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Journal of Health Sciences

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Knowledge Area

The works must be unpublished and refer to topics of clinical sciences, nutrition sciences, pharmacology, internal medicine, general medicine, internal medicine, preventive medicine and other topics related to Medicine and Health Sciences.

Presentation of Content

As the first article we present, *Hypertension and risk of severity in COVID-19 patients*, by BASILIO-CATALÁN, José Enrique, RAMOS-JAUBERT, Rocío Isabel, MUÑOZ-LÓPEZ, Temístocles and VILLARREAL-SOTO, Blanca Margarita, with adscription in the Instituto Mexicano del Seguro Social and Universidad Autónoma de Coahuila, as the second article we present, *Inflammatory fibrous hyperplasia*, by ROSADO-VILA, Graciella, ZAPATA-MAY, Rafael, OROZCO-RODRIGUEZ, Ruben and VIDAL-PAREDES, Jorge, with adscription in the Universidad Autónoma de Campeche, as third article we present, *Comparison of hypoglycemic activity of two varieties of Averrhoa carambola L. in streptozotocin-induced diabetic rats as a model of type 2 diabetes mellitus*, by TEMORES-RAMÍREZ, Cynthia Guadalupe, DÉLANO-FRIER, John Paul, GÓMEZ-LEYVA, Juan Florencio and ZAÑUDO-HERNÁNDEZ, Julia, with assignment at the Universidad de Guadalajara, IPN, Instituto Tecnológico de Tlajomulco, as last article we present, *Antimicrobial effect of Allium sativum (garlic) against Escherichia coli and Salmonella typhimurium generated by poultry activities*, by GUTIÉRREZ-LEÓN, Diana Guadalupe & SERRANO-RAMÍREZ, Tomás, with adscription in the Universidad Politécnica de Guanajuato.

Content

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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.

COVID-19, Hypertension, Human development

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, 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).

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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, ≥ 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).

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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).

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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).

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).

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).

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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)

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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.

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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.

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	N	Mean	minimium	maximum	S
Age	254	41.85	0.00	83.00	14.58

Table 1 Age frequency distribution
Source: Data collection instrument

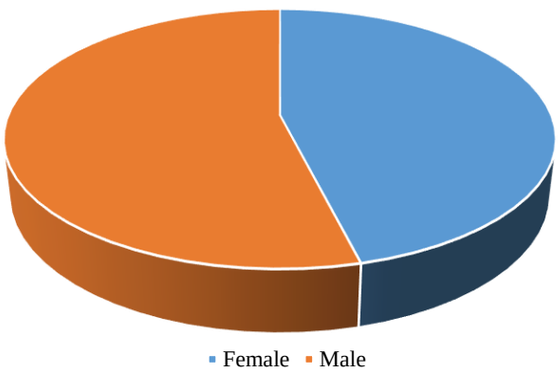
Table 2 shows the distribution of absolute frequencies and relative frequencies of the sex of the patients, with a higher prevalence in males with 137 subjects.

	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



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

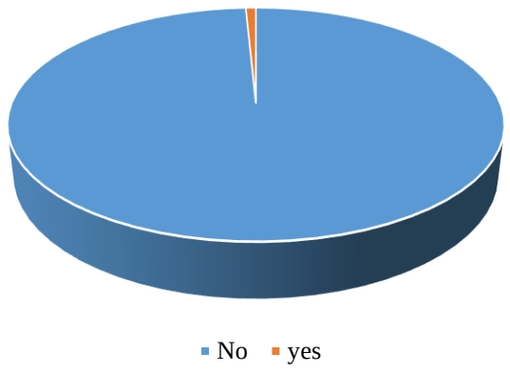
Table 3 shows the distribution of absolute frequencies and relative frequencies of the presence of COPD, which is not present in 252 cases.

	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



Graphic 2 COPD
Source: Data collection instrument. Si=Yes

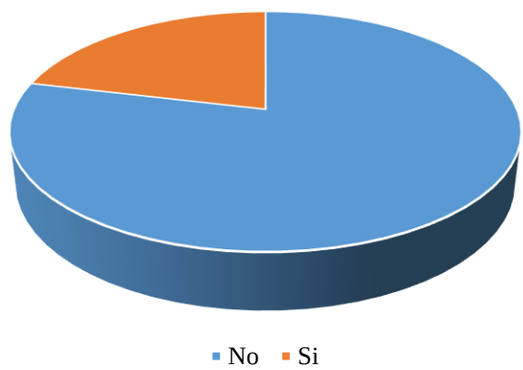
Table 4 shows the results of the presence of type 2 diabetes mellitus in 54 cases, which represents 18.95%, it is not present in most of the subjects.

	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



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

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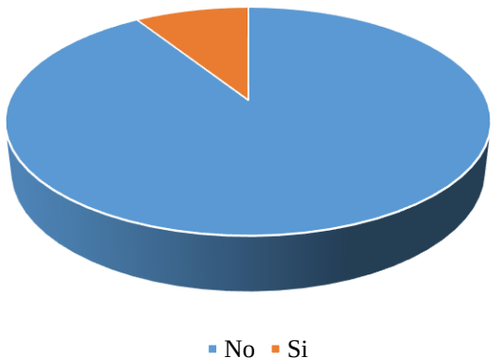
In graphic 4, the frequency distribution of the presence of Smoking is observed

Graphic 4 Smoking



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

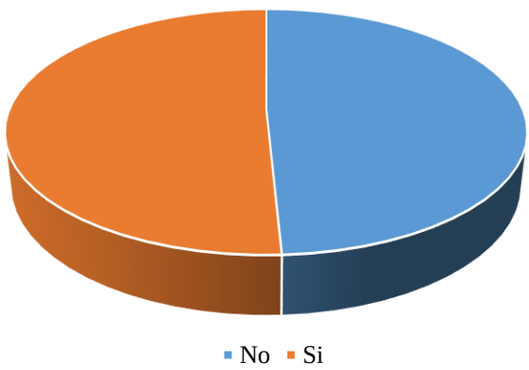
In Table 6, it is observed that 129 patients present obesity, which represents 50.79% of the subjects.

	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

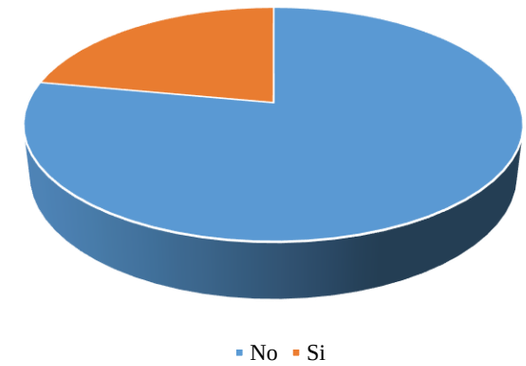
In Table 7, it is shown that 198 patients do not present hypertension, which represents 49.21% of the subjects, 56 if they present hypertension.

