Research on the health literacy promotion strategies of rural middle-aged and elderly people based on a two-stage grey clustering model

Rui Li

School of Public Affairs, Xiamen University, Xiamen, Fujian, China

Abstract: The improvement of health literacy of the elderly in rural areas has always been the focus of medical and social attention. With the increasing aging of rural population, the health status and literacy level of middle-aged and elderly people pose a major challenge to the sustainable development of society and health management. The health literacy of middle-aged and elderly people not only affects their quality of life, but also has a profound impact on the distribution of medical resources and social and economic stability. Therefore, it is important to understand the health status, needs and promotion strategies of the middle-aged and elderly. Traditional methods have some limitations in dealing with this problem, but the research method based on two-stage grey clustering model provides us with a new tool and perspective, which is expected to better understand the health needs of middle-aged and elderly people and optimize the promotion strategy.

1. Introduction

The aging trend in rural areas is intensifying, and the proportion of middle-aged and elderly people in rural areas is gradually increasing. This trend has raised concerns about the health status and literacy levels of the elderly in rural areas. The health literacy of middle-aged and elderly people is not only related to their individual quality of life, but also directly affects the sustainable development and health management of rural communities. Therefore, it is of great significance to study and improve the health literacy of the elderly in rural areas.

2. The importance of health literacy of middle-aged and elderly people

2.1 Definition of health literacy

Health literacy is a comprehensive concept, which covers the degree of an individual's mastery of health-related knowledge, skills and behaviors. Health literacy includes not only physical health, but also knowledge and competence in mental health, social interaction, disease prevention and management. It goes beyond traditional medical models and emphasizes the individual's proactive role in maintaining and promoting their own health.

Health knowledge: an individual's basic knowledge of health and disease, including disease

prevention, symptom recognition, treatment and drug management. Health skills: Include self-care skills such as eating right, physical exercise, coping with stress and managing emotions. Health behaviors: health-related actions taken by individuals, such as smoking cessation, alcohol withdrawal, regular medical examinations, and medication as prescribed by a doctor. Social support: Interaction with society and family, including the ability to obtain support, understanding, and encouragement. Self-management: Individuals assess and monitor their own health and actively participate in the treatment and rehabilitation process. Health literacy usually includes the following important components: Health literacy: The first element of health literacy is an understanding of health-related knowledge. This includes knowledge of health risk factors, disease prevention, health promotion, the functioning of the health care system, and more. Health skills: Health literacy also involves developing health-related skills such as how to manage one's health, deal with emergencies, and adopt appropriate lifestyle choices. Health awareness: Health literacy also includes awareness of one's own state of health. This involves recognizing potential health risks, understanding body signs and symptoms, and the ability to proactively seek medical advice. Health decision-making competence: Health literacy also covers an individual's ability to weigh options in health-related decisions, including treatment options, lifestyle choices, and health care service choices. Health behaviors: Finally, an important component of health literacy is adopting positive health behaviors such as eating well, exercising regularly, and quitting smoking.[1]

2.2 Relationship between health literacy and health of the elderly

The relationship between health literacy and health in older adults: Health literacy is of particular importance among older adults because individual health issues and needs often become more complex as people age. Self-management: Health literacy empowers older adults to manage themselves, helping them better manage chronic diseases, medication management, regular checkups, and use of medical services. Health decisions: Older adults often need more health decisions as they age. Health literacy helps them make more informed choices about treatment options, healthcare services, and lifestyle. Quality of life: Health literacy helps to improve the quality of life of the elderly, reduce the symptoms and complications of disease, and extend life span. Self-protection: Health literacy helps older adults better protect themselves from threats such as health risks and scams.[2]

2.3 Special significance of health literacy of middle-aged and elderly people

Middle-aged and elderly people in rural areas often have some unique characteristics that have an important impact on their health. Some typical characteristics include: Population structure: The population structure in rural areas may be skewed towards aging, with a higher proportion of elderly people. This may be due to an exodus of young people due to urbanization trends. Economic status: Many of the elderly population in rural areas may have lower economic levels, and pensions or social security may not be as abundant as in urban areas. This can negatively impact their health care and quality of life. Access to health services: Rural areas may lack quality health care facilities and health care professionals. Older populations may face greater problems with access to health services. Lifestyle: The lifestyle in rural areas may be more traditional, such as manual labor and eating habits. This can have an impact on the health of older people.

