



# Laboratory Journal of Infectious Diseases

Homepage: <https://jurnal.poltekkeskupang.ac.id/index.php/LJID>



## Original Article

# Profile of Atherogenic Index in Elderly Individuals in Bitoa Village, Manggala District

Vera Kristianti Woso <sup>1</sup>, Mutmainnah Abbas <sup>2</sup>, Thaslifa <sup>3</sup>, Rosdiana Mus <sup>4</sup>

<sup>1</sup>Medical Laboratory Technology Study Program, Universitas Megarezky, Makassar City, Indonesia

<sup>2</sup>Faculty of Medicine, Universitas Pattimura, Ambon City, Indonesia

<sup>3</sup>Medical Laboratory Technology Study Program, Universitas Megarezky, Makassar City, Indonesia

<sup>4</sup>Faculty of Medicine, Universitas Pattimura, Ambon City, Indonesia

## ARTICLE INFO

### Article history:

Received 24 May 2025

Revised 7 June 2025

Accepted 23 June 2025

### Keywords:

Atherogenic index

Elderly

High density lipoprotein

Triglycerides

### Corresponding author:

Mutmainnah Abbas

Makassar City

[mutmainnahabbas@gmail.com](mailto:mutmainnahabbas@gmail.com)

### Doi:

## ABSTRACT

The atherogenic index is a good test used to measure the level of atherogenicity associated with the risk of atherosclerosis. The atherogenic index is the logarithmic ratio of TG/HDL. Atherogenic index examination in the elderly is done to see their health status. Elderly is someone who has reached the age of more than 60 years and has experienced several changes in physiological functions that will have an impact physical and psychological conditions, including stress and emotions. The purpose of this study was to describe the profile of the atherogenic index in elderly individuals. This type of research is descriptive study with a cross-sectional approach. The amount of data used in this study were 36 subjects obtained using the purposive sampling method. The results of the study at the age of 60-64 who had the results of the atherogenic index in the low category there were 6 respondents and the results of the atherogenic index in the moderate category there were 8 respondents, while for atherogenic index in the high category there were 16 respondents. Ages 65-69 obtained an atherogenic index in the low category, with one respondent in the high category, comprising 5 respondents. The conclusion of this study is that the atherogenic index value at the age of 60-69 obtained an atherogenic index in the low category; there were as many as 21 respondents, and the results of the atherogenic index in the moderate category were 8 respondents, while for the atherogenic index in the high category, there were 21 respondents.

## Introduction

Cardiovascular diseases remain the leading cause of premature death and the increase in healthcare costs worldwide. This disease is common with a low survival rate, yet its prevalence is increasing in the whole world. In 1990, the prevalence of cardiovascular disease was around 271 million, and doubled in 2019 to 523 million (Roth et al., 2020). The number of deaths due to cardiovascular diseases also continued to increase from 12,1 million in 1990 to 18,6 million in 2019, and around 58% occurred in Asia which is likely to increase along with population growth and aging (Roth et al., 2020; Zhao, 2021).

Age has been associated with increased cardiovascular risk factors and cardiovascular disease (CVD), with cardiovascular and cerebrovascular events being the leading cause of morbidity and mortality in the elderly population. However, we should know and address not only age but also other factors that play a key role in the development of CVD (Diez-Villanueva et al., 2022). Age itself is the main risk factor for vascular disease, involving macrovascular and microvascular impact (Hamczyk et al., 2020). Age-dependent arterial injury clinical

### Citation: .....



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manifestations typically occur after the fifth or sixth decade of life, although there is a high individual variability in vascular disease onset, as aging is a heterogeneous process (Hamczyk et al., 2020; Ungvari et al., 2020).

One of the modifiable risk factors for cardiovascular disease is atherogenic dyslipidemia (Dong et al., 2021). Dyslipidemia has a strong causal relationship with atherosclerotic cardiovascular disease (ASCVD). The disease is the most common type of cardiovascular disease in Asia. According to the 2020 report by the non-communicable disease risk factor collaboration (NCD-RisC), the number of deaths due to ASCVD in Southeast Asia more than doubled, from 110,000 to 310,000. The number of deaths due to ASCVD is associated with high cholesterol levels, excluding high-density lipoprotein (HDL). This is consistent with the finding of the highest increase in cholesterol levels in East Asia and Southeast Asia, including Indonesia (Zhao, 2021). According to data from Riset Kesehatan Dasar (Riskesdas) reported that the prevalence of cardiovascular diseases in Indonesia increased from 0,5% in 2013 to 1,5% or approximately 1,017,290 people in 2018, and this phenomenon is expected to continue (Kementerian Kesehatan Republik Indonesia, 2019).