	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

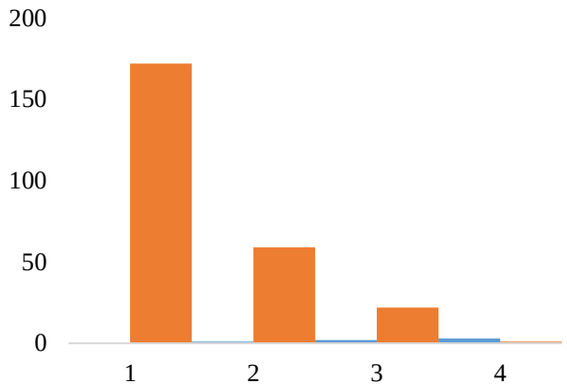
Table 9 shows the absolute and relative frequency of the risk of complication, with a prevailing risk of 0 with 172 patients.

	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

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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.

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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.

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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 & Caluña, 2021; Vargas-Correa et al, 2021; Parrales, Lucas & Caiza, 2021).

Gratitude

To the Mexican Institute of Social Security for the facilities granted in carrying out this study.

Self-funded research.

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.

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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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Inflammatory fibrous hyperplasia

Hiperplasia fibrosa inflamatoria

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Abstract

Introduction: The term hyperplasia refers to an increase in the volume of a tissue produced by the increase in the number of its cells. Inflammatory fibrous hyperplasia is a reactive, localized, and inflammatory type of enlargement of the connective tissue, more frequent in adolescents, adults and relatively common in children. The main etiology of inflammatory fibrous hyperplasia is associated with malocclusion, as well as the presence of bacterial plaque.

Objective: To evaluate the clinical and histological aspects and the possibilities of treatment, emphasizing the importance of an early and correct diagnosis of inflammatory fibrous hyperplasia for a better state of oral health.

Clinical Case: The surgical treatment implemented was the total removal of the lesion. Histopathological diagnosis: Inflammatory fibrous hyperplasia.

Malocclusion, Gingivitis, Oral health

Resumen

Introducción: El término hiperplasia se refiere a un aumento del volumen de un tejido producido por el incremento del número de sus células. La hiperplasia fibrosa inflamatoria es un agrandamiento del tejido conectivo de tipo reactivo, localizado e inflamatorio, más frecuente en adolescentes, adultos y relativamente común en niños. La principal etiología de la hiperplasia fibrosa inflamatoria está asociada a la maloclusión, así como a la presencia de placa bacteriana.

Objetivo: Evaluar los aspectos clínicos e histológicos y las posibilidades de tratamiento, destacando la importancia de un diagnóstico temprano y correcto de la hiperplasia fibrosa inflamatoria para un mejor estado de salud bucal.

Caso clínico: El tratamiento quirúrgico implementado fue la extirpación total de la lesión. Diagnóstico histopatológico: Hiperplasia fibrosa inflamatoria.

Maloclusión, Gingivitis, Salud oral

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Introduction

Fibroma is the most common benign tumor in the oral cavity, it consists of fully developed connective tissue, it has a superficial or deep location and there are different types, depending on its origin they can be odontogenic, not odontogenic, among the latter, peripheral fibroma stands out. or by irritation. Irritation fibroma, also called fibrous hyperplasia or hyperplastic scar, is long-lasting, can appear anywhere in the oral cavity, associated with the reaction of chronic trauma, such as cheek biting, cheilophagia, a sharp edge of a tooth, amalgam fractured or irritation due to prostheses, which in many cases has to do with defective acrylic relining or maladapted dentures that irritate the palate, inducing a pathological overgrowth of fibroblasts and the collagen produced by them, which causes a submucosal mass evident on clinical examination. On clinical observation, it appears as a solitary, smooth tumor with a color equal to that of the buccal mucosa, a hard or soft consistency, sessile or pedunculated, whose growth is usually slow and continuous. Histologically, the fibroma has a connective tissue origin, consisting of a large number of collagen fibers, cells (fibroblasts), blood vessels, sometimes it presents calcifications.

Traumatic fibroma is considered the most frequent benign tumor of the oral cavity. Cooke in 1952 closely related it to Fibrous Hyperplasia. It is slow-growing, and some authors such as Pinborg in 1981 suggest that constant trauma to the lesion accelerates the growth of the lesion, favoring the invasion of the underlying tissue, thus giving rise to a malignant transformation. However, some authors assure that it is predominantly female, in the same way that it can occur at any age but is more frequent after the second decade of life, in adult individuals. Its most frequent location is in areas prone to trauma, such as the cheeks, tongue, palate and lip.

However, some authors assure that its most frequent location is the gingiva, cheeks, lips and lateral edges of the tongue; when it appears in the gum it arises from the connective tissue or the periodontal ligament.

The importance of traumatic fibroma is that it has characteristics of malignancy when its size exceeds normal and the physical injury is constant, which can compromise the patient's life if it is not treated on time, despite the fact that it is a benign neoplasm without recurrence; there are few cases reported with a rapid evolution situation which causes alarm since the acuity sign suggests a malignancy trait; The presentation of a new case was considered of interest where its fundamental characteristic was the growth that it reached in 5 months.

Presentation of the case

The treatment of choice for traumatic fibroma is traditional surgical excision, and this rarely recurs since the usual approach is to eliminate the traumatic factor, waiting for the lesion to subside; in addition, any identifiable etiologic agent, such as calculus or any other foreign material, must be removed. In case of recurrence, its effect is attributed to continuous trauma in the affected region, the treatment of choice would be wide reexcision. Among other treatment alternatives. 27-year-old female patient, without relevant pathological data. Intraoral exploration shows increased volume adhered to the labial region of the right upper quadrant (Fig. 1) of five months of evolution, sessile projecting cheek and causing facial asymmetry, not painful, painless to the touch, not hyperemic, presumptive of hyperplasia inflammatory fibrosis, I present generalized gingivitis, (Fig. 3) the first appointment was performed prophylaxis, curettage, the brushing technique was changed and 2% chlorhexidine gluconate Bexident was prescribed, fifteen days after evaluating the female patient for inflammation With analgesic therapy for five days it decreased, for surgical treatment it was performed under local anesthesia, later it was removed surgically with scalpel No. 15 and an orange slice cut extended to healthy tissue to avoid recurrence (Img. 2), finally 3 stitches were made with no. 3.0 black silk. The patient was instructed to take Amoxicillin 500mg x 7 days every 7 hrs, Ibuprofen 400mg x 6 days every 7 hrs and return in 8 days.

