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Progress in Influencing Factors Affecting Malnutrition in TB Patients

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Abstract: *Malnutrition is a risk factor for early mortality in patients with TB, and it is also one of the common clinical signs in patients with active TB. Tuberculosis patients will appear the issue of malnutrition, malnutrition can lead to the aggravation of patients, forming a self-perpetuating cycle. With the improvement of peoples living standard and the progress of science, the problem of malnutrition attracts more and more attention. In order to effectively prevent and correct malnutrition in TB patients, this paper summarizes the influencing factors of malnutrition in TB patients, providing reference for subsequent health education and prevention and disposal of TB malnutrition.*

Keywords: *Tuberculosis; Malnutrition; Influencing Factors*

1. Introduction

According to the Global TB Report 2023,[1] Statistics, in 2022, an estimated 10.6 million people had TB, a total of 1.3 million people died from TB, more than 80% of cases and deaths occurred in low-and middle-income countries. Among them, malnutrition, AIDS, diabetes, smoking and other diseases will increase the risk of tuberculosis. In 2022,2.2 million new cases of TB worldwide were attributable to malnutrition. There is an interaction between TB and malnutrition, and undernourished people can increase the risk of developing TB, resulting in increased morbidity and mortality from TB. There are many factors affecting the malnutrition of tuberculosis patients, so this paper summarizes the key influencing factors of malnutrition in tuberculosis patients in recent years, aiming to provide reference for effectively dealing with the malnutrition of tuberculosis patients and the prevention and scientific control of the epidemic of tuberculosis.

2. Host factors

2.1 Age factor

A number of studies[2-5] Point out that older TB patients increase the incidence of malnutrition. The high incidence of malnutrition in elderly tuberculosis patients is mainly due to the following three reasons: first, with the growth of age, the physiological decline in patients, loose teeth fall off, chewing ability, swallowing difficulties and other reasons will affect the bodys intake of nutrients; second, the elderly tuberculosis patients with poor physical function, organs gradually aging, digestion and absorption ability of gastrointestinal tract decline; Thirdly, most of the elderly lack nutrition-related knowledge and have limited food choices. Moreover, some elderly tuberculosis patients who depend entirely on caregivers for their diet and daily needs can only passively accept the diet arrangement of others, and cannot choose the diet that is beneficial to the tuberculosis patients. Insufficient intake of nutrients and inadequate digestion and absorption can increase the risk of related complications in elderly TB patients, aggravate clinical symptoms and affect the clinical outcome of the disease.

2.2 TB classification

Patients with resistant TB have a higher incidence of malnutrition compared to non-resistant TB patients. This may be related to its longer treatment cycle, high basal metabolic rate, high energy consumption, and a series of adverse digestive system reactions caused by long-term administration of

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anti-tuberculosis drugs[6-8]. Long-term gastrointestinal dysfunction will appear loss of appetite, leading to the intake and absorption of nutrients in patients, easy to appear malnutrition.

In the investigation of nutritional risk status and influencing factors in hospitalized tuberculosis patients[3], researchers found that active tuberculosis had a greater proportion of nutritional risk than inactive tuberculosis. Active tuberculosis is highly prone to protein-energy malnutrition[21]. Patients with active tuberculosis have elevated metabolic demands, much protein loss, and the body is in a state of negative nitrogen balance, where the body loses more nitrogen than it gains for a long time. Anti-tuberculosis drugs cause a series of gastrointestinal tract and liver function damage, which makes protein-energy malnutrition further aggravate.

2.3 Economic situation

The economic status of TB patients can affect their nutritional status. An analysis of the influencing factors of malnutrition in primary tuberculosis patients in the Hotan region[9] found that high income is a protective factor against low-weight malnutrition in primary tuberculosis patients. This finding is also supported by foreign studies[10-11], which show that malnutrition occurs more frequently in low-income TB patients. The worse the economic status of TB patients, the greater the possibility of developing nutritional risk. In the onset of tuberculosis, the patient cannot participate in the work, so the income is affected, directly or indirectly lead to its economic pressure in terms of nutritional supplement. Patients often choose not to treat or delay treatment due to poor family income, and the delay of treatment will not only aggravate the patients condition, but also aggravate the economic burden of patients, forming a self-perpetuating cycle. Low family income will also affect the intake of protein-rich food in tuberculosis patients, leading to malnutrition and then affecting human immunity, thus increasing the bodys susceptibility to tuberculosis bacilli and increasing the burden of disease.

