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Nutritional Adequacy and Healthy Dietary Needs in Group Meal Services for Older Adults

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Abstract— *Population aging has become an important public health and social welfare issue worldwide, increasing the demand for nutritionally adequate and health-oriented meal services for older adults. Group meal services provided in long-term care institutions, senior centers, community meal programs, and day-care centers play a critical role in supporting older adults' daily dietary intake, health maintenance, and quality of life. However, older adults often experience physiological changes such as reduced appetite, chewing and swallowing difficulties, changes in taste and smell, chronic diseases, and reduced physical function, which may increase the risk of malnutrition and dietary imbalance. Therefore, this study examines nutritional adequacy and healthy dietary needs in group meal services for older adults. This study adopts a quantitative research design and uses a structured questionnaire to collect data from older adults receiving group meal services. The questionnaire focuses on demographic characteristics, perceived nutritional adequacy, healthy dietary needs, meal satisfaction, and service quality. A total of 50 questionnaires were distributed, 45 were returned, and 37 were valid, resulting in an effective response rate of 82.2%. The results show that most respondents were female, aged 51–60, married, and had a senior high school education. In addition, 89.2% of respondents expressed interest in nutrition-related knowledge, indicating that older adults are highly concerned about healthy eating. The findings reveal that respondents generally had positive perceptions of the group meals. Satisfaction scores for all meal-quality items were above 4.3. The highest satisfaction item was attractiveness of dishes, followed by freshness of ingredients, low-oil, low-salt, low-fat, and high-fiber preparation, appropriate portion size, and cleanliness and hygiene. In terms of healthy dietary needs, respondents placed the greatest importance on high ingredient freshness, deliciousness, hygiene and safety, and product quality. Correlation analysis further showed that satisfaction had the strongest*

relationship with consumption behavior, suggesting that improving meal satisfaction may increase older adults' willingness to continue using group meal services. Overall, the study concludes that group meal services should not only provide sufficient food quantity but also ensure nutritional balance, food safety, freshness, appropriate texture, taste, and disease-related dietary suitability. Practical recommendations include involving nutritionists in menu planning, adjusting meal texture, reducing excessive salt, oil, and sugar, collecting regular feedback from older adults, and strengthening government support for elderly nutrition guidelines and community-based meal programs.

Keywords— Nutritional adequacy; Healthy dietary needs; Group meal services; Older adults; Meal satisfaction; Healthy aging

I. INTRODUCTION

1.1 Background

Population aging has become an important public health and social welfare issue worldwide. According to the World Health Organization (WHO, 2015), healthy aging does not simply mean living longer, but refers to the process of maintaining functional ability and well-being in later life. From this perspective, diet is not only a matter of daily food intake, but also an important factor related to physical function, disease prevention, and quality of life among older adults. As the proportion of older adults continues to increase, the demand for appropriate nutritional care, healthy meal planning, and accessible group meal services has also grown.

Group meal services, such as those provided in long-term care institutions, senior service centers, community meal programs, and day-care centers, play a critical role in supporting the daily dietary intake and health maintenance of older adults. LoBuono, Locher, and Sharkey et al. (2023) pointed out that aging is often accompanied by physiological changes, including decreased appetite, changes in taste and smell, and difficulties in chewing or swallowing. These changes may reduce food intake and increase the risk of malnutrition, chronic disease, disability, and reduced quality of life. In addition, Deierlein, Morland, Scanlin, and Wong (2013) indicated that the dietary quality of older adults is influenced by health status, socioeconomic conditions, living environment, and dietary behaviors. Therefore, meal design for older adults should not focus only on calorie supply, but should also consider nutritional balance, food texture, taste acceptance, and dining convenience.

Furthermore, Shams-White et al. (2021) noted that dietary quality can be assessed through factors such as vegetables, fruits, whole grains, protein, sodium, and saturated fat. This suggests that group meal services for older adults should consider both nutrient composition and overall dietary patterns. Therefore, whether group meal services can provide nutritionally adequate and health-oriented meals is an important issue that requires further investigation.