The elderly are a group or population at risk whose numbers continue to increase every year. A high-risk population is a group of people who have health problems. The elderly have three health risk characteristics, including age-related biological risks, social and environmental risks, and behavioral or lifestyle risks. In the study involving postmenopausal women as research subjects, it was shown that postmenopausal women are a high-risk group for cardiovascular disease, as indicated by the results where 31 (75%) out of 40 (100%) postmenopausal women fell into the high-risk category ( $>0.21$ ) (Abbas, Thaslifa, & Rahim, 2022). As we age, the aging process, accompanied by the degenerative process, includes the decline of the body's metabolism and a decrease in hormone production, especially in women. Various complaints will be experienced due to estrogen deficiency and will have a clinical impact on the body, specifically affecting the levels of cholesterol, especially the decrease in HDL levels. The estrogen hormone plays a role in lipid metabolism, namely preventing the accumulation of fat in the blood vessels. In the elderly, the production of estrogen hormones will increasingly decrease, resulting in a decline in the function of body organs and a disruption in lipid metabolism, leading to various complications such as hypertension and coronary heart disease (Damanik & Hasian, 2019; Yulizawati & Yulika, 2022).

The examinations that can be conducted to detect cardiovascular disease risk factors include testing for TG and HDL levels. High TG levels and low HDL levels are the main risk factors for hypertension and heart disease. This can trigger the formation of deposits in the arterial blood vessels and cause the occurrence of plaques or blockages known as atherosclerosis. Dyslipidemia is described as an elevated plasma concentration of lipid (triglyceride (TG) and total cholesterol (TC) and their blood transporting lipoproteins; HDL-Cholesterol, LDL-Cholesterol, VLDL-Cholesterol). Strong scientific evidence indicates that there is a strong association between the incidence of CVD and high levels of LDL-C and also low levels of HDL-C; therefore, the LDL-C/HDL-C ratio is often calculated to estimate cardiovascular risk. On the other hand, a high level of TG has been related to an increased LDL-C particles and increased cardiovascular risk. On that basis, atherogenic dyslipidemia, defined as a high LDLC/HDL-C ratio and hyper TG, is associated with high cardiovascular risk (Niroumand et al., 2015). Index atherogenic plasma (IAP) is the logarithmic value of the TG/HDL ratio used as a new predictive indicator for coronary artery disease, while coronary heart disease (CHD) is known to be better predicted with the Castelli index, which is calculated based on the LDL/HDL ratio. The Castelli index is considered less reliable because it does not take into account TG levels, especially in someone with high TG levels (Wu et al., 2018).

Based on the background above, the researcher is interested in conducting a study on the Atherogenic Index Profile in the Elderly.

## Methods

The research design in this study is a descriptive type of research with a cross-sectional approach. The sample population in this study consists of 36 elderly female samples aged 60-69 years. This research was conducted from January to March 2022, with the sampling of elderly individuals in Bitoa Village, Manggala District, and the sample examination was carried out at the Parahita Makassar Clinical Laboratory.

## Results

**Table 1. Characteristics of the research subjects**

| Variable                  | N (%)      |
|---------------------------|------------|
| Gender:                   |            |
| Woman                     | 36 (100%)  |
| Age (years):              |            |
| a. 60-64                  | 30 (83,3%) |
| b. 65-69                  | 6 (16,7%)  |
| BMI (kg/m <sup>2</sup> ): |            |
| Normal (18,5-22,9)        | 36 (100%)  |
| Waist Circumference (cm): |            |
| Normal (<80)              | 36 (100%)  |

Table 1 present that there are total sample of 36 (100%) elderly female respondents. Based on other characteristics, the age range of 60-64 years has a larger number, namely 30 (83,3%), while the age range of 65-69 years has 6 people (16,7%). Based on BMI with a range of 18,5-22,9, there are 36 people (100%). And based on waist circumference, with a range of 70-74, there are 18 people (50,0%), then waist circumference 75-79 has 18 people (50,0%).

**Table 2. Atherogenic index profiles in the elderly**

| Respondent ID | Age (years) | Atherogenic Index (AI) |                            |                      |
|---------------|-------------|------------------------|----------------------------|----------------------|
|               |             | <0,11<br>(Low risk)    | 0,11-0,21<br>(Medium risk) | >0,21<br>(High risk) |
| A1            | 60          | 0,02                   |                            |                      |
| A2            | 65          | 0,03                   |                            |                      |
| A3            | 67          | 0,01                   |                            |                      |
| A4            | 62          | 0,03                   |                            |                      |
| A5            | 68          | 0,01                   |                            |                      |
| A6            | 64          | 0,02                   |                            |                      |
| A7            | 60          | 0,02                   |                            |                      |
| A8            | 60          |                        | 0,18                       |                      |
| A9            | 61          |                        | 0,14                       |                      |
| A10           | 62          |                        | 0,27                       |                      |
| A11           | 64          |                        | 0,09                       |                      |
| A12           | 65          |                        | 0,33                       |                      |
| A13           | 66          |                        | 0,11                       |                      |
| A14           | 65          |                        | 0,11                       |                      |
| A15           | 69          |                        | 0,30                       |                      |
| A16           | 63          |                        |                            | 0,61                 |
| A17           | 61          |                        |                            | 0,60                 |
| A18           | 64          |                        |                            | 0,59                 |
| A19           | 60          |                        |                            | 0,50                 |
| A20           | 61          |                        |                            | 0,63                 |
| A21           | 63          |                        |                            | 0,76                 |
| A22           | 64          |                        |                            | 0,70                 |
| A23           | 60          |                        |                            | 0,41                 |
| A24           | 61          |                        |                            | 0,44                 |
| A25           | 62          |                        |                            | 0,67                 |
| A26           | 64          |                        |                            | 0,33                 |
| A27           | 63          |                        |                            | 0,77                 |
| A28           | 62          |                        |                            | 0,55                 |
| A29           | 61          |                        |                            | 0,78                 |
| A30           | 61          |                        |                            | 0,56                 |
| A31           | 60          |                        |                            | 0,76                 |
| A32           | 63          |                        |                            | 0,31                 |
| A33           | 64          |                        |                            | 0,48                 |
| A34           | 63          |                        |                            | 0,76                 |
| A35           | 62          |                        |                            | 0,78                 |

