

## The Relationship Between Diet and Physical Activity With Cholesterol Levels in The Elderly: A Systematic Literature Review

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### ABSTRACT

*Cholesterol plays a significant role in the health of older adults. The elderly are often faced with a higher risk of cardiovascular disease and metabolic disorders, as well as uncontrolled cholesterol levels. In general, the elderly often experience changes in nutritional needs and diet and lack of physical activity that can have a significant impact on their health, including cholesterol levels. This study aims to determine the relationship between diet and physical activity with the incidence of cholesterol in the elderly. The research method used is literature review, in the form of searching journals through the Google scholar database with the keywords 'cholesterol', 'elderly', 'diet', 'physical activity' in the range of journal publication years from 2019-2023, the journals used in this study totaled 10 journals. Based on the literature review of ten journals regarding the relationship between diet and physical activity with cholesterol levels in the elderly, the results found that there is a relationship between diet and physical activity with cholesterol levels in the elderly. From these various journals, it was found that irregular diet and lack of physical activity as factors that cause cholesterol to have a very high risk. The elderly in this case really need guidance from children or family, because they have limitations in meeting their nutritional needs, diet and physical activity.*

**Keywords:** *cholesterol; diet; elderly; physical activity*

### INTRODUCTION

Cholesterol plays a significant role in the health of older adults. The elderly are often at a higher risk of cardiovascular disease and metabolic disorders, and uncontrolled cholesterol levels can be an important risk factor in this regard. The increasing number of elderly people poses problems especially in terms of the health and well-being of the elderly. The presence of disease affects a person's physical health condition which is one of the aspects that determine a person's quality of life. One of the diseases that are often suffered is cholesterol, uric acid. This cholesterol disorder increases with age and above 60 years of age which is included in the elderly group (Wahyuni, Sumiyati, dan Masyitah Wahab 2022)

The World Health Organization (WHO) estimates the number of high cholesterol cases worldwide at 16-33 million. The incidence of high cholesterol (Hypercholesterolemia) in Indonesia is estimated to be the highest in the world at 350-810 cases per 100,000 population. (Suarsih 2020)

The elderly period brings physical decline and a tendency for morbidity rates to increase, one of which is coronary heart disease. The disease is the main cause of the total deaths of the Indonesian and world population and one of the risk factors is hypercholesterolemia. This is influenced by age, gender, diet, stress, alcohol, and physical activity (Adhiyani, Analis Kesehatan Nasional Surakarta, dan Yos Sudarso 2013). Diet as one of the lifestyle indicators that has an influence on nutritional and health status. The unhealthy diet, namely consuming high-fat foods such as offal, meat and coconut milk, can lead to increased cholesterol (Lasanu<sup>10</sup>, Ilham, dan Umani 2022). Fiber consumption can help reduce the absorption of fat and cholesterol in the blood. Some studies show that a fiber diet by consuming foods high in legumes, including kidney beans, can reduce

cholesterol levels in the blood by up to 10% in patients with hypercholesterolemia. In addition, water-soluble fiber fermented in the colon will produce short-chain fatty acids that can deplete liver cholesterol synthesis. Fiber consumption can help reduce the absorption of fat and cholesterol in the blood (Lestari, Hama, dan Novianti 2020)

In addition, efforts to maintain, improve health and physical fitness for the elderly by providing non-pharmacological therapy are frequent daily physical activity, physical exercise and exercise. The first daily physical activity is in everyday life such as taking care of the house, washing clothes, mopping, walking, gardening. And for physical exercise, it is usually done in a structured and planned manner such as morning or evening walks, muscle stretching, gymnastics (Yunita, Wilujeng, dan Sayekti 2022). One example of physical activity that can be done is doing exercises such as ergonomic exercises. Each ergonomic exercise movement contains tremendous benefits in disease prevention and health care. This exercise can help in increasing good cholesterol levels (HDL) and lowering bad cholesterol levels (LDL). To get satisfactory results, it would be better if the exercise is done continuously, at least 2-3 times a week  $\pm$  20 minutes if all movements are performed perfectly (Handayani, Herliawati, dan Rizona 2020)

Based on the description above, I am interested in compiling a literature review on the relationship between diet and physical activity with cholesterol levels in the elderly. This study aims to determine the relationship between diet and physical activity with cholesterol levels in the elderly. With a better understanding of this relationship, it is hoped that new information about diet and physical activity with cholesterol in the elderly will assist in the development of more effective nutritional strategies. This could potentially reduce the risk of cardiovascular disease and improve the overall health of the elderly.

