are diagnosed as SAH, from the first medical consultation. A diagnosis of SAH is established in the second medical consultation (one month after the first blood pressure determination) when the patient manifests: figures greater than 140/90 mmHg, a positive log or a record of blood pressure at home or in both situations (IMSS, GPC Diagnosis and Treatment of Arterial Hypertension, 2014).

On the other hand, the WHO (WHO, HAS., 2020), estimates in 2019 that there are 1.130 million people with hypertension in the world and in retrospect, in 2015, 1 in 4 men and 1 in 5 women had hypertension, 1 in 5 had SAH controlled, being one of the leading causes of premature death in the world. As for Mexico, there is evidence that 15.2 million people suffer from hypertension. Presenting mainly in older adults, older than 70 years, it represents 18.47%; In terms of sex, 20.4% women and 15.3% men, being the population most vulnerable to COVID-19.

Coahuila is among the five entities with the highest percentage of SAH in the population aged 20 years and over, obtaining 22.4% of all cases. The population of hypertensive patients enrolled in the UMF is 32 thousand data from the ARIMAC department, this disease being the first cause of consultation in family medicine (ENSANUT, 2012).

So far some of the epidemiological and clinical characteristics of patients with COVID-19 are known; However, the risk factors for mortality and a detailed clinical course of the disease have not been fully described in the research carried out at the Jinyintan Hospital and the Wuhan Pulmonary Hospital, in a sample of 191 positive patients for Covid-19, the 48% had a comorbidity, with arterial hypertension being the most common 30%, followed by diabetes mellitus 19% and coronary disease 8% (Zhou, et al., 2020).

Likewise, the results showed an increase in the probabilities of in-hospital death related to advanced age, a high SOFA score and a D-dimer greater than 1 μg / ml, at the time of admission, which allows identifying patients with an inefficient prognosis at an early stage (Zhou, et al., 2020).

Although various emerging studies have shown a high prevalence of hypertension among patients with COVID-19, the evidence is still insufficient, the epidemiological relationship between hypertension and Covid-19 has been assessed in different countries, demonstrating a high incidence, but it is not yet considered a risk factor for acquiring the disease, since most of these registered patients were of legal age, and each country has reported different prevalences, this prompts us to know the relationship that may exist (Zhou, et al., 2020).

Considering the high proportion of people with undiagnosed hypertension, it would be reasonable to assume that the prevalence of hypertension in these reports may be underestimated. However, no supporting report was found showing a higher rate of hypertension among COVID-19 patients, and there have been no reliable reports demonstrating an increased risk of SARS-CoV-2 infection in the presence of hypertension (Zhou, et al., 2020).

Therefore, knowing the impact of hypertension on the severity and mortality of Covid-19; has led to comparisons of patients with mild and severe clinical symptoms, which can be used to assess whether SAH is a risk factor for worsening the disease. In a retrospective study carried out at the hospital in the Chinese province of Zhejiang in which 487 patients with COVID-19 participated, the prevalence of hypertension was higher in the 49 severe cases than in the 438 mild cases. Further analysis revealed that male gender, age ≥50 years, and hypertension were independent factors of COVID-19 severity at admission (Shi, et al., 2020).

In December 2019, in Wuhan, China, another study was conducted with a sample of 548 hospitalized patients, yielding results in which the prevalence of hypertension was significantly higher in patients with severe COVID-19 than in non-severe cases. In another age-adjusted research model, reporting a high level of lactate dehydrogenase (LDH) and D-dimer, hypertension was independently associated with the severity of COVID-19 at admission (Zhou, et al., 2020).

The comorbidities that occur with hypertension and that are the main determining factors of the severity of COVID-19 should be considered. The study in Wuhan also reported that male gender, age ≥65 years, high white blood cell count, LDH, cardiac injury, hyperglycemia, and high doses of corticosteroids were independent predictors of death at a proportional risk of Adjusted Cox (Zhou, et al., 2020).

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The conclusions of a French single-center study reported that hypertension was not significantly associated with the progression of COVID-19, that is, it did not merit mechanical ventilatory support, although the association was significant in a univariate model (Zhou, et al., 2020).

In these and other studies, hypertension was not selected as an independent factor for COVID-19 severity based on adjusted multivariate analysis, despite being identified as a risk factor by univariate survival analysis (Zhou, et al.., 2020), but with rheumatic inflammatory diseases for example (Mena-Vázquez, et al 2021).

It has been reported in various studies that hypertension may be an independent risk factor for severe COVID-19. However, it would be meritorious to interpret that the high prevalence of hypertension among patients with severe and fatal COVID-19 can be attributed to the frailty of the elderly to SARS-CoV-2 infection. However, to date, it has not been shown with certainty and clear epidemiological evidence to support that hypertension itself is an independent risk factor for developing severe disease in patients with COVID-19, despite studies in Different countries have not been able to demonstrate with certainty, due to the different measurement variables (Shibata, S., et al., 2020).

The National Institute of Medical Sciences and Nutrition Salvador Zubiran; evaluated the impact of comorbidities on the fatality rate and the development of adverse events in patients positive for SARS-COV-2 in the Mexican population; having comorbidities increased the risk of developing adverse events compared to previously healthy patients. Having multiple comorbidities further increased the risk (Kammar-García, et al., 2020).