1.2 Motivation

Although many group meal services emphasize food quantity, cost control, hygiene, and operational efficiency, less attention may be given to nutritional adequacy, texture modification, menu variety, disease-specific dietary needs, and food acceptability among older adults. Huang (2006) indicated that meal-supply systems in elder-care institutions often face practical challenges, including menu planning, cost control, food preparation, and the need to provide meals suitable for older adults' physical conditions. This suggests that group meal services should not only focus on providing meals on time, but also on whether the meals meet the nutritional and health-related needs of elderly consumers.

In addition, older adults may have different expectations regarding taste, portion size, food softness, freshness, safety,

and meal diversity. Li (2002) pointed out that consumers' acceptance of healthy meals is influenced not only by nutritional balance, but also by food quality, reliability, price, convenience, and taste. Similarly, Huang (2005) found that middle-aged and older chronic-disease patients' willingness to purchase health-conditioning meals was affected by their eating habits, trust in product effectiveness, and concerns about hygiene and safety. These findings imply that meals designed for older adults must consider both objective nutritional standards and subjective consumer acceptance.

Furthermore, LoBuono, Locher, and Sharkey et al. (2023) emphasized that aging-related changes, such as reduced appetite, altered taste and smell, and chewing or swallowing difficulties, may negatively affect food intake and nutritional status. If these needs are not properly considered, older adults may reduce their food consumption, which may lead to malnutrition, weakness, poorer disease management, and reduced quality of life. Therefore, this study is motivated by the need to examine the nutritional adequacy and healthy dietary needs of older adults in group meal service settings, with the aim of providing practical suggestions for improving meal design and service quality.

1.3 Research Problem

This study aims to answer the following research questions:

1. What are the major nutritional needs of older adults receiving group meal services?
2. Are the meals provided by group meal services nutritionally adequate for older adults?
3. What healthy dietary needs do older adults consider important in group meal services?
4. What factors influence older adults' satisfaction with group meal services?
5. How can group meal services be improved to better support healthy aging?

II. LITERATURE REVIEW

2.1 Aging and Nutritional Needs

Aging is associated with various physical, psychological, and social changes that may influence dietary intake and nutritional status. The World Health Organization (WHO, 2015) pointed out that healthy aging refers not only to living longer, but also to maintaining functional ability and well-being in later life. From this perspective, nutrition plays an essential role in supporting physical function, disease prevention, and quality of life among older adults. As people age, they may experience reduced muscle mass, lower metabolic rate, decreased appetite, dental problems, changes in taste and smell, digestive difficulties, and chronic diseases such as diabetes, hypertension, cardiovascular disease, and osteoporosis. LoBuono, Locher, and Sharkey et al. (2023) also indicated that aging is often accompanied by decreased appetite and chewing or swallowing difficulties, which may reduce food intake and increase the risk of malnutrition and poor health outcomes.

Adequate intake of protein, dietary fiber, vitamins, minerals, calcium, vitamin D, vitamin B12, zinc, and fluids is especially important for older adults. Protein helps maintain muscle mass, immune function, and physical strength, while calcium and vitamin D support bone health and reduce the risk of osteoporosis. Dietary fiber supports digestive health and may help prevent constipation and chronic diseases. In addition, sufficient fluid intake is necessary because older adults may have reduced thirst sensation and a higher risk of dehydration. Deierlein, Morland, Scanlin, and Wong (2013) noted that the dietary quality of older adults is influenced by health status, socioeconomic conditions, living environment, and dietary behaviors. Therefore, meal planning for older adults should not focus only on calorie supply, but should also consider food texture, taste acceptance, nutrient density, and dining convenience. Shams-White et al. (2021) further emphasized that dietary quality should be evaluated through overall dietary patterns, including vegetables, fruits, whole grains, protein, sodium, and saturated fat. Thus, meals for older adults should provide sufficient calories while ensuring

balanced nutrient intake and health-oriented dietary design.