## METHOD

This study is a research using the literature review method. Journal searches were conducted on the Google Scholar database with the keywords 'diet', 'cholesterol', 'elderly', 'physical activity' for journals in Indonesian. The following are the inclusion and exclusion criteria used in this study, namely as follows:

Table 1. inclusion and exclusion criteria

Inclusion Criteria	Exclusion Criteria
Keywords: "diet" and "cholesterol" and "elderly" and "physical activity"	Not relevant to the keyword
Research year from 2019-2023	Below from 2019
In accordance with the research theme	Not in accordance with the research theme

The journal search was limited to the last 5 years, with a range of 2019 to 2023. The articles found were read carefully to see if they met the inclusion criteria to be used as literature in writing the literature review. I found 10 journals that were closest to the research theme, namely the relationship between diet and physical activity with cholesterol incidence in the elderly.

## RESULTS AND DISCUSSION

Research results on the relationship between diet and cholesterol incidence in the elderly from 10 journals reviewed are presented in the following table. The results of the study can be seen in table 1.

**Table 1. Research Results.**

No.	Journal Title	Authors	Destination	Research Variables	Methods	Results	Keywords	Years
1	Hubungan pola makan dengan kejadian kolesterol pada lansia di wilayah kerja puskesmas Tambaksari	(Suarsih 2020)	The purpose of this study was to determine the relationship between diet and cholesterol incidence in the elderly in the Tambaksari health center working area.	The population in this study were all participants of Posbindu Karangpaningal in 2019, totaling 180 people.	cross sectional design.	The statistical test results showed that there was a relationship between diet and the incidence of hypercholesterolemia in Posbindu Karangpaningal with a p-value of 0.000.	cross sectional, diet, cholesterol	2020
2	Hubungan polamakan dengan peningkatan kadar kolesterol lansia di desa Tenggela kecamatan Tenggalo	(Lasanuddin, Ilham, dan Umani 2022)	This study aims to determine whether there is a relationship between diet and increased cholesterol levels in the elderly in Tenggela Village, Tilango District.	This study aims to determine whether there is a relationship between diet and increased cholesterol levels in the elderly in Tenggela Village, Tilango District.	The research design uses an analytical survey method with a cross sectional approach.	The results of the Chi-Square analysis test obtained a p value of 0.000 less than the value of 0.05, which means that H0 is rejected and Ha is accepted or there is a relationship between diet and cholesterol incidence in the elderly in Tenggela Village, Tilango District.	Diet, elevated cholesterol levels, elderly	2022
3	Hubungan pola konsumsi dengan kadar kolesterol masyarakat Di kota Bandar Lampung	(Novitasari dan Saputri 2021)	The purpose of this study was to determine the relationship between polyamory and cholesterol levels in the community in Bandar Lampung.	The population in this study were all people in Bandar Lampung City, with a sampling technique of stratified random sampling totaling 400 respondents.	This research is a quantitative study with a cross-sectional design.	The result of this study is that there is a relationship between diet and cholesterol levels in the community in Bandar Lampung both in the category of adolescents, adults and the elderly, as well as the category of female and male gender.	Consumption pattern, Cholesterol level	2021
4	Hubungan antara senam lansia dan pola makan terhadap kadar kolesterol total pada lansia di Puskesmas kejaksaaan kota Cirebon	(Wijayanti et al. 2022)	This study aims to determine the relationship between elderly gymnastics and diet on total cholesterol in the elderly at the AGO Health Center in Cirebon city.	Observational analytic study with cross sectional approach	elderly aged 60-74 years as many as 66 respondents, and most of the elderly are female as many as 54 respondents.	There is a significant relationship between diet and elderly gymnastics with total cholesterol levels in the elderly.	elderly; diet; elderly exercise; total cholesterol	2022
5	Hubungan pola konsumsi dan tingkat kecukupan serat dengan kadar kolesterol total pasien poliklinik jantung	(Lestari, Hama, dan Novianti 2020)	The purpose of this analysis is to determine the relationship between exercise habits, RLPP, consumption patterns, fiber adequacy levels, and smoking habits with total cholesterol levels of heart polyclinic patients at Banten Hospital.	This type of research uses a cross sectional design	sample of 96 respondents, namely cardiac polyclinic patients	The results of the analysis obtained Respondents with normal nutritional status were 66.70%, respondents who took cholesterol-lowering drugs were 55.2%. Respondents with normal cholesterol levels were 53.10%. Respondents with good consumption patterns were 68.75%. Respondents with sufficient fiber intake were 47.90%. There is a relationship between consumption patterns and fiber adequacy levels, to total cholesterol levels (p<0.05). The conclusion of this study is that consumption patterns, and the level of fiber adequacy, affect total cholesterol levels.	Consumption pattern, fiber adequacy, total cholesterol level	2020

