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# Journal of Nursing Techniques

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The works must be unpublished and refer to topics of Surgical techniques, technological innovation in nursing, drug management quality in patient care, first aid techniques, patient management and Control, patient grooming techniques and other topics related to Medicine and Health Sciences.

## Presentation of Content

As first article we present, *Application of a therapeutic exercise program to improve physical condition in patients with post-COVID-19 syndrome*, by MÁRQUEZ-SILVA, Salomé, ESLAVA-OSORIO, Omar, VALENCIA-MELO, Stephany and PATRICIO-RAFAEL, Emmanuel, with affiliation at the Universidad Tecnológica de Xicotepec de Juárez; as second article we present, *Determination of cholesterol and triglycerides and eating habits in foreign and local students*, by AKÉ-CANCHÉ, Baldemar, SARABIA-ALCOCER, Betty, LÓPEZ-GUTIÉRREZ, Tomás and PÉREZ-BALÁN, Román, as third article we present, *Law for the prevention of overweigh, obesity ande eating disorder from a multidiscipinary perspective*, by NEGRETE-CASTELLANO, María América, HEREDIA-QUEVEDO, Josefa Elizabeth, ARIAS-MOJARRO, Herica and AHUMADA-JIMÉNEZ, David, with secondment at the Universidad Autonoma de Nayarit, as last article we present, *Evaluation of weight loss and sweat rate, in soccer players who followed a different hydration plan, from the 2003 and 2004 categories of the Santos Tepic Soccer Academy*, by ARIAS-MOJARRO, Herica, RIVERA-CORTEZ, Ricardo César, NEGRETE-CASTELLANO, María América and REYES-MONROY, Mónica Griselle, with affiliation at the Universidad Autónoma de Nayarit.

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# Application of a therapeutic exercise program to improve physical condition in patients with post-COVID-19 syndrome

# Aplicación de un programa de ejercicio terapéutico para mejorar la condición física en pacientes con síndrome post-COVID-19

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**Abstract**

The post-COVID syndrome is a set of signs and symptoms that can persist from 3 weeks to 3 months after the resolution of an acute process, predominantly including fatigue and dyspnea, this makes it very difficult to return to your activities. the daily life of those who suffer from it. The objective of the research is to propose a therapeutic exercise program that improves physical condition in patients with post-COVID 19 syndrome. To meet the objective, a search and analysis of articles that included information related to post-COVID syndrome was carried out. COVID-19, its evaluation and the treatments provided with therapeutic exercise and respiratory physiotherapy. The proposed program was applied to university staff and students who met the inclusion criteria. Two evaluations were carried out, one initial and one final; the results show significant data of improvement in physical condition. Conclusion: The proposed exercise program allows the patient to recover functionality, impacting the physical condition, which as a consequence improves the quality of life and facilitates their integration into society.

**Post COVID-19 syndrome, Therapeutic exercise, Physical therapy in post COVID-19 syndrome**

**Resumen**

El síndrome post-COVID es un conjunto de signos y síntomas que pueden persistir de 3 semanas a 3 meses después de la resolución de un proceso agudo, entre los que predominan la fatiga y la disnea, lo que dificulta mucho la vuelta a sus actividades. la vida cotidiana de quienes lo padecen. El objetivo de la investigación es proponer un programa de ejercicio terapéutico que mejore la condición física de los pacientes con síndrome post-COVID 19. Para cumplir con el objetivo, se realizó una búsqueda y análisis de artículos que incluyeran información relacionada con el síndrome post-COVID COVID-19, su evaluación y los tratamientos realizados con ejercicio terapéutico y fisioterapia respiratoria. El programa propuesto se aplicó al personal universitario y a los estudiantes que cumplían los criterios de inclusión. Se realizaron dos evaluaciones, una inicial y otra final; los resultados muestran datos significativos de mejora de la condición física. Conclusiones: El programa de ejercicios propuesto permite al paciente recuperar la funcionalidad, incidiendo en la condición física, lo que como consecuencia mejora la calidad de vida y facilita su integración en la sociedad.

**Síndrome post COVID-19, Ejercicio terapéutico, Fisioterapia en el síndrome post COVID-19**

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## Introduction

Based on the existing current bibliographic evidence, such as in the article: "Recommendations for physical exercise in a population with a post-COVID-19 diagnosis": The virus responsible for severe acute respiratory syndrome caused by a coronavirus SARS-CoV-2 (COVID-19) has been classified as a global health problem (1).

According to the page of "Our World in data", in the world there have been a total of 612 million confirmed cases, and a death toll of 6.53 million; In Mexico, from the beginning of the pandemic in March 2020 to September 2022, there has been a registered total of 7.07 million confirmed cases, and a figure of 330 thousand deaths as a result (2).

The number of people who, despite having suffered from the SarsCov2 virus disease, have survived is, according to some researchers, around 66% (3).

Among the cases of COVID-19 that have occurred, we find patients who developed severe disabilities using the Intensive Care Units (ICU), as well as other patients who were less severe, and who did not use medical specialties, who only remained in isolation when presenting symptoms; In both types of patients, both severe and acute, we will find functional deterioration as a consequence of the recovery processes. Let us remember that rehabilitation is different in each case from severity to history and many more variables of each individual, it can be from a minimal process to prolonged rehabilitation, especially in those individuals who have had a very important loss of functional activities. . In both cases, rehabilitation is necessary, and to favor the process in patients discharged from a medical service, exercise guided by specialists in the field is of utmost importance and part of the comprehensive treatment in physiotherapy.

## Justification

This research is carried out with the purpose of demonstrating the influence of therapeutic exercises and their contribution to improving the physical condition of post-COVID-19 patients.

Currently, cases of COVID-19 continue to occur, a disease that presents a series of sequelae, including fatigue and dyspnea (which is reflected as shortness of breath when performing simple activities), recurring in the vast majority of patients who have the sequelae of having suffered from the disease, thus affecting their functional status and basic activities such as climbing stairs or walking long distances.

According to the Comprehensive Report on COVID-19 in Mexico, several waves with great impact in the country have been identified; During the development of the variants, various scenarios have been presented for the implementation of organized responses by all the institutions that represent the Health Sector in our country, as well as other government agencies, to meet the demand for clinical care of patients. patients, as a consequence of the different scenarios proposed, the different specialties in the health area have an emphasis on treating the sequelae. With the aforementioned, the Academic Body of Physical Therapy of the Technological University of Xicotepec de Juárez, implemented a study that would allow evaluating the effect of a program that contributes to improving the physical condition and that affects the functionality of the patients and with it impact functionality and quality of life.

The application of the generated program seeks to be a reference for Physical Therapists to consider within their therapeutic exercise programs to integrate warm-up, stretching, coordination, balance and strength; this is transcendental because it seeks to provide tools to other health professionals, for the management of people in whom symptoms such as fatigue, dyspnea and muscle weakness persist, in a way that contributes to the improvement of their physical condition.

## Theoretical framework

Post-COVID-19 syndrome refers to the persistence of signs and symptoms after having suffered from the disease, among which are: dyspnea, fatigue and reduced ability to participate in activities of daily living (4,5,6).

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The symptoms and signs can be varied; nevertheless, the two most frequent are fatigue and dyspnea, hence the importance of taking them as a reference for the protocol that is presented (4,5,6).

Currently there is still no specific treatment for this syndrome, despite this, the evidence shows a decrease in symptoms after completing a rehabilitation program. Therefore, the need to generate rehabilitation strategies to help people improve their condition after having suffered from the disease becomes evident (7,8).

Physical exercise is a systematic, planned, structured physical activity with the participation of repetitive movements which involve effort graded by intensity, which has a determined duration and is performed frequently, in order to achieve or maintain physical fitness or other specific objectives. In this regard, the World Health Organization WHO, (2020) recommends exercising or moderate physical activity at least 150 minutes a week, and in case of vigorous intensity, it recommends a total of 75 minutes. In turn, they recommend mixing both intensities and including at least two sessions of strength exercises. On the other hand, there are other recommendations that are specifically aimed at a population due to its particularities, age being a criterion for segmenting said processes. According to Matsudo , (9) stipulates that adults over 60 years of age should perform 180 minutes/day of physical activity with multicomponent exercises, involving cardiorespiratory fitness, muscle strength and balance, or failing that, remain as active as possible (10).

Based on the article "Post-COVID-19 physical rehabilitation in older adults": physical activity in the context of a pandemic can help maintain or improve exercise tolerance, maximum oxygen consumption, functional capacity, cardiovascular health, body composition, muscle strength. Any increase in physical activity can favorably reduce morbidity and the prognosis of various diseases, among other similar aspects (11, 12, 13).

Aerobic training to return to physical exertion should be gradual, individualized and based on subjective tolerance to exertion. The author mentions that patients should follow a regular program of aerobic exercise for 20-30 min, by cycling, walking, brisk walking, jogging, swimming, starting at low intensity and duration and gradually increasing: 20-30 min of exercise is recommended. duration of the session, 3-5 sessions/week, although it will always depend on the feeling of fatigue and/or dyspnea that each patient presents (14).

In progressive strength training: it is recommended to work on 1-3 muscle groups with a load of 8-12 repetitions, with training intervals of 2 minutes. The frequency would be 2-3 sessions/week for a minimum period of 6 weeks, increasing the load by 5-10%/week (14, 11).

After carrying out the reading of different articles, it is observed that several authors mention the performance of low or moderate intensity exercise, and contraindicate vigorous intensity exercise, because if there were an invasion of the myocardium by the COVID-19 virus, 19 could cause myocarditis, making the patient prone to heart failure, stroke or acute myocardial infarction that can cause death (11,12,15).

Let us not forget that some symptoms that may occur in post-COVID-19 patients are fatigue, dyspnea, chest pain, accompanied by a notable reduction in the immune system, which is why the patient is more vulnerable to developing pneumonia (16,17).

Taking into account the existing recommendations for the different populations according to their age, one of the objectives of the study is to establish specific data on physical exercise for those patients who have survived COVID-19 and who are discharged from a hospital environment, posing as a research question the following: what is the exercise that should be indicated to improve physical condition in patients diagnosed with post-COVId-19 syndrome? (18, 19).

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Through physiotherapy treatment, fatigue and dyspnea should be addressed, as they are the main factors that generate continuous deconditioning, incidents of long-term cardiopulmonary and musculoskeletal complications (20).

From the respiratory point of view, the goal of physical therapy is to reduce the sensation of dyspnea, preserve lung function, reduce dysfunction, disability, and improve quality of life (11,13).

**General objective**

The objective of this research is to generate an exercise program to improve the physical condition of patients with post-COVID-19 syndrome.