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Clinical procedure

Figure 1 Clinical appearance of the lesion
Source: Direct Source

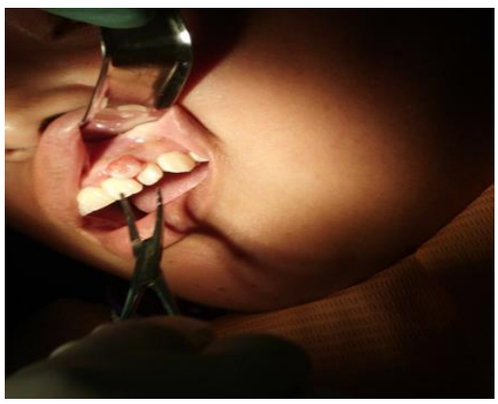

Figure 2 Removal of the tumor
Source: Direct Source

Figure 3 Presence of generalized gingivitis
Source: Direct Source

Figure 4 Appearance of Direct Source Suture

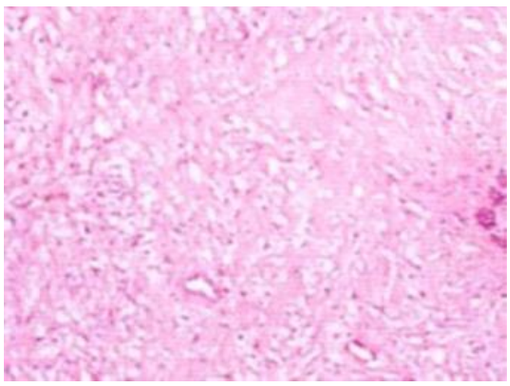

Figure 5 Result of the excisional biopsy

Figure 6 Appearance of healing Direct Source

Results

His prognosis is favorable, so it was decided to take a surgical therapeutic approach, by means of excisional biopsy, (Fig. 7), scheduling his next appointment seven days after surgery to remove the suture, the healing of the gingival tissue was observed (Fig. 5 , 6) as a result of the pathological study fifteen days after surgery, the final diagnosis was obtained, verifying the presence of an inflammatory fibrous hypetrophy.

Conclusions

Due to the fact that there are several lesions with clinical characteristics very similar to those presented by the patient, it is necessary to know the differential diagnoses, as well as to make an early diagnosis of the lesion in order to carry out an effective and adequate treatment.

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Comparison of hypoglycemic activity of two varieties of *Averrhoa carambola* L. in streptozotocin-induced diabetic rats as a model of type 2 diabetes mellitus

Comparación de actividad hipoglucemiante de dos variedades de *Averrhoa carambola* L. en ratas diabéticas inducidas por estreptozotocina como modelo de diabetes mellitus tipo 2

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Abstract

The fruits of *Averrhoa carambola* have different uses as food; it is also used empirically as an adjunct in the treatment of various diseases including diabetes, an important disease, mainly in developing countries, such as Mexico. The main objective of this study was to compare the hypoglycemic activity of two varieties of *A. carambola*. Winstar rats, induced to type 2 diabetes with 60 mg of streptozotocin / kg of body weight (BW), were used as the experimental model. Four experimental groups with a total of 40 rats each were formed, using the Arkin and Golden Star varieties. A dose of 200 mg of the lyophilized fruit per kg of BW, dissolved in a final volume of 500 µL, was orally administered for 40 days, using an esophageal catheter. Blood glucose levels were determined with a glucometer in samples taken from the tail vein every five days during the experiment, while the final blood glucose was obtained in samples by retroorbital bleeding using the enzymatic method based on glucose oxidase activity. Blood glucose levels were lower in the treatments than in the controls. Both varieties showed an effective hypoglycemic effect, although a significant difference in their effectiveness was observed between them.

Antioxidant activity, Carambola, Hypoglycemic effect

Resumen

Los frutos de *Averrhoa carambola* tienen diferentes usos como alimento. Aunque también se utilizan empíricamente como coadyuvantes en el tratamiento de diversas enfermedades, como la diabetes, una enfermedad importante, principalmente en países en vías de desarrollo, como México. El objetivo principal de este estudio fue comparar la actividad hipoglucemiante en dos variedades de *A. carambola* utilizando como modelo experimental ratas Winstar, inducidas a diabetes tipo 2 por estreptozotocina utilizando una dosis de 60 mg / kg de peso corporal (PC). Se conformaron cuatro grupos experimentales con un total de 40 ratas, empleando las variedades Arkin y Golden Star. Se suministró oralmente, 200 mg del fruto liofilizado por kg de PC disueltos en un volumen final de 500 µL, durante 40 días, utilizando un catéter esofágico. Los niveles de glucosa en sangre se determinaron con un glucómetro en muestras tomadas de la vena caudal cada cinco días, durante el experimento, mientras que la glucosa final se obtuvo en muestras por sangrado retroorbitario mediante el método enzimático basado en glucosa oxidasa. Los niveles de glucosa en sangre fueron más bajos en los tratamientos que en los controles. Ambas variedades mostraron un efecto hipoglucemiante, aunque se observó una diferencia significativa entre ellas.

Actividad antioxidante, Carambola, Efecto hipoglucemiante

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Introduction

Averrhoa carambola L., is a woody, perennial tropical plant belonging to the Oxalidaceae family. Although known to be native of Southeast Asia, the origins of this plant species are not well defined, as manifested by diverging reports that place its center of origin and domestication in Indochina (Orduz and Rangel, 2002), Malaysia and Indonesia (Watson et al., 1988) or, more precisely, in the islands formerly known as the Moluccas (Nakasone and Paull, 1999). It was introduced into Mexico at the beginning of the 18th century, and it is now distributed in its tropical and subtropical regions, where the tree is cultivated mostly for its edible fruits. Cultivation is concentrated in the states of Colima, Chiapas, Guerrero, Michoacán, Morelos, Nayarit, Sinaloa, Jalisco, Tabasco and Veracruz (Cruz and Garza, 2006). The star-shaped carambola fruits are fleshy and have an oblong to ellipsoidal shape, with five enlarged vertices. They are green before reaching maturation, turning yellow inside when ripe, which occurs four to five months after the onset of flowering (Crane, 1994).

