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Research Article

Vitamin B12 Deficiency in COVID-19 Recovered Patients: Case Report

ELHAM ALSHAMMARI[1*]
[1]Department of Pharmacy Practice, College of Pharmacy, Princess Nourah bint Abdulrahman University, Riyadh, Saudi Arabia.
*Corresponding Author
Email ID: ejalshammari@pnu.edu.sa
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ABSTRACT

Background: The link between immunity and nourishment is clearly known and special attention is being given to its role in the COVID-19 disease. Vitamin B12 is one of the dietary requirements necessary in the treatment of coronavirus patients. Coronavirus patients often show clinical symptoms, such as fever, cough, respiratory distress syndrome, gastrointestinal infection, and fatigue. It is sensible to suppose that COVID-19 affects cobalamin metabolism, impairs intestinal microbial proliferation, and contributes to symptoms of cobalamin deficiency. Such an assumption is based on the fact that there are signs and symptoms of vitamin B12 deficiency that are similar to those of a coronavirus infection. Based on these observations, it can be inferred that treatment with vitamin B12 can be useful in the recovery of COVID-19 patients.

Case Report: A 42-year-old healthy female with no chronic illness presented with a 1-week history of pale, weakness and fatigue, cold sensation in the extremities, dizziness and feeling of depression. She was recently diagnosed with mild COVID-19 symptoms but recovered without the need for hospital admission. After recovery, she resumed working but recent symptoms brought her to the doctor's office. Her laboratory findings revealed low Vitamin B. The attending doctor prescribed intramuscular daily vitamin B ampoules to replace and prevent further deterioration. The doses stopped when acute symptoms reduced, and normal levels were reached.

Conclusion: Based on the outcome of the case, recovered COVID-19 patients need to be checked for vitamin B12 deficiency and treated in time to prevent possible deterioration.

Keywords: Vitamin B12; Vitamin B12 Deficiency; COVID-19 patients.

BACKGROUND

The association between immunity and nourishment is quite known, and special attention is being given to its role in the coronavirus disease 2019 (COVID-19). Yet, the nutritional status of COVID-19 patients is uncertain and public health authorities are urged to use dietary approaches in their health policy guidelines [1], [2].

Vitamin B12, at times referred to as cobalamin, consists of various forms, including cyano-, methyl-, deoxyadenosyl- and hydroxy-cobalamin [3]. The cyno form of vitamin B12 is found in trace quantities of food and is often used in supplements [3], [4]. The other forms of vitamin B12 can be changed to the methyl- or 5-deoxyadenosyl versions that are needed as co-factors for methionine synthase as well as L-methyl-malonyl-CoA mutase. Methionine synthase is necessary for the development of purines and pyrimidines [4]. Vitamin B12 may present a number of health benefits. However, these gains are usually so challenging to determine due to the many additional roles of vitamin B12 working together with folic acid. They may reduce the extreme homocysteine levels below the threshold level attained by folic acid acting independently [5]. In sum, vitamin B12 may assist in the protection against persistent disease and neural tube defects. Deficiency can always develop as a result of the malabsorption of vitamin B12 and is a condition likely to be reported among the elderly, vegans, or ovo-lacto vegetarians on poor diets. Causes can also be tied to the insufficient production of Intrinsic Factor (IF), atrophic gastritis, and the interference in the ileal uptake of vitamin B12 as a result of disease. Other factors that might cause deficiency include bacterial overgrowth, interactions between drugs and nutrients, and the effect of some of the less common genetic defects [4]. B12 deficiency often manifests as macrocytic anemia, and may include signs and symptoms such as fatigue, anemia, and pallor. Jaundice may also be a presenting symptom of B12 deficiency due to an increase in hemolysis resulting from the formation of impaired red blood cells. Other potential signs and symptoms may include peripheral neuropathy, diarrhea, glossitis, neuropsychiatric disturbances, and headaches [6].

The nutritional status of patients and the general population has been at risk during the COVID-19

outbreak. The national lockdown by different governments across the world may have contributed to the closure of many businesses and led to a major economic downturn. Most people have either lost livelihoods or experienced a decrease in their incomes during this period. Some of those affected most may have turned to cheaper food options considered to be of lower nutritional value. Inadequate supply of fresh produce has also significantly affected older people who visit stores infrequently and rely mostly on delivery services. The short-term effects of poor nutritional status include fatigue, decreased immune function, heightened risk of communicable diseases, and a higher rate of complications leading to hospitalization. While in the hospital, many patients are still unable to feed themselves enough due to challenges with chewing, cognitive disturbance, physical disabilities, psychosocial issues, or frailty. Medical teams are also overstretched due to many controlling factors and their focus is mostly on providing urgent clinical care rather than nutritional factors [7]. These and many factors contribute to inadequate support for COVID-19 patients during mealtimes, and lead to inadequate optimization of nutrition.