**Specific objectives**

- Propose a series of exercises that contribute to improving the physical condition of patients with post-COVID 19 syndrome.
- Apply the exercise program integrating warm-up, stretching, resistance exercises and strength exercises.
- Promote muscle balance.
- Promote respiratory capacity.
- Assess the effects of therapeutic exercises.

**Methodology**

The present study was of a quasi-experimental quantitative type, a functional evaluation and application of therapeutic exercises was carried out in patients with Post-COVID-19 Syndrome. The inclusion criteria included people between the ages of 18 and 56, a positive COVID test and symptoms such as fatigue and dyspnea after the disease. The exclusion criteria were: patients with uncontrolled chronic health conditions (Systemic Arterial Hypertension, Type II Diabetes Mellitus, among others), acute conditions (respiratory type) that make physical activity impossible, and patients older than 56 years.

Initially, the interview was carried out by filling out an identification form, later tests were applied and anthropometric measurements (height, weight, etc.) were taken to determine functional capacity; Following this, the candidate patients entered the rehabilitation protocol based on physical exercise.

The treatment program consisted of the application of 10 sessions of physical activity, with a frequency of four times a week, the duration of the treatment was 60 to 90 minutes per session. The session was divided into: warm-up; central phase where muscle strength and endurance exercises were worked on; aerobic training; balance exercises, and breathing exercises.

| Application of a therapeutic exercise program to improve physical condition in patients with post-COVID-19 syndrome | | |
|---|---|---|
| **Independent variable** | **Dependent variable** | **Evaluation method** |
| Therapeutic exercise | | Borg / 6 minute walk (6, 21,24) |
| | Fatigue | Oximetry (22) |
| | Dyspnoea | Barthel (23) |
| | Physical condition | Fantastic |
| | | Fatigue Assessment Scale (FAS) |
| | | Modified Medical Research Council Scale ( mMRC )( 23) |
| | | Single Breath counting |

**Table 1:** Variables and Units of measurement for the evaluation of the Protocol
*Source: Own elaboration*

**Results**

Five patients participated in the application of the program, the youngest patient was 18 years old, and the oldest patient was 56 years old. Within the treatment protocol, 10 sessions were contemplated; of which the first adaptations occurred even from the first session.

The patients were evaluated in two moments, one at the beginning and one at the end of the application of the exercise program.

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In the Fatigue Assessment Scale (FAS), in the initial mental evaluation, the minimum score was 13 and the maximum score was 24; Regarding the physical evaluation, the minimum score was 14 and the maximum score was 20. In the Modified Scale of the Medical Research Council ( mMRC ), only one patient obtained grade 3 in the initial evaluation and the others obtained grade 1. In the Barthel Index all patients obtained a score of 100. In the Fantastic test, one patient obtained a score of 44 in the initial evaluation, being the lowest and the highest score was 94. In the respiratory evaluation or Single Breath Counting the patient with a lower index was 21 words with a single breath with respect to the maximum that was 34 words.

According to the initial aerobic evaluation (6-minute walk), the lowest recorded heart rate was 72 beats per minute ( bpm ) and the maximum was 115 bpm , in oximetry the lowest percentage was 94% and the highest high 96%; Taking into account the BORG dyspnea and fatigue scale, the lowest score obtained was 3, and the highest score was 5. The last aspect evaluated was blood pressure, with the lowest data being 110/50 mmHg and the highest 140/90 mmHg.

Regarding the initial evaluation of strength, the maximum resistance (1RM) of 4 anaerobic exercises was taken into account, which were: bench press, minimum weight 2.3Kg and the highest 7.16Kg; military press, minimum weight 1.3Kg and the highest of 9Kg, in the squat minimum weight 5Kg and the highest was 12.02Kg and the last exercise was deadlift with a minimum weight of 4Kg and the maximum of 12.02Kg.

In the final part of the evaluation, the Berg test was implemented with a minimum score of 46 and a maximum of 56.

Once the treatment protocol was concluded, the reassessment was carried out, obtaining the following:

FAS in the mental reevaluation, the minimum score was 11 and the maximum score was 18; and in the physical evaluation the minimum score was 14 and the maximum score was 20. In the mMRC scale, two patients obtained grade 1 and the rest of the patients obtained grade 0. In the Barthel index, all patients obtained a score of 100 in the revaluation. In the Fantastic test, the lowest level was 48 and the highest 93. One patient presented a value of 88, decreasing 6 points compared to the initial evaluation. In the Single Breath Counting the patient with a lower index was 21 words with a single breath with respect to the maximum that was 48 words.

Regarding the initial aerobic reassessment (6-minute walk), the lowest recorded heart rate was 75 bpm, and the maximum was 140 bpm. In oximetry, the lowest percentage was 94% and the highest was 98%; Taking into account the BORG scale in dyspnea and fatigue, the lowest score was 2 in both and 4 being the highest score; and in blood pressure, the lowest data recorded was 110/60 mmHg and the highest 110/80 mmHg, both considered within normal ranges.

In the re-evaluation of strength, the following was obtained: bench press, minimum weight of 5.7Kg and the highest of 9.59Kg; in the military press, minimum weight of 6.7Kg and the highest of 11Kg; in the squat, minimum weight of 9.6Kg and the highest was 14.45Kg and the last deadlift exercise, minimum weight 4.8Kg and maximum 12.02Kg.

In the Berg test, a minimum score of 51 and a maximum of 56 was obtained in the reassessment.

**Analysis of results**

According to the results of the evaluations, we observed that in the mental FAS scale there was a decrease of 3.6 and a decrease of 4.4 in physical FAS, these data represent an improvement in the physical and mental evaluation of the patients. In the mMRC scale, in the initial assessment the mean was 1 grade and only 1 patient obtained grade 3; in the reassessment, the mean was 0 degrees and 2 patients obtained grade 1. That is, a positive decrease of 1 degree was obtained, which translates as beneficial changes in the activities of daily life of the patients, reducing dyspnea.

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The results in the Barthel index remained at 100 points, so there were no changes.

Regarding the Fantastic test, in the initial assessment the mean score was 73.4 and in the reassessment, it was 77; the score increased 3.6, this translates into an improvement in lifestyle.

In the respiratory evaluation (Single Breath Counting) the mean of the initial evaluation was 24.2 and in the reassessment 34.4, which shows an increase of 10.2 words with a single breath. These data are significant because they contribute to the improvement of lung capacity, which has an impact on physical condition, only one patient did not show changes.

In the aerobic evaluation (6-minute walk) the mean heart rate in the initial evaluation was 81.2 bpm , in the oximetry the mean was 95.2%, in terms of the results of Borg dyspnea a mean of 4.2 was obtained, in fatigue a mean of 3.6, in blood pressure the mean was 110/80 mmHg ; in the reassessment, a mean heart rate of 103.4 bpm was obtained , in the oximetry 96.2%, Borg dyspnea and fatigue the mean remained at 3, the mean blood pressure was 110/80 mmHg . The above shows an increase in heart rate of 22.2 bpm , an increase of 1% in oximetry, in Borg decreased dyspnea 1.2 and fatigue 0.6. Blood pressure was maintained and changes in vital signs after evaluation were satisfactory.

The results of the comparative strength evaluation indicate positive changes, obtaining an increase in the bench press of 2.16kg, in military press 1.88kg, in the squat 2.37kg and in the deadlift 1.24kg. In this category, one patient obtained the lowest results compared to the other patients.

Regarding the Berg scale, the results indicate an increase of 1.2. On this scale, one patient obtained the lowest scores in both evaluations. The remaining patients maintained the same data as at baseline. With the data contained at the moment, the treatment plan can be determined favorably, noting positive changes in the increase in physical condition, data that is evidenced in the independence of the patients.

## Conclusions

Physical activity in the context of a pandemic can help maintain or improve exercise tolerance, maximal oxygen uptake, functional capacity, cardiovascular health, body composition, muscle strength. It is argued that any increase in physical activity can favorably affect the decrease in morbidity and the prognosis of various diseases, among other similar aspects.

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# Determination of cholesterol and triglycerides and eating habits in foreign and local students

# Determinación de colesterol y triglicéridos y hábitos alimentarios en estudiantes foráneos y locales

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**Abstract**

Objective: To determine the difference in eating habits in foreign and local students of the Faculty of Chemical Biological Sciences (UAC), through the analysis of serum levels of cholesterol and triglycerides. Methodology: A descriptive study was carried out with 30 students between 18 and 23 years of age from the Autonomous University of Campeche of the Q.F.B educational program in the state of Campeche. Results: The cholesterol levels of foreign men are 163.5 and in the locals it is 136.8; having a difference of 26.7. In the female gender, foreigners have an average of 137.13 and locals one of 135.78; having a difference of 1.35, a smaller difference compared to men. In triglyceride levels, local women have the highest triglyceride levels compared to foreign women, obtaining a difference of 14.2. In men, foreigners are the ones that contain the highest serum levels, having a difference of 17.7 with the triglyceride levels of local men. With respect to this parameter, men are the ones most associated with hypertriglyceridemia disorders.

**Cholesterol, Triglycerides, Eating habits, Students**

**Resumen**

Objetivo Determinar la diferencia de hábitos alimenticios en los estudiantes foráneos y locales de la Facultad de Ciencias Químico-Biológicas (UAC), mediante el análisis de los niveles séricos de colesterol y triglicéridos. Metodología: Se realizó un estudio descriptivo con 30 estudiantes entre los 18 y 23 años de la Universidad Autónoma de Campeche del programa educativo de Q.F.B en el estado de Campeche. Resultados: Los niveles de colesterol de hombres foráneos son de 163.5 y en los locales es de 136.8; teniendo una diferencia de 26.7. En el género femenino las foráneas tienen una media de 137.13 y las locales una de 135.78; teniendo una diferencia de 1.35, una diferencia menor en comparación con los hombres. En los niveles de triglicéridos las mujeres locales tienen los niveles de trigliceridos más elevados en comparación con las foráneas, obteniendo una diferencia de 14.2. En los hombres los foráneos son los que contienen los niveles séricos más altos teniendo una diferencia de 17.7 con los niveles de trigliceridos de los hombres locales. Con respecto a este parámetro los hombres son los que se encuentras más asociados a trastornos de hipertrigliceridemia.

**Colesterol, Triglicéridos, Hábitos alimenticios, Estudiantes**

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## Introduction

Adolescence is the period in which dietary habits are established, taste matures, preferences and temporary or definitive aversions are defined, constituting the basis of eating behaviour for the rest of life. At this stage, environmental, family, cultural and social conditions have an important influence on the definition of the nutritional personality, on which the nutritional status will depend.