6	Hubungan aktifitas fisik dengan kadar kolesterol pada lansia (Elderly) Di Posyandu pisang wilayah kerja puskesmas Sobo kabupaten Banyuwangi tahun 2022	(Yunita, Wilujeng, dan Sayekti 2022)	The purpose of this study was to determine the relationship between physical activity and cholesterol levels in the elderly (elderly) at the banana posyandu in the working area of the Sobo Banyuwangi health center in 2022.	The type of research used is cross sectional	the number of samples was 35 respondents with total sampling technique	This study showed that almost all respondents were in the category of less physical activity (<15) as many as 32 respondents (91%) and almost all respondents who had high cholesterol levels (>240 mg/dl) as many as 27 respondents (77%). The results of Exact. Sig. (2-sided) 0.003 <0.05. There is a significant relationship between physical activity and cholesterol levels in the elderly (elderly) at the banana posyandu in the working area of the Sobo Banyuwangi health center in 2022.	Physical Activity, Cholesterol Level, Elderly (elderly)	2022
7	Penerapan Senam lansia untuk mengontrol kadar kolesterol di posyandu Marsudi Waras RT 12 kota Surakarta	(Kardi, Widarti, dan Nasrii 2020)	This case study aims to describe the application of elderly gymnastics to control cholesterol levels at the Marsudi Waras RT 12 posyandu in Surakarta.	The methods used in this community service are promotion through counseling and prevention through the application of elderly exercises.	The activity was carried out at the Marsudi Waras Elderly Posyandu RW 12 Jebres Surakarta City with 40 elderly people.	The results of cholesterol examination obtained data as many as 55% (22 people) of the elderly with normal cholesterol levels, 35% (14 people) of the elderly with high cholesterol levels and 10% (4 people) of the elderly with high cholesterol levels. Based on the results obtained, it is concluded that the application of elderly gymnastics will be routinely carried out to control the cholesterol levels of the elderly, especially for those who already have high cholesterol levels.	Cholesterol; exercise.	2020
8	Pengaruh senam ergonomis terhadap kadar kolesterol darah pada lanjut usia di panti sosial Tresna Werdha Teratai Palembang	(Handayani, Herliawati, dan Rizona 2020)	This study aims to determine changes in blood cholesterol levels after ergonomic exercise in the elderly.	This research design is a type of quantitative pre-experimental with a one group pretest posttest design approach.	The sample in this study were 15 respondents. Sampling in this study was carried out in a non-probability way using purposive sampling technique.	The results of the Paired Sample t-test statistical test showed that there was an effect of ergonomic exercise on blood cholesterol levels in the elderly at Teratai Tresna Werdha Social Home Palembang with p value = 0.000 (p <0.05). The average blood cholesterol levels before and after ergonomic exercises were 205.80 mg/dL and 200.40 mg/dL. The difference in cholesterol levels before and after ergonomic exercises amounted to 5.4 mg/dL. Researchers hope that ergonomic exercises can be applied by the elderly in their spare time 2-3 times a week to help reduce blood cholesterol levels.	Blood Cholesterol Level, Ergonomic Gymnastics, Elderly	2020
9	Manfaat senam lansia terhadap kadarkolesterol di wilayah kerja puskesmas Noling di Kecamatan Bupon	(Astuti 2022)	The purpose of the implementation of this community service is to reduce cholesterol levels in	The method of implementing this community service is to provide education and physical activity actions through elderly	The participants in this community	The results of this community service activity are that there are differences in cholesterol levels before and after exercise in the elderly because elderly	cholesterol levels, elderly, exercise	2022

