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Analysis of Risk Factors for Dyslipidemia in Older Adults: A Literature Study

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Abstract

Background: *In Indonesia, the prevalence of dyslipidemia increases with age, rising from 9.3% among individuals aged 25—34 years to 15.5% among those aged 55—64 years. With advancing age, they become more susceptible to degenerative diseases, including dyslipidemia. This increased susceptibility is attributed to the aging process, which involves declining cellular function, reduced immune system efficacy, and elevated blood lipid levels in the elderly. This research examined the determinants of dyslipidemia in the older adult population.*

Methods: *This research used a literature review approach following the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines. A total of 40,315 journals were examined using the search keywords "dislipidemia pada lansia" or "dyslipidemia in elderly." The inclusion criteria encompassed original research articles that specifically measured cholesterol levels in study subjects, with the study population consisting of elderly individuals. After the screening process, six journal articles were found to be relevant to the research objectives.*

Results*: The analysis of the selected articles revealed that the risk factors for dyslipidemia in the elderly include menopause, poor health-related behaviors, including smoking, sedentary behavior, and unhealthy eating patterns with insufficient fiber intake, together with diabetes mellitus and obesity.*

Conclusion: *The study identified several risk factors for dyslipidemia in the elderly, including age, gender, menopause, unhealthy lifestyle habits, diabetes mellitus, and obesity.*

Keywords: *Elderly, Dyslipidemia, Literature review, Risk factors*

INTRODUCTION

Urbanization and the change in 21st-century lifestyles are increasing the prevalence of chronic noncommunicable diseases.[1] The Indonesian Ministry of Health defines noncommunicable diseases (NCDs) as diseases of non-infectious origin that are not transmitted between individuals. NCDs are often chronic and associated with lifestyle, along with specific risk factors including tobacco use, high alcohol intake, physical inactivity, and exposure to air pollution.[2] According to the 2018 Basic Health Research (Riskesdas), the prevalence of NCD has increased compared with the 2013 Riskesdas survey.[2]

Worldwide, cardiovascular disease remains the leading contributor to mortality and disability among all NCDs. The World Health Organization (WHO) states that 12 millions of fatalities occur all over the world every year because of cardiovascular conditions, such as heart failure, stroke and cardiac arrest.[3] Dyslipidemia is a metabolic disorder that indicated through increased concentrations of total cholesterol, low-density lipoprotein cholesterol (LDL-C), triglycerides, and decrease in high-density lipoprotein cholesterol (HDL-C). This condition has the potential to increase the risk of coronary heart disease and stroke.[4]

According to the WHO, 39% of the adult demographic in the world suffers from dyslipidemia, with a slightly higher prevalence rate in women (40%) than in men (37%).[3] Data from the 2018 Basic Health Research (Riskesdas) indicated that as many as 28.8% of Indonesians aged 15 years or older have ≥200 mg/dL total cholesterol level and 27.9% have ≥150 mg/dL triglyceride (TG) level. When compared with the data in 2013, there was an escalate in the prevalence of Indonesians who experience dyslipidemia.

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The prevalence of dyslipidemia in Indonesia rises with age, from 9.3% in adults aged 25—34 years to 15.5% in the 55—64-year-old population.

Older adults are individuals aged 60 years and above. [5] WHO categorizes this population into three groups based on age range, namely the younger-old adults (aged 60–69 years), the middle-old adults (aged 70–79 years), and the oldest-old adults (aged 80 years and above).[4] Based on the Central Statistics Agency, In 2023, the proportion of older adults in Indonesia reached 11.75%. This figure has increased by 1.27% points compared to the previous year, which recorded a prevalence of 10.48%.[6] Advancing age is associated with increased vulnerability to degenerative diseases, including dyslipidemia. This susceptibility reflects age-related physiological changes, including progressive cellular dysfunction, declining immune function, and metabolic alterations that contribute to elevated blood lipid levels in older adults. [7] Previous studies have shown that more than 75% of individuals with cardiovascular disease experience at least one episode of dyslipidemia highlighting its clinical significance.[8] Based on this evidence, the present study aimed to identify risk factors associated with dyslipidemia in the elderly.