Adolescence is characterised as a period of physical and mental maturation; consequently, nutritional requirements at this stage increase and vary according to sex and individual. Common eating problems in adolescents can lead to overweight and obesity; these disorders can be caused by sedentary lifestyles and lifestyle changes. Other causes relate to the fact that this age group is subjected to rigid school schedules and extracurricular activities. Some young people - of low socio-economic level - use their scarce economic resources to cover the minimum family needs, which sometimes leads to the omission of some meals, especially breakfast, a situation that favours the presence of poor dietary habits (Castañeda et al.).

The prevalence of overweight and obesity has increased markedly in the last two decades. This is particularly due to the fact that obesity can be linked to various conditions such as hypertension, diabetes and atherosclerotic disorders, with a prevalence in adolescents and young people between 18 and 23 years of age. An important problem related to young people's eating habits is the metabolic syndrome which is a complex interrelationship of risk factors for cardiovascular disease and diabetes mellitus (DM). These factors include: elevated triglyceride levels, decreased levels of high-density lipoprotein cholesterol (HDL-cholesterol) and obesity.

Plasma lipid profile values are the result of complex metabolic processes influenced by genetic and environmental factors, cardiovascular problems and poor dietary habits. Several studies have shown that abnormal lipid profile levels are completely associated with the type of diet in daily life, with young people being the most affected (Díaz et al.).

## Methodology to be developed

To achieve the proposed objective, a descriptive study was carried out with 30 students between 18 and 23 years of age from the Universidad Autónoma de Campeche of the Q.F.B. educational programme in the state of Campeche.

The students were interviewed at the University in one of the laboratories; weight and height measurements were taken to calculate the body mass index according to the World Health Organization and the World Health Organization; waist circumference measurements were also taken to determine health risks according to their size; the results were compared with the International Diabetes Federation, IDF and ESNA 2000.

Venous blood samples were taken under adequate aseptic conditions after a 12-hour fast; this procedure was carried out under the stipulations of NOM- 007- SSA- 2011. Measurements of serum total cholesterol and triglycerides were carried out by automated analysis on Mindray BS-120 Chemistry Analyter. All determinations were analysed in a clinical analysis laboratory at the university facilities, under the aforementioned standard.

The following values were used as reference to interpret the results obtained:

Cholesterol determination:

Less than 200 mg/dL: Normal

200 - 239: Moderate

240 or more: High

Triglyceride determination:

**Males:** 40 - 160 mg/dL

**Women:** 35 - 165 mg/dL

From a bioethical point of view, informed consent was requested from all students and all students agreed to participate in the research.

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## Results

The distribution of the students consisted of 30 students; 50 % belonged to the group of foreign students and 50 % belonged to the group of local students; 60 % were female and 40 % were male.

It was observed that only 27 % of the patients analysed had high triglyceride levels; in the case of cholesterol only 3 % of the patients had moderate levels (95 mg/dL).

Further statistical analysis showed that foreign men have a very high prevalence of body mass indexes, having the highest body mass indexes; the same is true for cholesterol and triglycerides, which have the highest serum levels (Figure 1).

| Determinants | Gender | average | Standard deviation | Minimun | Maximum |
|---|---|---|---|---|---|
| height | female | 1.56 | 0.049 | 1.49 | 1.63 |
| | man | 1.715 | 0.095 | 1.62 | 1.88 |
| size | female | 81.25 | 8.51 | 64 | 90 |
| | man | 105.83 | 17.66 | 87 | 126 |
| weight | female | 58.89 | 9.63 | 44.2 | 71.2 |
| | man | 92.4 | 25.5 | 66.9 | 128 |
| Body mass index | female | 24.18 | 3.83 | 19.91 | 29.68 |
| | man | 31.04 | 6.34 | 24.87 | 41.42 |
| cholesterol | female | 137.13 | 22.38 | 112 | 171 |
| | man | 163.5 | 34.4 | 138 | 217 |
| triglycerides | female | 111.8 | 54.7 | 67 | 212 |
| | man | 142.7 | 67.9 | 66 | 249 |

**Figure 1** Determinants of variables in study of foreign students

With regard to the results obtained from the analysis of the local students, it was observed that, in the body mass index, men have the highest indices with a difference of 2.57 in comparison with the female gender; with regard to serum levels, it was obtained that there is only a difference of 1.02 in the levels between men and women, with men having the highest levels. In the case of triglycerides, a very significant finding was that women had higher levels than men, although there was only a difference of 1.0 compared to men (Figure 1).

With respect to foreign males, it was observed that the BMI was higher than local students and in the case of the female gender, it was the local female students who had a higher BMI compared to the foreign female students (Figure 2).

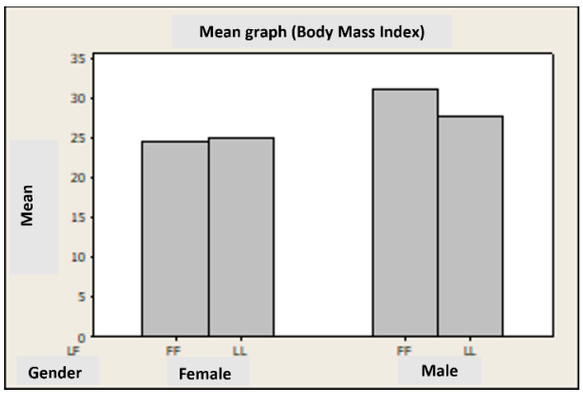


**Figure 2** BMI comparison. LL: Local; FF: Foreign

Likewise, cholesterol is more prevalent in foreign students, with foreign men having the highest serum levels. Based on the analysis of the data, it was determined that the cholesterol levels of foreign men are 163.5 and local men 136.8, with a difference of 26.7. In the female gender, foreigners have a mean of 137.13 and locals 135.78, with a difference of 1.35, a smaller difference compared to men.

| Determinants | Gender | average | Standard deviation | Minimun | Maximum |
|---|---|---|---|---|---|
| height | female | 1.5411 | 0.0506 | 1.49 | 1.65 |
| | man | 1.7333 | 0.1179 | 1.6 | 1.91 |
| size | female | 83 | 10.86 | 70 | 107 |
| | man | 95 | 13.4 | 77 | 112 |
| weight | female | 59.64 | 11.52 | 44.3 | 81.3 |
| | man | 84.08 | 19.16 | 55 | 104 |
| Body mass index | female | 25.07 | 4.35 | 18.68 | 31.21 |
| | man | 27.64 | 3.55 | 20.96 | 31.1 |
| cholesterol | female | 135.78 | 27.46 | 95 | 170 |
| | man | 136.8 | 26.4 | 109 | 180 |
| triglycerides | female | 126 | 78.8 | 43 | 256 |
| | man | 125 | 81 | 81 | 176 |

**Figure 3** Determinations of variables in local student studies

In the case of triglyceride levels, something very different happens with respect to cholesterol; it can be observed that local women have higher triglyceride levels than foreign women, with a difference of 14.2. In the case of men, it can be observed that foreign men have the highest serum levels, with a difference of 17.7 compared to the triglyceride levels of local men (Figure 1 and 3).

With all of the above, it can be determined that cholesterol and triglyceride content varies in both locals and foreigners, with foreigners having a prevalence of elevated cholesterol levels.

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## Conclusions

Determinations of cholesterol and triglycerides for a comparison of dietary habits between foreign and local students indicate that consumption of high fat foods can vary serum content and is linked to the variant of being a foreigner, in the case of cholesterol levels; with men having the highest levels, this can be attributed to women secreting oestrogen, which is a hormone that acts as a cardiovascular protector, helping to regulate cholesterol levels and increasing the concentration of HDL (high density lipids), although it should be borne in mind that hypercholesterolaemia disorders are more associated with women. With respect to triglyceride levels, it is distributed for the female gender in local female students and for the male gender in local male students; with respect to this parameter, men are the ones who are more associated with hypertriglyceridaemia disorders.

In conclusion we can determine that bad eating habits are completely associated with foreign students, this is because their consumption of fats and carbohydrates is determined by the consumption of foods known as fast food and the nightly intake of large quantities of junk food; but one of the important points that triggers the levels of cholesterol and triglycerides is associated with not consuming foods with high nutritional intake at breakfast, taking into account that breakfast is the main meal.

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# Law for the prevention of overweigh, obesity and eating disorder from a multidiscipinary perspective

# Ley de prevención de Sobrepeso, obesidad y Trastornos de conducta alimentaria desde una mirada multidisciplinar.

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**Abstract**

Consider the potential of education with a multidisciplinary management as a promoter of healthy citizens

Objective: To show that the approach and management that has been given in the case of Obesity, overweight and eating disorders (TCA), where the physical aspect has been taken into account mainly, has marked a diminished and impoverished management of the illness.

Methodology: For this research, a review of the laws based on the prevention of overweight, obesity and eating disorders in Mexico was carried out. According to statistical data from the 2018 National Health and Nutrition Survey (ENSANUT).

Contribution: The result of the analysis of the review shows that there are legal gaps in the law, which do not meet criteria that generally address the issue of overweight, obesity and eating disorders. In a timely manner, the law of the state of Nayarit was reviewed and compared, and a prevention proposal was made that includes comprehensive care for these diseases.

**Laws, Obesity, Eating disorders**

**Resumen**

Considerar el potencial de la educación con un manejo multidisciplinar como impulsor de ciudadanos sanos

Objetivo: Mostrar que el enfoque y manejo que se ha dado en el caso de la Obesidad, el sobrepeso y los trastornos de conducta alimentaria (TCA), donde se ha tomado en cuenta principalmente el aspecto físico, ha marcado un manejo disminuido y empobrecido de la enfermedad.

Metodología: Para esta investigación, se llevó a cabo una revisión de las leyes en función de la prevención de Sobrepeso, obesidad y trastornos de conducta alimentaria de México. Según datos estadísticos de la encuesta nacional de salud y nutrición (ENSANUT) 2018.

Contribución: El resultado del análisis de la revisión demuestra que hay vacíos legales en la ley, que no cumplen con criterios que aborden de forma general el tema de sobrepeso, obesidad y trastornos de conducta alimentaria. De forma puntual se revisó y comparo la ley del estado de Nayarit y se realizó una propuesta de prevención que incluye atención integral de estas enfermedades.

**Leyes, Obesidad, Trastornos de la conducta alimentaria**

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## Introduction

The World Health Organization establishes the definition of Health as "a complete state of physical, mental and social well-being" and not only the absence of disease. Based on this premise, it is important to consider that, although in Mexico health care is a fundamental and indispensable right for human beings, it is observed that in some diseases such as obesity, overweight and eating disorders (ED), the approach and management has been given taking into account mainly the physical aspect, marking a diminished and impoverished management of the disease.