				the elderly in the Noling Health Center Working Area, Bupon District, 2022.	gymnastics.	service activity were 30 elderly people.	exercise is very beneficial for human health, including improving the work and function of the heart, lungs and blood vessels.		
10	Penerapan Ergonomik menurunkan kadar kolesterol pada lansia di keluarga wilayah binaan puskesmas pengandan Semarang	Senam untuk kadar kolesterol pada lansia di wilayah binaan pengandan	(Wulan Sari dan Rahmanti 2022)	This case study aims to describe the application of ergonomic exercises to reduce cholesterol levels in elderly patients in the family of the Pegandan Semarang Health Center.	The case study method is a descriptive case study.	Data collection used two elderly people with high cholesterol and in accordance with the research criteria.	The results of observations of the assessment of cholesterol levels in Subject I and Subject II showed a decrease in cholesterol levels between before ergonomic exercise and after doing ergonomic exercise for 3 times a week with the level of family independence Subject I increased from 2 to 3 and Subject II increased from 3 to 4.	Family, Cholesterol, Elderly, Ergonomic Gymnastics	2022

Diet is a person's habit of fulfilling his or her daily nutritional needs. A healthy diet is a diet that recommends the presence of several food elements in one serving such as carbohydrates, side dishes (animal and vegetable), vegetables, and fruits (Keperawatan dan Kesehatan 2020)

The results of a review conducted on eleven journals, found that 5 of these journals concluded that there was a relationship between diet and cholesterol incidence in the elderly. According to (Suarsih 2020) the more fatty foods you eat, the higher the cholesterol levels in the blood. This is in accordance with the opinion of Nurrahmani (2012) who states that people who are at risk of having high cholesterol levels are those who apply a diet that contains high levels of saturated fat. Saturated fat (found in meat, butter, cheese and cream). Increases LDL cholesterol levels in the blood. However, a healthy diet can lower cholesterol levels by about 5-10%, even more Reducing saturated fat intake (replacing it with monounsaturated and polyunsaturated fats) and eating more fruits, salads and soy can also help. Cooking methods such as baking which is healthier than frying can also be done. This is in line with the theory that cholesterol is a substance similar to white fat. Cholesterol can be found in some of the foods we eat. Cholesterol is also made through the intermediary of all body cells. But the most important are liver cells (Lasanuddin, Ilham, dan Umani 2022)

Meal portions will determine the amount of calories that enter the body, if a person's portion of food is excessive, the amount of calorie intake obtained is also high which will lead to excessive nutrition and the emergence of various health problems. Meal portions will affect food intake, which impacts on nutritional fulfillment. Consumption patterns will determine a person's health, if the consumption pattern is good, then health will be maintained, otherwise if the consumption pattern is incorrect or not good, it is likely to be affected by various diseases. (Novitasari dan Saputri 2021)