METHOD

Participants and Study Design

This study employed a literature review approach. Relevant articles were identified through systematic searches using the keywords "dislipidemia pada lansia" (Bahasa Indonesia) and "dyslipidemia in Elderly" (English) across electronic databases, including Google Scholar, BioMed Central (BMC), and PubMed. The search was limited to full-text published from 2014 to 2024 and available in either Indonesian or English.

Inclusion criteria comprised original research articles that assessed cholesterol levels in older adult populations (aged 60 years or older). Exclusion criteria included narrative reviews, opinion pieces, editorials, and literature reviews, as well as studies that did not measure cholesterol levels or involved participants younger than 60 years old.

Measurements and Procedure

The initial literature search identified a total of 40,317 records, comprising 21,428 articles from PubMed, 10,879 from BioMed Central (BMC), and 8,010 from Google Scholar. Following the screening process, six studies were deemed eligible and included in this literature review. The article selection process is presented in a Preferred Reporting Items for Systematic Reviews and Meta-analysis (PRISMA) flow diagram. The stages of study identification, screening, and inclusion are described below:

RESULTS

Increasing age is linked to a higher risk of dyslipidemia among older adults, with an Odds Ratio (OR) of 3.347 (95% Confidence Interval [CI]: 1.445–7.753).[9] However, in the study by Xi et al., dyslipidemia showed a significantly greater prevalence in men compared to women (37.9% vs. 27.5%, $P < 0.001$).[10] However, this study found that postmenopausal women showed a higher prevalence of dyslipidemia components. This finding is in line with the study of Ihn et al., which reported that 11.9 per 100 person-years of postmenopausal women experienced dyslipidemia. The average time from menopause to the onset of dyslipidemia was 5.3 years.[9]

Multiple studies have identified gender differences in dyslipidemia. One study found that older women experience dyslipidemia more frequently than men.[9] Whereas another study indicated that men generally exhibit higher triglyceride levels and lower HDL cholesterol.[10] Women generally have higher HDL cholesterol (good cholesterol) levels compared to men, but they may also develop higher LDL cholesterol (bad cholesterol) levels after menopause. Hormonal factors, such as estrogen, can significantly influence women's lipid profiles.[10]

