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NUTRITIONAL MEDICAL TREATMENT IN PATIENTS WITH COVID-19

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Abstract. Introduction. Coronaviruses are a large family of viruses that can cause disease in both animals and humans. In humans, several coronaviruses are known to cause respiratory infections that can range from the common cold to more serious illnesses such as Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS). Methods. Nutritional medical treatment is of the utmost importance, given the high energy and protein needs associated with the energy expenditure that the disease entails, and in the recovery phase, which can be long. An inadequate diet, whether it is associated with overweight or obesity or malnutrition, can significantly influence the evolution of Covid-19. Therefore, patients hospitalized for Covid-19 must be properly nourished.

Keywords: Keywords: COVID-19, Treatment for COVID-19 patients, Nutrition for COVID-19 patients.

TRATAMIENTO MÉDICO NUTRIMENTAL EN PACIENTES CON COVID-19

Resumen. Introducción. Los coronavirus son una extensa familia de virus que pueden causar enfermedades tanto en animales como en humanos. En los humanos, se sabe que varios coronavirus causan infecciones respiratorias que pueden ir desde el resfriado común hasta enfermedades más graves como el síndrome respiratorio de Oriente Medio (MERS) y el síndrome respiratorio agudo severo (SARS). Método. El tratamiento médico nutricional es de suma importancia, dado las altas necesidades energéticas y proteicas asociadas al gasto energético que conlleva la enfermedad, Y en la fase de recuperación, que puede ser larga. Una alimentación poco adecuada, tanto si se asocia a un cuadro de sobrepeso u obesidad como a un cuadro de desnutrición, puede influir notablemente en la evolución de la Covid-19. Por ello, a los pacientes ingresados por Covid-19 hay que nutrirles adecuadamente.

Palabras clave: COVID-19, Tratamiento para pacientes con COVID-19, Nutrición para pacientes con COVID-19.

Introducción

There is a long family of viruses that were identified in the mid-1960s, causing various diseases in humans. Some types of coronaviruses are common in people and others in animals. Earlier examples of these viruses such as SARS and MERS were spread by cats or camels.

The first cases of COVID-19 were reported on December 31, 2019, in Wuhan city in Hubei province, China, where a cluster of pneumonia cases with unknown etiology was reported.

On January 30, 2020, the Director-General of the World Health Organization (WHO) declared the outbreak to be a public health emergency of international concern (PHEIC), accepting the advice of the Emergency Committee of the International Health Regulations (IHR).

On February 11, following World Health Organization (WHO) best practices for naming new human infectious diseases, it named the disease, COVID-19, short for coronavirus disease 2019.

On the same day, the International Virus Taxonomy Committee announced "severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)" as the name of the new virus causing COVID-19. Finally, on March 11, 2020, the WHO Director-General declared the pandemic associated with COVID-19 (2).

As of April 19, 2020, 2,241,778 confirmed cases of COVID-19 have been reported globally, which were reported by 212 countries, areas, or territories. Of the total number of reported cases, the number of deaths included has exceeded 100,000 with 152,5511 deaths reported. There has been a decrease in the number of new COVID-19 cases and deaths reported from China since February and an accelerated increase in the number of cases and deaths reported from countries outside China, mainly driven by some European countries and the United States of America (2,3).

This disease primarily affects the respiratory tract, but can deteriorate to multi-organ failure and be fatal. Prolonged stays in the Intensive Care Unit are a major cause of morbidity and mortality in patients with COVID-19. Older adults and poly morbid individuals have worse outcomes and higher mortality.

Signs and Symptoms

Coronaviruses are respiratory viruses that replicate in the airways. And, throughout the course of the disease, people may be asymptomatic, i.e., without symptoms or symptomatic usually causing mild to moderate upper respiratory tract illnesses, such as the common cold.

Common symptoms are fever, cough, and tiredness. And about 5% of people who become severely ill have difficulty breathing. And they can include runny nose, headache, sore throat, fever, a general feeling of malaise, loss of taste, smell, and appetite, among others. These human coronaviruses can sometimes cause respiratory tract diseases, such as pneumonia or bronchitis in more severe cases and without timely treatment.

People who already have a pathology such as cardiopulmonary disease, weakened immune systems, infants, and older adults may be at higher risk.