The number of middle-aged and elderly people in rural areas is increasing, and their health status poses an important challenge to the sustainable development of society and health management. The health literacy of middle-aged and elderly people is particularly important in this context. Need for social support: Middle-aged and older adults often need social and family support, especially in coping with chronic illnesses, medication management, and daily life. Health literacy can help them

better interact with family and society and get the necessary support. Disease prevention and management: Middle-aged and older adults are more likely to suffer from chronic diseases such as high blood pressure, diabetes and cardiovascular disease. Health literacy helps them better understand disease risks, take preventive measures, and actively participate in treatment and recovery. Improved quality of life: Health literacy helps middle-aged and older adults better manage their health conditions, improve quality of life, extend life span, and reduce health care costs. Sustainable development of community and society: The health status of middle-aged and elderly people is directly related to the sustainable development of community and society. Improving the health literacy of middle-aged and elderly people can reduce the medical burden and promote the economic prosperity and stability of society. Cultural inheritance and social participation: Older people play an important role in rural communities, their cultural traditions and knowledge need to be passed on, and health literacy helps them to continue to actively participate in social and community activities.[3-4]

2.4 Health status of the elderly in rural areas

High incidence of chronic diseases: Rural middle-aged and elderly people generally face high incidence of chronic diseases, such as hypertension, diabetes, coronary heart disease and chronic obstructive pulmonary disease (COPD). These diseases have a negative impact on their quality of life and health. Malnutrition and obesity: Some middle-aged and elderly people in rural areas may face malnutrition, while others may face obesity and associated health risks. Changes in diet and lifestyle have had an impact on health in rural areas. Inadequate medical resources: rural areas usually lack adequate medical resources and medical institutions, resulting in limited medical services for middle-aged and elderly people. This can make it difficult for them to access timely and effective health care. The level of health knowledge and health literacy is not high: some rural middle-aged and elderly people lack health knowledge and have limited understanding of health issues. They may not understand the early symptoms and preventive measures of the disease, which can affect their level of health literacy. Differences in socio-economic status: There are different socio-economic status among middle-aged and elderly people in rural areas, some may live in poverty while others may be relatively well-off. This economic disparity also affects their health status and health literacy. Understanding the health status of the elderly in rural areas is an important prerequisite for developing appropriate health literacy promotion strategies.[5]

2.5 Global health literacy trends and research

Global Health literacy trends: Globally, health literacy has become a central element of health promotion and disease prevention. More and more countries and regions begin to pay attention to the improvement of health literacy, through policies, education and publicity activities to enhance the level of public health literacy. Research trends: Health literacy research is also increasing, covering all age groups and populations, including older adults. Research focuses on how to improve health literacy, its relationship with health behaviors, health service use, and health outcomes, and how to improve health literacy through education and intervention.

In conclusion, health literacy is a complex and multi-dimensional concept that is critical to the health of older adults. Global trends show that improving health literacy can improve the quality of life of older adults, reduce healthcare costs, and help them better cope with health challenges. Therefore, studying health literacy and its relationship to health in older adults is critical to provide strong support for the development of more effective health policies and interventions.