This is the reason for the interest of this research that aims at a multidisciplinary review of this problem, for this purpose, a review of the laws for the prevention of overweight, obesity and eating disorders in Mexico was carried out. According to statistical data from the National Health and Nutrition Survey (Shamah et al., 2018), in the last 30 years, the prevalence of overweight and obesity in Mexico has tripled, and currently just over 70% of the Mexican adult population has a weight above the recommended, which has led our country to currently occupy the second place in obesity in adults and the first in the child population. The promotion of obesogenic environments and the lack of detection of eating disorders in schools, as well as the lack of adequate services to promote the health of children, adolescents and young people, to prevent this type of diseases and to treat them in a timely manner, leads to serious health problems and psychosocial risk conditions for the school population, which cannot be addressed in a timely and efficient manner due to the demand for services required, mainly by health institutions. In our country, the public school concentrates in the basic and high school level a little more than 23 million students (86.5% of school enrollment) (SEP, 2017), a condition that makes it a social space with enormous potential that counteracts the health crisis that currently puts children and young people at risk, through real actions.

From the result of the analysis of the review, it shows that there are legal gaps that do not meet criteria that generally address the issue of overweight, obesity and eating disorders, have focused on general aspects neglected others no less important, as is the case of overweight and obesity without taking into account eating disorders, In some cases, this has resulted in approaches that instead of benefiting the population have been overloaded with information gaps that are incongruent with the policies that have been tried to be applied, without having results that reflect that the path that has been followed has been the most optimal to achieve a positive and tangible change in terms of this type of diseases that undoubtedly has repercussions in poor health, nutrition and poor quality of life.

Under this framework and after carrying out a review of the laws that support public policies regarding food health in Mexico and the legislation of each state of our country, it was possible to compare that of the state of Nayarit and proceed to make a proposal for a law that includes comprehensive care and a proposal for the prevention of these diseases.

Obesity and overweight have become a worldwide public health problem. Governmental actions to address this problem include a wide spectrum of instruments ranging from information campaigns to the design of specific legal regulations (Castellano, A., Temporelli, K., and Chaz, S, M. 2017). According to the World Health Organization, obesity is a chronic disease, characterized by increased body fat, associated with increased health risk. In adults, obesity is classified by considering the Body Mass Index (BMI), due to the correlation that this indicator presents with body fat and health risk at the population level. The classification of obesity according to WHO, considers overweight a BMI of 25 - 29.9, Obesity grade one 30-34.9, severe obesity 35-39.9 and 40 or more indicates a very severe increase (Moreno, 2012).

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Psychological disorders that involve severe abnormalities in eating behavior are referred to as "eating disorders" (Raich, 2011). Eating disorders (EDs) are characterized by presenting abnormal eating behaviors as a response to their dissatisfaction with their body image. They are heterogeneous and complex diseases and different factors may be involved in their etiopathogenesis: genetic, biological, psychological, individual, familial and sociocultural (Sánchez and Prats, 1998). It includes two specific disorders: anorexia nervosa (AN) and bulimia nervosa (BN); in addition, six eating disorders not otherwise specified (EDNOS) have also been defined, according to the Diagnostic and Statistical Manual of Mental Disorders, revised and published by the American Psychiatric Association, DSM-IV-TR (APA, 2000).

It is emphasized that the problem of obesity is not new, society and different health institutions have identified it; however, it has not been addressed in a multidisciplinary manner and therefore the many failed attempts to combat this problem. In other words, obesity is a complex medical problem that according to the World Health Organization (WHO) has become a worldwide epidemic. This condition, which is caused by the decrease in energy expenditure or increase in the caloric intake of individuals, generates not only physical but also psychological problems that trigger a series of diseases that reduce the quantity and quality of life, increasing the demand for health care (Temporelli and Mussini, 2012).

It is perceived as a worldwide phenomenon and assumes a complexity that impacts the health of the child population due to the important physical consequences, such as cardiovascular diseases, diabetes, increased risk of cancer; others are mental, such as low self-esteem, depression or anxiety; in addition to the social ones, such as stigma, discrimination or difficulties in relating; and all of them imply a lower quality of life, according to the High Commissioner for Child Poverty (2022) despite this, the results indicate that the efforts made have been partial, inadequate and insufficient.

Latin American countries in general are facing changes in the health conditions of their inhabitants. There is a sustained increase in the prevalence of chronic diseases and a decrease in infectious diseases (Bernabeu and Robles, 2000; Robles, Bernabeu and Benavides, 1996). These changes have generated a "health change" term that recognizes the importance of social and behavioral factors in the health status of populations (Viego & Temporelli, 2015; Robles, Bernabeu, & Benavides, 1996)

Health risks associated with the processes of industrialization and urbanization originate in individual choices that lead to the adoption of new lifestyles that are not always healthy. On the one hand, there is an increase in the consumption of foods with low nutritional content and high caloric intake, while on the other hand, sedentary activities increase both in the work and recreational environments (Santos-Preciado, 2003; Robles, Bernabeu and Benavides, 1996).

Obesity and overweight stand out among the emerging health problems in this new paradigm of the rest, due to the sustained increase in their prevalence and because they constitute a risk factor for other non-communicable diseases such as arterial hypertension, diabetes mellitus type I and II, cardiovascular diseases, hypoventilation and obstructive sleep apnea syndromes, liver disease due to fatty infiltration of the liver, cholelithiasis, osteoarthrosis, epiphysiolysis, dyslipidemia and some types of cancer (Flegal, Graubard and Williamson, 2005; Sturm, 2002).

These are pointed out as relevant and determinants of the increase in obesity:

– The increase in the price of fruits and vegetables and the decrease in the price of industrialized foods (with higher caloric intake).

– The increase in food consumption outside the home, sometimes due to the insertion of women in the labor market, which reduces the time devoted to food preparation.

– Sedentary activities such as playing video games, watching television, using cell phones, computers, and other electronic devices,

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- The number of fast food restaurants has increased and the size of the portions offered has increased.

- Advertising tending to increase the consumption of foods rich in sugar and fat, aimed mainly at children.

- In urban environments, there has been an increase in insecurity, which reduces the possibility of engaging in physical or recreational activities in open-air spaces.

- The growth of cities has increased and so has the need to use transportation, which limits the possibility of walking.

Globally, in 2014, more than 1.9 billion adults aged 18 years and older were overweight, of which more than 600 million were obese. That is, about 13% of the world's adult population was obese, with differences between men (11%) and women (15%). On the other hand, 39% of the adult population was overweight. Beyond the number of individuals suffering from these pathologies, the WHO report states that between 1980 and 2014 the global prevalence of obesity has doubled and this trend does not seem to be reversed (WHO, 2016).

In today's Mexico we face undeniable effects of modern life and transculturation (Rebato, 2009), vertiginous changes have been adopted by the population. There has been an increase in the consumption of fats, flours and various foods that are not part of the national culture, leaving aside the consumption of corn and beans, just to name a few. On the other hand, the mass media and advertising of large food companies incite excessive consumption and at the same time the prototype of beauty requires us to be thin, this restriction confronts us with another paradox. For this reason, abnormal behaviors of food intake are adopted, leading to disorders such as anorexia and bulimia (Torrero and Urbiola, 2010).

In addition, they "sell" and claim that said a prototype of beauty towards extreme thinness that does not fit with most of the population and that mainly influences young people, who internalize that being extremely thin is synonymous with beauty, success and popularity, leading them to carry out unhealthy eating habits (Pérez and Romero, 2008; Pérez-Gil and Romero, 2010; Pérez, Vega and Romero, 2007). Therefore, it is a problem where social influence predominates.

In the specific case of Mexico, the food and nutritional panorama is complicated; on the one hand there are problems of malnutrition and nutritional deficiencies and on the other hand there is obesity and chronic degenerative diseases, in many cases as a result of customs and habits alien to the food culture in this country (Torrero and Urbiola, 2010).

The proposal is based on the diagnostic criteria of the Diagnostic and Statistical Manual of Mental Disorders (DSM) of the American Psychiatric Association (APA), which contains a classification of mental disorders and provides clear descriptions of the diagnostic categories, so that clinicians and health science researchers can diagnose, study, exchange information and treat the different mental disorders.

**Methodology:**

The laws involving the topic of health were identified and reviewed to establish the relationship with the topics of obesity, overweight and ACTs in Mexico, there is a General Health Law that serves as a frame of reference for state legislatures. The following emanates from it:

To comply with the provisions of Article 4 of the Political Constitution of the United Mexican States, the General Health Law (1984) is created in which, in Article 1, establishes the bases and modalities for access to health services and the concurrence of the Federation and the federative entities in matters of general health. It also mentions that it is applicable throughout the Republic and its provisions are of public order and social interest. Likewise, article 2 mentions the following aspects:

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I. The physical and mental well-being of man in order to contribute to the full exercise of his capabilities;

II. The prolongation and improvement of the quality of human life;

III. The protection and enhancement of values that contribute to the creation, preservation and enjoyment of health conditions that contribute to social development; etc.

Although there is a general health law at the national level, it only briefly addresses the issues of obesity, overweight and eating disorders. The 32 state congresses have issued their respective laws addressing the issues in question, although not all of them address them with the same denomination.

**Analysis and proposed amendments to the law for the prevention of obesity, overweight and eating disorders in the state of Nayarit**

The present law was registered as Second Class Article on December 1, 1921, a modification is located in September 2015 proposed by the then Governor of the State of Nayarit LIC. NEY GONZÁLEZ SÁNCHEZ.

**Law for the prevention of obesity, overweight and eating disorders in the state of Nayarit (september 2015)**

A second modification is made with the Governor of the State of Nayarit ROBERTO SANDOVAL CASTAÑEDA, in which Section 111 of Article 7, Sections and VI of numeral 16, as well as diverse 17 are reformed; Article 13 BIS. Section VII of numeral 16 and diverse 19 BIS are added, all of the Law for the Prevention of Obesity, Overweight and Eating Disorders in the State of Nayarit. (The date of modification is not mentioned).

A careful analysis of the present law was carried out by a multidisciplinary team, with the participation of knowledgeable people with experience in the subject, seen from different disciplines such as medicine, psychology, nutrition, pharmacobiological chemist, dentistry, education sciences, physical culture and law.

**Results**

As a result of the analysis of the LAW FOR THE PREVENTION OF OBESITY, OVERWEIGHT AND EATING DISORDERS IN THE STATE OF NAYARIT the report was submitted to the president of the congress of the XXXII Legislature to the Honorable Congress of the State of Nayarit, the initiative aims to reform and add various provisions of the Law for the Prevention of Obesity, Overweight and Eating Disorders in the State of Nayarit. which has the purpose of reforming and adding diverse provisions to the present law.