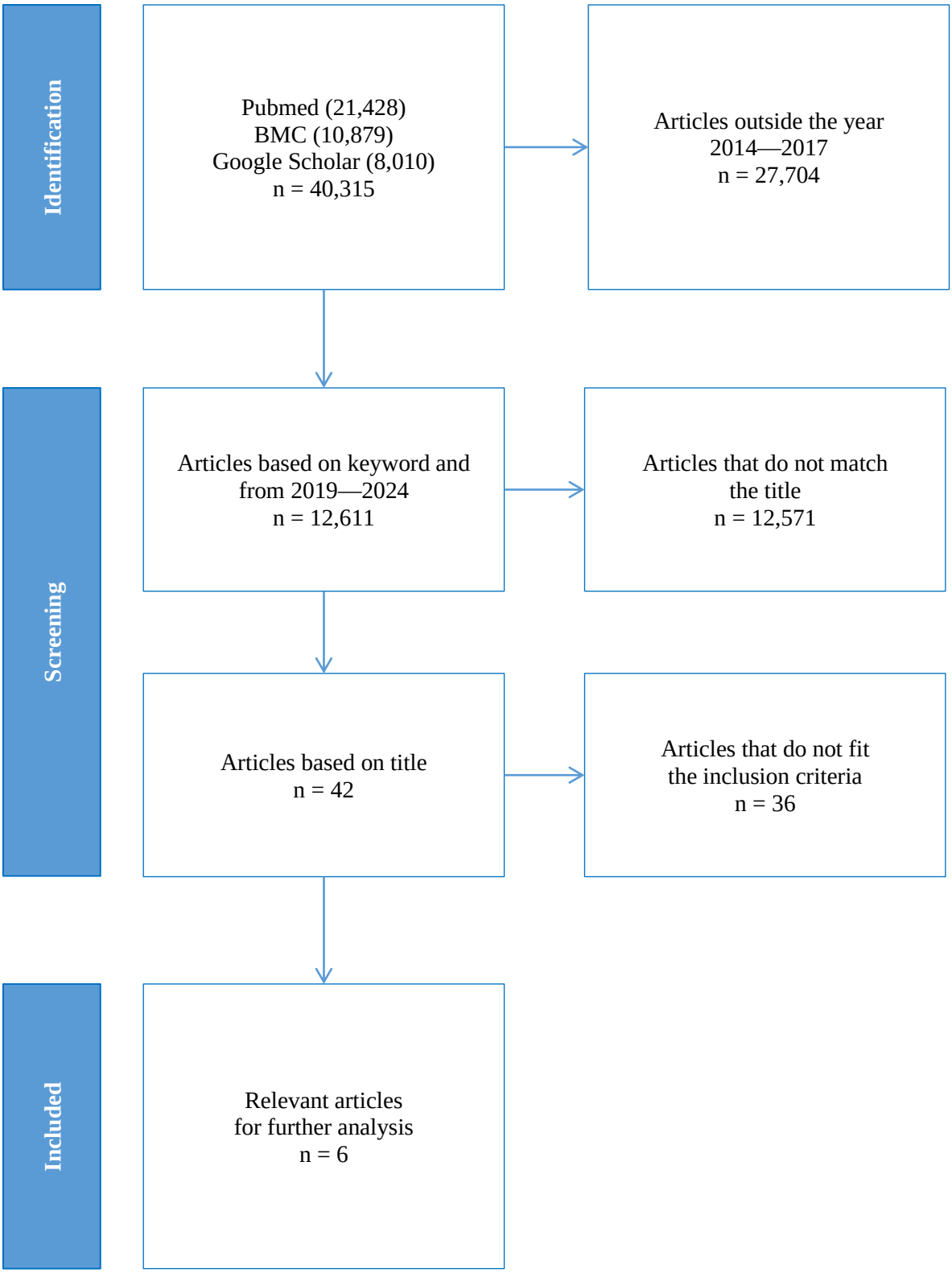

Figure 1. PRISMA Diagram

Table 1 shows that menopause is one of the risk factors for dyslipidemia. During menopause, hormonal changes, including declining estrogen levels, could increase lipid profile components, such as total cholesterol and low-density lipoprotein (bad cholesterol), and triglycerides, in a woman's blood. These metabolic alterations may increase the risk of dyslipidemia in women after menopause.[9] A study by Ihn et al. showed that dyslipidemia often occurs in women who experience menopause, especially in the period of 5 years after the onset of menopause.[11] These findings are in agreement with the study by Xi et al., which reported a significantly higher prevalence of dyslipidemia in men compared to women (37.9% vs. 27.5%; $p < 0.001$). However, the prevalence of dyslipidemia components was significantly higher among postmenopausal women.[10]

As presented in Table 1, body mass index (BMI) and waist circumference, and obesity are risk factors for dyslipidemia in the elderly. Research by Maulina et al. found that BMI is associated with an increased risk of elevated cholesterol levels in older adults. In addition to BMI, obesity and an increase in waist circumference are also risk factors for the occurrence of dyslipidemia.[12] Lestari et al. reported that obesity and high waist circumference are associated with dyslipidemia in the elderly.[9] This finding confirms Dainy et al., who identified that the nutritional status (overweight and obese) in early elderly and the elderly is one of the only causes of the occurrence of dyslipidemia.[13] Achila et al. suggested that the increase in waist circumference in elderly people is a risk factor for dyslipidemia. BMI value, obesity, and waist circumference are closely related to the lifestyle of older people.[14]