2.4 Bad behavior and living habits

Both smoking and alcohol drinking can affect human immunity, which has been confirmed in relevant studies at home and abroad. Tuberculosis is a respiratory disease caused by Mycobacterium tuberculosis infection. Patients with long-term smoking are damaged by harmful substances in tobacco for a long time, increasing the risk of infection[12]. As shown in a study in Uganda[13], patients with moderate malnutrition smoked more frequently than patients with mild and severe malnutrition. Other scholars[14] pointed out that tuberculosis patients with a longer smoking history (>10 years) are more likely to have total protein deficiency. Smoking is a risk factor for recurrence after cure of primary tuberculosis, which will also affect immunity and the effect of anti-tuberculosis treatment[15-16]. This may be related to smoking, the reduction of alveolar macrophage activity, pulmonary lymphocyte immune response, cytotoxic activity of natural killer cells, impaired the body's natural airway cleaning mechanism, and altered lung dendritic cell activity[17]. It is reported in the literature[18] Higher proportions of TB patients who have quit drinking or are drinking alcohol have insufficient energy intake than those who never drink alcohol, and excessive alcohol consumption can also lead to an increased likelihood of Mycobacterium tuberculosis infection. Bad life behavior factors run through the whole disease process of tuberculosis, so it is very important to correctly understand and correct the bad lifestyle.

2.5 Mental health

The psychological status of patients with TB can also affect their nutritional status. Depression is prevalent among patients with pulmonary tuberculosis. In a hospital-based cross-sectional study conducted in Cameroon, Kehbila et al[19] found that more than 50% of patients with TB are affected by depression. A study of the association between depression and malnutrition in pulmonary tuberculosis patients[20] showed that PTB patients with depression had a higher malnutrition rate of 45.33%. Nutrition problems may be caused by psychological problems. The longer the treatment time, the greater the psychological pressure on patients will bear. Over time, there will be doubt and fear of the tuberculosis treatment, so depression may lead to loss of appetite and digestive dysfunction; long-term treatment will also lead to increased psychological pressure on patients with family financial difficulties. Therefore, medical staff should pay more attention to whether patients with tuberculosis have bad psychological states. For patients with depression and anxiety symptoms, they can intervene through psychological counseling and education to improve the nutritional status of patients.

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3. Basic diseases

3.1 Tuberculosis combined with diabetes mellitus

Tuberculosis and diabetes are both common chronic diseases in China, among which type 2 diabetes is the type with the largest number of patients. The most obvious feature of type 2 diabetes patients is that the blood glucose level in the body is higher than normal, and the glucose consumed cannot be effectively absorbed and used by cells, leading to malnutrition[22]. The prevalence of pulmonary tuberculosis in diabetic patients is 3-4 times higher than that in the general population, and the basic reason why patients with type 2 diabetes mellitus are more susceptible to Mycobacterium tuberculosis is that their malnutrition leads to low immunity[23]. Due to insulin deficiency, the body cannot properly utilize glucose for energy, forcing it to break down muscles and fat for heat energy. This leads to reduced protein synthesis. Furthermore, the disorders in lipid metabolism, protein metabolism, and glucose metabolism in diabetes patients increase their risk of malnutrition[24]. Relevant studies have shown that[25-26], Diabetes patients with tuberculosis often suffer from malnutrition, and malnutrition can also aggravate tuberculosis. In addition, the diet structure of patients with diabetes and tuberculosis is unbalanced. Compared with patients with tuberculosis alone and the normal population, their nutritional status and dietary quality are poor[27]. Clinically, more attention should be paid to the screening of malnutrition in tuberculosis patients with type 2 diabetes, because of its more obvious clinical symptoms and lower immunity.

3.2 Tuberculosis combined with AIDS

The vast majority of patients with human immunodeficiency virus (HIV) infection/AIDS experience malnutrition. This malnutrition further weakens the body's immune capacity. Combined with the direct inhibition of immune function by viral infection, the incidence of opportunistic infections increases significantly, which further aggravates malnutrition. Nutritional status is one of the important factors determining AIDS survival duration and quality of life[28]. The relationship between tuberculosis and malnutrition is well known. Tuberculosis exacerbates the occurrence of malnutrition, and malnutrition weakens the bodys immune system, especially the reduction of protein synthesis, which has a serious impact on the bodys cellular immune function[29]. TB and AIDS together impose significant physical, metabolic, and nutritional burdens on patients, leading to increased energy intake, increased absorption, and increased nutrient deficiency, leading to a faster breakdown of body fat and protein, and the infection may lead to loss of appetite and decreased nutrient intake. Despite clear differences between HIV and TB, both share wasting and often affect low-income groups. Furthermore, HIV is an important determinant of TB, and therefore co-infections are common[30-31].