The changes made included in the exposition of motives the legal loopholes that were not contemplated in the law.

The following are some of the main arguments that gave way to the proposed law:

a) The World Health Organization that establishes the definition of Health as "a complete state of physical, mental and social well-being" and not only the absence of disease, it is established as a right the attention of human beings in an integral manner, with this premise it is important to point out that in the management of obesity overweight and eating behavior disorders, the approach and management has been given taking into account mainly the physical aspect, marking with it a diminished and impoverished management.

b) In Mexico; on the one hand, there are problems of malnutrition and nutritional deficiencies and on the other hand, there is also obesity and chronic degenerative diseases, as a result in many cases of customs and habits foreign to the food culture in this country. There are problems related to food intake and at the same time problems related to food restriction.

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c) According to statistical data from the National Health and Nutrition Survey (ENSANUT) 2018. In the last 30 years, the prevalence of overweight and obesity in Mexico has tripled, and currently just over 70% of the Mexican adult population has a weight above the recommended, which has led our country to currently occupy the second place in obesity in adults and the first in the child population.

d) Overweight and obesity are conditions that are related to genetic susceptibility, psychological, social and metabolic disorders; which increase the risk of developing comorbidities such as: arterial hypertension, type 2 diabetes mellitus, cardiovascular and cerebrovascular diseases.

e) Eating disorders (ED) are characterized by abnormal eating behaviors in response to dissatisfaction with body image. They are heterogeneous and complex diseases and their etiopathogenesis may involve different factors: genetic, biological, psychological, individual, familial and sociocultural. Most of the time their diagnosis is made in advanced stages of the disease when the disorder is already installed and the outlook is not very encouraging.

f) In the State of Nayarit we have a prevalence of Eating Disorders of 14.29%. Eating disorders are found in urban areas, although they are also found in rural areas, only with a lower percentage. It is worth noting that 31.54% of adolescents are overweight or obese, as well as Eating Disorders at the same time. When we talk about Eating Disorders, Overweight and Obesity we realize that they not only have personal implications that affect the biological, psychological and social aspects, but also involve the family area and society in general, due to the consequences derived from the diseases themselves (Negrete, Pénelo, Guzmán and Raich, 2019).

After the review, the proposed amendments to the present law were made and are presented below:

DRAFT DECREE

ONLY. - The name of the Law "LAW FOR THE PREVENTION OF OBESITY, OVERWEIGHT AND EATING BEHAVIOR DISORDERS IN THE STATE OF NAYARIT" is amended; fractions I, II, III and IV of article 2; article 3; article 4; fractions I, II, III, IV and V of article 5; the name of chapter II "Of the Council for the Prevention and Integral Attention of Obesity and Eating Behavior Disorders"; article 6; Article 7; Article 9; Sections II and III of Article 10; Article 11; Article 12; second paragraph of Article 13; Article 13 BIS; Article 14; first paragraph of Article 15; Article 16; Article 17; Article 18; Article 19; Article 19 BIS; the denomination of Chapter IV "On the Evaluation of Actions for the Prevention and Care of Obesity and Eating Disorders"; Article 21. A second paragraph is added to Section III of Article 15, all of the Law for the Prevention of Obesity, Overweight and Eating Disorders in the State of Nayarit, to read as follows:

| LAW FOR THE PREVENTION OF OBESITY, OVERWEIGHT AND EATING DISORDERS IN THE STATE OF NAYARIT | PROPOSED CHANGES TO THE LAW |
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| LAW FOR THE PREVENTION OF OBESITY, OVERWEIGHT AND EATING DISORDERS IN THE STATE OF NAYARIT (SEPTEMBER 2015). | LAW FOR THE PREVENTION OF OBESITY, OVERWEIGHT AND EATING DISORDERS IN THE STATE OF NAYARIT (2021). |
| Article 2.<br>l. To establish the legal framework in order to create the necessary instruments for the integral prevention of obesity, overweight and eating disorders in the State of Nayarit, as well as the development of eating and nutritional habits that allow the inhibition of their incidence. | Article 2.<br>To establish the legal framework in order to create the necessary instruments that contribute to establish conditions for the integral prevention of obesity, overweight and eating disorders in the State of Nayarit. |
| III. To establish as an obligation of the authorities of the State of Nayarit, in accordance with their area of competence, the comprehensive prevention of obesity, overweight and eating disorders, and | III. To establish as an obligation of the authorities of the State of Nayarit, in accordance with the general norms established in a comprehensive manner, a mechanism for the attention, control and prevention of obesity, overweight and eating disorders. |
| IV. To formulate the general administrative dispositions regarding the prevention and integral attention of obesity, overweight and eating disorders, as well as the promotion of appropriate nutritional habits in the inhabitants of the State of Nayarit. | IV. To formulate the general administrative provisions that establish the guidelines related to the prevention and integral attention of obesity, overweight and eating disorders in the State of Nayarit. |
| Article 3.- The State Government, through the Nayarit Health System, shall promote the coordinated participation of the social and private sectors in the conformation, implementation and evaluation of the State Program for the Prevention and Fight against Obesity, Overweight and Eating Disorders. | Article 3.- The State Government, through the Nayarit Health System, shall promote the coordinated participation of the public, social and private sectors in the conformation, implementation and evaluation of the State Program for the Prevention and Fight against Obesity, Overweight and Eating Behavior Disorders. |

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| Article 4.- The State Program for the Prevention and Fight against Obesity, Overweight and Eating Disorders is the guiding instrument of the governmental action in the matter of the present Law. | Article 4.- The State Program for the Prevention and Combat of Obesity, Overweight and Eating Behavior Disorders is the guiding instrument of the governmental action in the matter of the present Law. |
| Article 5.<br>I. To issue, with the participation of the organized social and private sectors, the State Program for the Prevention and Fight against Obesity, Overweight and Eating Disorders in Nayarit; | Article 5.<br>I. To issue, with the participation of the diverse public and private sectors, social and governmental, as well as non-governmental, the State Program for the Prevention and Combat of Obesity, Overweight and Eating Behavior Disorders in Nayarit. |
| II. Through the Ministry of Health, to permanently provide the inhabitants of Nayarit with information on the prevention of obesity, overweight and eating disorders; | II. Through the Ministry of Health, to permanently provide the inhabitants of Nayarit with information on the prevention of obesity, overweight and eating disorders; |
| III. In coordination with the educational authorities and their trade organizations, promote the adoption by society and particularly in schools, of nutritional habits that inhibit the incidence of obesity, overweight and eating disorders; | III. In coordination with the educational authorities and their trade organizations, promote the adoption by society and particularly in schools, of psycho-educational strategies for the prevention and treatment of obesity, overweight and eating disorders, in order to establish strategies for protective factors. For this purpose, a subject may be included at the secondary level that will be developed by experts who have previous research in the disciplines of nutrition, psychology and physical activity, ensuring that the student knows about healthy eating habits, physical activities necessary for a good development and the psychological aspects that influence the development of obesity, overweight and eating disorders; |
| IV. To organize the participation of the social and private sectors in relation to the prevention and fight against obesity, overweight and eating disorders; | IV. To organize the participation of the public, social and private sectors in relation to the prevention and fight against obesity, overweight and eating disorders; |
| V. To carry out the necessary research on obesity, overweight and eating disorders, making the results obtained public knowledge, and | V. To carry out the necessary research on obesity, overweight and eating disorders, making the results obtained public knowledge, and |
| Chapter II<br>The Council for the Prevention and Integral Care of Obesity and Eating Disorders | The title of Chapter II "The Council for the Prevention and Comprehensive Care of Obesity and Eating Disorders" is changed to "The Council for the Prevention and Comprehensive Care of Obesity and Eating Disorders". |
| Article 6.- The State Council for the Prevention and Integral Attention of Obesity, Overweight and Eating Disorders, is the collegiate instance, of permanent character, of structure, content, consultation and evaluation of the Program for the Prevention and Integral Attention of Obesity, Overweight and Eating Disorders in Nayarit. | The State Council for the Prevention and Integral Attention of Obesity, Overweight and Eating Behavior Disorders is the collegiate instance, of permanent character, of structure, content, consultation and evaluation of the Program for the Prevention and Integral Attention of Obesity, Overweight and Eating Behavior Disorders in Nayarit.<br>of the Program for the Prevention and Integral Attention of Obesity, Overweight and Eating Behavior Disorders in Nayarit. |
| Article 7.- The State Council for the Prevention and Integral Attention to Obesity, Overweight and Eating Disorders shall be integrated by: | Article 7.- The State Council for the Prevention and Integral Care of Obesity, Overweight and Eating Behavior Disorders shall be integrated by: |
| V. Two representatives of the Sindicato Nacional de Trabajadores de la Educación (National Union of Education Workers), one from Section 20 and the other from Section 49 of Nayarit; | V. Two representatives of the National Union of Education Workers, one corresponding to section 20 and the other to section 49 of Nayarit; which must comply with the regulations of knowledge in the matter of this law to enforce the guidelines of this legal order; |
| VI. At the proposal of the Head of the Executive Branch, two representatives of educational institutions in the health area, as well as two representatives of civil society, and | VI. At the proposal of the head of the Executive Branch, two representatives of educational institutions in the area of health, as well as two representatives of the civil society,<br>who must comply with the regulations of knowledge in the matter of this law in order to enforce the guidelines of this legal order, and |
| VII. A Technical Secretary with recognized knowledge in the subject matter, who shall be appointed and revoked if necessary by the Chairman of the Board. | VII. A Technical Secretary who shall comply with the following requirements:<br>I. Be a Mexican citizen, in the exercise of his rights;<br>II. Be at least 35 years of age on the day of appointment;<br>III. Hold a professional degree, with a master's degree and/or doctorate and with a minimum seniority of 10 years;<br>IV. To have broad experience and public recognition in the area of obesity, overweight and eating disorders; and<br>V. Ethical aptitude and committed to the management and promotion of pertinent actions for the solution of these problems.<br>The attributions of the Technical Secretary are<br>I. To execute the agreements of the Council and its President;<br>II. To grant certification and keep a registry of public, social and private sector organizations. II. To grant certification and keep a registry of the public, social and private sector organizations that operate rehabilitation centers in the area of obesity, overweight and eating disorders;<br>III. To distribute the allocation of subsidies to the non-governmental organizations that meet the<br>III. To distribute the allocation of subsidies to the non-governmental organizations that comply with the provisions of this law, in the terms agreed upon by the Council;<br>IV. To cancel the registration, prior hearing, of the non-governmental organizations that operate rehabilitation centers, when they do not comply with the provisions of this law;<br>V. Oversee that the actions of the Council are adjusted in the relative to the Mexican Official Standards, for the prevention, treatment, research and control of obesity, overweight and eating disorders, and<br>VI. The others that this law, other dispositions, the Council or its president confer to it within the framework of its competencies. |

