

Strengthening Immunity through Nutrition to Tuberculosis

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DESCRIPTION

Medical treatments for Tuberculosis (TB) have advanced significantly, addressing underlying risk factors like under-nutrition is critical in combating the disease. Under-nutrition not only weakens the immune system but also increases susceptibility to TB, making it a major public health challenge. Under-nutrition occurs when the body does not receive adequate nutrients to meet its energy and physiological needs. It can result from insufficient food intake, poor dietary quality, or malabsorption of nutrients. Common indicators of under-nutrition include low body weight, stunted growth, and micronutrient deficiencies, such as lack of vitamin D, zinc, and iron. These nutrients are crucial for maintaining a healthy immune system, which plays a key role in protecting the body against infections like TB.

Under-nutrition weakens immunity

The relationship between under-nutrition and TB is bidirectional. On one hand, under-nutrition weakens the immune system, reducing the body's ability to fight off *Mycobacterium tuberculosis*, the bacteria that causes TB. On the other hand, active TB itself can lead to significant weight loss and malnutrition due to increased metabolic demands and reduced appetite. The immune system relies on adequate nutrition to function effectively. Micronutrients like zinc, selenium, iron, and vitamins A, C, and D are essential for immune cell production and function. A lack of these nutrients impairs the body's ability to produce key immune responses, including, macrophages are immune cells that engulf and destroy TB bacteria. Without adequate nutrition, their activity is significantly reduced. T-cells play a crucial role in containing TB infection. Under-nutrition impairs their ability to recognize and eliminate infected cells. Cytokines are signalling molecules that help coordinate the immune response. Nutrient deficiencies can lead to reduced cytokine production, weakening the overall immune defense. Numerous studies have highlighted the association between under-nutrition and increased TB risk:

Low Body Mass Index (BMI): Individuals with a low BMI (<18.5 kg/m²) are significantly more likely to develop TB compared to

those with a healthy BMI. This is because low body weight reflects insufficient energy reserves and compromised immunity.

Micronutrient deficiencies: Research shows that deficiencies in vitamin D, iron, and zinc are common among TB patients. These deficiencies impair the body's ability to mount an effective immune response against TB bacteria.

Socioeconomic factors: Poverty, food insecurity, and lack of access to nutritious food contribute to both under-nutrition and higher TB prevalence, creating a vicious cycle.

Under-nutrition to reduce TB risk

Given the strong link between under-nutrition and TB, addressing nutritional deficiencies is an essential part of TB prevention and management. Providing balanced diets rich in macronutrients (carbohydrates, proteins, and fats) and micronutrients can help improve immunity and reduce TB susceptibility. Nutritional supplementation programs targeting vulnerable populations, such as children, pregnant women, and individuals in poverty, can have a significant impact. Supplementing key nutrients like vitamin D, zinc, and iron in at-risk populations can enhance immune function and reduce TB risk. For example, vitamin D has been shown to play a role in activating the body's defenses against TB bacteria. Addressing food insecurity through policies that improve access to affordable and nutritious food is crucial. Governments and non-governmental organizations can implement programs such as food subsidies, school meal programs, and community-based nutrition education to combat under-nutrition. TB prevention and treatment programs should include nutritional assessment and support as part of routine care. This includes monitoring patients' nutritional status, providing dietary counseling, and ensuring access to nutritious food during treatment. Addressing under-nutrition is not only critical for reducing TB risk but also for improving treatment outcomes in TB patients. Malnourished TB patients are more likely to experience treatment failure, relapse, and mortality. Providing nutritional support during TB treatment can help restore body weight, strengthen immunity, and enhance recovery.

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CONCLUSION

Under-nutrition significantly increases the risk of TB by weakening the immune system and reducing the body's ability to fight infections. Tackling this issue requires a multifaceted approach that includes improving access to nutritious food,

implementing targeted supplementation programs, and integrating nutritional support into TB prevention and treatment strategies. By addressing under-nutrition, we can make significant strides in reducing the global burden of TB and improving public health outcomes.