The common factor that guides most of the dietary and nutrition advices to prevent COVID-19 and other viral infections lies within the correlation between food intake and immunity. Current research data indicates that food intake has a major impact on individual's immune system and vulnerability to diseases. It has been shown that certain nutrients or combination of nutrients might impinge on the immune system through the stimulation of cells, modification of signaling molecules, and gene expression. Additionally, dietary components are major elements of the microbial composition of the gut and can eventually shape the features of immune responses within the body. Past research has shown a close link between nutritional deficiencies of protein, energy, and certain micronutrients and weakened immune function and heightened vulnerability to infection [8]. Enough intake of iron, zinc, and vitamins A, E, B6, and B12 has mostly been found to be necessary for the protection of immune function [8], [9]. In this regard, the key to sustaining an efficient immune system is to prevent inadequacies of nutrients that play a significant role in the prompting, interaction, distinction, or functional expression of the cells involved in maintaining immunity.

Data from a National Family Survey was used to test the effect of nutritional status and anemia on COVID-19. The study covered the five hotspot states of India which reported over 60% of the COVID-19 cases. The general analysis in the study revealed that nutritional status had an impact on COVID-19 cases. Adults with less than normal body mass index (BMI), overweight or obesity, and anemia were the most vulnerable to COVID-19 [10]. In another recent study, nutritional management of COVID-19 patients was evaluated in a rehabilitation unit. COVID-19 patients suffer an increased risk of malnutrition resulting from chronic pathologies and a decrease in food intake due to nausea, loss of appetite, and diarrhea. What's more, it is clearly known that advanced age is strongly associated with the risk of malnutrition which is an important factor considering that most of those infected by the coronavirus disease are of age. For instance, at least 40% of those infected by COVID-19 in Italy to date are over 70 years old [11].

Recently, clinical information has been circulated on the nutritional issues associated with COVID-19 patients [12], [13]. Some of the communications support customized meal supply protocols blended with oral food supplements to meet the high energetic and protein requirements caused by COVID-19. For those patients unable to feed orally, recent guidelines suggest the use of high proteins with lower levels of glucose content [12]. [13] presented a nutritional supplement guideline for COVID-19 patients in a noncritical condition. Their suggestion was based on the fact that a majority of the patients at the time of hospitalization had acute inflammatory status and anorexia, which resulted in a strong decrease in food intake. The researchers offered a quick intravenous administration of vitamins, whey proteins, and minerals until the patients achieved the suggested dietary requirement [13]. The patients also received subsequent oral food supplements or artificial nutrition for those who did not tolerate these supplements.

Previous research has also shown that malnutrition can impede healing times and increase the period of hospitalization among COVID-19 patients [14], [15]. [14] provided various interventions that can be used to support effective nutrition and hydration among older persons in an effort to maintain or improve the nutritional status, clinical course, and quality of life. In the same manner, [15] provided practical guidelines from experts on how to manage nutrition among SARS-CoV-2 patients. Longer stay in the intensive care unit (ICU) needed for the stabilization of COVID-19 patients has been found to worsen or cause malnutrition. The prevention, diagnosis, as well as care of malnutrition should be part of the management process of patients diagnosed with the coronavirus. In [15], the European Society for Clinical Nutrition and Metabolism (ESPEN) provide 10 concise guidelines for the nutritional management of

COVID-19 patients. The recommendations entail checking for malnutrition; optimizing the nutritional status of the patients; supplementation with vitamins and minerals; regular engagement in physical activity; oral nutrition supplements; enteral nutrition; medical nutrition in non-intubated ICU patients; medical nutrition in intubated ICU patients; and nutrition in ICU patients with dysphagia.

This report describes the case of healthy female with no chronic illness, recently diagnosed and recovered from mild COVID-19 that did not require hospital admission. She resumed working after recovery but has experienced recent symptoms characteristic of low Vitamin B12.