The Renin Angiotensin Aldosterone Inhibitors were investigated in the context of patients who required mechanical ventilation, it was shown that there was no relationship in relation to the increase in severity regarding their use, there are probably other factors or the use of other drugs that can explain unfavorable development in these patients (Tsolaki, V., Zakynthinos, GE, Mantzarlis, K., & Makris, D. 2020).

More research, including histological examination of cardiac tissue in COVID-19 patients, is required to characterize the relationship between COVID-19 and myocardial injury. Since biopsy-proven myocarditis can occur in the absence of troponin release, autopsy studies of COVID-19 victims, regardless of troponin levels, are helpful in clarifying whether SARS-CoV-2 is a new cause of Viral myocarditis (Shi. et al. 2020).

On July 1, 2020, in a study conducted with the Mexican population; out of a total of 23,593 patient samples were evaluated by a laboratory of the Mexican Institute of Diagnosis and Epidemiological Reference. Patients who were positive for COVID-19 had a higher percentage of obesity in 17.4%, diabetes in 14.5% and hypertension in 18.9%, compared to patients who did not present a confirmed diagnosis. Compared with non-obese patients, those who were obese were 1.43 times more likely to develop severe COVID-19 upon admission, while subjects with diabetes and hypertension were more likely to develop severe COVID-19 upon admission 1.87 and 1.77 respectively (Denova-Gutiérrez, E., Lopez-Gatell, 2020).

In clinical practice, an adequate questioning is not always carried out in order to investigate comorbidities, added to arterial hypertension, obesity being a new and important risk factor to consider for the evolution of the clinical picture of COVID-19 (Zhou, et al., 2020).

In Spain they demonstrated from the context of obesity as a risk factor for severity in patients with Covid-19; as severe obesity has higher risks of hospitalization, mechanical ventilation, intensive care and / or death, regardless of other comorbidities (Petrova, et al., 2020).

The Ministry of Health, as of May 15, published that Obesity is the comorbidity most strongly associated with Covid-19 in Mexico, followed by Diabetes Mellitus 2 and Hypertension, without mentioning the mechanism of action, however, they recommend doctors take these comorbidities into account in the treatment of the population, to prevent the development of serious complications (Hernández Garduño, 2020).

The care of endocrine diseases such as Diabetes Mellitus 2, during the pandemic showed tough challenges, with complications and hospital saturation, in serious states of the disease, among its major complications is diabetic ketoacidosis, hyperosmolar hyperglycemic state and severe insulin resistance , there is an extensive bibliography regarding the best treatment in this situation (Kim, et al., 2020).

In the same context, different studies agree on the greater severity that endocrine diseases present in the face of Covid-19, suggesting that this group of patients be taken into account as a priority to be vaccinated before hospital admissions are presented in greater quantity for complications derived from the two diseases (Said, Y. COVID Vaccination and Diabetes).

In a study where the prognostic factors of severity in patients with DM2 were assessed, as well as microvascular and macrovascular lesions, they determined that poorly controlled diabetes with central and peripheral lesions have a higher risk of severity than well-controlled diabetics (Scheen, AJ, Marre, M., & Thivolet, C., 2020).

The protective effect of a biguanide was studied, in this case metformin as the first line of treatment for the management of type 2 diabetes mellitus in patients with COVID-19, having anti-inflammatory and satisfactory results for the evolution of the disease (Lima -Martínez, MM, Boada, CC, Madera-Silva, MD, Marín, W., & Contreras, M., 2020).

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It was demonstrated in a study carried out in sedentary patients and those who performed some physical activity, that the former had a higher risk of hospital admission, in addition the risk of severity was increased, suggesting that the patient be invited to lead a non-sedentary life (Sallis, R ., Young, D. et al. 2020).

On the other hand, regarding the treatment in the initial phase of the COVID-19 pandemic, antihypertensives with angiotensin converting enzyme type 2 (ACE2) inhibitors or angiotensin receptor blockers (ARBs) were proposed. to adverse outcomes in patients with hypertension and COVID-19. This was based on experimental studies showing that inhibitors of the renin angiotensin system could alter tissue activity or expression of ACE2 (Liu, M. Y., Zheng, B., Zhang, Y., & Li, J. P., 2020).

The increased membrane expression of ACE2 induced by these drugs may, in theory, increase the possibility of virus entry into organs, but it is also conceivable that inhibition of the Renin Angiotensin System (RAS) contributes to the protection of the organs against respiratory infections, as mentioned above (Liu, MY, Zheng, B., Zhang, Y., & Li, JP, 2020).

Finally, there is little evidence that the therapeutic dose of RAS inhibitors influences the expression or tissue activity of ACE2 in humans. More research is required to clarify whether the influence of SRA inhibitors on COVID-19 is beneficial, neutral, or harmful (Liu, M. Y., Zheng, B., Zhang, Y., & Li, J. P., 2020).

On the other hand, in terms of organs responsible for the entry of SARS-CoV-2, the human lung contains type 2 alveolar epithelial cells that co-express ACE2 (angiotensin converting enzyme type 2) and transmembrane serine protease 2 (TMPRSS2) and is considered which are the main responsible for the entry of the virus in both SARS and Covid-19 (Sungnak, W., et al., 2020).

It was recently reported that ACE2 and TMPRSS2 are highly coexpressed in epithelial and nasal cells, as well as in enterocytes. These findings suggest alternative routes of viral entry through the upper respiratory tract, in addition to the eyes and intestinal organs (Sungnak, W., et al., 2020).

