

# Research Progress on Metabolic Diseases in Rural Areas

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**Abstract** Through the review of relevant literature in recent years, it is found that the incidence rate of metabolic diseases in rural areas is on the rise. The related factors that may cause diseases include diet structure, exercise habits, medical resources and other aspects. At the same time, there are some limitations in the intervention and treatment measures of this kind of disease. It is urgent to carry out in-depth exploration for the special conditions in rural areas. By reviewing the research progress related to metabolic diseases in rural areas, more new ideas are provided for the treatment and improvement of metabolic diseases in rural areas.

**Key words** Rural area, Metabolic disease, Pathogenic factors, Summary

## 1 Introduction

According to the Global Burden of Disease (GBD) report, the incidence rate of metabolic diseases in the world continued to increase from 2000 to 2019, including hypertension (HTN), diabetes mellitus type 2 (T2DM), obesity, hyperlipidemia (HLD) and nonalcoholic fatty liver disease (NAFLD)<sup>[1]</sup>. With the development of economic level and the change of different factors such as people's lifestyle, diet structure and environmental conditions, metabolic diseases have become a global public health problem. The incidence rate of metabolic diseases in rural areas around the world is increasing year by year, which has seriously affected the health and quality of life of rural residents. Therefore, this paper summarizes relevant literature in recent years and reviews the incidence trends, factors, and prevention and treatment measures of metabolic diseases in rural areas, in order to provide more new ideas for the research direction of metabolic diseases in rural areas.

## 2 Trends in the incidence of metabolic diseases in rural areas

In 2000, Purnell JQ proposed that the peak incidence of obesity in metabolic diseases would occur within the next 5–6 years and may continue to worsen in the next few decades, developing into a global disease that seriously affects human health. According to relevant research in recent years, the incidence rate of metabolic diseases or obesity in rural areas is on the rise<sup>[2–3]</sup>. Ac-

cording to the *Guidelines for the Combined Diagnosis and Treatment of Metabolic Syndrome* in 2023, the prevalence of metabolic syndrome among people aged 20 and above in China is 31.1%. According to a US survey in 2022, metabolic syndrome has developed into a common disease in the United States, with a prevalence rate of up to 26% among people over the age of 17. The prevalence of this type of disease gradually increases with age, especially among people over 60 years old. With the rapid development of population aging and urbanization in recent years, people's dietary structure and lifestyle have undergone significant changes, and rural populations have gradually become high-risk groups for metabolic diseases<sup>[4]</sup>. According to the GBD report, the mortality rate of metabolic diseases such as hyperlipidemia, hypertension, nonalcoholic fatty liver disease has gradually declined in the past 20 years, but the mortality rate of obesity and diabetes mellitus type 2 is increasing year by year. At the same time, in a survey on the geographical division of metabolic diseases worldwide, it was found that in rural areas with higher fertility rates, the social and economic burden brought by metabolic diseases is particularly significant. In countries with medium to low levels of development, the mortality rate of metabolic diseases is higher, with obesity being one of the metabolic diseases that causes the highest mortality rate. In 2019, the global mortality rate caused by obesity reached 41.09%. Previous research data shows that the prevalence rate is higher in underdeveloped regions and areas with lower economic and social levels<sup>[5]</sup>. It can be seen that compared with urban areas with rapid economic development, rural areas with slower development face greater challenges in metabolic diseases.

## 3 Pathogenic factors of metabolic diseases in rural areas

In recent years, the global people's consumption of high protein and lipid foods such as meat, eggs and milk far exceeds their demand for vegetables and fruits. Among them, rural residents have an obvious problem of single food structure, which also leads to changes in the metabolic function of the population in this area,

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and the incidence rate of metabolic diseases continues to surge. The frequent occurrence of metabolic diseases in rural areas may also be related to factors such as the lifestyle of rural residents, infrastructure construction in rural areas, medical conditions, and exercise habits<sup>[6]</sup>. The *Report on the Nutrition and Chronic Disease Status of Chinese Residents* (2020) released in 2020 clearly stated that the lifestyle and dietary structure of Chinese residents are imbalanced, and dietary structure of some urban and rural residents has significant problems, especially in rural areas. The incidence rate of diabetes in rural areas is 1.5 times higher than that in urban areas, which may be related to various factors such as the diet structure of high fat and low fiber of rural residents, less opportunities for regular sports, and higher smoking and drinking rates. Therefore, metabolic diseases have become the primary factor threatening the health of Chinese residents, especially those in rural areas.