Obesity can alter the body's metabolism, affecting lipid profiles. This encompasses increased levels of triglycerides and low-density lipoprotein (LDL, “bad” cholesterol), along with reduced high-density lipoprotein (HDL, “good” cholesterol). Obesity most likely leads to insulin resistance, in which the body becomes less responsive to insulin, thereby impairing blood glucose regulation. Additionally, obesity can increase LDL cholesterol production while reducing HDL cholesterol production. High levels of LDL cholesterol are associated with a greater risk of developing atherosclerosis, which involves the narrowing and hardening of arteries. In contrast, low HDL cholesterol levels are less effective in transporting cholesterol from the blood vessels back to the liver for elimination.[15]

Elevated fasting blood glucose levels reported in the two reviewed studies are presented in Table 1. Lestari et al. reported that increased fasting blood glucose levels were found related with a higher risk of dyslipidemia among older adults.[9] Similarly, Achilas et al. found that elevated fasting blood glucose concentrations were linked to an increased risk of dyslipidemia in the elderly population.[14]

Lifestyle factors, including physical activity, dietary patterns, and smoking behaviors, have also been identified as significant risk factors for dyslipidemia among older adults.[16] Rubiah et al. demonstrated that a poor diet significantly increased the risk of dyslipidemia in this population.[17] In addition, Achila et al. reported that insufficient physical activity and unhealthy dietary intake were associated with a higher risk of dyslipidemia.[14] Furthermore, smoking was identified as a contributing risk factor for dyslipidemia in older adults in a study by Lestari et al.[9]

DISCUSSION

According to the definition by the American Academy of Family Physicians (AAFP), dyslipidemia is a disorder of lipoprotein metabolism characterized by abnormalities in the synthesis or elimination of lipoproteins in the body. Common clinical manifestations include elevated levels of total cholesterol, LDL (low-density lipoprotein) cholesterol, and triglycerides, as well as reduced levels of HDL (high-density lipoprotein) cholesterol.[18] Generally, dyslipidemia is classified into two categories: primary dyslipidemia, which is caused by genetic factors, and secondary dyslipidemia, which is multifactorial and often associated with underlying medical conditions. Secondary dyslipidemia can be triggered by metabolic disorders, environmental factors, dietary habits, and an individual’s lifestyle.[19]

Table 1. Summary of Reference which is Used in this Literature Review

Nr.	Title	Researcher Name (Year)	Reseach Design	Population	Sample	Research Method	Result
1	Incidence and Risk Factors of Dyslipidemia after Menopause	Jeong Ihn Sook, Yun Hae Sun, Kim Myo Sung, Hwang Youn Sun 2022	Cohort Study	Postmenopausal women in Ansan-Ansung, South Korea, who did not have dyslipidemia, were included in the study from 2001 to 2002, until the seventh follow-up in 2015 to 2016.	245 Postmenopausal women	Lipid profile levels measurement	The findings indicate that the prevalence of dyslipidemia is particularly elevated among postmenopausal women, especially within the first five years following the onset of menopause.
2	Faktor Risiko Kejadian Dislipidemia Pada lansia (Studi Kasus Kontrol Pada Lansia di Poli Lansia RSUD. Bangkinang Kabupaten Kampar Tahun 2016–2017) (Risk Factors for Dyslipidemia among Older Adults: A Case-Control Study at the Geriatric Clinic of Bangkinang Regional General Hospital, Kampar Regency, 2016—2017]	Ayuning Lestari, Myrnawati Crie Handini, Taruli Rohana Sinaga 2018	Case-Control Study	Older adults who sought treatment at the Geriatric Department of RSUD Bangkinang	The sample size in this study was 135 respondents, 45 respondents in the case group and 90 respondents in the control group.	Cholesterol level measurement	Advancing age, female sex, obesity, diabetes mellitus, and smoking are associated with an increased risk of dyslipidemia.
3	Risiko Peningkatan Kadar Profil Lipid dengan Indeks Massa Tubuh Lansia di Panti Jompo Kota	Nora Maulina, Harvina Sawitri 2022	Cross-Sectional	Older adults in Darussaadah Nursing Home-Lhokseumawe	55 older adults	Body mass index (BMI) and lipid profile levels measurement	The mean cholesterol concentration among older adults exceeded the established normal threshold. Body mass index (BMI) accounted for