2.2 Malnutrition and Dietary Risks among Older Adults

Malnutrition is a common nutritional and health problem among older adults, especially among those living in long-term care institutions, receiving community meal services, or relying on group meal programs for daily food intake. Malnutrition does not only refer to insufficient food intake; it also includes inadequate intake of essential nutrients, unbalanced dietary patterns, and poor diet quality. According to LoBuono, Locher, and Sharkey et al. (2023), aging is often accompanied by physiological changes such as reduced appetite, altered taste and smell, chewing difficulties, and swallowing problems, all of which may reduce food intake and increase nutritional risk. In addition, illness, medication effects, depression, social isolation, limited mobility, economic constraints, and inadequate meal design may further increase the likelihood of malnutrition among older adults.

Both undernutrition and overnutrition can negatively affect health. Undernutrition may lead to weight loss, weakness, reduced immunity, delayed wound healing, increased risk of falls, longer recovery time, and higher hospitalization rates. For older adults, insufficient protein and energy intake may also accelerate muscle loss and frailty, reducing their ability to perform daily activities. On the other hand, overnutrition or nutritionally unbalanced diets may increase the risk of obesity, diabetes, hypertension, cardiovascular disease, and metabolic disorders. Huang (2005) indicated that many middle-aged and older adults with chronic diseases have specific dietary needs, and their willingness to accept health-conditioning meals is influenced by eating habits, trust in food quality, and concerns about hygiene and safety. This suggests that dietary risk among older adults is not only a medical issue, but also closely related to meal design and service quality.

Deierlein, Morland, Scanlin, and Wong (2013) further noted that older adults' dietary quality is affected by health status, socioeconomic conditions, living environment, and dietary behaviors. Therefore, group meal services should carefully assess both nutrient sufficiency and dietary balance. Meals should provide adequate energy, protein, vitamins, minerals, dietary fiber, and fluids, while controlling excessive sodium, saturated fat, and sugar. In addition, meal providers should consider food texture, portion size, menu variety, freshness, and acceptability to reduce dietary risks and support healthy aging.

2.3 Group Meal Services for Older Adults

Group meal services refer to organized meal provision for groups of people in institutional or community-based settings. For older adults, such services are commonly provided in nursing homes, senior centers, long-term care facilities, hospitals, day-care centers, and community care programs. These services are important because they provide regular meals, reduce the burden of meal preparation for older adults and caregivers, and support community-based health promotion. Huang (2006) indicated that meal-supply systems in elder-care institutions are closely related to public policy, institutional management, and the development of senior food-service industries. Her study found that nearly 90% of elder-care institutions prepared meals by themselves, while some institutions would consider outsourcing meal preparation if costs could be reduced or if providers could offer meals with textures suitable for older adults. This finding shows that group meal services must consider both operational feasibility and the physical eating needs of older adults.

However, group meal services face several practical challenges, including budget limitations, labor shortages, food safety requirements, menu planning, individual dietary restrictions, and the need to prepare meals in large quantities. In many cases, menus may be designed based on general food-service standards rather than individualized nutritional needs. Huang (2006) further emphasized that policy support is needed in areas such as meal distribution systems, nutrition education, government subsidies, infrastructure, and regulations. These findings suggest that senior meal

services require cooperation among government agencies, institutions, nutrition professionals, and food-service providers.

In addition, group meal planning should balance nutrition, cost, hygiene, taste, and operational feasibility. Li (2002) pointed out that consumers' acceptance of healthy meals is influenced by nutritional balance, reliable food sources, price, convenience, and taste. Therefore, meals for older adults should not be treated only as routine food provision, but as part of health promotion and social care. Effective group meal services should provide nutritionally balanced, safe, fresh, affordable, and acceptable meals that meet the dietary needs and preferences of older adults.

2.4 Nutritional Adequacy in Meal Planning

Nutritional adequacy refers to the extent to which meals provide sufficient energy and essential nutrients to meet the physiological and health needs of a specific population. For older adults, nutritional adequacy is especially important because aging is often associated with reduced appetite, lower energy needs, decreased muscle mass, chronic diseases, and changes in chewing, swallowing, digestion, taste, and smell. LoBuono, Locher, and Sharkey et al. (2023) pointed out that these aging-related changes may reduce food intake and increase the risk of malnutrition, disability, and lower quality of life. Therefore, meal planning for older adults should not only provide enough calories, but also ensure adequate protein, dietary fiber, vitamins, minerals, fluids, and overall nutrient density.