The tree is also cultivated for diverse purposes, principally due to several properties that have been attributed to antioxidant, hypoglycemic and anti-inflammatory properties (Lim, 2012; Pantaleón-Velasco et al., 2014). For example, it is used in Western, Mexico as an empiric auxiliary for the treatment of several illnesses associated to type II diabetes mellitus (T2DM), one of the most important world-wide public health issue, due to its persistent increase in the last years, most importantly in developing countries, such as Mexico (Salcedo et al., 2008; Shamah-Levy et al., 2020). T2DM consists of a battery of dysfunctions characterized by a hyperglycemic condition resulting, in part, from the combination of insulin resistance and inadequate insulin secretion, due to faulty β pancreatic cells (INSP, 2006). When this happens, a cellular balance is broken that leads to oxidative damage caused by the excess production of free radicals able to act deleteriously on the proteins, carbohydrates, lipids and nucleic acids of the cell. As a result, cellular, structural and functional alterations originate that lead to cellular deterioration and cell death and, eventually, to the appearance of different chronic diseases (Cuerda et al., 2011).

In the case of T2DM, increased free radicals disrupt the action of insulin at the peripheral level and contribute to pancreatic beta cell dysfunction, in addition to promoting the development of chronic complications (Evans, et al., 20003; Forbes et al., 2008; Giugliano, et al, 1996; Robertson et al., 2004).

In addition, there is a general metabolic syndrome, for which the patient must be monitored clinically. The latter due to the fact that glucose accumulation is generally accompanied by an increase in triglycerides, total cholesterol and free fatty acids (Ogbonnia et al., 2008; Saravanan and Ponmurugan, 2012). Furthermore, numerous oxidative reactions at the mitochondrial level trigger cell apoptosis (Chowdhury et al., 2008; Turk and Stoka, 2007). Another associated problem is that a secondary effect of many drugs used for T2DM treatment, designed to target insulin resistance (Manka et al., 2021), is the emergence of non-alcoholic fatty liver disease, although liver fat, or steatosis, and even more advanced stages of liver fibrosis can occur in the absence of diabetes (Ranjbar et al., 2019). Therefore, recent interest has arisen to generate alternative treatments for diabetes that do not produce damaging secondary effects. Based on the above, a study was performed to compare the hypoglycemic activity of two varieties of *A. carambola*, which was tested in streptozotocin-induced type II diabetic rats. Here, the most important results obtained are presented and succinctly discussed.

Materials and methods

Description of the study site, sample collection and preparation of plant material.

A recent study compared the nutritional composition of fresh and freeze-dried carambola fruits of the Golden Star (GS) and Arkin (Ar) varieties and determined the conservation of these components in different tissues of both varieties (Temores-Ramírez, 2021). Based on this data, we proceeded to perform experiments designed to test the hypoglucemic effect of these fruits after aesophagic catheter delivery to diabetically induced rats.

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Averrhoa carambola fruits were of both the Arkin (Ar) and Golden Star (GS) varieties were randomly collected in a commercial plantation located in the municipality of Cihuatlán, in the south-west of the state of Jalisco, México (19° 22’ 30" N, 104° 42’ 30" W, at 13 m above sea level). For transportation, the fruits were kept at approximately -20°C with solid CO_2, and were subsequently stored at the same temperature until needed for analysis. Fruits were then ground in an electrical blender and the resulting pulp was subsequently lyophilized.

Extraction and determination of ascorbic acid levels, antioxidant capacity, total soluble phenols and flavonoids

The lyophilized fruit material was used to determine several factors that could be associated with a possible hypoglycemic effect such as ascorbic acid levels (AA) and antioxidant capacity (AOC). AA was determined using a manual electronic refractometer, (Atago Pocket Acidity Meter; Atago Tokyo, Japan). AOC in MeOH fruit extracts was determined by the 2, 2´-azino-bis (3-ethylbenzthiazoline-6-sulfonic acid) (ABTS) and 2,2-diphenyl-1-pricrylhydrazyl (DPPH) radical scavenging activity assays according to Brand-Williams et al. (1995) and Re et al., (1999), and subsequently modified by Pulido et al., (2000), and Yahia et al. (2011), respectively. All AOC assays were modified to fit a micro-plate format.

The total soluble phenols (TSP) and flavonoids (TF) contents in fruits were determined as described previously by Maranz et al. (2003) and Sakanaka et al. (2005), respectively.

Evaluation of hypoglycemic capacity of Averrhoa carambola fruits in rats

The hypoglycemic capacity of carambola fruits was examined in 30 male Winstar adult rats having an average weight of 200 g (obtained and kept in the bioterium of the Western Biomedical Research Center, Guadalajara, Jalisco, México). The adult rats were injected with streptozotocin [STZ; 60 mg/ kg of body weight (BW) in 0.1 M citrate-buffered saline, pH 4.5] to induce T2DM.

All animal trials were conducted according to The International Ethical Committee for the Experimental Use of Animals, All the animals received a commercial concentrate for laboratory animals (Rodent Laboratory Chow, Nestlé Purina, St. Louis, MO, USA) with a 10% fat composition. Three experimental groups were formed: diabetic or positive control, and two additional groups treated with the Ar and GS fruit varieties, respectively. In addition, a group of 10 individuals comprised the healthy or negative control. The animals were distributed by placing two rats per cage in each treatment group. They were kept at room temperature (approximately 23ºC ± 2) with a 12:12 light / dark photoperiod in the above-mentioned bioterium. Lyophilized fruit pulp was fed orally (200 mg of ripened fruit pulp per kg of BW dissolved in a final volume of 500 µL) to the experimental rats for 40 days using an aesophagic catheter. Blood glucose levels were determined with a glucometer in samples taken from the caudal vein every five days, for the duration of the treatment with the carambola extract, whereas the final blood glucose (FBG), triglycerides and cholesterol determination were performed in samples obtained by retro-orbital bleeding. Glucose was determined using a glucose oxidase-based enzymatic method (Trinder, 1969). Blood serum cholesterol was quantified based on the enzymatic hydrolysis of cholesterol esters, oxidation of cholesterol by cholesterol oxidase, and colorimetric measurement of liberated perioxide with 4-aminoantipyrine, phenol, and peroxidase (Lie et al., 1976). Triglycerides in serum were measured enzymatically using a series of coupled reactions designed to hydrolyze triglycerides to glycerol, which is subsequently oxidized with glycerol oxidase to produce H_2O_2, which, is measured at 500 nm (Bucolo and David, 1973; Fossati and Prencipe, 1982). Three experiments were carried out, in which similar results were obtained.