**3.1 Unreasonable dietary structure** The diet structure in rural areas is relatively simple. The intake of foods with high calorie, high fat and high sugar is relatively large, while the intake of dietary fiber, vitamins and other nutrients is relatively insufficient<sup>[7]</sup>. This unreasonable diet structure is one of the important reasons for the increase in the incidence rate of metabolic diseases, including obesity, in rural areas. According to the statistics, the proportion of fat in the daily diet of people in rural areas has exceeded the recommended upper limit by 30%, which has led to a continuous rise in the prevalence of metabolic diseases, especially obesity, hypertension, diabetes and other common metabolic diseases.

**3.2 Unscientific exercise habits** Compared to urban residents, some rural residents have a greater amount of physical activity, but lack formal scientific guidance, which can easily lead to improper or excessive exercise, and there may also be risk factors such as sports injuries. Therefore, the exercise habits of rural residents urgently need to be guided and standardized.

**3.3 Relatively scarce medical resources** Some rural areas have relatively scarce medical resources, and the professional technical level and medical equipment conditions of grassroots health service institutions are limited, making it difficult to provide more comprehensive health management and intervention measures for local residents<sup>[9]</sup>. The economic income level of rural residents is generally lower than that of urban residents, which has also become an obstacle to the health of rural residents and an important reason for the high incidence rate of metabolic diseases in rural areas.

**3.4 Relatively low economic and cultural level** The cultural level of rural residents is relatively low. In the era of rapid economic and technological development, the demand for labor-oriented talents in society is becoming smaller and smaller. Therefore, the income channels of rural people are relatively single, and the per capita basic income level is relatively low, and the living burden is relatively heavy. Moreover, due to the generally low level of education among rural residents, their attention to their own health status is relatively low, and their health awareness is relatively weak. This is also a major factor that has led to the continuous increase in metabolic diseases in rural areas around the world

in recent years.

In the investigation and study on the incidence rate of metabolic syndrome in rural areas, it was found that the incidence rate of metabolic diseases in women around 50 years old was far higher than that in men, which also suggested that the incidence of metabolic diseases might be related to the fluctuation of hormone levels and socio-economic status.

## 4 Prevention and treatment of metabolic diseases in rural areas

**4.1 Foreign research progress** Scholar Bray GA proposed that some drugs for treating obesity have been found to have certain side effects. Although the treatment measures for fat burning are highly regarded, progress in the development of thermogenic drugs has been slow. Related research shows that dietary composition has an important impact on changes in blood lipid levels. For example, a low carbohydrate diet can lower triglyceride (TG) levels more than a high carbohydrate diet, while a high fat diet can hinder the decrease of low density lipoprotein cholesterol (LDL-C) to some extent, providing new ideas for further intervention in the prevention of metabolic diseases. Yoriko Heianza proposed in his research report that specific primary fatty acids can predict the response of weight loss treatment measures to a certain extent, which also provides a new research direction for metabolic diseases, including obesity<sup>[10]</sup>. Multiple countries around the world are paying increasing attention to the development of their own dietary guidelines, with the balance, rationality, and health of dietary patterns being important concerns. However, there are still some residents in various countries who are not very familiar with the release of dietary health policies and the content of dietary guidelines, and have not made corresponding improvements based on these guidelines. Therefore, it is necessary to further increase publicity efforts, continuously carry out ideological education for the grassroots public, and arouse people's attention to the severe situation of metabolic diseases. Early prevention and treatment are necessary.