Age affects the deterioration of body functions including blood vessel stiffness (shrinking and aging). Increasing age also affects the decline in the function of the hormones estrogen and testosterone in distributing fat, thus allowing fat accumulation in the body which is supported by changes in diet that were previously high in carbohydrates, high in fiber and low in fat changing to a new diet that is low in carbohydrates, low in fiber, and high in fat, thus shifting the quality of food towards an imbalance. (Wijayanti et al. 2022). Several factors trigger an increase in total cholesterol levels, one of which is the lack of fiber intake, which is able to bind bile acids so as to prevent reabsorption from the small intestine and increase their excretion through feces. This will increase the conversion of cholesterol from blood serum into bile acids in the liver, thus reducing the cholesterol circulating in the blood. In addition, consuming yogurt will have a good impact on the body. Lactobacillus contained in yogurt ferments fiber into short-chain fatty acids and gas, short-chain fatty acids are able to bind bile acids so that bile acid levels decrease. Reduced bile acid can slow the absorption of fat so that fiber plays a role in lowering cholesterol levels in the blood (Lestari, Hama, dan Novianti 2020)

There are research results from 5 other journals that show the relationship between physical activity and cholesterol in the elderly. According to (Yunita, Wilujeng, dan Sayek ti 2022) Someone who does regular physical activity has normal cholesterol levels compared to someone who has less physical activity. Someone who does physical activity, the use of energy will also automatically increase to meet the needs of the body due to increased body metabolism. The higher the intensity of physical activity performed and the longer the duration, the greater the use of energy. Regular physical activity is very important, in addition to avoiding the occurrence of diseases such as elevated cholesterol levels.

Diet and physical activity can determine cholesterol levels in the body. The more physical activity performed, the more ATP needs and will cause less formation of total cholesterol and Low Density Lipoprotein (LDL) cholesterol and an increase in High Density Lipoprotein (HDL) cholesterol. In line with the results of other studies which state that HDL cholesterol levels will be influenced by physical activity with heavy categories. It is further explained that physical activity has a significant inverse relationship with total and LDL cholesterol levels. Based on the results of research that has been done before, it reveals that physical activity with the right dose and regulating diet has an impact on cholesterol levels (Kardi, Widarti, dan Nasrii 2020)

Ergonomic gymnastics is a gymnastic technique to help burn cholesterol because ergonomic gymnastics movements are very effective, efficient and logical movements. Ergonomic gymnastics movements performed regularly and repeatedly can reduce lipase enzymes in the liver, thereby inhibiting HDL catabolism and increasing HDL levels in the blood (Handayani, Herliawati, dan Rizona 2020). Elderly gymnastics which is done regularly can reduce blood cholesterol levels in the elderly. If cholesterol levels decrease, it is very good for the body because it can prevent us from the risk of



cardiovascular disease. Aerobic exercise done three times a week for six weeks is said to reduce blood LDL cholesterol levels by about 9% (Astuti 2022)

In cases like this, family support in overcoming a family member's health problem is the main thing in improving family health status. Family nurses play a consultant role in helping families overcome their health problems and remind families in carrying out family functions and roles in improving and maintaining family health status (Wulan Sari dan Rahmanti 2022)

## CONCLUSIONS

Based on a literature review of eleven journals regarding the relationship between diet and physical activity with cholesterol levels in the elderly, there is a relationship between diet and physical activity with cholesterol levels in the elderly. From the journal, it was found that irregular and fatty diets and lack of physical activity as factors that cause cholesterol to have a very high risk. The elderly really need guidance from children or family, because they have limitations in meeting their nutritional and dietary needs. In addition, the elderly also need care and guidance in living their lifestyle and daily activities in order to become qualified and healthy elderly.

Educational institutions should be used as additional information and input to improve the quality of learning about cholesterol problems in the elderly. The community, especially the elderly, should maintain a diet so as not to suffer from cholesterol. For the elderly, it is recommended to always pay attention and follow healthy lifestyle recommendations and be able to control diet to prevent cholesterol events. For Nurses or Resource Persons, it is suggested that health workers always provide education or counseling about the dangers of cholesterol disease caused by an irregular diet. To future researchers, the results of this study can increase knowledge and become a reference to be used as a better reference for perfection by future researchers.