Results and Discussion

Ascorbic acid levels, antioxidant capacity, total soluble phenols and flavonoids in lyophilized carambola (A. carambola) fruits, varieties Golden Star (GS) and Arkin (Ar)

AA is an organic acid with excellent anti-oxidant properties, which plays an important role in the disease prevention activities of the immune system (Toledo, 2008).

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No difference in AA content was observed in GS and Ar fruits (Table 1). The AA levels in ripe Ar fruits, although high enough to provide a distinctive acid taste and be considered a good source of vitamin C (Dürüst et al., 1997), were lower than those detected in other AA-rich fruits, such as sour orange (16.25 to 51.0%), mandarin (12.32%), and grapefruit (28.17%) (Muñoz de Chávez et al., 1996).

The ABTS and DPPH methods yielded similar AOC levels in the fruit extracts of both carambola fruit varieties, although slightly higher AOC values were obtained using the DPPH method. However, AOC values determined by both methods were higher in the Ar variety (7.5 [Ar] *vs.* 2.3 [GS] µM Eq Trolox/g dry weight on average) (Table 1). The values recorded in this study were similar to those reported by Troya-Santos et al. (2017) in black maca (*Lepidium meyenii*) by the DPPH method. The relatively high AOC levels detected in ripe Ar fruits could have represented a factor contributing to the hypoglycemic effect observed. This, by ameliorating the deleterious oxidative effects on metabolism produced as a consequence of the diabetic condition. A significantly higher AOC, also triggered in response to ripening (Temores-Ramírez, personal observations) may have also contributed to the hypoglycemic effect observed by providing increased protection against oxidative cell processes.

Antioxidants are considered as adjuvants in the treatment of chronic degenerative diseases. Regarding T2DM, various studies have reported that they can decrease lipid peroxidation and the oxidation of LDL-cholesterol particles, in addition to their contribution to improve endothelial function and endothelium-dependent vasodilation (Cuerda et al., 2001). Some other reports have described the benefit of oxygen radical absorption capacity and equivalent Trolox antioxidant capacity in human serum after the consumption of high-fat diets. Also, a significantly positive correlation believed to occur via a decreased lipid peroxidation, was observed between anthocyanin content in human serum, the metabolic syndrome and the postprandial antioxidant status, (Basu et al., 2009; Folli et al., 2011; González-Jiménez et al., 2015; Mazza et al., 2002).

However, the positive effect of antioxidants in the treatment of T2DM and the complications derived from this disease remains a controversial issue considering the lack of significant effects on the metabolic control of diabetic patients reported by some workers (Cuerda et al., 2001).

On the other hand, no significant differences in TSP were observed between the varieties, although a slightly higher value was determined in Ar fruits, whereas an almost 2-fold higher TF levels were detected in GS fruits (Table 1). Similar TF values have been detected in nopal and wereque roots (Ramírez-Ortíz et al., 2016), black tea, red pepper, apple and the lowest value-range in red wine (González-Sánchez et al., 2011).

*Evaluation of the hypoglycemic capacity of A. **c**arambola fruits in rats*

The parameters used to evaluate the hypoglycemic effect of *A. **c**arambola* fruit extracts in diabetic rats were FBG, blood serum cholesterol and triglyceride levels. As shown in Table 2, these parameters remained high in the diabetic control group maintained with the experimental diet only, without *A. **c**arambola* fruit extract supplementation. In contrast, FBG levels, 348.75 and 430 mg/ dL, were lower in the experimental groups treated with Ar and GS fruit extracts during 40 days, respectively (Table 2). Compared to the diabetic control group, FBG levels were 2 and 1.5 times lower in the Ar- GS-treated groups, respectively. Thus, both fruit varieties tested showed an effective hypoglycemic effect. Similar reduction of FBG levels were reported in diabetic rats treated with an aqueous-ethanol extract of *A. **c**arambola* roots (Xu et al., 2014).

The high fructose content detected in *A. carambola* fruits could partially explain why these fruits reduced the blood glucose level in diabetic rats (Temores-Ramírez et al., 2021). The latter considering that fructose does not increase blood glucose levels, even though it is metabolized mainly in the liver but, unlike glucose, it does not require insulin for its metabolism. Thus, carambola fruits could be considered as an adjunct food for the treatment of T2DM patients, since their high fructose levels could be tolerated better than glucose-rich fruits.

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However, other studies have suggested that hypoglycemic effect of some aqueous or alcoholic plant extracts may result from the inhibition of alpha amylase and alpha glucosidase activities (Ramírez-Ortíz et al., 2016). This is a possibility that remains to be defined by further experimentation in carambola fruits.

Similar to FBG, the cholesterol content detected in the diabetic control group was higher. However, there were no significant differences between the negative control and the GS-treated group, whereas the Ar-treated group showed a slight but significant reduction in cholesterol levels with respect to these two groups, which were 1.5-times lower than diabetic rats (Table 2).

Compared to the positive control, the triglyceride levels were also lower in the GS- and Ar-treated groups. The reduction observed was *ca*. 72% in the GS-treated group (Table 2). In this regard, the lyophilized fruit extracts of both varieties, but mostly GS, contributed to a significant reduction in the blood triglycerides concentration, since they were lower than the reference values of 150 mg/dL and much lower than those detected in the positive control group, that registered 247 mg/dL. Values similar to these were previously reported by Sanhueza et al. (2014). Compared to GS, no significant differences were recorded between Ar and the negative control.

Blood glucose levels (BGL) and FBG were significantly higher in the positive control group (Table 2; Graphic 1) compared to the two carambola-treated experimental groups. However, the hypoglycemic effect was more effective and pronounced in rats fed with Ar fruits, which showed a consistent reduction of BGL which remained stable during the duration of the experiment (Graphic 1). Conversely, the hypoglycemic effect in rats fed with GS fruits was slower, being detected 40 days after the experiment was started.

Compared to diabetic rats, both fruit varieties tested had an effective hypoglycemic effect, although the effect was significantly species-specific (Graphic 1). The effect produced, however, was still significantly higher than the negative control group of healthy rats, in which the BGL remained below 100 mg/ dL for almost the entire experiment.

The hypoglycemic effect, determined as BGL, was consistent with the lowered FBG levels detected. A similar decrease of glycemia over time was observed in diabetically induced rats treated with black maca extracts (Troya-Santos et al., 2011).