Two other human coronaviruses, MERS-CoV and SARS-CoV, have been known to cause severe symptoms frequently. Symptoms of MERS generally include fever, cough, and shortness of breath that often progress to pneumonia.(4)

The symptoms, in any case, are similar in all these pathologies. The main difficulty in comparing them is the variability in which the flu can present itself. Fever, cough, and shortness of breath are some of the most common.

Thus, for example, fever can occur in 83 to 98 percent of coronavirus cases and in virtually all cases of SARS (99-100 percent) and MERS (98 percent of cases). For influenza, however, it can occur in 36 to 100 percent of cases.

Similarly, cough affects 76 to 82 percent of Covid-19 cases; 62 to 100 percent of SARS cases; 83 percent of MERS cases; and 40 to 100 percent of influenza cases.

Pathophysiology

Currently, there is little information about it; however, the initial infection will be caused by the virus entering the respiratory tract, then the binding of AC2 receptors and multiplication causing cellular injury. And with this, the immune response begins together with the great capacity of viral dissemination or contagiousness (5).

The major structural proteins found on the membrane surface of SARS-Cov-2 viral particles are: Membrane (M) and envelope spike (S).

Particularly, the SARS-Cov-2 receptor anchor domain is located in the membrane protein S. The ACE2 receptor is a type I membrane receptor; under normal conditions, its main function is the proteolytic cleavage of angiotensin 1 into angiotensin 1-9, while under pathological conditions, it is the protein binding site of several coronaviruses (5).

Protein S has two subunits: S1 and S2, the first one is the one that binds to the host cell receptor by possessing the anchor domain. SARS-CoV-2 and when the stability of the S protein is broken, a link is formed that enters by endocytosis to release its RNA and initiate the viral replication cycle.

The cells with the highest receptor capacity are the ACE2 cells, which are present in humans regardless of age or gender. They are distributed throughout the body and can be found in type II pneumocytes of the pulmonary alveolus, stratified epithelial cells of the esophagus, absorptive enterocytes of the ileum and colon, myocardial cells, epithelial cells of the renal proximal tubule, and urothelial cells of the bladder. Therefore, symptomatology in these devices must be taken into account.

Passing to the pulmonary infection phase, the virus moves to the alveolus, causing a lesion in the wall, inflammatory reaction, and activation of immunity in general. Macrophages will be activated, presenting alveolitis related to edema and alteration in the small vessel that triggers an alteration in perfusion (5).

Later in the pulmonary infection and hyperinflammatory phase, it can cause respiratory distress and endothelial injury, which can be associated with thrombosis, myocarditis, diarrhea, renal failure, liver failure, or acute necrotizing encephalopathy in the bloodstream.

Transmission

The disease is spread primarily from person to person by droplets that are ejected from the nose or mouth of an infected person when coughing, sneezing, or talking. There are various estimates of the incubation period for SARS-CoV-2, but the most widely accepted are 4 to 5.1 days. Human coronaviruses are most commonly transmitted from an infected person to others through the air by coughing and sneezing. Close personal contact, such as touching or shaking hands.

Obesity, risk, and severity of COVID-19

There is some discussion as to how obesity may increase the risk for severe cases of viral disease, and there are several explanations for this. The nutritional status of a given person may alter the immune response to a virus. And some comorbidities are risk factors for progression to the severe spectrum of COVID-19.

In the first instance, it is considered that obesity modifies the humoral and cellular responses of immunity by being a proinflammatory state. If this is examined in microenvironments, such as the lung, it is observed that there are alterations in the function of macrophages and T cells, favoring viral expansion at that site, increasing the possibility of serious damage.

In addition to the above, it has been said that in patients with obesity and respiratory viral infections there is a higher viral load due to a delay in viral clearance or a higher viral elimination in the symptomatic phase of the infection (6).

All this is relevant, given that in the current SARS-CoV-2 pandemic, which causes coronavirus pneumonia or COVID-19, obesity has been reported as one of the risk factors associated with the development of severe pneumonia.

In a recent analysis in New York City, of 4,103 patients confirmed with COVID-19, 26.8% were obese (body mass index ≥ 30 kg/m2), and 15% had diabetes. Furthermore, 39.8% of the patients who required hospitalization were obese, compared with 14.4% of the positive cases who were not hospitalized. In the multivariate analysis, grade 3 obesity (≥ 40 kg/m2) was one of the factors most associated with the risk of critical illness (hazard ratio: 6.2; 95% CI: 4.2 - 9.3), defined as admission to intensive care, use of mechanical ventilation, or death (6).