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| Article 9.- The representatives of the civil society before the Council shall have knowledge on the subject. | Article 9.- The representatives of the civil society before the council shall have knowledge in the subject matter of this law. |
| Article 10.- The following are functions of the Council:<br><br>I. To elaborate and evaluate the state program for the prevention and integral attention of obesity, overweight and eating disorders, as well as to verify the content of the information directed to society on the subject;<br>II. To issue the opinions related to the strategies to be implemented, in order to prevent obesity, overweight and eating disorders, as well as to promote and social adoption of habits that inhibit their incidence;<br>III. To promote the linkage between the public organisms and the society, in the matter of the present ordinance;<br>IV. To formalize the subscription of collaboration agreements and other legal instruments that may be required, with institutions and organizations of the public, social and private sectors and of the teachers' unions, as well as with other entities of the Federation or international organizations, in order to comply with the objectives of the present ordinance;<br>V. To approve its internal regulations and other provisions required for the best performance of its functions; and<br>VI. The others contained in the present ordinance and other applicable laws. | Article 10. The following are functions of the Council:<br>II. To issue opinions regarding the psychoeducational strategies to be implemented, in order to control and prevent obesity, overweight and eating disorders, as well as the promotion of habits that inhibit their incidence;<br>III. To promote the linkage between public and private organizations and the society in the matter of the present ordinance; |
| Article 11.- Since it constitutes a public health issue, the prevention and attention of obesity, overweight and eating disorders is considered a priority.<br><br>The State Public Administration, other government and autonomous bodies, in accordance with their respective spheres of competence, shall develop and implement actions to comply with the objectives of this ordinance. | Article 11.- Since it is a matter of public health, the control, prevention and attention of obesity, overweight and eating disorders is considered as a priority.<br>The State Public Administration, other organs of government, autonomous and linked to the general or special regimes in accordance with their respective areas of competence, shall develop and implement actions to comply with the objectives of the present ordinance. |
| Article 12.- The agencies of the state public administration and other obligated subjects, indicated in the previous article, without prejudice to their legal attributions and independently of those imposed by the present ordinance, shall develop the actions of prevention and integral attention, related to overweight, obesity and eating disorders, established in the State Program. | Article 12.- The agencies of the state public administration and other obligated subjects, indicated in the previous article, without prejudice to their legal attributions and independently of those imposed by the present ordinance, shall develop the actions of control, prevention and integral attention, related to overweight, obesity and eating disorders, established in the State Program. |
| Article 13.- In order to modify sedentary work habits and promote the health of workers, the agencies of the state public administration shall encourage the development of physical activities within their facilities. Likewise, they shall carry out sporting and recreational activities outside their facilities for their personnel, implementing incentives in favor of their participation in these activities. | Article 13.<br>In the development of the aforementioned actions, due coordination shall be established with the Secretary of Health in Nayarit, the Secretary of Education and the Technical Secretary. |
| Article 13 Bis.- In coordination with the Secretary of Health of the entity, the educational institutions and the agencies of the state public administration, within the scope of their respective competencies, shall promote campaigns against obesity, overweight and eating disorders, through the realization of sports days, conferences on healthy nutrition and constant health monitoring, and shall at all times ensure the practice of exercise, as well as a healthy and balanced diet. | Article 13 BIS. - In coordination between the technical secretary and the Secretariat of Health of the entity, the educational institutions and the dependencies of the state public administration, in the areas of their respective competences, shall promote campaigns against obesity, overweight and eating disorders, through the realization of sports days, lectures on healthy nutrition and constant monitoring of health, having at all times to procure the practice of exercise, as well as a healthy diet.<br>exercise, as well as healthy and balanced nutrition, based on the following: |
| | I. Attending to the principle of proportional universality, inclusive, adapted and safe possibilities must be offered that allow participation in physical education with the premise of maintaining the full development of the worker's physical, psychological and social capabilities;<br>II. They must have the possibility to participate and reach a level of achievement corresponding to their abilities, possibilities and interests either in some physical activity and/or in sports in order to achieve an adequate state of mental and physical health;<br>III. Provide active breaks to increase physical activity to the general population during the workday to contribute to increased productivity, reduction of injuries and absenteeism, and<br>IV. To integrate personnel duly trained in sports science, management of obesity and eating disorders, so that the various sectors of the population take into account the possibilities for workers to access spaces and time according to their interests in this area.<br>Interests in this area. |
| Article 14.- In accordance with their budgetary exercise, the agencies of the state and municipal governments, as well as the autonomous agencies, may foresee within their budgetary projections, the necessary resources to carry out the actions referred to in this chapter. | Attending to their budgetary exercise, the dependencies of the state and municipal governments, as well as the autonomous organisms, must foresee within their budgetary projections, the necessary resources to carry out the actions and the generation of research centers, control, prevention and attention of overweight, obesity and the disorders of the eating behavior referred to in this law.<br>The research centers must have adequate infrastructure to carry out the actions of control, prevention and attention of overweight, obesity and eating behavior disorders, to count with trained human resources regarding the guidelines of this legal order for a good operation and to comply with the regulations of this law. |
| Article 15.- The following are attributions of the Secretariat of Health: | Article 15.- The following are attributions of the Technical Secretary, the Secretary of Health and the Secretary of Education: |

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| IV. Any others conferred by this ordinance.<br><br>For the development of the actions included in sections I and II of this article, educational institutions, as well as civil society organizations on the subject, shall be called upon to collaborate. | IV. ...<br>For the development of the actions included in sections I and II of this article, civil society organizations with knowledge in the matter shall be called upon to collaborate. |
| Article 16.- It is incumbent upon the Secretary of Education of the State:<br>I. Promote within the educational centers, the consumption of healthy food, as well as establish the prohibition to distribute, commercialize or promote the consumption of food and beverages with low nutritional value or containing ingredients that favor obesity, overweight or eating disorders, as well as to manage the appropriate before the federal authorities so that they apply similar measures in the educational centers of their jurisdiction in the state;<br><br>II. To implement information campaigns in the educational centers in the state, regarding the need to modify the eating habits of the students of all educational levels, particularly regarding the prevention of obesity, overweight and eating disorders;<br><br>III. Promote the use, by children and adolescents, of public spaces for the practice of sports and recreational activities;<br><br>IV. To cooperate with the municipal governments in the adoption of the measures indicated in the previous section; | Article 16.<br>I. Promote within the educational centers, the consumption of food with the necessary nutritional requirements for a healthy development, for which shall be established according to the manual made by nutrition specialists with qualified knowledge in obesity, overweight and eating disorders.<br>Two ways of providing food are considered according to the disposition and need of the campus.<br>a) Snacks only, according to the morning or afternoon schedule.<br>a) Snacks only, which shall be provided in accordance with the manual provided by specialists in nutrition, overweight, obesity and eating disorders.<br>b) Breakfasts, lunches or dinners, depending on the needs of the campus, which shall follow the menus established in the manual provided by specialists in nutrition, overweight, obesity and eating disorders.<br>provided by specialists in nutrition, overweight, obesity, overweight, obesity and eating disorders,<br>obesity and eating disorders.<br>II. Trained personnel in the area of nutrition, expert in the area of overweight, obesity and eating behavior disorders will be in charge of following up with the personnel in charge of food handling, as well as its preparation and distribution within the school centers that will make sure to provide the size of the portions according to the requirements of the students;<br>III. Involve and train teachers, parents or guardians, through workshops for healthy eating; |
| Article 17.- The Ministry of Health, in coordination with the State Ministry of Education, as well as the National Union of Education Workers, shall implement intensive information campaigns to prevent and eradicate any type of discrimination towards persons suffering from overweight, obesity or eating disorders, especially aimed at the child and adolescent population. | Article 17.- The Technical Secretary, the Secretary of Health, in coordination with the Secretary of Education of the State, as well as the National Union of Education Workers, shall implement intensive information campaigns to control and prevent any type of discrimination towards people who suffer from overweight, obesity or eating disorders, especially aimed at the child and adolescent population. |
| Article 18.- The Nayarit Institute of Physical Culture and Sports shall promote the realization of sports and cultural events, mainly oriented to the child and adolescent population in order to promote the development of physical activities and inhibit the incidence of sedentary lifestyles, as a cause of overweight, obesity and eating disorders. | Article 18.- The Nayarit Institute of Physical Culture and Sports shall promote the realization of sports and cultural events, mainly oriented to the child and adolescent population in order to promote the development of physical activities focused on the reduction of sedentary lifestyles, as a cause of overweight, obesity and eating disorders. |
| | Focused on the reduction of sedentary lifestyles, as a cause of overweight, obesity and eating disorders, for this purpose:<br>I. Programs and opportunities that contribute to exercise the right to physical activity in the different stages of life, different levels of activity and different capacities, in company and alone, should be strengthened, in order to reduce the disparity in physical activity, by age, gender,<br>disability, pregnancy, economic and geographic situation, integrating vulnerable groups, such as ethnic groups and/or people with chronic diseases, that is to say, the population in general;<br>II. To strengthen the formation of expert professionals dedicated to the service of control, prevention and treatment of programs directed towards the fulfillment of the law for the prevention of obesity, overweight and eating disorders in the state of Nayarit. Including, but not limited to, the health sector, transportation, urban planning, education, tourism and recreation, sports and fitness, community groups, community organizations, and other organizations.<br>and fitness, community groups, civil organizations, in order to maintain policy coherence between sectors, increase knowledge, skills concerning their role and contribution to create inclusive and equitable opportunities;<br>III. The provision of physical activity services for the prevention of obesity, overweight, and eating disorders shall be of quality and provide positive experiences for active recreation, sports<br>and games for girls and boys, with an inclusive approach at different educational levels so that they receive instruction in physical activity throughout their lives according to their abilities and aptitudes, and<br>IV. Integrate policy monitoring and evaluation systems, improving and integrating efficient data systems, including new digital technologies that allow the monitoring of socio-cultural and environmental factors of physical activity and sports with respect to the reduction of obesity,<br>overweight and eating disorders. |
| Article 19.- Within the scope of their competence, the Municipal Governments shall carry out free and open access activities in sports, recreational and cultural facilities under their responsibility, likewise, they shall promote actions aimed at the prevention and attention of overweight, obesity and eating disorders, with special attention to children and adolescents. | Within the scope of their competence, the Municipal Governments shall carry out activities of free and open access in sports, recreational and cultural facilities under their charge, and shall also promote actions oriented to the prevention and attention of overweight, obesity and eating disorders, with special attention to children and adolescents, in actions such as<br>attention to overweight, obesity and eating disorders, with special attention to children and adolescents, in actions such as: |