Annexes

Parameters	Variety	
	GS	Ar
Ascorbic acid (%)	5.80 ± 0.95a	5.23 ± 0.11a
Antioxidant capacity (µM Eq Trolox/g dry weight)[1]	2.25 ± 0.19b	6.12 ± 0.10a
Antioxidant capacity (µM Eq Trolox/g dry weight)[2]	2.32 ± 0.16b	8.85 ± 0.49a
Total soluble phenols (mg GAE/g dry weight)	4.82 ± 0.41a	5.87 ± 0.40a
Total soluble flavonoids (mg EQ/100g dry weight)	15.23 ± 1.89a	8.68 ± 0.13 b

Table 1. Ascorbic acid levels, antioxidant capacity, total soluble phenols and flavonoids in lyophilized carambola (*Averrhoa carambola* L.) fruits, varieties Golden Star (GS) and Arkin (Ar). [1]Measured by the ABTS method. [2]Measured by the DPPH method. The data are means ± SE (n =10). Different letters within each column indicate statistically significant differences between the two varieties at $P < 0.05$, determined by an ANOVA followed by a Tukey-Kramer test.

	Parameters		
Treatment	Blood glucose (mg/dL)	Total Cholesterol (mg/dL)	Triglycerides (mg/dL)
Golden Star	430.66±172.40ab	63.17±5.58b	69.21±12.99c
Arkin	348.60±83.19b	55.04±3.65c	94.87±6.85b
Control +	674±23a	80.19±0.86a	247.92±12.14a
Control -	155±1.15c	61.96±0.92b	91.08±15.33b

Table 2. Evaluation of hypoglycemic effect of the supply of *Averrhoa carambola* fruit varieties Golden Star and Arkin in rats, data were compared to those determined in diabetic controls or positive control (Control +) and healthy control or negative control (Control -). Different letters within each column indicate statistically significant differences between treatments at $P < 0.05$, determined by an ANOVA followed by a Tukey-Kramer test.

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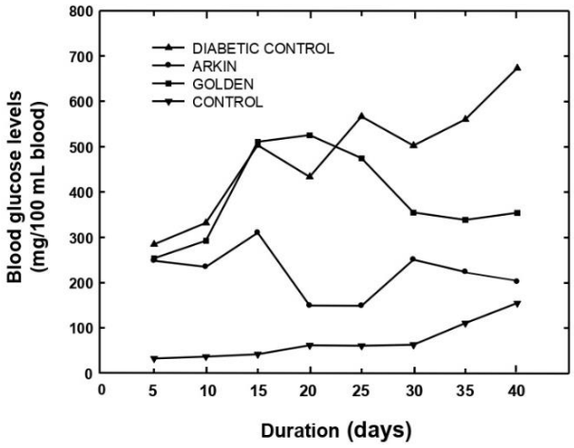

Graphic 1. Blood glucose levels (BGL) (mg/100 mL of blood) in male adult Winstar rats whose diet was complemented with pulp of two varieties of *Averrhoa carambola* fruits. BGL were determined in T2DM-induced rats fed with a standard diet alone [(diabetic controls or positive control (triangles)], complemented with fruit of two varieties: Golden Star (squares) and Arkin (circles). BGL were compared to those determined in healthy control or negative control (inverted triangles). Each point represents the mean value of n = 10 measurements.

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Conclusions

A strong hypoglycemic effect was observed in streptozotocin-induced diabetic rats treated with extracts obtained from the *Averrhoa carambola* fruit varieties GS and Ar. A significant reduction of blood cholesterol and triglyceride levels was also observed. The effect was variety-specific, since the Ar variety had a greater hypoglycemic effect and GS was more effective in the reduction of blood triglycerides.

Thus, a diet including ripe carambola fruits could be used as a auxiliary for the treatment of T2DM patients.

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Antimicrobial effect of *Allium sativum* (garlic) against *Escherichia coli* and *Salmonella typhimurium* generated by poultry activities

Efecto antimicrobiano de *Allium sativum* (ajo) frente a *Escherichia coli* y *Salmonella typhimurium* generadas en actividades avícolas

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Abstract

The poultry sector plays a fundamental role on an industrial scale and in rural areas; one of the problems it faces today, through farming, meat and eggs production, preservation and sale to the consumer, is the presence of pathogenic microorganisms such as *Escherichia coli* and *Salmonella typhimurium*, which represent a latent risk to the health of the population. With the aim of contributing to the knowledge of an alternative for the reduction/elimination of these bacteria, this work proposes a treatment based on a 30% w-v garlic-aqueous solution, applied to a water sample obtained as a result of activities related to chicken farming. The evaluation of the effect was carried out at 0, 5, 10, 20, 30, 45, 60 and 90 minutes, using the plate count technique. At the end of the treatment, it was determined that the garlic-aqueous solution has an antimicrobial effect, which allows a reduction in concentrations of 1.6-$\log_{10}$ for *Escherichia coli* and 2.2-$\log_{10}$ for *Salmonella typhimurium* in the established treatment time. It is suggested to extend the knowledge in the use of this alternative, in addition to the existing technologies to contribute to sustainable development.

Garlic, Bacteria, Poultry-activities

Resumen

El sector avícola desempeña un papel fundamental a escala industrial y en zonas rurales; una de las problemáticas a las que se enfrenta hoy en día, a través de la crianza, la producción de carne y huevos, conservación y venta al consumidor, es la presencia de microorganismos patógenos tales como *Escherichia coli* y *Salmonella typhimurium*, las cuales representan un riesgo latente para la salud de la población. Con el propósito de contribuir al conocimiento sobre una alternativa para la reducción/eliminación de dichas bacterias, en este trabajo se propone un tratamiento con base en una solución acuosa de ajo al 30% p-v, aplicado a una muestra de agua obtenida como resultado de actividades vinculadas con la crianza de pollos. La evaluación del efecto se realizó a 0, 5, 10, 20, 30, 45, 60 y 90 minutos, empleando la técnica de recuento en placa. Al finalizar el tratamiento, se determino que la solución acuosa-ajo posee un efecto antimicrobiano, que permite en el tiempo de tratamiento establecido, una reducción en concentración de 1.6-$\log_{10}$ para *Escherichia coli* y de 2.2-$\log_{10}$ para *Salmonella typhimurium*. Se sugiere extender el conocimiento en la utilización de esta alternativa, en complemento a las tecnologías ya existentes para contribuir a un desarrollo sustentable.

Ajo, Bacteria, Actividades avícolas

Citation: GUTIÉRREZ-LEÓN, Diana Guadalupe & SERRANO-RAMÍREZ, Tomás. Antimicrobial effect of *Allium sativum* (garlic) against *Escherichia coli* and *Salmonella typhimurium* generated by poultry activities. Journal of Health Sciences. 2021. 8-24:33-38.