A recent report in the Bunyavanich study, found that ACE2 mRNA expression in the nasal epithelium increased with age when data were stratified into groups of younger children (<10 years), children older than 10 to 17 years , in young adults ages 18 to 24 and adults over 25, which could help explain the relatively low prevalence of COVID-19 in children (Bunyavanich S, Do A, Vicencio A., 2020)

There is currently no strong scientific evidence on whether the risk of SARS-CoV-2 infection increases in patients with hypertension. Hypertension is associated with endothelial injury and this triggers thromboembolism, one of the important complications that influence the outcome of the disease in COVID-19 (Salazar, M., Barochiner, J., Espeche, W., & Ennis, I. (2020); Higashi, Y., Kihara, Y., 2020).

So far it is unknown whether the pre-existing endothelial injury increases the severity of COVID-19; However, special care is suggested in the detection of hypertensive patients with atherosclerotic diseases due to the risk of new-onset Cardiovascular Disease (CVD) during SARS-CoV-2 infection (Tanaka, M., & Itoh, H ., 2019).

In the state of Coahuila, a study of 17,479 patients with COVID-19 was carried out, with the following risk factors, age, DM2, SAH, CKD and obesity, showing that these comorbidities increase mortality, the factor that most contributes to risk death is age, mainly over 60 years (Aguirre, JS, García, C. S, 2020).

In the context of Mental Health, the COVID-19 pandemic can increase the risk of disorders such as anxiety, economic problems and the decrease in physical activity, this could trigger uncontrolled Arterial Hypertension. It is currently unknown if COVID-19 will affect blood pressure control, if the same lack of control increases the risk of severity of the clinical picture or the development of Brain Vascular Events in the long term; however, it is necessary to carefully control the blood pressure of each patient (Tsolaki, V., Zakynthinos, G. E., Mantzarlis, K., & Makris, D., 2020)

At the end of 2020, the process of researching vaccines to combat Covid-19 began in various parts of the world, several are already available and others are in the trial phase. The WHO has an updated list of which vaccines have been authorized (Casas, I., & Mena, G. 2021).

In addition, there is oral treatment which has been established and documented its effects and contraindications, even without establishing the use worldwide, in Mexico according to the Journal of Internal Medicine there are several drugs that have demonstrated their positive effect in reducing the serious complications of Covid-19 (Zúñiga-Blanco, BL, Pruneda-Álvarez, LG, de Lourdes Enríquez-Macías, M., & Fyda, J. 2020).

Likewise, the use of statins as anti-inflammatory agents at the vascular level has been linked to their use in patients hospitalized for Covid, so far the protection relationship between patients with statin use and those who do not have been established. should continue with clinical trials (Guijarro, C. 2020).

Currently in Mexico there are different vaccines which have different mechanisms of action, vaccines with inactivated or attenuated viruses, based on proteins, vaccines with viral vectors, vaccines with RNA and DNA, all with the aim of preparing our immune system to fight Covid-19 (Ministry of Health, 2021).

The Government of Mexico (2020) on its Covid vaccine website, addresses the need to report in real time on the progress of immunization in the country and by state, presenting the vaccination calendar by age groups, with a base of data where adverse effects attributable to vaccination and immunization are recorded. The rationale for this research focuses on the fact that COVID-19, caused by the so-called severe acute respiratory syndrome coronavirus type 2 (SARS-CoV-2), causes a respiratory disease, which progresses to a form of severe pneumonia in 10 to 15 % of patients, and continues until a state of critical illness, characterized by the presence of acute respiratory distress syndrome (ARDS) until ending in multisystemic organ failure (MFD). These critical patients are part of the 5% who require ICU treatment and use of mechanical ventilation (WHO, 2021; Rondoy Rimaycuna, 2021)

The health care of patients with serious or critical illness has been responsible for the collapses of health systems, which are secondary due to a crisis due to the lack of supplies, health personnel and the massive need for hospital beds and a nursing unit. Intensive Care (ICU). Despite treatment, it is estimated that 50% of severe or critical cases that require ICU management will die, according to estimates by the organization Mexico assesses.

To optimize the care of patients with COVID-19 and the allocation of financial and hospital resources during this pandemic, it is necessary to identify the main diseases that occur before infection, such as: Diabetes Mellitus 2, High blood pressure, Pulmonary disease Chronic Obstructive Disease (COPD), Cardiovascular Diseases, Obesity, Smoking, identifying them with the aim of calculating their prevalence, to detect early patients likely to have a high risk of severity, this with the support of the application of assessment scales of severity (qSOFA), which make it possible to reduce the mortality rate (WHO, 2021).

In the Family Medicine Unit (UMF), there are a large number of hypertensive patients, this being the main cause of consultation in the unit, the relationship between the presence of Arterial Hypertension and the risk of severity of the picture was analyzed. determined the comorbidities of patients with COVID-19, providing results of the health status of our study population and allowed to carry out interventions and influence a specific plan for this vulnerable group, making doctors and patients aware of the importance of good metabolic control of the disease (s), in order to reduce complications from COVID and their mortality.

