

Research Progress on the Nutritional Support System for Community-Based Elderly Diabetics

Qiu Xia

Department of Health Economics Management, Nanjing University of Chinese Medicine, Nanjing, China
012422103@njucm.edu.cn

Abstract. With the intensification of China's population aging issue, the prevalence of diabetes among the elderly continues to rise, making the nutritional problems of community-based elderly diabetics increasingly prominent. Current nutritional support models for this group exhibit diverse characteristics, including community-led and family-collaborative linkage models, integrated medical and elderly care models, and new models empowered by intelligent technology. However, these models face multiple implementation barriers, such as shortages of professional personnel, lack of service standards, poor cross-departmental collaboration, insufficient family caregiving capacity, and economic burdens. This study systematically analyzes research progress in this nutritional support system, summarizes the advantages and disadvantages of existing service models, deeply dissects key implementation barriers, and proposes a four-dimensional "Policy-Resource-Technology-Family" optimization pathway. The research finds that policy support, innovation in community participation mechanisms, building family caregiving capacity, and technological innovation are crucial measures for optimizing the system. However, current research lacks support from large-scale empirical data and pays insufficient attention to the differentiated needs across different regions and cultural backgrounds. Future research should strengthen the study and promotion of standardized service processes, promote the construction of data-sharing platforms, and develop culturally sensitive intervention programs to achieve comprehensive system optimization.

Keywords: Community-based elderly diabetics, Nutritional support system, Service models, Implementation barriers, Optimization pathways

1. Introduction

As China's population aging continues to deepen, chronic disease management faces new challenges. Diabetes, as one of the common chronic diseases, has seen its prevalence among the elderly population rise steadily. Pathological mechanisms such as glucose metabolism disorders and insulin resistance impose a heavy burden on individuals, families, and society. Against the backdrop where home-based elderly care has become the mainstream model, the nutritional issues of community-based elderly diabetics are becoming increasingly prominent. Due to declining physical function with age and the impact of diabetic metabolic abnormalities, dietary and nutritional

metabolic balance requirements are stringent. Scientific nutritional support is directly related to blood glucose control and complication prevention and control, making it particularly important for elderly diabetes management.

Studies indicate that over two-thirds of elderly hospitalized patients suffer from malnutrition [1]. Diabetics face an even higher risk of nutritional imbalance due to the disease's specific impact on nutrient metabolism, coupled with limited dietary management and medical care resources in home settings. Malnutrition can disrupt blood glucose fluctuations, weaken immunity, accelerate complications such as diabetic nephropathy, and reduce quality of life. Conversely, nutritional support combined with acarbose therapy significantly improves dietary glycemic index adjustment, nutritional supplementation, synergistic blood glucose reduction, condition improvement, and reduction of adverse reactions, highlighting the critical role of nutritional intervention [2].

Currently, the nutritional support system for community-based elderly diabetics is inadequate. Traditional medical care struggles to extend into community homes and conduct long-term nutritional monitoring. Community resources are fragmented, lacking professionals and convenient tools, which constrains the development of nutritional support in community-based elderly care. From a societal perspective, optimizing the nutritional support system helps reduce the medical burden, improve the quality of life for elderly diabetic patients, and promote the in-depth development of the "integrated medical and elderly care" model. From an academic research standpoint, systematically reviewing research progress in this field, analyzing the pros and cons of existing service models, and exploring feasible optimization pathways can provide a theoretical basis for policy formulation and practical improvement. Sun Xuelian et al. emphasized that early screening and assessment of malnutrition, followed by appropriate nutrition, can improve patients' nutritional status, shorten average hospital stays, improve adverse clinical outcomes, and enhance patients' quality of life [3]. This article systematically reviews the nutritional support models for community-based elderly diabetics, conducts an in-depth analysis of key barriers in their implementation process, and based on this, proposes a multi-dimensional optimization pathway. This research aims to provide a theoretical basis and practical guidance for constructing a more effective, accessible, and sustainable community nutritional support system, ultimately enhancing the quality of life and health outcomes of elderly diabetic patients.