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| | I. Apply road safety regulations to people who perform physical activities in different areas and adapt according to the needs required;<br>II. Provide educational centers with safe, inclusive and accessible spaces in their exterior and interior, so that children remain physically active and reduce sedentary habits;<br>III. Create learning environments suitable for physical activity that contributes to the prevention of obesity, overweight and eating disorders;<br>IV. Provide opportunities to participate in programs and services that promote physical and recreational activities as users, service providers and professional training in the field of prevention of obesity, overweight and eating disorders;<br>V. Strengthen systems of evaluation and specialized counseling for patients diagnosed with obesity, overweight and eating behavior disorders, through health, community and social care services with personnel duly trained in physical activity<br>physical activity and sports, and<br>VI. Urban planning should observe the principles of mixed land use, allowing neighborhoods to be connected with networks that allow access on foot, by bicycle and other wheeled means, such as wheelchairs, skates, skateboards, designs that allow inhabitants and visitors with different abilities to be physically active in buildings and their environment in order to contribute to the reduction of sedentarism and with this to the obesity, overweight and eating disorders. |
| (ADDED, P.O. SEPTEMBER 5, 2015)<br>Article 19 Bis.- Within the scope of their competence, the municipal governments, the educational authorities and other corresponding instances shall promote actions aimed at regulating street commerce near schools, watching over, where appropriate, that during school hours, as well as in the hours close to the entrance and exit of educational institutions, the sale of foods low in nutritional content that favor obesity, overweight or eating disorders is avoided. | Article 19 BIS.- Within the scope of their competence, the municipal governments, the educational authorities and other corresponding instances shall promote actions aimed at regulating street commerce near schools, watching that during school hours, as well as in the hours close to the entrance and exit of educational institutions, the sale of foods with low nutritional content that promote obesity, overweight or eating disorders is avoided. |

Among the main contributions to the proposal are the following:

The name of the law is amended to read "Law for the prevention of obesity, overweight and eating disorders". It is also proposed to establish as an obligation the prevention and integral attention of the problem.

It includes the participation of the private, social, governmental and non-governmental sectors. The institutions responsible for its application are the Ministry of Health and the Ministry of Public Education.

It is considered to include psycho-educational strategies, in order to establish protective factors, for this purpose it is proposed to include a subject at secondary school level developed by experts in these issues from different disciplines such as nutritionists, psychologists, physicians, physical culture.

In order to enforce the regulations, a technical secretary with extensive experience and a minimum of a master's degree is proposed, among other requirements. It is the responsibility of the technical secretary to respect the agreements, grant certifications, distribute the allocation of subsidies.

It is proposed that eating disorders be included in a real way and not only mention them as most of the laws of the country do, with the intention of carrying out prevention and timely care.

Provide active breaks during the workday for physical activation in order to contribute to increased productivity, reduction of injuries and absenteeism.

It is proposed to the institutions to grant mandatory budget for prevention, combat, as well as the creation of infrastructure for attention and research centers with trained human resources.

Article 16 proposes the consumption of food in educational centers with the necessary nutritional requirements for a healthy development, for which manuals made by specialists in clinical nutrition are proposed.

Research centers are proposed that have adequate infrastructure to carry out actions for the control, prevention and care of overweight, obesity and eating disorders.

Strengthen programs that contribute to exercising the right to physical activity in the different stages of life.

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Municipal governments will provide safe spaces for physical activity.

**Conclusions and recommendations**

After the analysis we can conclude that economic theory has used several approaches to review the phenomenon of obesity. One of them, the most developed, aims to apply the traditional theoretical analysis in which individuals freely choose what to eat and the time they devote to exercise (Temporelli and Monterubbianesi, 2016; Lakdawalla and Philipson, 2002). Likewise, evidence has shown that food choices are generally habitual and occur without conscious effort on the part of the subject (Neal and Wood, 2007; Neal, Wood, and Quinn, 2006).

From an economic perspective, the presence of market failures linked to this issue should be noticed (Mussini and Temporelli, 2013; Temporelli and Mussini, 2012). Inefficient situations have been identified both due to the existence of information problems and the presence of externalities. The existence of market failures (supply/demand), and the inefficient allocations they generate from a social perspective, justify the need for some kind of intervention or regulation of the functioning of markets linked to such problems (Sunstein, 2013).

In reference to information and communication problems, they manifest themselves in different ways. On the one hand, in the difficulty for people to know the characteristics of the good being consumed, with the consequent bias towards the choice of lower quality products. Therefore, the need to present a clear, precise and unambiguous plan of action can have a positive effect by generating incentives to move from the initial situation and have conscious choice options.

It is evident that the problem to be solved is extremely complex. If it is recognized that agents face bounded rationality, relevant questions arise as to which instruments are the most appropriate. Finally, attention should be paid to cognitive failures and the appropriateness of designing other instruments should be considered (Castellano, A., Temporelli, K., and Chaz, S, M. 2017).

Although classical approaches relating lifestyles and the development of childhood obesity have focused on the importance of physical activity and diet, international scientific evidence increasingly clearly shows the importance of sleep, as well as emotional well-being, considering results that indicate the association of overweight and obesity with the risk of depression, anxiety, low self-esteem and body dissatisfaction in children and adolescents in maintaining a healthy weight, both directly and through their influence on physical activity and eating (Moradi, Mozaffari, Askari, & Azadbakht, 2021; Sutaria, et al. , 2019).

Recent research results affirm that treatments aimed at weight loss based on restrictive diets are not effective in the long term and may even compromise the patient's health and well-being. According to the results obtained it is intended to be oriented in this direction, some researchers have considered changing the focus of obesity treatment to a paradigm focused on health and not on weight loss, associated with parameters of physical and psychological well-being, that is to focus primarily on health at any size (HAES) (Cadena-Schlam, L., and López-Guimerà, G. 2015).

To conclude and coinciding with the results of the data obtained, in a Harvard University research, it was concluded that obesity is a "contagious disease" that is transmitted not only by pathogenic elements, but through the links that are established in social, family, friendship or company environments of the sufferer. This study indicates that when a person gains considerable weight, the possibility that his or her partner, family members or friends will also gain weight increases. Plan of action for the prevention of obesity in childhood and adolescence, PAHO, (2014). Washington, D.C., USA

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# Evaluation of weight loss and sweat rate, in soccer players who followed a different hydration plan, from the 2003 and 2004 categories of the Santos Tepic Soccer Academy

# Evaluación de pérdida peso y tasa de sudoración, en futbolistas que llevaron un plan diferente de hidratación, de las categorías 2003 y 2004 de la Academia Fútbol Santos Tepic

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**Abstract**

Sweat losses during training cause weight loss greater than 1% and sweating rates above 1.45 L/h, with a decrease in energy and water reserves in soccer players, compromising his health and performance.

Objective: to compare and evaluate the changes made in two different hydration plans, ingesting a commercial isotonic drink versus water.

Methodology: 30 football players from Santos Tepic Football Academy, 2003 and 2004 category of the league of Football Association of the state of Jalisco, with weight data before and after training, fluid ingested during training and duration of the physical activity, the percentage of weight change and sweating rate were calculated. It was determined that there is no association between variables, because the degree of freedom (GL) obtained (3,841) for X2 and the results were lower, so it is interpreted that our value of p ($p<0.05$) es not significant.

Contribution: it was obtained that a marketed moisturizing drink does not have better benefits than simple water, with the right amounts in a periodized time, good hydration can be achieved, maintaining the weight change percentage and sweating rates within the permissible ranges.

**Football, Hydration, Sweat rate**

**Resumen**

Las pérdidas de sudor durante el entrenamiento causan disminución de peso mayor 1% y tasas de sudoración arriba de 1.45 L/h, con descenso en las reservas energéticas e hídricas en el futbolista, comprometiendo su salud y rendimiento.

Objetivo: evaluar los cambios obtenidos en dos planes diferentes de hidratación, ingiriendo una bebida isotónica comercial vs agua.

Metodología: se analizaron 30 futbolistas de la Academia de Fútbol Santos Tepic, categorías 2003 y 2004 de la liga de la Asociación de Fútbol del Estado de Jalisco, obteniendo datos de pesaje antes y después del entrenamiento, líquido ingerido durante el mismo y duración de la actividad física, se calculó el porcentaje de cambio de peso y tasa de sudoración. Se determinó que no hay una asociación entre variables, debido a que el grado de libertad obtenido (3.841) para X2 fueron menores, por lo que se interpreta que el valor de p ($p<0.05$) no fue significativa.

Contribución: una bebida hidratante comercializada no tiene mejores beneficios que el agua simple, con las cantidades adecuadas en un tiempo periodizado se puede lograr una buena hidratación, manteniendo el porcentaje de cambio de peso y tasas de sudoración en rangos permisibles.

**Futbol, Hidratación, Tasa de Sudoración**

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## Introduction

Soccer is a team sport, which requires skill, endurance and sprinting, likewise, it requires a high energy expenditure, due to the distances that players travel during a match or training. This causes a great decrease in the energy and water reserves of the soccer player, therefore, they must be recovered in a correct way and as soon as possible (Yustika, 2019).

Nowadays, it is known that water and solute losses by sweating in soccer players can vary, even in the same training session and environmental conditions (Guillermo Casas Ares, 2018); sweat losses during physical activity can vary with a range of 400 ml/h up to 2000 ml/h (Rebeca Vega-Pérez, 2016). Sweat loss is estimated by changes in body mass after fluid intake (Fernandes*, 2020). Taking as reference the weight before and after exercise. The level of dehydration is expressed as a percentage of body mass (Rebeca Vega-Perez, 2016). Dehydration equal to or greater than a loss of 2% of body mass status comes to have a negative impact on the performance and health of players (Guillermo Casas Ares, 2018), (Baker1, 2017).

Currently, water and electrolyte requirements in players do not receive the necessary attention and in addition, athletes do not always follow the proper hydration plan to prevent dehydration.

Isotonic drinks contain sugars and minerals at the same osmotic pressure as blood, favoring rapid assimilation. The basic components are: water, simple carbohydrates (fructose, glucose, dextrose, sucrose), complex carbohydrates (maltodextrins) and minerals (sodium, potassium, chlorine and phosphorus). The hydrating drink Gatorade contains more glucose than fructose and 0.1% of calcium in its composition (Consumer, 1st), (Martínez Jr, 2008).

During competitions or intense sports practices, there are usually significant changes in body weight, mainly caused by the loss of water in the form of sweat. This can alter the homeostasis of intra and extracellular volume of the organism, and produce important alterations in body functions involving the nervous, cardiovascular, thermoregulatory, metabolic, endocrine and renal systems.