2.6 Evaluation of existing health literacy promotion strategies

Evaluation of existing health literacy promotion strategies: Health literacy promotion strategies for middle-aged and elderly people in rural areas have been implemented, some of which have achieved some success in practice, but there is still room for improvement. These strategies include: Community Health Education: Through community education programs, providing health knowledge and skills to help older adults better understand and manage their health issues. Telemedicine services: The use of technology to provide telemedicine advice and services to alleviate health care accessibility issues. Family support or community service support can promote social connections among older people and reduce loneliness and mental health problems. Nutrition Improvement Program: Provides complementary foods and dietary advice to improve the nutritional status of older adults. Evaluating the effectiveness of these strategies is key to determine which ones are best suited for different rural areas and older age groups. The sustainability of the strategy and the challenges of implementation also need to be considered. Health literacy promotion strategies for middle-aged and elderly people in rural areas need to be tailored to meet their specific needs and circumstances.[6]

3. Basic principle of two-stage grey clustering model

3.1 Grey system theory

Grey system theory is a mathematical theory used to deal with incomplete information and uncertainty. It was first proposed by Chinese scientist Chen Shiyong in the 1960s and has been widely used in various fields, including management, engineering, medicine and social sciences. The core idea of grey system theory is to analyze and predict the behavior of the system by building a grey model in the case of insufficient information. It emphasizes the study of the overall characteristics and regularity of the system without relying on detailed data and information. Grey Mathematics: Grey system theory uses mathematical methods to deal with the incompleteness of information. This includes mathematical tools such as difference equations, differential equations, integral equations, etc., in order to better describe the dynamic changes of incomplete information. Model building: The key of grey system theory is to build grey models for modeling and analyzing systems with incomplete information. These models can be used for prediction, optimization, decision-making and other tasks.

3.2 Basic principle of grey system theory

Grey system theory: Grey system theory is a mathematical modeling method used to deal with problems with incomplete information, uncertainty and ambiguity. Its basic principles include: Definition of grey systems: Grey systems are those systems whose information is incomplete, unknown or uncertain. In these systems, we usually only have access to one part of the information, while the other part of the information may not be available or difficult to access. Grey Mathematics: Grey system theory uses mathematical methods to deal with the incompleteness of information. This includes mathematical tools such as difference equations, differential equations, integral equations, etc., in order to better describe the dynamic changes of incomplete information. Model building: The key of grey system theory is to build grey models for modeling and analyzing systems with incomplete information. These models can be used for prediction, optimization, decision-making and other tasks.

3.3 Construction and working principle of grey clustering model

Grey clustering is a technology that groups similar data points into clusters, and its working principles include: Data preparation: First, it is necessary to prepare the data set to be clustered, which contains the sample data to be grouped. This data usually contains multiple attributes or characteristics. Similarity measures: Grey clustering models determine the similarity between data points by defining appropriate similarity measures. This usually involves calculating a measure of distance or similarity between data points. Initial clustering: Initial clustering is the partitioning of data points into a number of smaller initial clusters. Typically, the initial cluster can be a single data point or generated according to some heuristic. Clustering iteration: In grey clustering, iteration is the core step. In each iteration, data points are redistributed to the most similar clusters to form new clusters. This process continues until the cluster no longer changes significantly. Convergence condition: Convergence condition is used to determine when to stop iteration. In general, the convergence condition can be that the distribution of the cluster no longer changes or reaches a predetermined number of iterations.

3.4 Introduction of two-stage grey clustering model

Two-stage grey clustering model is a cluster analysis method based on grey system theory. It is mainly divided into two stages, namely preliminary clustering and fine clustering. In the initial clustering phase, the model divides the data into several categories to better understand the overall structure of the system. Then, in the fine clustering phase, the model further subdivides each category to reveal the underlying laws and features within the system. The advantage of this model is that it can handle complex data sets and can mine the patterns and laws behind the data, even when the data is incomplete or uncertain. It is a powerful tool for solving complex problems and optimizing decision making, especially in the field of health research, and can help us better understand the health literacy needs and promotion strategies of middle-aged and elderly people.

3.5 Application of the model in health literacy research

Two-stage grey clustering model has been widely used in health literacy research. It is able to classify the health data of middle-aged and elderly people into preliminary categories, such as different types of health needs. Then, through further segmentation, the model can identify the characteristics and needs within different groups to support the development of more targeted health literacy promotion strategies. The application of this model can help to identify patterns in the health needs of middle-aged and older adults, such as differences in age, gender, geographic location or health status. This helps policy makers and healthcare providers better tailor health management programs to provide support and services that are more tailored to different groups. In addition, the two-stage grey clustering model can also predict the future health needs and disease risks of middle-aged and elderly people, which is helpful to develop long-term health literacy promotion strategies.