2. Nutritional service models for community-based elderly diabetics

2.1. The "community-led, family-collaborative" multi-dimensional synergy model

The nutritional services for community-based elderly diabetics require the construction of a linkage model led by the community and coordinated by the family. In terms of family support, family members' participation in nutritional management significantly improves patients' blood glucose control, particularly benefiting female patients and those under 60 years old. Japanese research shows that patients' acceptance of family nutritional support is negatively correlated with HbA1c levels, and emotional barriers can weaken the intervention effect [4]. In the practice of the domestic "Family-Community Linkage" model, Li Yaling et al. improved patients' dietary compliance from 62.3% to over 93.5% (an increase of over 30%) by training caregivers in nutritional knowledge and conducting regular home visit supervision [5], highlighting the fundamental role of family support in daily nutritional interventions. Simultaneously, community-led service models can compensate for the shortcomings of family care through systematic operation. Yang Xiao proposed a "central kitchen + community distribution" system, relying on big data analysis of dietary preferences to solve the dining difficulties of patients living alone through standardized meal delivery [6]. Pilot

programs in Xi'an City showed that community meal service points staffed with public nutritionists could improve patients' insufficient protein intake, but service coverage was limited [7]. The American Diabetes Association recommends registered dietitians as core members of multidisciplinary teams to develop personalized medical nutrition therapy plans for patients [8]. This concept has begun pilot promotion in some developed regions of China.

2.2. Synergistic effects of the integrated medical and elderly care model

The integrated medical and elderly care model achieves synergistic effects by integrating medical and elderly care resources. Li Yuan's research confirmed that intervention programs led by the nutrition department of community hospitals, combined with regular blood glucose monitoring to adjust dietary plans, could significantly improve patients' blood lipid metabolism indicators [9]. The perioperative nutritional management plan proposed by French scholars emphasizes that for elderly diabetic patients with complications, preoperative weight loss should be avoided, and nutritional requirements should be calculated based on standard body weight [10]. The Chinese "Guidelines for Medical Nutrition Therapy for Diabetes" point out that individualized dietary therapy for hospitalized patients can reduce the average hospital stay from 12.5 days to 8.3 days and decrease insulin dosage from an average of 32.6U per day to 21.4U [11].

2.3. New service models empowered by intelligent technology

New service models empowered by intelligent technology are emerging. Implementing remote nutritional guidance through the WeChat platform can significantly improve the dietary compliance of discharged patients [12]. Enzyme-resistant starch-rich (ERSR) biscuits developed by Turkish scholars aim to resist digestion in the small intestine and promote the production of short-chain fatty acids (SCFAs) through colonic fermentation, thereby improving insulin sensitivity and stabilizing blood glucose. Although they showed paradoxical effects in insulin-dependent type 2 diabetics—significantly increased blood glucose fluctuations in normal-weight patients ($AUC\ P < 0.001$)—blood glucose did not significantly increase in obese patients, who exhibited a trend towards potential metabolic benefits [13]. However, the widespread adoption of intelligent monitoring devices at the community level faces cost and technical threshold limitations, making the balance between precision nutrition intervention and universal service a research challenge.

3. Implementation barriers of the nutritional support system

3.1. Challenge of professional personnel shortage

The implementation of the nutritional support system for community-based elderly diabetics faces multiple barriers, among which the shortage of professional personnel constitutes the primary obstacle. Insufficient deployment of registered dietitians in communities makes personalized nutrition plans difficult to popularize [8]. On one hand, accelerated aging and the high incidence of diabetes create enormous demand, but the training of professional nutrition personnel lags and their distribution is uneven across regions. On the other hand, there is a gap in policy implementation. Although policies require therapeutic diets, mandatory standards and supporting resources for dietitian staffing are lacking. Coupled with insufficient attractiveness of community positions in terms of salary and career development, this further exacerbates brain drain. In the actual implementation process of the community nutritional support system, research on the implementation of the community elderly meal service policy in Xi'an showed that only 12.7% of

meal assistance points citywide were equipped with public nutritionists, covering less than 40% of the target population [7]. Patients in rural and economically underdeveloped areas find it even harder to access professional guidance.

3.2. Issues of missing service standards and poor cross-departmental collaboration

Missing service standards and poor cross-departmental collaboration constitute systemic barriers. Different communities use varied nutritional assessment tools and intervention plans, lacking unified norms [5]. The medical nutrition therapy standards proposed by the American Diabetes Association have not been effectively adapted at the grassroots level in China [8]. The responsibilities of medical, civil affairs, and community service agencies are blurred, leading to fragmented nutritional support services. Wang Qian's investigation pointed out that disorder among policy execution bodies resulted in the difficulty of sustaining elderly meal services, with an annual discontinuation rate as high as 35% [7], reflecting deep-seated management system contradictions.