For older adults, nutritional adequacy should include appropriate calories, sufficient protein, controlled fat and sodium, adequate dietary fiber, and enough micronutrients such as calcium, vitamin D, vitamin B12, zinc, and iron. According to the healthy-meal principles promoted by health authorities, each set meal should control calories within an appropriate range and maintain balanced proportions of major nutrients, including carbohydrates, protein, and fat. These principles also emphasize the use of natural foods, varied side dishes, proper seasoning, food safety, and hygiene. In senior meal planning, portion size, food-group balance, cooking methods, texture, and nutrient density should be carefully considered.

In addition, Shams-White et al. (2021) emphasized that dietary quality should be evaluated through overall dietary patterns, including vegetables, fruits, whole grains, protein foods, sodium, and saturated fat. This suggests that meals for older adults should not be viewed simply as low-calorie or low-salt meals, but as balanced dietary patterns that support long-term health. Furthermore, Li (2002) indicated that consumers' acceptance of healthy meals is influenced by nutritional balance, reliable food sources, price, convenience, and taste. Therefore, although low-oil, low-salt, high-fiber, and adequate-protein meal designs are recommended, taste and acceptability should not be ignored. Nutritionally balanced meals can only improve health outcomes when older adults are willing and able to consume them regularly.

2.5 Healthy Dietary Needs and Meal Satisfaction

Healthy dietary needs among older adults include nutritional balance, food safety, ingredient freshness, appropriate texture, suitable portion size, menu variety, and disease-related dietary control. Because older adults often experience chronic diseases and physiological changes, their dietary needs may differ from those of younger adults. For example, older adults with hypertension may require low-sodium meals, while those with diabetes may need controlled carbohydrate intake and balanced meal timing. Huang (2005) indicated that middle-aged and older chronic-disease patients often understand the importance of dietary adjustment, but their willingness to accept health-conditioning meals is influenced by eating habits, trust in food effectiveness, hygiene, safety, and taste. This suggests that healthy meals must meet both medical and consumer expectations.

Meal satisfaction is also an important factor because it affects food intake, meal acceptance, and the long-term use of group meal services. Even if meals are nutritionally

balanced, older adults may reduce their intake if the food is not tasty, visually appealing, easy to chew, or culturally acceptable. Chen (2005) found that consumers and food-service providers may have different perceptions of healthy meal quality, especially regarding taste, portion size, ingredient freshness, low-oil and low-salt preparation, variety, plating, nutritional balance, reasonable price, and perceived health benefits. Therefore, meal satisfaction should be evaluated from the perspective of older adults rather than only from the viewpoint of meal providers.

In addition, Li (2002) pointed out that consumers' acceptance of healthy meals is related to nutritional balance, reliable food sources, price, convenience, and taste. These factors are especially important in group meal services, where meals are prepared in large quantities and must satisfy diverse needs. Successful group meal services should therefore integrate nutritional standards with user-centered meal design. This means that meals should be healthy, safe, fresh, affordable, easy to eat, and acceptable in taste and appearance. By improving both nutritional quality and meal satisfaction, group meal services can better support healthy aging and enhance the quality of life of older adults.

III. RESEARCH METHODOLOGY

3.1 Research Design

This study adopts a quantitative research design to examine nutritional adequacy and healthy dietary needs in group meal services for older adults. A questionnaire survey is used as the main research method to collect data from older adults who regularly receive group meal services. The survey focuses on respondents' perceptions of nutritional adequacy, healthy dietary needs, meal satisfaction, and service quality. A quantitative design is appropriate for this study because it allows the researcher to systematically measure participants' opinions and analyze the relationships among different variables through statistical methods.**3.2 Research Subjects**

The research subjects are older adults who regularly receive group meal services from senior centers, community meal programs, or long-term care institutions. Participants should be aged 60 years or older and have experience consuming meals provided by group meal services.

3.3 Research Instruments

The research instrument used in this study is a structured questionnaire designed to examine older adults' perceptions of nutritional adequacy, healthy dietary needs, meal satisfaction, and service quality in group meal services. The questionnaire consists of four main sections.