The magnitude of the study implies that of all confirmed cases, 62% have at least one comorbidity, 6% for liver and malignant diseases and 29% for heart diseases, the most common comorbidities were Diabetes mellitus 2 (40%), heart disease (37%) and lung disease (12%). 29% of adults aged 29 to 59 years had at least one comorbidity compared to 57% of adults aged 60 and over. 44% had one comorbidity, 11% had two comorbidities, and 1.5% had 3 or more comorbidities.

Confirmed cases of COVID-19 continue to increase, which entails an impact on the health of patients, with a risk of presenting sequelae, such as a functional or work limitation, impacting the patient's economy, directly in decreasing income, which may affect family dynamics.

Arterial Hypertension is the main contributor to the development of cardiovascular and kidney diseases, myocardial injury and advanced chronic kidney disease are associated with an increased risk of serious disease after COVID-19 infection, patients carrying more than one disease, old age, and obesity are at higher risk of severity.

The early detection of the main pathologies involved in the patient with COVID-19 and their adequate metabolic control by the first contact doctors, reduces the risk of severity of the disease, its complications and, in turn, mortality, as regards The objective for patients is to strengthen the knowledge of their health status and involve them in an optimal control of the disease and / or comorbidities.

Identifying the main diseases that occur in the study population in patients with COVID-19, for optimal therapeutic management, can contribute to a better prognosis by mitigating the progression towards a severe disease. Although currently the vaccine is already available from different laboratories and countries, which has contributed to reducing deaths and the severity of COVID-19. The primary care physician must contribute to the prevention of chronic diseases, by improving the quality of life of patients, reducing the risk of complications, severity and mortality with chronic diseases.

The research question is: What is the relationship between the presence of Hypertension and the risk of severity in confirmed COVID-19 patients?

The general objective lies in: Analyzing the relationship between the presence of Arterial Hypertension and the risk of severity in confirmed COVID-19 patients

The specific objectives are located in:

To determine the prevalence of associated comorbidities in patients confirmed with COVID-19.

Classify the risk of severity in patients with Arterial Hypertension, confirmed with COVID-19.

The working hypotheses are:

- Hypertension presents a statistically significant relationship, with a higher risk of severity in confirmed COVID-19 patients.

- Arterial Hypertension is the most prevalent comorbidity in patients confirmed with COVID-19.

- Arterial Hypertension presents a high risk of severity in patients confirmed with COVID-19.

The null hypotheses are:

- Hypertension presents a statistically non-significant relationship, with a higher risk of severity in patients confirmed with COVID-19.

- Arterial Hypertension is the least prevalent comorbidity in patients with COVID-19.

- Hypertensive patients confirmed with COVID-19 have a low risk of severity.

Methodology

This research is of a clinical nature, due to the intervention of the researcher it is observational as it is based on epidemiological databases, and analytical in the relationship between the study variables, and cross-sectional due to the number of measurements of the study phenomenon.

The files of patients who presented themselves between the months of March to September 2020 assigned to a Family Medicine Unit (UMF) in the city of Saltillo, Coahuila, were analyzed. The population consisted of 746 confirmed COVID-19 patients, the type of sampling was systemic probabilistic, adding 10% of the total sample, with a total of 254 patients that made up the final research database and that meet the following Inclusion criteria: confirmed COVID-19 patients, over 20 years of age, male or female, assigned to the UMF. The elimination criteria is that they are not confirmed COVID-19, under 20 years of age and do not belong to the UMF.

The information regarding patients was acquired from the epidemiological study of suspected cases of viral respiratory disease, it is applied by doctors to patients who come to the Covid area. The electronic records of each patient are reviewed in the Family Medicine Information System (SIMF) to obtain information on the result of the assessment scale Scale for patients with sepsis, highly specific for selecting seriously ill patients or Quick Secuential Organ Failure Assessment (qSOFA) , the latter used for rapid evaluation criteria for organ failure, which will be related to the risk of complication in a patient with a diagnosis of Arterial Hypertension.

The measurement instrument was used (based on the epidemiological study of a suspected case of viral respiratory disease), which contains two sections, the first consisting of general data, such as age, gender and social security number. The second section contains clinical data such as comorbidities: Hypertension, Chronic Obstructive Pulmonary Disease (COPD), Diabetes Mellitus 2, Obesity, Smoking, Cardiovascular Disease and the risk of complication, which is answered with YES and No, according to The comorbidity that the patient presents, with regard to the risk of complication variable, this was obtained from the review of the clinical record, if it did not have it, it was calculated using the parameters already established, such as heart rate, blood pressure and neurological evaluation.

Regarding the ethical aspects of this research, it was carried out in accordance with the General Health Law on Research for Health regarding the ethical aspects of research in articles 13, 14, 16 and 17; in accordance with the Nüremberg Code, granting informed consent, granting the results that benefit the welfare of society. Taking care of the confidentiality and privacy of the information, guaranteeing it to the patient in accordance with the General Law on Protection of Personal Data.

Results

The results of the investigation are presented below.

Table 1 shows the arithmetic mean and standard deviation of the Age of the study patients. Observing a mean of $X = 41.85$ years and a standard deviation of $S \pm 14.58$ years.