Prevention and Treatment

Health measures and strategic objectives should be generated to limit the spread among individuals and contain the epidemic or encourage its progression. Pay close attention to the promotion of prompt and adequate clinical care, and social distancing to avoid contagion. Some very important sanitation measures according to WHO to avoid contagion are to wash hands often with soap and water for at least 20 seconds.

Avoid touching your eyes, nose, or mouth with unwashed hands. Covering your mouth and nose with a tissue when coughing or sneezing, or with the angle of your elbow, are good preventive measures, as well as avoiding close contact with sick people and staying home if you are symptomatic, cleaning and disinfecting frequently touched objects and surfaces, wearing facemasks, and people who have symptoms of Covid-19 should wear facemasks to help prevent the spread of the disease to others. Facemask use is also essential for health care workers and people caring for someone in a closed environment (at home or in a health care facility). If soap and water are not available, use a hand sanitizer containing at least 70 percent alcohol.

There is no specific antiviral treatment recommended for Covid-19 coronavirus. People with Covid-19 should receive supportive care to help relieve symptoms.

The most frequent symptoms are fever, dry cough, and general malaise, representing 98%, 76%, and 44% of patients, respectively. Gastrointestinal symptoms, such as diarrhea and neurological symptoms, such as headache, are also reported. The increased prevalence of reports of anosmia and ageusia will also be considered among the primary symptomatology to be considered during the presumptive diagnosis.

In severe cases, treatment should include medical care to support vital organ function. It is very important that persons who believe they may have been exposed to Covid-19 should contact their health care provider immediately.

Vaccination

Considered one of the most important inventions in the history of mankind, vaccines represent the simplest and most cost-effective intervention to protect against epidemics and pandemics. Basically, the benefits are related to the reduction of mortality and morbidity, and include, in turn, economic benefits by avoiding hospitalization, preventing long-term disability, and sustaining the economy.

There are currently vaccines developed against SARS-CoV-2, and those licensed are Oxford-AstraZeneca, Pfizer-BioNtech, Sputnik V, CanSino, SinoVac, Janssen, Sinopharm, and Bharat.

Equitable access to safe and effective vaccines is critical to ending the COVID-19 pandemic, so it is hugely encouraging to see so many vaccines in testing and development. WHO is working tirelessly with partners to develop, manufacture, and deploy safe and effective vaccines.

Safe and effective vaccines are a game-changing tool; however, for the foreseeable future we must continue to wear masks, clean our hands, ventilate indoor spaces well, maintain physical distance, and avoid crowded places.

Being vaccinated does not mean that we can disregard precautionary measures and put ourselves and others at risk, especially since the extent to which vaccines protect not only against disease, but also against infection and transmission, is still under investigation.

Nutritional treatment

Nutrition-based treatment includes checking a person's nutritional status and giving appropriate foods or nutrients to treat conditions, such as those caused by diseases, such as diabetes, heart disease, and cancer or communicable diseases.

It may involve simple changes in a person's diet, or intravenous or tube feeding. Medical nutrition therapy can help patients recover faster and spend less time in a medical center or intensive care.

Nutritional support for patients with COVID-19 according to the ESPEN and ASPEN guidelines indicates that energy needs can be assessed using indirect calorimetry or weight-based prediction equations and formulas.

For patients at risk of refeeding syndrome, it is recommended to start with 25% of the total caloric expenditure and monitor the serum phosphorus, potassium, and sodium level of these patients. It is recommended between 15-20 kcal/kg/day and 1.2 to 2 grams/kg/day of protein (7).

27 kcal per kilogram of body weight of total expenditure is used for polyomorbid patients over 65 years of age and 30 kcal per kilogram of body weight for severely underweight polyomorbid patients.

The calculation of proteins, carbohydrates, and lipids should be 1 gram of protein per kilogram of body weight and more than 1 gram for hospitalized patients (7).

In terms of carbohydrates and lipids, both are adapted to the energy needs of each patient with Lp: 30% and CHO: 50%.

Take great care in the adequate supply of vitamins to potentially reduce the impact of the disease. Vitamin D and its deficiency has been associated with viral diseases, such as influenza, HIV, and Hepatitis, and it has been observed that patients with a good supply of Vitamin D have had better disease outcomes. Vitamin A has been shown that adequate supplementation can reduce morbidity and mortality in infectious diseases.