3.3. Dilemma of insufficient family care capacity and low patient adherence

Insufficient family care capacity and low patient adherence are also constraining factors. Emotional barriers weaken the effectiveness of family nutritional support [4], and the rising proportion of elderly living alone in China exacerbates this problem. Among discharged patients receiving remote guidance via the WeChat platform, the difficulty rate for those over 60 years old reached 68.4% [12], indicating that technological usage barriers limit the popularization of intelligent intervention methods. The average protein intake of elderly diabetic patients is only 63.5% of the recommended amount [14], and conflicts between traditional dietary habits and scientific dietary recommendations make behavior change difficult.

3.4. Economic burden and sustainability challenges

Economic burden and sustainability challenges cannot be ignored. The "central kitchen + community distribution" meal delivery model—involving centralized, standardized production of elderly care meals in a central kitchen, followed by cold-chain or hot-chain distribution to community meal points or homes—faces high operational costs, significant upfront investment, and equipment purchase expenses, constraining its promotion speed [6]. Professional nutritional preparations for perioperative nutritional management are costly, and medical insurance reimbursement coverage is limited, with patients' out-of-pocket expenses accounting for up to 72% of the total cost, making it unaffordable for many patients [10]. These barriers intertwine, forming a complex network that restricts the efficiency improvement of the nutritional support system.

4. Optimization pathways for the nutritional support system

4.1. Policy support

Addressing the challenges of the nutritional support system for community-based elderly diabetics, scholars domestically and internationally have proposed multi-dimensional optimization solutions. Policy support is the foundational guarantee; establishing cross-departmental collaboration mechanisms can integrate resources [7]. In pilot areas in China, after including nutritional guidance services in medical insurance reimbursement, the proportion of patients receiving professional nutritional support increased from 23.6% to 68.9% [11]. The American Diabetes Association's

recommendation to position registered dietitians as core members of multidisciplinary teams is worth promoting in communities [8].

4.2. Innovation in community participation mechanisms

Innovation in community participation mechanisms is key to enhancing service accessibility. Promoting the "Family-Community Linkage" model improves patients' dietary behaviors by training caregivers in nutritional knowledge combined with home visit supervision [5]. After implementing the "Four Modernizations" strategy for elderly meal services in Xi'an, China, the population covered by community nutritional services expanded from 12,000 at the beginning of the pilot to 38,000 [7]. The French perioperative nutritional management scheme, centered on principles like calculating nutritional requirements based on adjusted body weight [10], provides important scientific reference for the nutritional management of elderly diabetic patients in the community. Integrating standardized, individualized principles for calculating nutritional requirements and refined management strategies for specific chronic diseases into the community service system can significantly enhance the scientific validity, effectiveness, and sustainability of nutritional interventions. China can learn from these principles to establish more precise nutritional assessment and intervention standards at the community level, empowering family caregivers and enabling the "Family-Community Linkage" model to truly achieve the optimization of the nutritional support system.

4.3. Family care capacity

Building family care capacity cannot be overlooked. Emphasizing emotional support and the transmission of nutritional knowledge is important; encouraging family members' participation can effectively reduce patients' HbA1c levels [4]. Addressing the increase in elderly living alone, China can learn from Japan's experience in establishing neighborhood mutual assistance networks to ensure the continuity of nutritional interventions. Strengthening guidance on protein and vitamin D intake should be included as core content in family caregiving training [14].

4.4. Technological innovation

Technological innovation provides new possibilities for precision nutrition intervention. The model proposed by Yang Xiao enables personalized meal recommendations through big data analysis of dietary preferences combined with smart terminals [6]. ERSR biscuits developed by Turkish scholars can improve insulin sensitivity and lower blood glucose; after localization and adaptation, they hold promise for benefiting more patients [13]. The application of remote monitoring technology has progressed significantly; WeChat platform nutritional guidance improves dietary compliance in discharged patients, but interfaces need simplification to suit elderly users [12].

5. Conclusion

This study systematically reviews the research progress on the nutritional support system for community-based elderly diabetics, focusing on analyzing the characteristics of existing service models, implementation barriers, and optimization pathways. The research finds that current service models exhibit diverse characteristics, including the "community-led, family-collaborative" multi-dimensional synergy model, the integrated medical and elderly care model, and new models empowered by intelligent technology. While these models have achieved results in improving

patients' nutritional status and controlling blood glucose, their grassroots promotion still faces multiple barriers such as shortages of professional personnel, lack of service standards, poor cross-departmental collaboration, insufficient family care capacity, and economic burdens.