**4.2 Domestic research progress** Based on the previously established prospective large sample Chinese population queue, Bu Jun *et al.* successfully conducted large-scale community natural population queue detection using nanoparticle enhanced laser desorption ionization solid-phase mass spectrometry, and systematically depicted the plasma metabolic fingerprints of MetS and its preclinical patients. Moreover, they have innovatively developed a large-scale natural population queue community screening and diagnosis platform based on machine learning frameworks, which predicts individual metabolic risk status in real-world environments through plasma metabolic fingerprints. They have also obtained new methods and established new models, providing new technical methods for the research and prevention of metabolic diseases. Scholars have discussed the research on the intervention of metabolic diseases through the integration of traditional Chinese and Western medicine, and advocated the abandonment of traditional single target and single disease treatment measures, and the adoption of multi-target approach of the integration of traditional

Chinese and Western medicine for intervention and treatment. Therefore, traditional Chinese medicine has important advantages in the prevention and treatment of metabolic diseases, and traditional Chinese medicine formulas have also shown good efficacy and safety in clinical practice.

At present, intervention measures for metabolic diseases in rural areas mainly focus on improving dietary structure, increasing physical activity, and improving the technical level of grassroots health service institutions. According to the current global survey of metabolic diseases in rural areas, health education is one of the important means to improve the health level of rural residents. By going deep into the grassroots, holding health lectures, distributing promotional materials, and conducting health activities, it aims to convey knowledge related to metabolic diseases to rural residents and improve their awareness and understanding of these diseases. Health education can not only enhance the health awareness of rural residents, but also encourage them to change their unhealthy lifestyle habits, thereby reducing the risk of illness. It could guide the people to pay timely attention to the latest national dietary guidelines, adjust their dietary structure in accordance with the guidelines. By promoting the concept of healthy eating, increasing the daily intake of fresh vegetables and fruits, reducing the intake of high-calorie and high-fat foods, the improvement of the dietary structure of rural residents could be promoted. Government agencies should intervene in a timely manner. By establishing nutritional meal plans, it could provide more healthy and rich food for impoverished rural families, ensuring that the nutritional needs of rural children and the elderly are met. At the same time, it should accelerate the construction of rural infrastructure, enrich fitness equipment in rural areas and communities, and provide sports guidance, guiding people to exercise reasonably and providing guidance on relaxation and rest after work injuries. Timely medical intervention should be conducted. Currently, industry surveys have shown that mainstream treatment measures based on single target and single disease are not effective in intervening in metabolic diseases. Developing integrated innovation of traditional Chinese and Western medicine has certain advantages in this field<sup>[11]</sup>. It should properly use traditional Chinese medicine and Chinese patent medicines, such as Wuling Powder, Simiao Pill, Jianpi Huashi Recipe, to regulate the functions of the organs and intestinal flora. It should pay attention to the hormone level of rural people in a timely manner, and reasonably use traditional Chinese medicine techniques, such as acupuncture and moxibustion, hot compress, acupoint application, *etc.*, to promote the metabolism of glucose and lipid in the human body and the restoration of balance of metabolism in the human body. Due to the complexity of human metabolic regulation, there are still bottlenecks in the research and development of metabolic drugs. Existing research on the implementation and effectiveness evaluation of intervention measures requires long-term intervention, follow-up research, and comparative analysis<sup>[12]</sup>.

## 5 Conclusions

In order to better improve metabolic diseases in rural areas,

this paper reviews the relevant research progress. It could improve the medical security level of rural residents by strengthening technical training and equipment investment of grassroots health service institutions. It could conduct long-term follow-up research and scientifically evaluate the effectiveness of intervention measures. In response to the special circumstances of rural areas, it could explore personalized intervention measures suitable for local residents. It should strengthen health promotion and education, enhance the health awareness and self-management ability of rural residents, and guide them to balance and improve their lifestyles and dietary structure. It should further explore the role of traditional Chinese medicine in the prevention and treatment of metabolic diseases and obesity, reasonably apply existing traditional Chinese and Western medicine technologies, promote multi-target metabolic drug research, and timely adjust and optimize intervention measures to improve their applicability and effectiveness in rural areas.

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