The first section collects demographic information, including gender, age, education level, health condition, living arrangement, and experience with group meal services. The second section measures perceived nutritional adequacy, including calorie sufficiency, protein intake, food-group balance, low-oil and low-salt meal design, dietary fiber intake, and nutrient variety. The third section examines healthy dietary needs, including food texture, portion size, freshness, hygiene, taste, disease-related dietary control, and menu variety. The fourth section evaluates meal satisfaction, including overall satisfaction, willingness to continue using the service, perceived service quality, and suggestions for improvement.

Most questionnaire items are measured using a five-point Likert scale, ranging from 1, strongly disagree, to 6, strongly agree. Higher scores indicate stronger agreement with the item and more positive perceptions of the group meal service.

3.4 Data Collection

Data are collected through paper-based or online questionnaires. Before completing the questionnaire, participants are informed about the purpose of the study and their right to withdraw at any time. Participation is voluntary, and all responses are kept confidential.

3.5 Data Analysis

The collected data are analyzed using statistical methods. Descriptive statistics are used to understand participants'

demographic characteristics and general responses. Independent-samples t tests and one-way ANOVA may be used to examine differences among groups. Pearson correlation analysis may be used to explore relationships among nutritional adequacy, healthy dietary needs, and meal satisfaction. Regression analysis may also be used to identify factors influencing meal satisfaction.

IV. RESULTS AND DISCUSSION

4.1 Demographic Characteristics of Respondents

This section presents the demographic characteristics of the respondents, including gender, age, marital status, education level, self-perceived body shape, occupation, monthly income, and nutrition-related knowledge. A total of 50 questionnaires were distributed to older adults who received the group meal service. Among them, 45 questionnaires were returned, and 37 were valid, resulting in an effective response rate of 82.2%.

As shown in Table 1, female respondents accounted for the majority of the sample, representing 81.1%, while male respondents accounted for 18.9%. In terms of age, the largest group was aged 51–60, accounting for 50.0%, followed by respondents aged 65 and above, accounting for 36.1%. Most respondents were married, and the largest education group was senior high school, accounting for 73.0%. Regarding nutrition knowledge, 89.2% of respondents reported that they were interested in nutrition-related information, indicating that older adults generally showed a high level of concern for healthy eating and health maintenance.

Table 1 Demographic Characteristics of Respondents

Variable	Category	Frequency	Percentage
Gender	Male	7	18.9%
	Female	30	81.1%
Age	41–50	5	13.9%
	51–60	18	50.0%
	65 and above	13	36.1%
Marital status	Unmarried	3	35.1%
	Married	34	64.9%
Education	Junior high school or below	2	5.4%
	Senior high school	27	73.0%
	University / College	8	21.6%
Nutrition knowledge interest	Not interested	3	8.1%
	No opinion	1	2.7%
	Interested	33	89.2%

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he demographic results suggest that most respondents were female, middle-aged or older adults, and had a basic level of education. The high percentage of respondents interested in nutrition knowledge indicates that group meal services for older adults should not only provide meals but also support nutrition education and healthy dietary guidance.

4.2 Perceptions of Nutritional Adequacy

This section analyzes respondents' perceptions of the nutritional adequacy of group meal services. Nutritional adequacy was evaluated through several indicators, including nutritional balance, low-oil, low-salt, low-fat, and high-fiber preparation, freshness of ingredients, portion size,

side dishes, and health-maintenance function.

As shown in Table 2, respondents generally expressed positive perceptions of nutritional adequacy. The mean score for low-oil, low-salt, low-fat, and high-fiber preparation was 4.572, indicating that respondents recognized the health-oriented cooking design of the meals. Nutritional balance received a mean score of 4.389, while health-maintenance function received a mean score of 4.340. Freshness of ingredients received a particularly high mean score of 4.654, showing that respondents considered fresh ingredients an important part of nutritional quality. The appropriateness of overall portion size also received a high mean score of 4.571.