	Lhokseumawe Tahun 2021 (Risk of Elevated Lipid Profile Levels in Relation to Body Mass Index among Older Adults in Nursing Homes in Lhokseumawe City, 2021]						23.4% of the variability in cholesterol levels.
4	Status Gizi Kaitannya Dengan Dislipidemia Pada Pralansia dan Lansia (Nutritional Status Related to Dyslipidemia in Pre-elderly and Elderly)	Nunung Cipta Dainy, Clara M. Kusharto, Siti Madanijah, Martina Wiwie Setiawan Nasrun 2016	Cross-Sectional	Older adults in Dahlia Senja Elderly Health Post, Depok City	116 older adults	Measurement of body weight, height, upper arm circumference, calf circumference, and blood samples for lipid profile analysis	Nutritional status constitutes a significant determinant of dyslipidemia in both young-old and older adult populations, with overweight and obesity playing a substantial role in its development.
5	Factors Affecting Hypercholesterolemia in Lansia in the Working Area of Puskesmas Daik 2020	Rubiah, Mira Agusthia, Rachmawaty M Noer 2020	Cross-Sectional	Older adults in Daik Community Health Center	165 older adults with hypercholesterolemia	Diet questionnaire, GPAQ (Global Physical Activity Questionnaire) measurement	A statistically significant association was identified between dietary patterns and hypercholesterolemia in the Puskesmas Daik service area. Physical activity was also found to be significantly associated with hypercholesterolemia.
6	Dyslipidemia and Associated Risk Factors in the Elderly Population in Asmara, Eritrea: Results from a Community-Based Cross-Sectional Study	Oliver Okoth Achila , Mathewos Araya, Arsiema Brhane Berhe, Niat Habteab Haile, Luwam Kahsai Tsige, Bethelihem Yemane Shifare,Tesfalem Abel Bitew, Israel Eyob Berhe, Samuel Tekle Mengistu , and Eyob Garoy Yohaness 2021	Cross-Sectional	Older adults (aged 60 to 85 years old) between January dan June 2018 in Asmara, Eritrea.	319 older adults (145 men dan 174 women)	Anthropometry, lipid profile, fasting plasma glucose (FPG), and blood pressure (BP) measurements	A high prevalence of dyslipidemia was identified among the elderly population in Asmara. Significant risk factors included elevated fasting plasma glucose (FPG), increased waist circumference (WC), physical inactivity, and low intake of healthy foods.

A growing body of research has examined the risk factors associated with the development of dyslipidemia, particularly among adult and elderly populations. Table 1 presents a summary of six studies included in this review, consisting of four cross-sectional studies, one cohort study, and one case-control study. The populations analyzed across these studies were predominantly older adults, with the majority of participants ranging in age from 60 to 80 years. Based on the findings of these six studies, several risk factors for dyslipidemia in older adults were identified, including gender, age, menopausal status, body mass index (BMI), diabetes mellitus, obesity, waist circumference, as well as lifestyle-related factors such as smoking, physical inactivity, and unhealthy dietary patterns.