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Introduction

Worldwide, the growth of poultry industry is accelerated due to food requirements generated as a result of demographic expansion. In 2019, meat production by the poultry sector accounted for about 39% in livestock sector at global scale and, in the period of 1961-2019, meat and eggs production reached increments of 14-fold and 6-fold, respectively (FAO, 2021). Technological advances have been reflected in reproduction, feeding, slaughter and safety methods, that are feasible to implement by large-scale producers; however, FAO (2021) highlights that, an important proportion of poultry production is developed on a small scale, in rural areas with family dependence and whose function, is important for the preservation of life in these environments, since it provides them the opportunity to generate income and a source of nutritional consumption (FAO, 2021; Farrell, 2013).

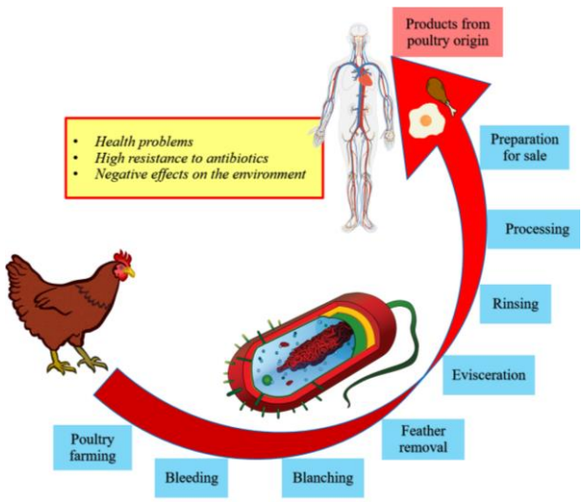

Figure 1 Stages for obtaining products in poultry industry Source: (*Own elaboration based on information by Ventura da Silva, 2013; Logue and Nde, 2007*)

Operation of poultry sector in both scales share one essential vulnerability: the existence of pathogenic microorganisms in the different rearing stages, as well as in the production process of meat, eggs and derivatives from them (Figure 1).

As a result, it is anticipated that those producers who do not have appropriate safety control systems in place to perform their functions within the poultry industry will face serious economic consequences. In addition, there is a latent health risk for the population, which would require the identification and solution of a problem that could compromise the life of people.

In this respect, López, Burgos, Díaz, Mejía and Quinteros (2018) conducted a research work in El Salvador due to cases associated to health problems such as: foodborne diseases, diarrhea and gastroenteritis. As a result, they identified a significant contamination in chicken meat due to the presence of *Salmonella spp*, *E. coli* and *S. aureus* in a supermarket product. They attributed this to failures generated during the production process, handling and even the transfer for sale to the final consumer. On the other hand, EFSA and ECDPC (2019), in 2018 reported that, diseases caused by *Salmonella* represented 30.7% of all cases of foodborne origin in the European Union, percentage that experimented an increase of 20.6% respect to 2017.

Some alternatives have been generated to reduce problems derived by pathogen microorganisms during different stages of poultry activities: using of formaldehyde for disinfection of eggs (Baylan, Akpinar, Canogullari and Ayasan, 2018); Facon *et al.* (2017) highlights the importance of vaccination for the control of colibacillosis in chickens, an infectious disease derived from *E. coli* and contracted because the bird is in contact with contaminated feces, water and dust. However, this infection, like others, continues to be treated with antibiotics (Selecciones avícolas, 2018). At the moment, it could be a benefit to farmers in the effectiveness production because it is an extensive productive activity; however, problems associated with water contamination from poultry effluents and bacterial resistance strains (Agyare, Boamah, Zumbi and Osei, 2018) and their dissemination in the environment, constitute a serious threat.

Bagust (2013) emphasizes the high probability that new pathogens may emerge from poultry farming in the coming years affecting not only this sector, but also to human being.

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In the last years, alternatives such as the use of herbal plants in the control of pathogen agents have been proposed. In this case, garlic, has been used due to its chemical components that allow it to act against diseases. Some research works have been concluded that garlic has a potential bactericidal action and, it is recommended for activities related in the different stages of meat poultry, eggs production, farming activities until the product is purchased by the final consumer (Nayab, 2022; Baylan *et al*., 2018; Fouad, Abdel-Hafez and El-Halim, 2018). Additionally, Ogbuewu, Okoro, Mbajiorgu and Mbajiorgu (2018) suggest the garlic, as an element to contribute significantly to animal nutrition, able to create beneficial effects associated with growth, health of livestock and a reliable alternative to reduce the use of antibiotic and chemical substances.

Based on the above, the aim of this work is determining the effect of garlic-aqueous solution, in relation to time, on the reduction in concentration of pathogen bacteria: *Escherichia coli* and *Salmonella typhymurium*, contained in an effluent of water from poultry activities. With this, it is expected to contribute to the knowledge on the behaviour of pathogenic microorganisms using a sustainable, safe and viable alternative to apply, for both large productive sectors and rural areas to satisfy needs of consumers and for those whose livelihood depends on poultry farming.

Methodology

Preparation of garlic-aqueous solution

Aqueous solution of *Allium sativum* (garlic) was prepared in 30% w/v concentration, according to the following equation:

$$\%\frac{w}{v} = \frac{mass\ of\ solute\ [g]}{volume\ of\ solution\ [mL]} * 100 \quad (1)$$

The solute, in this case garlic, was separated from its coating to be disinfected with ethanol. Subsequently, 15 g of garlic was placed in a mortar to be ground and introduced into a volumetric flask to be put in contact with water in order to complete 50 mL volume solution. Then, both components were incorporated and kept below room temperature until they were brought into contact with bacteria.

Sample of bacteria from poultry activities

Water is an important resource used in different stages of poultry activities, therefore, in this work it was contemplated as the bacteria resource (Figure 2). Subsequently, 100 ml volume of water from poultry activities was collected according to NOM-109-SSA1-1994. Then, material of significant size was removed to homogenize the sample for applying the microbiological analysis and later, the proposed treatment.

Figure 2 Identification of bacteria in poultry activities. *Source: Own elaboration*

Implementation of treatment: bacteria-garlic

The treatment was applied by triplicate. In it, 1 mL of water sample containing bacteria was poured into a test tube and subsequently, 9 mL of 30% w-v garlic-aqueous solution was introduced in it to be homogenized. At this time, the first sample (time = 0 s), with 0.1 mL volume, is taken to evaluate the effect of the garlic-aqueous solution on the inactivation of *Escherichia coli* and *Salmonella Typhimurium* through the application of microbiological analysis. Then, the solution was kept at rest and samples (volume = 0.1 mL) were taken at testing times of: 5, 10, 20, 30, 45, 60 and 90 minutes; before sampling, homogenization is important.