Deficiencies of minerals such as selenium, zinc, and polyunsaturated fatty acids, such as Omega-3, should be considered in the evaluation for these patients (8).

Glutamine is not recommended for enteral supplementation, Omega-3 formulas have been shown to improve intensive care stays. Arginine has been shown to have a possible replacement benefit for the patient with COVID-19. Vitamin C, a water-soluble vitamin with a recognized antioxidant effect, may be administered in short periods. Vitamin D, which is severely deficient in sepsis, may help reduce mortality (8).

Enteral and Parenteral Nutrition

The most important issue is the timing of initiation of nutritional therapy. The goal should be to initiate early enteral nutrition (EN) within 24-36 hours of ICU admission or within 12 hours after intubation and placement on mechanical ventilation. In the patient who is unable to maintain voluntary oral intake, early EN is recommended by the SCCM / ASPEN 2016 and ESPEN 2019 guidelines.

Parenteral nutrition (PN) should be initiated as early as possible in the high-risk or moderately to severely malnourished patient for whom early gastric EN is not feasible.

Enteral nutrition should always be preferred over parenteral nutrition due to lower infectious and non-infectious complications.

Nutrition is a basic concept for all living beings. In general terms, it is responsible for our organism to obtain the necessary elements to carry out its vital functions as well as the energy we require in the execution of daily activities.

Although it seems a simple process, which all people do on a daily basis, sometimes, due to various circumstances such as illnesses and even accidents, it cannot be done in a natural way. In these cases, it becomes essential to administer supplements, either by enteral or parenteral route.

Parenteral nutrition is performed intravenously, through a catheter that provides the body with a solution containing about 40 essential nutrients for human beings, such as proteins, crystalline amino acids, carbohydrates, lipids, and electrolytes.

Providing adequate nutritional support is very important in the evolution and recovery of hospital patients. Health institutions report that up to 70% of them are in some stage of malnutrition, which increases infectious complications, length of stay in the health center, and mortality (9).

In people affected by COVID-19, nutrition must be one of the central measures of an integral treatment to optimize its results since a sufficient supply of nutrients is essential to survive the severe aggression that this virus produces in the organism.

Although coronavirus is a recent disease and there are few studies on the subject, it has been detected that it can have repercussions in several organs, in addition to the lungs, especially during the acute phase.

When critically ill patients with COVID-19 present complications in the stomach and/or intestines, manifesting inflammation in the abdomen, diarrhea, vomiting, among other symptoms, enteral nutrition is not functional.

Although clinical guidelines approved by the Society of Critical Care Medicine and the American Society for Parenteral and Enteral Nutrition (ASPEN) indicate that the enteral route should be the first choice, in cases of gastrointestinal intolerance, such as those mentioned above, adequate parenteral nutrition may be beneficial during the pandemic under certain variables. (10)

In general, it provides a practically complete nutritional supply to critically ill patients and favors the rehabilitation of those who are recovering.

In addition, with the correct use of personal protective equipment, parenteral nutrition implies a lower risk of contagion by saliva and secretions for health professionals since, as it is performed intravenously, it avoids the contact involved in the placement and maintenance of the oral device used in enteral nutrition.

On the other hand, the European Society for Clinical Nutrition and Metabolism (ESPEN) has pointed out that parenteral nutrition with state-of-the-art lipid-based formulations, such as olive oil, as opposed to soybean oil emulsions, does not contribute to disease-induced inflammation or the development of liver disorders. (11)

Recommendations

The world is currently experiencing the Coronavirus-19 pandemic. Given the circumstances and one of the main recommendations is quarantine, which in medicine is a term to describe the isolation of people for an unspecified period of time to prevent or limit the risk of the spread of a disease.

And one of the things that can be associated with the disruption of our normal routine can lead to generate types of feelings and conditions of our mental health.

Therefore, increase energy intake, the consumption of higher amounts of fats, carbohydrates, and proteins.

In which certain behaviors are united, such as the emotional, which is the intense desire to eat, the behavioral, which is the search for food, and the cognitive, which are the thoughts we develop about food, and without forgetting the physiological, which includes salivation (12,13).

It is important to consume foods that contain or promote the synthesis of serotonin and melatonin in the diet. This includes a considerable variety of plant species, including roots, leaves, fruits, and seeds, such as almonds, bananas, cherries, and oats.