The research results indicate that optimizing this nutritional support system has significant practical importance. From a societal perspective, scientific nutritional support helps reduce the medical burden, improve patients' quality of life, and promote the in-depth development of "integrated medical and elderly care." From an academic research perspective, this study integrates the health social determinants theory and social support theory to construct a four-dimensional "Policy-Resource-Technology-Family" optimization pathway, providing a theoretical basis for policy formulation and practical improvement.

However, this study has certain limitations. The article is primarily based on literature and some pilot cases, lacking support from large-scale empirical data, and pays insufficient attention to differentiated needs across various regions and cultural backgrounds.

Future research should focus on the construction of standardized service processes, the establishment of multi-departmental data-sharing platforms, and the development of culturally sensitive intervention programs. Through multi-dimensional research and practice, it is expected to build a more effective, accessible, and sustainable community nutritional support system, enhancing the quality of life and health outcomes of elderly diabetic patients.

References

- [1] Feng, L., Li, Z. S., Wang, L., et al. (2019). Nutritional risk screening and evaluation of individualized dietary therapy for diabetic inpatients. *Chinese Journal for Clinicians*, (6).
- [2] Franz, M. J., Bantle, J. P., Beebe, C. A., et al. (2002). Evidence-based nutrition principles and recommendations for the treatment and prevention of diabetes and related complications. *Diabetes Care*, 25(1), 148–198.
- [3] Sun, X. L., & Dong, B. R. (2017). Importance and characteristics of nutritional therapy for chronic diseases. *Journal of Modern Clinical Medicine*, (4).
- [4] Koin-Watanabe, N., Kurose, T., Kitatani, N., et al. (2010). The role of family nutritional support in Japanese patients with type 2 diabetes mellitus. *Internal Medicine*, 49, 983–989.
- [5] Li, Y. L., Gan, Z. H., & Wu, X. Y. (2023). Application of whole-course health education and nutritional support in elderly diabetic patients and its impact on their self-care ability. *Chinese Medical Innovation*, (12), 1729–1735.
- [6] Yang, X. (2020). Research on the analysis of elderly catering demand and development model from the supply-side perspective. *Nutrition and Health*, (10).
- [7] Wang, Q. (2019). Research on the implementation effect of the community elderly meal service policy in Xi'an City —Based on Smith's policy implementation process model [Master's thesis, Northwest University], (1), 1–60.
- [8] American Diabetes Association. (2004). Nutrition principles and recommendations in diabetes. *Diabetes care*, 27(suppl_1), s36-s36.
- [9] Li, Y. (2021). Research on the impact of nutritional support intervention on the nutritional status of elderly type 2 diabetic patients. *Diabetes New World*, (2), 42–44.
- [10] Chambrier, C., & Sztark, F. (2010). Recommandations de bonnes pratiques cliniques sur la nutrition périopératoire. Actualisation 2010 de la conférence de consensus de 1994 sur la « Nutrition artificielle périopératoire en chirurgie programmée de l'adulte ». *Nutrition Clinique et Métabolisme*, 24, 145–156. [Good Clinical Practice Recommendations on Perioperative Nutrition. Update 2010 of the 1994 Consensus Conference on "Perioperative Artificial Nutrition in Scheduled Adult Surgery"].
- [11] Chinese Diabetes Society, & Chinese Medical Doctor Association Nutritionist Professional Committee. (2016). China guideline for medical nutrition therapy of diabetes (2013). *Diabetes World·Clinical*, (7).
- [12] Hao, L., Zheng, X., Yuan, Y., et al. (2024). Bibliometric analysis of nutritional care for diabetic patients in China. *Tianjin Journal of Nursing*, (4), 450–455.
- [13] Cesur, F., & Öztürk Kara, G. (2024). Can consumption of type 4 resistant starch reduce high blood glucose fluctuations? A randomised trial. *International Journal of Food Science and Technology*.
- [14] Guo, H. L., & Zhang, P. H. (2022). Nutritional management of frailty in elderly diabetic patients. *Chinese Journal of Multiple Organ Diseases in the Elderly*, (10), 797–808.