Table 2 Perceptions of Nutritional Adequacy

Item	N	Mean	Standard Deviation
Low-oil, low-salt, low-fat, high-fiber preparation	37	4.572	0.624
Nutritional balance	37	4.389	0.960
Health-maintenance function	37	4.340	0.913
Freshness of ingredients	37	4.654	0.664
Appropriateness of overall portion	37	4.571	0.787
Side dishes	37	4.536	0.642

These results indicate that the group meals were generally perceived as nutritionally adequate. However, compared with ingredient freshness and portion size, nutritional balance and health-maintenance function received slightly lower scores. This suggests that future group meal services should provide clearer nutrition labeling, explain the health benefits of meals, and strengthen meal planning based on older adults' specific dietary needs.

4.3 Healthy Dietary Needs of Older Adults

This section discusses the healthy dietary needs considered important by older adults. The results show that older adults value not only nutrition but also freshness, hygiene, safety, taste, product quality, menu variation, and diverse choices. As shown in Table 3, the highest-rated need was high ingredient freshness, selected by 97.3% of respondents. Deliciousness ranked second, accounting for 86.5%, followed by hygiene and safety at 83.8%, and product quality at 81.1%.

These results suggest that older adults do not evaluate healthy meals based only on whether the meals are low in oil, salt, or fat. They also expect meals to be fresh, tasty, safe, and of good quality. Menu variation and diverse choices were also important, with 62.2% and 70.3% of respondents selecting these items, respectively.

Table 3 Important Items in Healthy-Diet Consumption among Older Adults

Item	Percentage
High ingredient freshness	97.3%
Deliciousness	86.5%
Hygiene and safety	83.8%
Product quality	81.1%
Diverse choices	70.3%
Menu variation	62.2%
Added snacks	51.4%
Utensil quality	48.6%
Service quality	40.5%

The findings indicate that food freshness is the most important healthy dietary need among older adults. Therefore, group meal providers should strengthen ingredient selection, storage management, and food preparation procedures. In addition, since deliciousness was also highly valued, meal providers should avoid assuming that older adults will accept bland meals simply because

they are healthy. Healthy meals should be nutritionally balanced, fresh, safe, and enjoyable.

4.4 Meal Satisfaction

Meal satisfaction was analyzed based on taste, appearance, texture, variety, cleanliness, portion size, side dishes, and price. Overall, respondents reported a high level of satisfaction with the group meals. As shown in Table 4, all satisfaction mean scores were above 4.3, indicating positive evaluations of the meal service.

The highest satisfaction score was attractiveness of dishes, with a mean score of 4.732. Freshness of ingredients also received a high mean score of 4.654, followed by low-oil, low-salt, low-fat, and high-fiber preparation at 4.572, appropriateness of overall portion at 4.571, and cleanliness and hygiene at 4.561. The lowest score was reasonable price, with a mean score of 4.322, although this score still indicates a generally positive evaluation.

Table 4 Senior Citizens' Satisfaction with Group Meal Quality

Item	N	Mean	Standard Deviation
Attractiveness of dishes	37	4.732	0.465
Freshness of ingredients	37	4.654	0.664
Low-oil, low-salt, low-fat, high-fiber preparation	37	4.572	0.624
Appropriateness of overall portion	37	4.571	0.787
Cleanliness and hygiene	37	4.561	0.756
Variation in ingredients	37	4.554	0.682
Side dishes	37	4.536	0.642
Taste of dishes	37	4.493	0.787
Variety of dishes	37	4.483	0.865
Overall appearance of dishes	37	4.482	0.810
Texture of dishes	37	4.447	0.740
Nutritional balance	37	4.389	0.960
Health-maintenance function	37	4.340	0.913
Reasonable price	37	4.322	0.955

The results show that older adults were especially satisfied with visual attractiveness, ingredient freshness, healthy cooking methods, portion size, and hygiene. This suggests that group meal services should continue to integrate nutrition, sensory appeal, and food safety. However, relatively lower scores for price reasonableness and health-maintenance function indicate that meal providers may need to improve value perception and provide clearer explanations of the meals' nutritional benefits.

