



Mini Review

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Critical Analysis of Selenium Deficiency Diseases: An Overview

Sivakumar JT Gowder*

College of Applied Medical Sciences, King Faisal University, Al-Ahsa, Kingdom of Saudi Arabia

*Corresponding author: Sivakumar JT Gowder, College of Applied Medical Sciences, King Faisal University, Al-Ahsa, Kingdom of Saudi Arabia.

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Introduction

Selenium is a crucial trace element required for the optimal functioning of several physiological functions. Selenium is an essential element in selenoproteins, which are involved in antioxidant defense, immunological response, and thyroid hormone metabolism. A selenium deficiency may result in serious health issues, such as Keshan disease, Kashin-Beck illness, cardiovascular diseases, and heightened susceptibility to viral infections. This review provides an update on selenium deficiency-related diseases, focusing on their etiology, clinical manifestations, and potential strategies for prevention and management.

Objective

This article intends to encapsulate new discoveries on disorders resulting from selenium deficiency and examine their etiology, clinical manifestations, and therapeutic strategies. Additionally, we evaluate the broader public health implications of selenium deficiency and highlight potential interventions.

Methods

This review compiles data from many research about selenium deficient illnesses. Data was obtained from contemporary scientific publications. The emphasis was on ailments mostly linked to selenium insufficiency, such as Keshan disease, Kashin-Beck illness, and cardiovascular disorders, along with selenium's function in immunity and viral infections.

Results

Keshan Disease

Keshan disease, often known as KD, is a kind of endemic cardiomyopathy that is largely detected in certain locations of China

that have a low selenium level in the soil material. It presents with heart failure and myocardial necrosis, often leading to fatal outcomes if untreated. Selenium deficiency, in combination with viral infections, particularly Coxsackievirus, is thought to increase oxidative stress, contributing to the progression of KD. Patients often experience cardiogenic shock, arrhythmias, and dilated cardiomyopathy. Selenium supplementation has been shown to reduce the severity of KD symptoms and improve cardiac function [1].

Kashin-Beck Disease

The Kashin-Beck illness, often known as KBD, is another condition that is strongly associated with a lack of selenium. This osteoarthropathy primarily affects children and adolescents living in selenium-deficient areas, particularly in parts of China and Tibet. KBD leads to cartilage degeneration, resulting in joint deformities and stunted growth. Because of the deficiency of selenium, oxidative stress plays a specific role in the pathophysiology, leading to cellular damage in cartilage tissues. When started early in childhood, selenium supplementation has been shown to inhibit the development and progression of KBD [2].

Cardiovascular Diseases

Numerous heart conditions are also linked to deficiencies in selenium. Heart failure, myocardial infarction, and coronary heart disease have all been linked to low selenium levels. By being incorporated into antioxidant enzymes such as glutathione peroxidase, selenium helps shield cardiac tissues from oxidative damage. Research has shown that the use of selenium supplements enhances mitochondrial activity and reduces oxidative stress, hence improving outcomes for individuals suffering from heart disease. Low selenium levels are associated with worse outcomes for heart failure pa-



tients, whereas supplementation improves exercise tolerance and cardiac function in general [3].

Neurodegenerative Disorders

It is well known that selenium shields the neurological system from oxidative damage. A deficit in selenium may raise the risk of neurodegenerative illnesses including Parkinson's and Alzheimer's. Selenium is highly concentrated in the brain, especially in areas related to motor and cognitive function. Glutathione peroxidase and other selenium proteins provide vital defense against oxidative stress, a role in the etiology of neurodegenerative diseases. Selenium supplementation has shown promise in mitigating symptoms of these conditions, especially in the early stages of disease progression [4].

Viral Infections and Immune Function

A lack in selenium increases vulnerability to viral infections, such as hepatitis B, HIV, and more recently, COVID-19. Selenium is essential for immunological function. Selenium's antioxidant qualities lessen viral proliferation and mutation while also regulating immunological responses. According to a comprehensive analysis, individuals with COVID-19 who had lower serum selenium levels had poorer outcomes, such as increased death rates [1].

COVID-19 and Selenium

Selenium insufficiency in relation to COVID-19 has been well researched. Individuals with reduced serum selenium levels often have worsening illness outcomes, including increased death rates. Because selenium helps to reduce inflammation and improve immunological function, it has been suggested as a potential therapy adjunct. According to studies, selenium levels rise in COVID-19 patients who are recuperating, indicating that having enough selenium may speed up and enhance healing [5].

Cancer and Selenium Deficiency

Selenium has also been linked to cancer prevention. Selenium's role in DNA repair and the regulation of apoptosis positions it as a key factor in reducing cancer risk, particularly in selenium-deficient individuals. Prostate, lung, and colorectal cancer rates have been shown to be greater in populations with lower intakes of selenium. In those who are deficient in selenium, taking supplements has been linked to a lower risk of cancer [1].

Discussion

A serious public health concern is selenium deficiency, particularly in areas where the soil contains little selenium. Conditions such as Keshan disease and Kashin-Beck illness emphasise how

important selenium is for skeletal and cardiovascular health maintenance. When started on time, selenium supplements have been shown to be a successful intervention in the prevention of certain illnesses. Additionally, selenium's role in immune function has become increasingly relevant in the context of viral infections, including COVID-19. Maintaining adequate selenium levels may not only improve individual health outcomes but also play a role in public health strategies aimed at mitigating viral pandemics [1-3]. Selenium's ability to prevent neurodegenerative disorders is further supported by its neuroprotective qualities. The small range between therapeutic and hazardous amounts of selenium makes careful monitoring and dosage of selenium supplements essential. To investigate the wider implications of selenium supplementation in the prevention and treatment of chronic diseases, longer-term clinical studies are required [1,4,5].

Conclusion

A deficit in selenium may cause a variety of health problems, including viral and neurological illnesses, osteoarthropathies, and cardiomyopathies. Preventing these illnesses requires maintaining an appropriate selenium intake, especially in areas where selenium deficiency exists. Supplementing with selenium is a viable answer, but since greater amounts of the mineral may be harmful, it must be used carefully. To improve selenium dosage practices and deepen our knowledge of its function in disease prevention and health maintenance, further study is required.

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Conflicts of Interests

The authors declare no conflicts of interest.

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