All of them can impair physical and psychological capacities during exercise (Lisett Hernández-Ponce a M. S.-G.-C.-C.-U.-P., 2021).

## Material and method

*Design and study population*

The present experimental, longitudinal and prospective study. It was carried out in soccer modules 5 and 6, located within the facilities of the Universidad Autónoma de Nayarit at an altitude of 940 m above sea level. A total of 30 players belonging to the 2003 and 2004 categories of the Santos Tepic Soccer Academy, who competed in the league of the Amateur Soccer Association of Jalisco, were evaluated and met the selection criteria.

At the beginning, the Clinical-Nutritional History was applied according to NOM-004-SSA3-2012. The instruments used were reviewed and calibrated prior to the measurements taken. Body weight was recorded with the TANITA FitScan 577F standardized scale with a measurement range of 0 to 150 kg and an accuracy of 0.1 kg. Height was determined using the Seca 213 portable stadiometer, with a range of 20-205 cm ± 5 mm.

For the aforementioned evaluations, two measurements were taken, one at the beginning and the other at the end of training. The players were weighed wearing their usual training uniform, which was the same for all measurements. To carry out the hydration control, two types of beverages were used, the first was an isotonic drink (Gatorade) and the other was natural water, providing sports drink to the starters and natural water to the substitutes. In quantities of 250 ml of liquid every 20 minutes (according to the American College of Sports Medicine, 2007).

*Sweat rate calculation according to Dunford 2010*

$$TS = \frac{P1-P2+I\ X\ 60}{\text{Min.Ent.}} \quad (1)$$

- TS= Sweating rate
- P1= Weight before physical activity

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- +I= Liquid intake during physical activity (in liters)
- Min. Ent= Minutes that the workout lasted
- 60= Constant to bring the calculation to the hour.

*Calculation of weight percentage*

It was carried out with the following formula:

$$\% \, Lost \, Weight = \frac{Pre{-}weight \, {-}Post{-}weight}{\text{Previous weight X 100}} \quad (2)$$

## Results and analysis

The results obtained from the present study are shown in the following tables, in which a description is made of both the treated and untreated players, as well as the variable of environmental temperature and humidity. In which the mean and standard deviation are indicated.

In both the treated and control groups, the percentage of weight change was very similar, so it was necessary to establish the X2 test, based on the criteria established by the American College of Sports Medicine (ACSM), which states that a weight loss >1% can impair performance during training or a match. The mean weight loss with Gatorade was 0.59% and 0.66% with water, being higher, however, both results are very similar (Table 1).

| | GATORADE | | WATER | |
|---|---|---|---|---|
| Month: | % CP | Gr | % CP | Gr |
| February | 0.86% | 448 | 0.94 | 468 |
| March | 0.53% | 302 | 0.61 | 305 |
| April | 0.63% | 359 | 0.73 | 366 |
| May | 0.32% | 182 | 0.37 | 187 |
| Media: | 0.59% | | 0.6625% | |

**Table 1** Variations in % weight loss in hydration plans

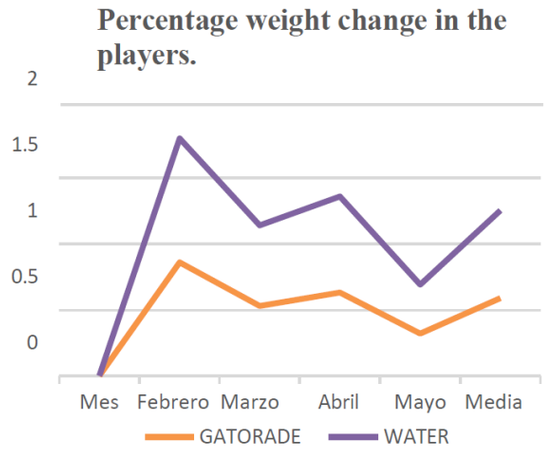


**Figure 1** Comparative graph of percentage weight change

In sweating rates, the hydration plan with isotonic drink had an efficiency of 89.39%, in comparison with plain water, an efficiency of 97.91% was obtained, showing in this category, plain water a better response to maintain sweating rates lower than 1.45 L/h, this being the reference range observed in different bibliographies (Table 2, Graph 2).

| Month: | GATORADE % CP | WATER Gr |
|---|---|---|
| February | 0.86% | 448 |
| March | 0.53% | 302 |
| April | 0.63% | 359 |
| May | 0.32% | 182 |
| Media: | 0.59% | |

**Table 2** Comparison of sweating rates of hydration plans

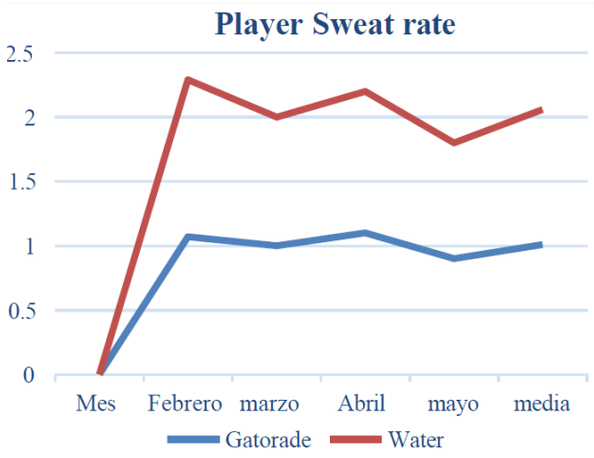


**Figure 2** Comparative graph of sweating rate

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## Discussion

Maughan et al. 2004, conducted a study in 24 players of a soccer team, during the competitive stage, who were given 1 L of sports drink for hydration, which was ingested voluntarily. The result was a minimum weight loss of 0.54 kg, equivalent to 0.65% of body weight, and a maximum of 1.98 kg, equivalent to 2.58% of body weight. In the sweat volume, the mean was 2033 ml and the standard deviation was 413 ml. Finding no significant relationship between the variables (Rebeca Vega-Pérez, 2016).

In the study conducted ("Evaluation in weight loss and sweating rate, in soccer players who took a different hydration plan, of the 2003 and 2004 categories of the Academia Futbol Santos Tepic." ), the minimum weight change percentage obtained was -0.34% and a maximum of 2.3% for the starters, while in the substitutes, the minimum weight change percentage was 0.1% and a maximum of 2.1%, coinciding with the results (Maughan et al. 2004), without obtaining a significant relationship. The data obtained from this research were, mean sweating rate of 43.83±14.70 ml/min (2.628±0.882 L/h), and mean percent weight lost of 0.99±1.12%, with no significant differences observed in this parameter in the six encounters analyzed (p=0.997).

Nuccuio RP, et al. 2017. Analyzed the results of three studies, compared the impact of hydration with body weight loss. The results of the study by Ali et al. in a first division women's soccer team, showed a 2.2% loss of body weight with fluid restriction, and a 1.0% loss with water intake (Aguilera Daniela, 2016). With these results and those obtained from our research, the mean percentage weight change was 0.58% for the treated group and 0.66% for the control group. It can be concluded that the use of a hydration plan helps to maintain the levels of percentage weight change within the allowed ranges (<1% weight change according to American College Sports Medicine 2007).

Aguilera et al. 2016. Established in their research, a cut-off mark of <27°C, as a suitable temperature for physical activity, as a result, obtained the loss of weight change percentage of 0.5-0.6% (Aguilera Daniela, 2016). The general average in environmental temperature in our study is 25.9°C, remaining at adequate levels for the correct functioning of the body during exercise, likewise, similar results were obtained in percentage of weight change, 0.5% for the control group and 0.6% in alternates.

Peniche et al. 2011, demonstrated that a relative humidity of 50% or more can affect the capacity to evaporate sweat and therefore limits the effectiveness of the body's cooling system during exercise. At humidity levels of 90-100%, evaporative heat loss approaches zero (Guillermo Casas Ares, 2018). In our overall humidity results, an average of 53% was obtained, approaching these to a critical value for heat loss by evaporative means. Consequently, there is an increase in body temperature, affecting the health of the players.

The environmental conditions, the hydration and type of food the player took before starting the exercise, the acclimatization to heat, as well as the individual physical characteristics of each player, influenced the variability of the percentage of weight change and sweating rate of each one, making possible the increase of body weight or a drastic change of weight change, which influenced the losses of sweating rate and performance.

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## Conclusion

From this study it is concluded, that a commercialized hydrating drink has no better benefits than plain water, with the administration of adequate amounts in a periodized time, a good hydration can be achieved, maintaining the weight percentage change and sweating rates within the permissible ranges to avoid negative health effects and a decrease in the athlete's sports performance, even if the drink used during hydration is not a commercial isotonic drink. These judgments are made according to the results of the study.

The resulting effectiveness in percentage of weight change between the hydration plan with isotonic drink and plain water was 75 and 76.04% respectively, maintaining the percentage of weight change <1%.

While, in sweating rates, the hydration plan with isotonic drink presented an efficiency of 89.39%, compared to plain water, an efficiency of 97.91% was obtained, showing in this variable, plain water presented a better response to maintain sweating rates lower than 1.45 L/h, being this the reference range observed in soccer players, according to different bibliographies.

From the evidence of the study, the need arises to adjust the fluid intake of players continuously, and to ensure that they are well hydrated before the start of physical activity to minimize dehydration.

It is necessary to adjust the variables more rigorously to reaffirm the previous results.

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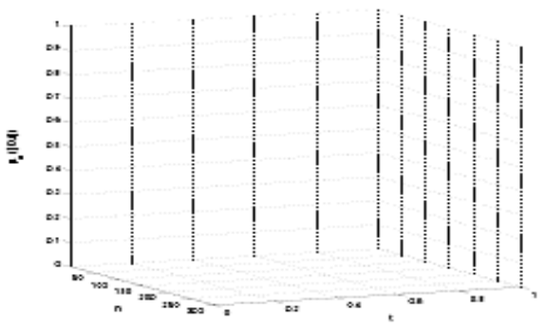

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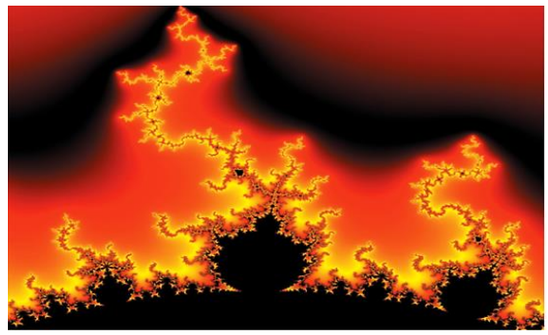

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