	N	Mean	minimum	maximum	S
Age	254	41.85	0.00	83.00	14.58

Table 1 Age frequency distribution
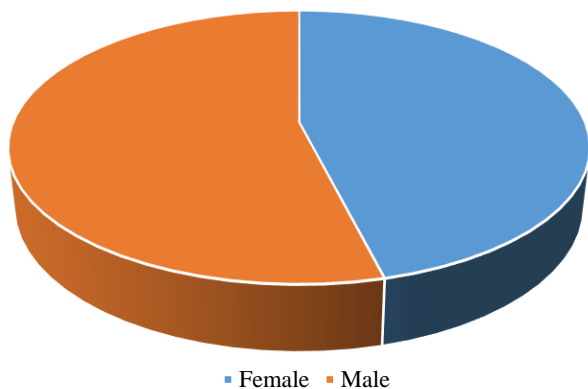*Source: Data collection instrument*

Table 2 shows the distribution of absolute frequencies and relative frequencies of the sex of the patients, with a higher prevalence in males with 137 subjects.

	N	Mean	minimium	maximum	S
Female	117	117	117	46.96	46.06
Male	137	254	254	53.94	100

Table 2 Sex frequency distribution
Source: Data collection instrument

In graphic 1, the distribution of sex frequencies is observed.

Graphic 1 Sex

■ Female ■ Male

**Graphic 1** Sex
Source. Data collection instrument. Si=Yes

Table 3 shows the distribution of absolute frequencies and relative frequencies of the presence of COPD, which is not present in 252 cases.

	N	Mean	minimium	maximum	S
No	252		252	99.22	99.22
Yes	2		254	0.78	100

Table 3 Frequency distribution of COPD
Source: Data collection instrument

Graphic 2 shows the frequency distribution of the presence of COPD.

Graphic 2 COPD

■ No ■ Yes
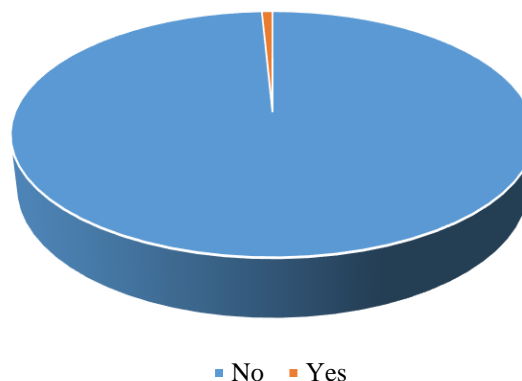
**Graphic 2** COPD
Source: Data collection instrument. Si=Yes

Table 4 shows the results of the presence of type 2 diabetes mellitus in 54 cases, which represents 18.95%, it is not present in most of the subjects.

	N	Mean	minimium	maximum	S
No	200		200	78.74	78.74
Yes	54		254	21.26	100

Table 4 Frequency distribution of type 2 Diabetes Mellitus
Source: Data collection instrument

In graphic 3, the frequency distribution of the presence of Diabetes is observed.

Graphic 3 Diabetes

■ No ■ Yes
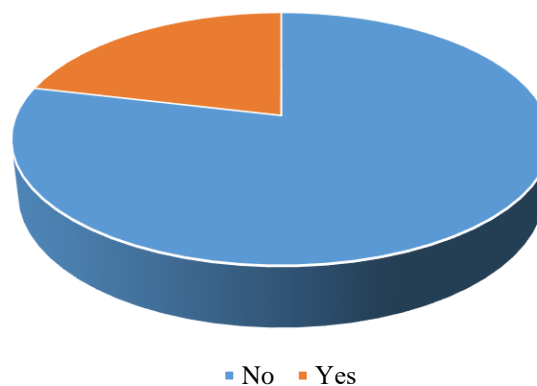
Graphic 3 Diabetes
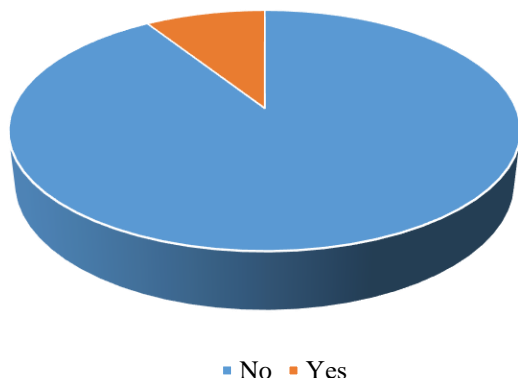*Source: Data collection instrument. Si=Yes*

In Table 5, it is observed that smoking does not occur in 231 subjects, which represents 90.95%, only 23 subjects present smoking.

	N	Mean	minimium	maximum	S
No	231		231	90.95	90.95
Yes	23		23	9.05	100

Table 5 Smoking frequency distribution
Source: Data collection instrument

In graphic 4, the frequency distribution of the presence of Smoking is observed

Graphic 4 Smoking

Graphic 4 Smoking
Source: Data collection instrument. Si=Yes

In Table 6, it is observed that 129 patients present obesity, which represents 50.79% of the subjects.
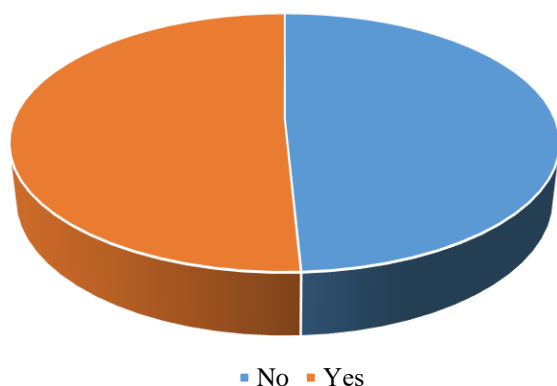
	N	Mean	minimium	maximum	S
No	125		125	49.21	49.21
Yes	129		254	50.79	100

Table 6 Obesity frequency distribution
Source: Data collection instrument

In graphic 5, the frequency distribution of the presence of Obesity is observed.