Microbiological analysis

Analysis to determine the effect of garlic-aqueous solution in *Escherichia coli* and *Salmonella typhimurium* bacteria was carried out extracting 0.1 ml volume of sample in the periods of time cited before. Subsequently, serial dilutions were carried out from each sample ($1{:}10^1$ to $1{:}10^5$); as inoculum was used the microbiological growth medium: Violet Red Bile Agar (VRB Agar, NEOGEN).

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For VRB Agar, 25 ml of microbiological medium at 318 K was poured in Petri dishes; once solidified, 0.1 ml of aliquot (sample taken in each testing time and dilutions) was distributed according to standard plate count (by duplicate). Later, Petri dishes were subjected to an incubation process at inverted position at 310 K during 18-24 h. Finally, microorganisms of interest were determined quantitatively by:

$$A\left[\frac{\text{CFU}}{\text{mL}}\right] = \frac{B \times C}{D\,[mL]} \quad (2)$$

where *A*, corresponds to bacteria concentration of the analyzed sample; *B* is the average of bacteria; *C*, dilution factor and *D*, represents the volume of inoculum.

Results

The results generated by the implementation of the experimental methodology proposed in this work are illustrated in Figure 3. Initial bacteria concentrations are showed graphically in testing time of 0 minutes; *Escherichia coli* with higher concentration (33×10^6 CFU/mL) than in the case of *Salmonella typhimurium* (16×10^5 CFU/mL). No immediate change is detected in concentrations bacteria when pathogen microorganisms are in contact with garlic-aqueous solution. Figure 4 shows the growth of both pathogen bacteria considered in microbiological medium VRB.

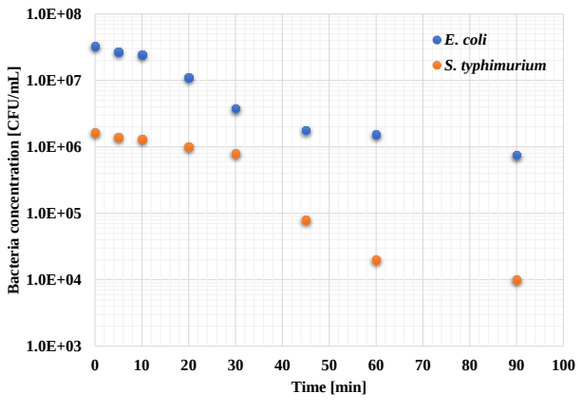

Figure 3 Bacteria reduction by the action of garlic-aqueous solution
Source: Own elaboration

In a period of 0-10 minutes of treatment, a linear trend in reduction (0.1-$\log_{10}$) is observed for both bacteria, obtaining concentrations of 24×10^6 CFU/mL and 13×10^5 CFU/mL for *Escherichia coli* and *Salmonella typhimurium* bacteria, respectively. Subsequently, in the specific case of *Escherichia coli* bacteria reduction increases (average: 0.3-$\log_{10}$) until the treatment finished (90 minutes). Mainly, at testing time 30 minutes, a greater effect of the garlic-aqueous solution on the inactivation of this pathogen microorganism is detected (0.5-$\log_{10}$). As a result of the treatment applied to *Escherichia coli* during 90 minutes, a total reduction of 1.6-$\log_{10}$ is achieved, which allows to obtain a final concentration of 76×10^4 CFU/mL.

Figure 4 Growth of *Escherichia coli* (red color) and *Salmonella typhimurium* (colorless) in VRB
Source: Own elaboration.

By the other hand, *Salmonella typhimurium* bacteria maintains a continuous reduction of 0.1-$\log_{10}$ before a testing time 45 minutes, in which garlic-aqueous solution reaches its maximum activity (0.9-$\log_{10}$ reduction). After, the inactivation effect starts to decrease until it reaches a concentration of 10×10^3 CFU/mL, thus achieving a reduction of 2.2-$\log_{10}$ respect to the initial concentration.

According to results, *Escherichia coli* and *Salmonella typhimurium* bacteria from poultry activities, experience vulnerability to the action of garlic-aqueous solution, as an agent to promote their reduction.

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Both bacteria, starting reduction with 0.1-log_{10} and ending the treatment with 0.3-log_{10}; however, during the evaluation time (90 s), *Salmonella typhimurium* shows greater reduction although a longer period of time is required to intensify bacterial decline in contrast to *Escherichia coli*.

These results could be attributed to substances such as allicin and diallyl trisulfide contained in garlic, which when it is crushed, interact with the water contained in the solution to reduce pathogen microorganisms.

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Conclusions

The garlic-aqueous solution in concentration 30% w-v, with treatment time 90 minutes proposed in this work, allows a simultaneous bacterial reduction for *Escherichia coli* (1.6-log_{10}) and *Salmonella typhimurium* (2.2-log_{10}). Due to the physical, chemical and microbiological properties of garlic, this kind of treatment can contribute to other methods or technologies to provide food with quality, reducing microbiological risks during the poultry farming and processes involved in reaching to the final consumer.

It is suggested to extend the knowledge by contemplating other concentrations of aqueous solutions of garlic due to its antimicrobial activity in the control of pathogen microorganisms, as well as to improve control over factors such as the physical, chemical and microbiological characteristics of the garlic to be used in the treatment.

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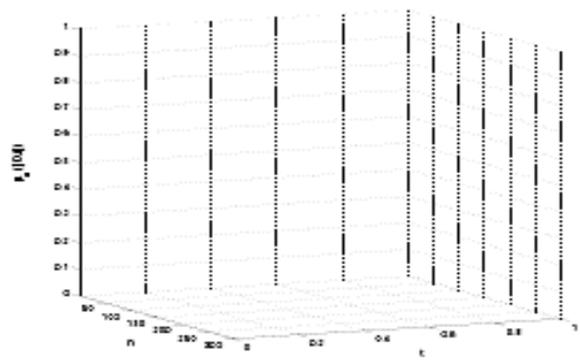

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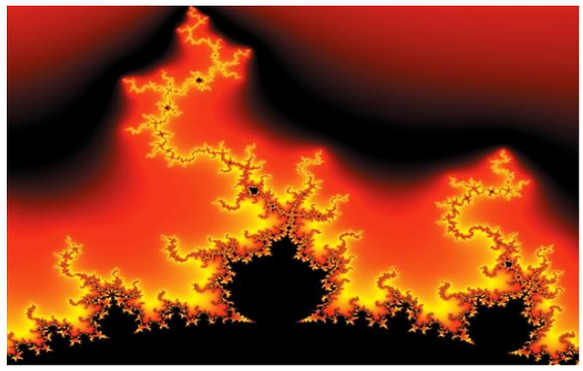

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