## REFERENCES

- Adhiyani, Cisillia, Akademi Analis Kesehatan Nasional Surakarta, dan Jln Yos Sudarso. 2013. "Hubungan Usia dan Konsumsi Makanan Berlemak dengan Kolesterol Total Pada Lansia Kelurahan Serengan Surakarta The Relationship of Age and Consumption of Fatty Food with Cholesterol for Elderly People in Serengan Sub-District Surakarta." *Journal of Pharmacy* 2(1): 1.
- Astuti. 2022. "Manfaat Senam Lansia Terhadap Kadar Kolesterol di Wilayah Kerja Puskesmas Noling Kecamatan Bupon." *Mega Buana Journal of Innovation and Community Service* 1(2): 25–29.
- Handayani, Elisa Desi, Herliawati, dan Fernaliza Rizona. 2020. "Pengaruh Senam Ergonomis Terhadap Kadar Kolesterol Darah Pada Lanjut Usia di Panti Sosial Tresna Werdha Teratai Palembang." *Keperawatan* 2: 8–13.
- Kardi, Ipa Sari, Rini Widarti, dan Nasrii. 2020. "Penerapan Senam Lansia untuk Mengontrol Kadar Kolesterol Di Posyandu Marsudi Waras RW 12 Kota Surakarta." *The 11th University Research Colloquium 2020 Universitas 'Aisyiyah Yogyakarta* (11): 59–63.
- Keperawatan, Program Studi, dan Fakultas Ilmu Kesehatan. 2020. "Literatur Review Hubungan Gaya Hidup." *jurnal keperawatan*: 1–7.
- Lasanuddin, Hamna Vonny, Rosmin Ilham, dan Rianti P. Umani. 2022. "Jurnal Ilmu Kedokteran dan Kesehatan Indonesia." 2(1): 22–34.
- Lestari, Reni Purnama Indah, Hama, dan Anugrah Novianti. 2020. "HUBUNGAN POLA KONSUMSI DAN TINGKAT KECUKUPAN SERAT DENGAN KADAR KOLESTEROL TOTAL PASIEN POLIKLINIK JANTUNG." : 230031.
- Novitasari, dan Saputri. 2021. "Hubungan Pola konsumsi Dengan Kadar Kolesterol Masyarakat." IX(1): 8–22.
- Suarsih, Cicih. 2020. "Hubungan Pola Makan Dengan Kejadian Kolestrol Pada Lansia Di Wilayah Kerja Puskesmas Tambaksari." *Jurnal Keperawatan Galuh* 2(1).
- Wahyuni, Sry, Sumiyati, dan Masyitah Wahab. 2022. "Efektivitas Air Rebusan Daun Karsen Terhadap Kadar Kolesterol Pada Lansia." *Jurnal Kesehatan* 15(2): 132–37.
- Wijayanti, Erti et al. 2022. "Hubungan Antara Senam Lansia Dan Pola Makan Terhadap Kadar Kolesterol Total Pada Lansia Di Puskesmas Kejaksan Kota Cirebon." *Tunas Medika Jurnal Kedokteran & Kesehatan* 8(2): 1–6.

- Wulan Sari, Novita, dan Ainnur Rahmanti. 2022. “Penerapan Senam Ergonomik Untuk Menurunkan Kadar Kolesterol Pada Lansia di Keluarga Wilayah Binaan Puskesmas Pegandan Semarang.” Health Journal 10(2).
- Yunita, Dela Nastasia, Atik Pramesti Wilujeng, dan Essy Sonontiko Sayekti. 2022. “Hubungan Aktivitas Fisik Dengan Kadar Kolesterol Pada Lansia ( Elderly ) Di Posyandu Pisang Wilayah Kerja Puskesmas Sobo Kabupaten Banyuwangi Tahun 2022.” Healthy 13(3): 1576–80.

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