Graphic 5 Obesity

Graphic 5 Obesity
Source: Data collection instrument. Si=Yes

In Table 7, it is shown that 198 patients do not present hypertension, which represents 49.21% of the subjects, 56 if they present hypertension.
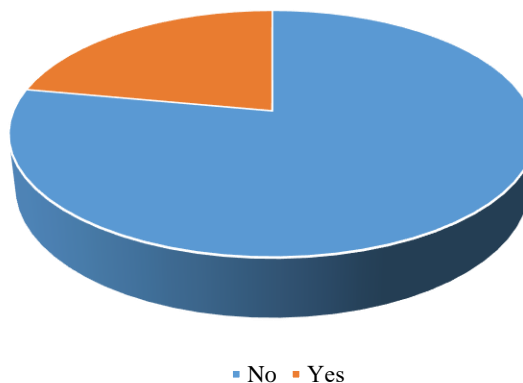
	N	Mean	minimium	maximum	S
No	198		198	77.96	77.96
Yes	56		254	22.04	100

Table 7 Hypertension frequency distribution
Source. Data collection instrument

In graphic 6, the frequency distribution of the presence of hypertension is observed.

Graphic 6 Hypertension

Graphic 6 Hypertension
Source: Data collection instrument. Si=Yes

Table 8 shows the presence of cardiovascular disease, where 250 cases do not present it, which corresponds to 98.43% of the patients.
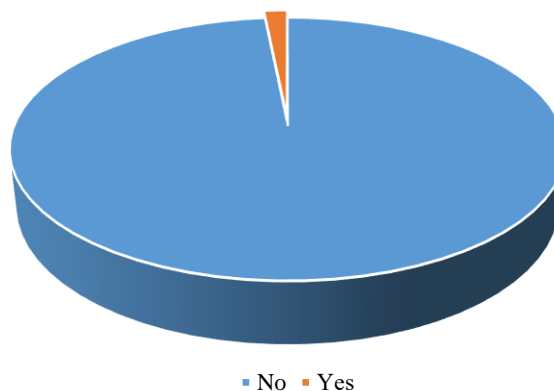
	N	Mean	minimium	maximum	S
No	250		250	98.43	98.43
Yes	4		254	1.57	100

Table 8 Frequency distribution of cardiovscular disease
Source: Data collection instrument

In graphic 7, the frequency distribution of the presence of cardiovascular disease is observed.

**Graph 7. Cardiovascular disease**

Graphic 7 Cardiovascular
Source: Data collection instrument. Si=Yes

Table 9 shows the absolute and relative frequency of the risk of complication, with a prevailing risk of 0 with 172 patients.

	N	Mean	minimium	maximum	S
0	172	172	67.72		67.72
1	59	231	23.23		90.95
2	22	253	8.66		99.61
3	1	254	0.40		100

Table 9 Severity risk frequency distribution
Source: Data collection instrument

Graphic 8 shows the frequency distribution of the presence of Risk of complication.

Graphic 8 Risk of complication
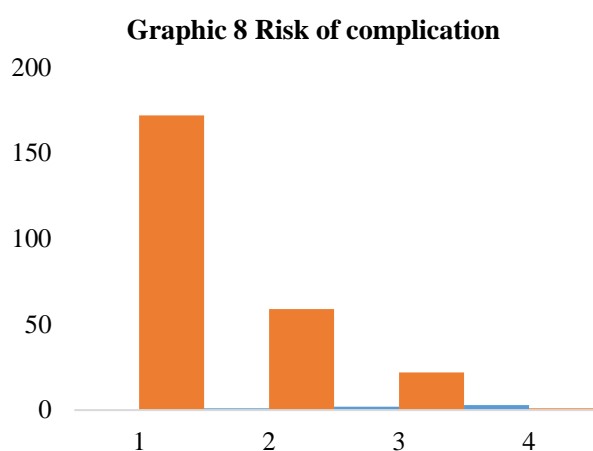
Graphic 8 Risk of complication
Source: Data collection instrument. Si=Yes

Due to the nature of the data with an asymmetric distribution, it was decided to apply the chi-square statistic to the results, crossing each of the comorbidities against the severity scale, and hypertension against the risk of complication and the comorbidities with hypertension.

According to the research hypotheses of this study, the results are presented:

Table 10 shows that the null hypothesis is rejected, that is, there are statistically significant differences between the risk of complication and the presence of hypertension, which indicates that the first and third hypotheses of this research, hypertension, are verified. Arterial has a statistically significant relationship with an increased risk of complication in confirmed COVID-19 patients and arterial hypertension presents a high risk of severity in confirmed COVID-19 patients.

Square chi	90.02	
Degrees of freedom	3	
Probability level	0.03	**Reject H0**

Table 10 Risk of severity vs hypertension
Source: Data collection instrument

Table 11 shows that the null hypothesis is accepted, that is, there are no statistically significant differences between Epoc and hypertension in confirmed COVID-19 patients.