Features of two-stage grey clustering model: Two-stage grey clustering model is a special grey clustering method, which has the following characteristics: Two-stage clustering: Different from the traditional single-layer clustering, the two-stage grey clustering model is divided into two stages. First, in the first stage, the data is clustered into larger groups, and then in the second stage, each large group is further subdivided into smaller subgroups. Hierarchical structure: This model creates a hierarchical structure that allows for an overall generalization of the data at a higher level, while more detailed analysis of the data at a lower level. Widely applicable: Two-stage grey clustering models have applications in many fields, including healthcare, finance, social sciences, and more. It can be used to process data of different granularity, at various levels from macro to micro. Refined

Analysis: This model allows for more refined data analysis in order to better understand the intrinsic structure and characteristics of the data.

Overall, the two-stage grey clustering model is a powerful data analysis tool for a variety of fields, including health, to help better understand and utilize data with incomplete information.

4. Application of two-stage grey clustering model in the study of health literacy of middle-aged and elderly people

4.1 Identification of health needs

Initial Classification of health needs of older adults: Using a two-stage grey clustering model, researchers were able to initially classify health data of older adults into different categories. These categories can be categorized according to characteristics such as age, gender, geographic location, etc., to better understand the patterns of their health needs.

Identifying the characteristics of different categories: After the initial classification, the model further subdivides each category to identify the characteristics and needs within the different groups. For example, it may be found that older adults in one category are more likely to suffer from chronic diseases, while older adults in another category are more in need of mental health support. This identification can help develop more targeted health literacy promotion strategies.

4.2 Optimization of promotion strategy

Group-specific strategy development: By identifying patterns in the health needs of middle-aged and older adults, researchers can develop more targeted promotion strategies. For example, for high-risk groups, more support for disease prevention and management can be provided, while for groups with higher mental health needs, mental health promotion activities can be rolled out. Resource optimization: Based on the results of the model, policymakers and health authorities can better allocate resources to meet the specific needs of middle-aged and older adults. This helps to improve resource efficiency, reduce healthcare costs, and provide more effective services.

5. Conclusion

The two-stage grey clustering model has a wide application prospect in the study of health literacy of middle-aged and elderly people. It can help us better understand the health needs of middle-aged and elderly people and provide more targeted support and services, thereby improving their quality of life and promoting the health and sustainable development of society. Compared with traditional methods, it has more advantages and potential, and is expected to be more widely used in future research and practice.

References

[1] Geng Hui, Yang Zhilan, Duan Lizhen, etc. Analysis of the health literacy level of the elderly in rural areas of Shanxi Province in 2021 [J]. Occupational and Health, 2023, 39 (14): 1950-1954.
[2] Wang Xiao, Du Xingyan. Impact of Internet use on the health of middle-aged and elderly rural people [J]. Journal of South China University of Technology (Social Science Edition), 2023, 25 (04): 14-27.
[3] Wang Lu. Study on Health Literacy Improvement of the Rural Elderly Based on Social Support Theory [J]. China Fruit Tree, 2023 (02): 148.
[4] Li Hongmin, Xu Jin, Zhai Min, etc. Analysis of electronic health literacy and its impact among rural residents in Ningxia [J]. China Health Service Management, 2022, 39 (11): 852-856 + 867.
[5] Xiong Huan, Luo Aijun, Xie Wenzhao, etc. Status and influencing factors of health information literacy among the elderly in rural areas [J]. Agricultural Book and Information Journal, 2022, 34 (10): 44-56.
[6] Chen Yifang, Yu Fangyuan, Ding Jiani, etc. Evaluation of the effect of health literacy intervention for the elderly [J]. Health Education and Health Promotion, 2021, 16 (06): 555-560.