3.3 Tuberculosis was combined with the tumor

Cancer patients have a large risk of co-infection with tuberculosis and are at high risk of tuberculosis. The immunosuppression status of patients with tumors and tumor-related treatment can increase the risk of tuberculosis infection in patients[32]. Chai mei[33] In a retrospective survey of patients with malignant tumors and pulmonary tuberculosis admitted between 2018 and 2014, et al. found that the body mass index of patients with malignant tumors and tuberculosis was significantly reduced, and the proportion of hypoproteinemia was significantly increased. Tuberculosis and tumor are also consumable diseases. Tuberculosis and tumor increases the burden of the body, increases the risk of death, affects the recovery ability of patients for disease, leading to weak body resistance, poor defense against bacteria and viruses, aggravating the degree of disease, and making the nutritional status worse.

3.4 Tuberculosis is complicated with renal disease

Chronic kidney disease is an irreversible change in the structure and function of the kidney caused by a variety of reasons. The prevalence of chronic kidney disease in Chinese adults is about 10%, and patients with chronic kidney disease are also susceptible to tuberculosis, and the probability of tuberculosis infection is 6-30 times that of normal people[34-35]. Chien-ying zhu[36] In the analysis of the prevalence of Mycobacterium tuberculosis infection in chronic kidney disease patients, they found that the infection rate of Mycobacterium tuberculosis in chronic kidney disease patients was high, mainly affected by the gender of the patient, plasma albumin level, 25-hydroxyvitamin D level and other factors, the plasma albumin level was reduced; the 25-hydroxyvitamin D level was low, and 25-hydroxyvitamin D deficiency can cause the impairment of monocyte function and the synthesis of antimicrobial peptides

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with strong anti-tuberculous infection level was greatly reduced, so the patients were susceptible to tuberculosis. Tuberculosis is a serious public health event in Nepal region and patients with chronic kidney disease are at higher risk of new infection and recurrent infected TB, a study in the Nepal region[37] Found that the most common clinical manifestations of TB in patients with chronic kidney disease were anorexia, fever, and weight loss. Nutritional status and vitamin D deficiency further contribute to impaired immunity in patients with chronic kidney disease, and the impaired immune response in patients with chronic kidney disease may lead to delayed treatment response and increased mortality.

3.5 Tuberculosis combined with anemia

Anemia is a major public health problem worldwide, with adverse effects on health and socio-economic development. A typical manifestation of TB is a large loss in body weight along with decreased hemoglobin levels and anemia. Many studies[38-39] suggest that low hemoglobin levels and anemia are highly prevalent in TB patients, and nutritional deficiency and malabsorption can further aggravate the severity of anemia. In a study of a multicenter prospective cohort of pulmonary TB patients in Brazil, Araujo-Pereira M et al[40] found a high prevalence of anemia at 56%, with 14% of patients having moderate or severe anemia, associated with more severe clinical symptoms and a higher incidence of adverse outcomes. Another study[41] found that the majority of anemic patients had tuberculosis, and these anemic patients had higher rates of malnutrition compared to non-anemic patients. It suggests that clinicians should pay more attention to the changes of hemoglobin in TB patients, correct anemia in time, and improve the nutritional level of patients.

4. Conclusion

Malnutrition of TB patients remains a key problem for now and for some time in the future. The nutritional status of tuberculosis patients is affected by many factors. In conclusion, various basic diseases such as age, tuberculosis type, economic status, bad life behavior, psychological status, tuberculosis with diabetes are the factors affecting malnutrition in tuberculosis patients. Therefore, in the process of anti-tuberculosis treatment, in addition to routine clinical treatment, the doctor can first for nutritional risk screening, comprehensive assessment of the nutritional status, according to the nutritional adjuvant treatment, improve the nutritional status of patients, improve body immunity, and improve the treatment compliance of patients, eventually improve the treatment success rate of tuberculosis patients, the effective prevention and control of tuberculosis epidemic is of great significance.

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