Square chi	.92	
Degrees of freedom	1	
Probability level	0.34	**Acept H0**

Table 11 Hypertension and COPD
Source: Data collection instrument

Table 12 shows that the null hypothesis is accepted, that is, there are no statistically significant differences between smoking and hypertension.

Square chi	1.19	
Degrees of freedom	1	
Probability level	0.27	**Acept H0**

Table 12 Hypertension vs smoking
Source: Data collection instrument

Table 13 shows that the null hypothesis is accepted, that is, there are no statistically significant differences between cardiovascular risk and hypertension.

Square chi	0.02	
Degrees of freedom	1	
Probability level	0.88	**Acept H0**

Table 13 Hypertension and cardiovascular risk
Source: Data collection instrument

Table 14 shows that the null hypothesis is rejected, that is, there are statistically significant differences, which indicates the presence of hypertensive patients with diabetes, which could complicate with a higher risk of complication.

Square chi	1.19	
Degrees of freedom	1	
Probability level	0.00	**Reject H0**

Table 14 Hypertension vs diabetes
Source: Data collection instrument

Table 15 shows that the null hypothesis is rejected, that is, there are statistically significant differences, which indicates the presence of hypertensive patients with obesity, which could complicate with a higher risk of complication.

Square chi	3.94	
Degrees of freedom	1	
Probability level	0.05	**Reject H0**

Table 15 Hypertension and obesity
Source: Data collection instrument

Table 16 shows that the null hypothesis is rejected, that is, there are statistically significant differences between the risk of complication and people with diabetes. Being the comorbidity with the highest risk of complication, in addition to hypertension.

Square chi	16.46	
Degrees of freedom	3	
Probability level	0.00	**Reject H0**

Table 16 Risk of severity vs diabetes
Source: Data collection instrument

Table 17 shows that the null hypothesis is accepted, that is, there are no statistically significant differences between the risk of complication and people with COPD.

Square chi	4.546902	
Degrees of freedom	3	
Probability level	0.208145	**Acept H0**

Table 17 Risk of complication vs COPD
Source: Data collection instrument

Table 18 shows that the null hypothesis is accepted, that is, there are no statistically significant differences between risk of complication and people due to Smoking.

Square chi	3.015954	
Degrees of freedom	3	
Probability level	0.389172	**Acept H0**

Table 18 Risk of complication vs Smoking
Source: Data collection instrument

Table 19 shows that the null hypothesis is accepted, that is, there are no statistically significant differences between the risk of complication and people with obesity.

Square chi	1.089821	
Degrees of freedom	3	
Probability level	0.779532	**Acept H0**

Table 19 Risk of complication and obesity
Source: Data collection instrument

Table 20 shows that the null hypothesis is accepted, that is, there are no statistically significant differences between the risk of complication and people with cardiovascular risk.

Square chi	1.462409	
Degrees of freedom	3	
Probability level	0.690973	**Acept H0**

Table 20 Risk of complication and cardiovascular risk
Source: Data collection instrument

Discussion

The fight maintained since December 2019 in China has spread throughout the planet, until on March 20, 2020 the planet is paralyzed, interrupting non-essential activities, suspending all school and work activities worldwide, moving to the study and work at home, a situation that has been perpetuated until the end of October 2021, in some permitted cases they still continue in isolation; The virus does not yet have full control of contagion, with regular spikes, mainly due to a percentage of the population that must continue their work in person, which increases the risk of contagion among the workers themselves and their families.

The presence of COVID-19 in the world is relatively new, causing multiple systemic complications in the patient's body due to different morbidities and comorbidities that have become known in the course of the pandemic, little by little more knowledge of the impact that this disease can have and the care that patients and health personnel must have to prevent the contagion process from continuing.

Before the pandemic, it was common that when a person fell ill with a cold, both co-workers and family members were infected; However, at this time using the mouth cover and restricting attendance at the workplace, when suffering from Acute Respiratory Infections (ARI), in addition to guiding rest while staying at home, prevents the transmission of the epidemiological chain.

It is necessary to implement new healthy lifestyles, already known by all actors in the health sector, and promoted for a long time, in order to achieve a better quality of life and the best example is the decrease in the incidence of acute respiratory infections (ARI), it is known that people do not go to health services, the truth is that, with the application of the implemented measures, people get less sick, not only from COVID-19, but from other types of ARI.

The world carries the protocols designated by the World Health Organization (WHO) and Mexico is no exception, the hygiene, safety, care and protection protocols, which continue in the world, are applied in each of its socioeconomic zones.

It is important to recognize that the studies are taking place at this precise moment in Mexico and throughout the world, however, there are previous studies carried out among the topics that support this thesis.

Where Álvarez-López, Espinoza-Molina, Cruz-Loustaunau, & Álvarez-Hernández, (2020) and de León et al (2020), mention the risk of Covid-19 and its complications occurs in adults over 60 years of age, with obesity, Diabetes Mellitus and hypertension mainly. However, in this research it was found that hypertension and type 2 diabetes mellitus are the only ones that present statistically significant differences, which is why we differ with the authors.

On the other hand, Navarrete-Mejía, Lizaraso-Soto, Velasco-Guerrero, & Loro-Chero, LM (2020), concluded that 73% of the deceased were older than 60 years up to 79 years (54.8%), male, with diabetes mellitus (17%) and hypertension (24%), in a population of 1,947 deceased over 30 years; In our investigation, the number of deceased persons was not analyzed, but it does agree in the presence of hypertension and type 2 diabetes mellitus; without forgetting gastrointestinal disorders (Schmulson, Dávalos, & Berumen, 2020).