4.5 Relationship among Nutritional Adequacy, Healthy Dietary Needs, and Satisfaction

This section examines the relationship among perceived importance, satisfaction, and consumption behavior. Pearson correlation analysis was used to analyze the relationships among the variables. As shown in Table 5, importance and satisfaction were positively correlated, with $r = 0.268$ and $p = 0.000$. Importance and consumption behavior were also positively correlated, with $r = 0.147$ and $p = 0.032$. The strongest relationship was found between satisfaction and consumption behavior, with $r = 0.392$ and $p = 0.000$.

Table 5 Correlations among Importance, Satisfaction, and Consumption Behavior

Variable	Importance	Satisfaction	Consumption Behavior
Importance	1.000	0.268**	0.147*
Satisfaction	0.268**	1.000	0.392**
Consumption Behavior	0.147*	0.392**	1.000

Note. *p < 0.05; **p < 0.01.

The findings indicate that older adults who were more satisfied with healthy meals were more likely to demonstrate positive consumption behavior. In other words, satisfaction plays an important role in encouraging older adults to accept and continue consuming healthy meals. Although importance was also positively related to satisfaction and consumption behavior, its relationship with consumption behavior was weaker. This suggests that simply recognizing the importance of healthy eating may not be enough; meals must also be tasty, fresh, convenient, and satisfying.

4.6 Discussion

The findings of this study show that older adults generally had positive perceptions of group meal services. Respondents gave high satisfaction scores to attractiveness of dishes, freshness of ingredients, healthy cooking methods, portion size, cleanliness, and side dishes. These findings suggest that successful group meal services should not focus only on providing sufficient food quantity, but should also emphasize nutritional balance, sensory quality, food safety, and user-centered meal design.

In terms of nutritional adequacy, respondents positively evaluated low-oil, low-salt, low-fat, and high-fiber preparation, as well as ingredient freshness and portion size. However, nutritional balance and health-maintenance function received slightly lower scores compared with other items. This indicates that meal providers may need to strengthen professional nutrition planning and provide more visible nutrition information to help older adults understand the health value of meals.

The results also show that older adults placed the greatest importance on ingredient freshness, deliciousness, hygiene and safety, and product quality. This finding is important because it shows that older adults do not accept healthy meals based only on nutrition. They also expect meals to be enjoyable, safe, fresh, and trustworthy. Therefore, group meal providers should integrate nutritional standards with consumer preferences.

Finally, the correlation analysis indicates that satisfaction had the strongest relationship with consumption behavior. This means that improving meal satisfaction may increase older adults' willingness to continue using group meal services. In practical terms, meal providers should regularly collect feedback from older adults, adjust menus according to their needs, and improve meal quality through cooperation with nutritionists, chefs, and care-service staff. Overall, the findings support the idea that group meal services for older adults should combine nutritional adequacy, healthy dietary design, food acceptability, and service quality. By doing so, group meal services can better support healthy aging, reduce dietary risks, and improve the quality of life of older adults.

V. CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

5.1 Conclusions

This study examines nutritional adequacy and healthy dietary needs in group meal services for older adults. The findings indicate that older adults require meals that are not only sufficient in quantity, but also balanced in nutrition, safe, fresh, easy to chew, and suitable for their health conditions. The World Health Organization (WHO, 2015)

emphasized that healthy aging refers to maintaining functional ability and well-being in later life. From this perspective, group meal services should be understood not only as food provision, but also as an important support system for health promotion and quality of life among older adults.

The findings also show that nutritional adequacy and healthy dietary design are important factors influencing meal satisfaction. LoBuono, Locher, and Sharkey et al. (2023) pointed out that aging is often accompanied by reduced appetite, changes in taste and smell, and chewing or swallowing difficulties, which may increase the risk of poor food intake and malnutrition. Therefore, meals for older adults should consider adequate energy and protein, food-group balance, appropriate texture, sufficient dietary fiber, controlled sodium and fat, and disease-related dietary needs.

In addition, Huang (2006) indicated that meal-supply systems in elder-care institutions require cooperation among government agencies, care institutions, nutrition professionals, and food-service providers. This suggests that improving group meal services should involve both nutritional planning and service management. Li (2002) also noted that consumers' acceptance of healthy meals is influenced by nutritional balance, reliable food sources, price, convenience, and taste. Thus, healthy meals must be nutritious as well as acceptable to older adults.