The World Health Organization (WHO) defines physical activity as any bodily movement produced by skeletal muscles that requires energy expenditure. Engagement in moderate to vigorous intensity physical activity has been demonstrated to yield substantial health benefits.[20] In contrast, physical inactivity is associated with unfavorable lipid profiles, including elevated triglyceride concentrations and decreased high-density lipoprotein (HDL) cholesterol levels, thereby increasing the risk of dyslipidemia.[21]

Ghazwani et al. identified several key risk factors for dyslipidemia, including low levels of physical activity, elevated body mass index (BMI), and dietary patterns characterized by high lipid intake.[19] Furthermore, Mutalifu et al. reported a significant interaction between physical activity (PA) and diet quality in relation to dyslipidemia ($p < 0.05$), indicating that insufficient physical activity combined with poor dietary quality contributes to an increased risk of dyslipidemia.[16]

Diet can be conceptualized as a structured approach to regulating both the quantity and variety of food intake based on established guidelines or nutritional information. Its primary objectives include maintaining health, achieving optimal nutritional status, and supporting disease prevention and recovery.[22] Dietary patterns characterized by high intake of saturated fats and cholesterol and low consumption of dietary fiber are considered detrimental, as they negatively influence lipid profiles and subsequently elevate the risk of dyslipidemia.[21]

Lestari et al. reported a higher prevalence of dyslipidemia among older women compared to men.[9] Several studies have documented sex-based differences in dyslipidemia prevalence. Conversely, Xi et al. found a significantly higher prevalence among men than women (37.9% vs 27.5%; $p < 0.001$).[10] Despite these inconsistencies, existing evidence indicates that postmenopausal women are particularly vulnerable to dyslipidemia. This population exhibits a higher prevalence of dyslipidemia components, as supported by Ihn et al., who reported an incidence rate of 11.9 cases per 100 person-years among postmenopausal women, with a mean duration of 5.3 years between menopause onset and dyslipidemia development.[11]

In general, men tend to present with higher triglyceride levels and lower HDL cholesterol levels. Women typically exhibit higher HDL cholesterol concentrations; however, following menopause, they may also experience increased levels of low-density lipoprotein (LDL) cholesterol. Hormonal factors, particularly estrogen, play a significant role in modulating lipid profiles in women.[10]

Obesity has consistently been identified as a major risk factor for dyslipidemia. Lestari et al. demonstrated a significant association between obesity and the incidence of dyslipidemia among older adults.[9] This finding is corroborated by Dainy et al., who reported that excessive nutritional status or obesity in both young-old and older age groups constitutes a major contributor to dyslipidemia.[13] Obesity can disrupt metabolic processes, thereby adversely affecting lipid profiles, including increased triglyceride and LDL cholesterol levels and decreased HDL cholesterol levels. Additionally, obesity is closely linked to insulin resistance, a condition in which the body exhibits reduced responsiveness to insulin, ultimately impairing lipid regulation in the bloodstream. Moreover, obesity promotes increased hepatic production of LDL cholesterol while reducing HDL cholesterol synthesis and function. Elevated LDL cholesterol levels contribute to the development of atherosclerosis, characterized by the narrowing and hardening of blood vessels, whereas reduced HDL cholesterol impairs the reverse

transport of cholesterol from peripheral tissues to the liver for excretion.[1]

CONCLUSION

Age, sex, menopausal status, obesity, and unhealthy lifestyle behaviors are recognized as principal determinants of increased dyslipidemia risk among older adults. The reduction in estrogen levels during menopause is associated with unfavorable alterations in lipid metabolism, including elevated concentrations of total cholesterol, low-density lipoprotein (LDL) cholesterol, and triglycerides, thereby increasing the risk of dyslipidemia, particularly within the first five years following menopause. Consistent evidence further indicates that postmenopausal women exhibit a higher prevalence of dyslipidemia compared with both premenopausal women and men.

Obesity, as reflected by elevated body mass index (BMI), increased waist circumference, and suboptimal nutritional status, also contributes significantly to the development of dyslipidemia. In addition, comorbid conditions such as diabetes mellitus, along with unhealthy lifestyle behaviors including insufficient physical activity, imbalanced dietary patterns, and smoking further exacerbate this condition. Therefore, reducing the risk of dyslipidemia among older adults necessitates comprehensive management of these factors, including menopausal changes, obesity, dietary habits, physical activity, and glycemic control, through targeted interventions and the adoption of healthier lifestyles.

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