Protein foods such as milk and dairy products are the main sources of the sleep-inducing amino acid tryptophan. In addition, tryptophan is involved in the regulation of satiety and calorie intake through serotonin, which primarily reduces carbohydrate and fat intake and inhibits neuropeptide Y, the most potent hypothalamus mineral peptides (14).

During quarantine, increased macronutrient intake may also be accompanied by micronutrient deficiency as occurs in obesity.15, which is commonly associated with impaired immune responses, particularly cell-mediated immunity, phagocyte function, cytokine production, secretory antibody response, antibody affinity, and the complement system, making them more susceptible to viral infections (15,16).

Therefore, during this time, it is important to take care of nutritional habits, following a healthy and balanced nutritional pattern containing a large amount of minerals, antioxidants, and vitamins. Several studies reported that fruits and vegetables that supply micronutrients can boost immune function.

Sources of vitamin C include red peppers, oranges, strawberries, broccoli, mangoes, lemons, and other fruits and vegetables. The main dietary sources of vitamin E are vegetable oils (soybean, sunflower, corn, wheat germ, and walnuts), nuts, seeds, spinach, and broccoli. In addition, quarantine may be associated with less time outdoors, less sun exposure, and reduced vitamin D production as a result of lower levels of 7-dehydrocholesterol in the skin.

Vitamin D deficiency in winter has been reported to be associated with viral epidemics. In fact, adequate vitamin D status reduces the risk of developing several chronic diseases, such as cancers, cardiovascular diseases, diabetes mellitus, and hypertension, which significantly increase the risk of death from respiratory tract infections that otherwise cure people (17,18).

Since time spent outdoors and consequently sun exposure is limited, it is recommended to get more vitamin D from the diet. Foods containing vitamin D include fish, liver, egg yolk.

Another essential trace element that is crucial for the maintenance of immune function is zinc. Zinc has been reported to inhibit the binding and elongation of the severe acute respiratory syndrome (SARS) RNA polymerase (RdRp) template in Vero-E6 cells. Although oysters contain the highest amount of zinc per serving, the most common foods for zinc are represented in poultry, red meat, nuts, pumpkin seeds, sesame seeds, beans, and lentils (19).

Method

A search was carried out in the main bibliographic databases of peer-reviewed articles, in search engines of scientific articles that are in the process of peer review, in generic internet search engines, and in COVID-19 development follow-up platforms of academic institutions; where treatments are described in the acute stage of the disease in stable patients in adult population.

Table 1. Search strategy: The search was based on the following databases: PubMed, Biblio Xplora and ScienceDirect.

PubMed	**Xplora Library**	**ScienceDirect**
10 results	100 results	10 results
5 included	9 included	6 included
Excluded - 3 Per title in case of - 1 Per abstract - 1 Restricted	Excluded - 50 Per title - 40 Per abstract - 1 Repeated	Excluded - 2 Per title - 2 Per abstract - 2 Repeated

Inclusion criteria

- Articles in English and Spanish
- 2019-2020 Updated Studies

Exclusion criteria

- Languages other than English or Spanish.

Results

The search yielded a total of 120 articles, of which 102 were excluded because of title, abstract, or year of publication. In total, as a result of this search, 20 articles were included which met at least one of the criteria. Based on the results of the study, these show a great diversity in the changes and recommendations for patients showing the pathology.

Discussion and conclusions

There is currently no vaccine or specific antiviral treatment to prevent or treat COVID-19 infection. The only proven methodology to prevent infection is to avoid exposure to the virus; therefore, uninfected persons (with the exception of appropriately protected health care professionals) should avoid contact with affected persons. In general, persons infected with COVID-19 should receive supportive treatment depending on their clinical presentation, i.e., to help alleviate symptoms in relatively mild cases or to ensure respiratory function in more severe cases.

The response to COVID-19 has demonstrated a much clearer understanding of mental well-being as a central consideration compared to previous emergencies.

Wellness has been a common part of media and public discourse, with workplaces, health systems, and civil society rising to the challenge of finding innovative ways to maintain social support, communication, and provision of basic needs. There has been a considerable amount of high quality, evidence-based resources available to guide mental health and wellness support for specific groups.

Thus, a healthy lifestyle and wellness support in terms of health, mental health, and nutrition is essential to reduce susceptibility and long-term complications of Covid-19.

Now more than ever, wider access to optimal nutrition should be a priority, and people should be aware of the importance of healthy lifestyle to reduce susceptibility and long-term complications of Covid-19.

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