CASE REPORT

This is the case of a 42-year-old healthy female with no chronic illness presenting with a 1-week history of pale, weakness and fatigue, cold sensation in the extremities, dizziness and feelings of depression. She is a working mom of four children recently diagnosed and recovered from mild COVID-19 that did not require hospital admission. After recovery, she resumed working but the recent symptoms brought her to the doctor office.

Her laboratory findings revealed low Vitamin B12 of 142.70 pg/ml (reference range: 211.00-946.00 pg/ml), iron of 11.8 umol/1 (reference range 8.80-27.00), serum ferritin of 80.01 (reference range: 13.00-150.00), and insufficient vitamin D of 13.63 ng/ml (reference range: 30.00-40.00 ng/ml). The attending doctor prescribed intramuscular daily vitamin B ampoules to replace and prevent further deterioration. Doses stopped when acute symptoms subsided, and normal levels reached.

DISCUSSION

Vitamin B12 is the largest and most complicated of all the vitamins. While it is not used directly in the human body, it needs to be decoded into activating forms, such as hydroxo-, adenosyl- and methylcobalamin [4], [6], [16]. This vitamin is important for the formation of red blood cells, cell division, maintenance of a healthy nervous system, myelin synthesis, cellular growth and reproduction, as well as rapid synthesis of DNA. At the moment, the natural course of vitamin B12 deficiency is not properly understood [5], [6], [16]. Holotranscobalamin, otherwise referred to as active B12 is preferred in the identification of subclinical B12 deficiency. However, the normal levels of serum B12 and methylmalonic acid do not eliminate symptomatic B12 deficiency. Because of this, it is difficult to establish a valid diagnosis of vitamin B12 deficiency and recommend the right treatment [16]. This has resulted in so many cases of B12 deficiency being disregarded or at times diagnosed incorrectly.

COVID-19 patients often show clinical symptoms, such as fever, cough, respiratory distress syndrome, gastrointestinal infection, and fatigue. Findings from clinical laboratories may also include arrhythmia, impaired liver function, shock, acute cardiac injury, increased PCR, and a decrease in platelet count and the rate of erythrocyte sedimentation [16]. It is sensible to suppose that COVID-19 affects cobalamin metabolism, impairs intestinal microbial proliferation, and contributes to symptoms of cobalamin deficiency. Such an assumption is possible since there are symptoms of vitamin B12 deficiency that are related to those of COVID-19 infection. Some of these symptoms include an increase in oxidative stress, activation of the coagulation cascade, homocysteine concentration, elevated lactate dehydrogenase, thrombocytopenia, intravascular coagulation thrombosis, low reticulocyte, vasoconstriction, as well as renal and pulmonary vasculoathies [5], [6], [16]. These symptoms can contribute to gastrointestinal, respiratory, and central nervous system disorders. As evident from research, B12 deficiency can be treated by administering high doses of methylcobalamin [16]. Based on these observations, it can be inferred that treatment with vitamin B12 can be useful in the recovery of COVID-19 patients.

The current case demonstrates the impact of COVID-19 on the nutritional status of a recovered patient. At the moment, there is no accepted drug treatment or vaccine for SARS-CoV-2 virus [16], [17]. Until these options become obtainable, patient treatment must incorporate balanced nutrition for appropriate operation of the body and boosting of the immune system. Vitamin B deficiency can significantly impair the functioning of cells and the immune system, eventually causing inflammation due to hyperhomocysteinemia [17]. SARS-CoV-2 can interfere with the metabolism of vitamin B12, thereby ruining intestinal microbial proliferation.

The patient's recent symptoms after recovering from COVID-19 are concerning, perhaps indicating the role of vitamin B12 in building and maintaining a healthy immune system. She may have been predisposed to these new symptoms as a result of her poor nutritional status [16], [17]. Therefore, a balanced diet is important for immune-competence. Adequate intake of vitamin B12 is necessary for proper functioning of the body and the strengthening of the immune system.

CONCLUSION

The present case shows the impact of COVID-19 on the nutritional status of a recovered patient. Her laboratory findings revealed low Vitamin B12 and the attending doctor prescribed daily vitamin B

ampoules to prevent further deterioration of her health. Considering in mind that COVID-19 interferes with the absorption of vitamin B12, those affected with the virus are likely to develop symptoms associated with the deficiency of the vitamin. Therefore, recovered COVID-19 patients need to be checked for vitamin B12 deficiency to protect their health from deteriorating.

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