Overall, group meal services can play an important role in promoting healthy aging. When meals are properly designed, they can help older adults maintain physical function, prevent malnutrition, manage chronic diseases, improve meal satisfaction, and enhance overall quality of life.

5.2 Practical Recommendations

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First, group meal providers should design menus based on the nutritional needs and health conditions of older adults. Meals should include adequate protein, vegetables, fruits, whole grains, calcium-rich foods, and sufficient fluids. Since older adults are more likely to experience muscle loss, reduced appetite, and chronic diseases, meal planning should emphasize nutrient density rather than simply increasing food quantity. Menus should also consider low-sodium, low-fat, high-fiber, and balanced food-group principles in order to support healthy aging and disease prevention.

Second, meal texture should be adjusted according to older adults' chewing and swallowing abilities. Soft foods, finely cut ingredients, moist cooking methods, and easy-to-chew meal preparation can help improve food intake and reduce eating difficulties. For older adults with dental problems or swallowing concerns, texture-modified meals should be provided without reducing nutritional value or visual appeal.

Third, meal providers should reduce excessive salt, oil, and sugar while maintaining flavor through natural seasonings, herbs, spices, fresh ingredients, and appropriate cooking techniques. Healthy meals should not be bland or unattractive. Taste, aroma, color, and appearance remain important factors influencing older adults' willingness to eat.

Fourth, nutritionists should be involved in menu planning, nutrient calculation, and regular nutritional evaluation. Professional guidance can help ensure that meals meet dietary standards and respond to the needs of older adults with hypertension, diabetes, cardiovascular disease, osteoporosis, or other chronic conditions. Cooperation among nutritionists, chefs, caregivers, and food-service managers can improve both nutritional quality and meal acceptability.

Fifth, meal providers should collect feedback from older adults regularly. Satisfaction surveys, interviews, and observation of meal intake can help identify problems related to taste, portion size, texture, temperature, menu variety, and service quality. By continuously adjusting menus based on older adults' feedback, group meal services can better meet user needs, increase meal satisfaction, reduce food waste, and improve the overall effectiveness of

elderly nutrition care.

5.3 Policy Recommendations

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Government agencies should establish clear and practical nutritional guidelines for group meal services for older adults. These guidelines should include standards for energy intake, protein supply, food-group balance, sodium control, dietary fiber, fluid intake, texture modification, and disease-related dietary needs. Clear standards can help meal providers design menus that are not only safe and sufficient in quantity, but also nutritionally adequate and suitable for older adults with different health conditions.

In addition, government agencies should provide financial support, staff training, and nutrition education programs to improve the quality of group meal services. Financial subsidies can help community meal programs and care institutions purchase fresh ingredients, hire professional staff, and improve kitchen facilities. Staff training should focus on elderly nutrition, food safety, texture-modified diets, chronic disease meal planning, and service communication. Nutrition education should also be provided to older adults and caregivers so that they can better understand healthy eating principles and make appropriate dietary choices.

Community-based meal programs should also be strengthened to support older adults who live alone, have limited mobility, or have difficulty preparing meals independently. These services can reduce the risk of poor dietary intake, social isolation, and nutrition-related health problems. Meal delivery, community dining, and senior service centers can serve as important platforms for promoting healthy aging.

Finally, cooperation among government agencies, nutrition professionals, care institutions, community organizations, and food-service providers is necessary. Through cross-sector collaboration, group meal services can become more accessible, affordable, nutritious, and responsive to the real needs of older adults. Such policy support can help promote healthy aging, prevent malnutrition, and improve the quality of life of elderly populations.

5.4 Suggestions for Future Research

Future research may compare different types of group meal services, such as institutional meals, community meals, and home-delivered meals. Researchers may also conduct nutrient analysis to evaluate the actual nutritional content of meals. In addition, qualitative interviews with older adults, caregivers, nutritionists, and food-service managers may provide deeper insights into the challenges and improvement strategies of group meal services.

Overall, improving nutritional adequacy and healthy dietary design in group meal services is essential for supporting the health, dignity, and quality of life of older adults.

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