However, Bello-Chavolla et al (2020), Dana et al (2021), Giorgino et al (2021), González-Tabares et al (2021), Guijarro (2020), Halpern et al (2021), Kass, Duggal , & Cingolani (2020), Minchola et al (2021), Simonnet, et al (2020), & Trujillo, Valenzuela, & von Oetinger (2020)., Found that obesity, diabetes, hypertension and dyslipidemia have been associated with greater severity and mortality of COVID-19; this establishes a possible relationship between the metabolic syndrome and the severity of COVID-19. Therefore, the pathophysiological mechanisms through which these comorbidities contribute to an aggravated prognosis in patients confirmed with COVID-19 are not yet fully clarified. Chronic inflammation is found to favor immune system dysfunction and a prothrombotic state; Furthermore, elevated levels of ECA2, the entry point for SARS-CoV-2, in the metabolic syndrome would be compromised.

Likewise, Vintimilla (2021), concludes that patients infected with Covid-19 with a higher risk of death are men, older than 62.4 years with hypertension. obesity, type 2 diabetes mellitus and the presence of hypothyroidism.

Alcocer et al (2021), have found other risk factors that aggravate the situation for chronic renal failure in patients with hemodialysis replacement treatment with COVID-19.

In addition, Ledesma (2021), in a case study report, concludes that many of the patients who show COVID-19 do not report the symptoms associated with this virus; So it is enough that they have a symptom to worry us, or some pathology that may have complications associated with Covid-19, it is suggested to rule out using RT-PCR and radiological studies to confirm the diagnosis. This case study with high risks of complications and morbidity and mortality, since it is an older adult, with arterial hypertension, being important due to the high percentage within the population with this pathology and the relationship with the virus.

Finally, González-Tabares et al (2021), conclude that hyperglycemia and diabetes "both diabetes and hyperglycemia induce severe clinical forms of COVID-19 with worse evolution parameters and higher mortality, recommending steroids and jusvinza.

Other studies of a similar nature recognize the risk of arterial hypertension associated with comorbidities such as type 2 diabetes mellitus. This result being the one that is corroborated in this study (Herrera, Herrera & Caluňa, 2021; Vargas-Correa et al, 2021; Parrales, Lucas & Caiza, 2021).

Gratitude

Conclusions

The research question, objectives and hypotheses are answered:

Regarding the research question: What is the relationship between the presence of Arterial Hypertension and the risk of severity in confirmed COVID-19 patients?

It was found that the risk of complication arises as arterial hypertension occurs added to the comorbidity of type 2 diabetes mellitus.

The general objective mentions: Analyze the relationship between the presence of Arterial Hypertension and the risk of severity in confirmed COVID-19 patients; it was found that in effect the risk of complication increases to the extent that the patient who tested positive for COVID-19 has arterial hypertension but in addition to type 2 diabetes mellitus.

In relation to the specific objectives, it was found that:

To determine the prevalence of associated comorbidities in patients confirmed with COVID-19. Hypertension and type 2 diabetes mellitus were determined to be the associated chronic diseases in confirmed COVID-19 patients.

Classify the risk of severity in patients with Arterial Hypertension, confirmed with COVID-19. It is identified that the presence of arterial hypertension associated with type 2 diabetes mellitus increases the risk of complications in patients confirmed with COVID-19.

The results show in the research hypotheses, that:

Hypertension presents a statistically significant relationship, with a higher risk of severity in confirmed COVID-19 patients. This hypothesis is accepted, as the null hypothesis is rejected, therefore it is accepted that there are statistically significant differences.

Arterial Hypertension is the most prevalent comorbidity in patients confirmed with COVID-19, specifically with diabetes. This hypothesis is accepted, as the null hypothesis is rejected, thus statistically significant differences were found.

Arterial Hypertension presents a high risk of severity in patients confirmed with COVID-19. This hypothesis is accepted, as the null hypothesis is rejected, finding statistically significant differences, especially when the comorbidity of type 2 diabetes mellitus is combined.

Likewise, age and sex are presented in 41-year-old men, with arterial hypertension and comorbidity of type 2 diabetes mellitus, mainly; increasing the risk of complication.

There is no statistically significant evidence with other comorbidities such as: smoking, COPD, obesity or cardiovascular risk.

Proposals for intervention

Approach patients from the outpatient family medicine consultation, in order to provide knowledge about the care they should have, when bringing the new normal in public institutions, avoiding comments on the non-existence of the virus, in order to favor the short term , medium and long term, measures that prevent the spread of the virus in the general population.

Provide information to doctors and patients about the importance of a healthy diet, exercise, staying hydrated, and taking food supplements that promote optimal development of the immune system.

Create online workshops that offer information to patients on the importance of leading a healthy life, commenting on complications coupled with high blood pressure and type 2 diabetes mellitus as comorbidities and the care that should be taken in relation to COVID-19.

Promote the results of this research in Forums, Colloquia, Medical Congresses.

Publish the results in high impact peer-reviewed and indexed journals.

Promote the recording, use and application of the results of this research in informative posters, the Institution's website and other places such as radio and television spots, as well as digital radio.

Prepare informative triptychs with the results of the research to be delivered to the medical population and the health area, presenting the results of this research in colloquia or university forums.

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