| A36 | 60      | 0,61      |           |            |
|-----|---------|-----------|-----------|------------|
|     | 60-69   | 7 (19,5%) | 8 (22,2%) | 21 (58,3%) |
|     | Average | 0,02      | 0,17      | 0,6        |

Table 2 shows that in the age group of 60-69, the results of the atherogenic index in the low category were 7 respondents with an average of 0,02, and the results of the atherogenic index in the moderate category were 8 respondents with an average of 0,17, while the results of the atherogenic index in the high category were 21 respondents with an average of 0,6.

Based on Table 1, it shows that there is a total sample of 36 (100%) elderly female respondents who have agreed to participate. Based on other characteristics, the age range of 60-64 years has a larger number, 30 (83,3%), while the age range of 65-69 years has 6 people (16,7%). Based on BMI with a range of 18,5-22,9, there are 36 people (100%). Based on Waist Circumference (WC) with a range of 70-74, there are 18 people (50,0%), and WC 75-79 also has 18 people (50,0%).

In Table 2, the atherogenic index profile in the elderly shows that in the age group of 60-69, there were 7 respondents with a low atherogenic index category, averaging 0,02, and 8 respondents with a moderate atherogenic index category, averaging 0,17.

## Discussion

In this study, it was found that the research subjects involved were elderly women. Older women experience significant physiological changes, especially in the production of estrogen hormones. Estrogen hormones play a role in lipid metabolism. Menopausal women experience a decrease in estrogen hormone synthesis. The decrease in the hormone estrogen causes physiological changes in the vascular system, body fat distribution, blood pressure, and lipid profile, thus leading to the emergence of advanced risk factors such as dyslipidemia, overweight, and hypertension, which can indirectly lead to a high risk of cardiovascular disease during the postmenopausal period (Khanduker et al., 2018). The increased incidence of dyslipidemia in elderly women also raises the risk of developing cardiovascular diseases. Besides age factors, this study also found that the research subjects had poor activity patterns and eating habits. It was noted that some of the research subjects consumed high-fat foods and lacked awareness in regularly engaging in light to moderate physical activities.

Based on the research results, it was found that 11 people had high triglyceride levels, reaching 538 mg/dL. Additionally, there were 18 people with low HDL levels, which were less than <50 mg/ dL. Based on the theory, according to (Agustyanti, Pradigdo, & Aruben, 2017), it is stated that triglyceride levels can be influenced by several factors, including age, gender, diet, and physical activity. Lack of physical activity and poor dietary habits are at risk of causing the accumulation of fat and triglycerides in the body. In addition, triglyceride levels can also be influenced by food intake. This is consistent with the research subjects who do not adopt a healthy lifestyle, particularly consuming foods high in fat and lacking physical activity, as well as the age factor, which can also influence the research results, because with increasing age, there will be a decline in organ function.

The aging process in the elderly can result in a decrease in structural and physiological functions. With the occurrence of the decline in physiological function, the body's resistance in the elderly will increasingly decline, making it very easy to be exposed to various diseases. One of the common physical changes experienced by the elderly namely the change in the elasticity of arteries in the cardiovascular system, which can affect heart function. Physical changes that tend to experience a decline will cause various physical disturbances characterized by reduced activities carried out by the elderly, which will then affect the quality of life of the elderly (Katuuk & Wowor, 2018).

## Conclusions

Based on this research, it can be concluded that the atherogenic index profile in the elderly shows that at the age of 60-69, the atherogenic index results in the low category were obtained for 7 respondents, and the atherogenic index results in the moderate category were obtained for 8 respondents, while the atherogenic index results in the high category were obtained for 21 respondents.

## Author contributions

VKW, MA, Thaslifea, RM contributed to the study's concept and design. T assisted with experimental studies and data acquisition. RM managed the literature search, data analysis, and statistical analysis. All authors participated in manuscript preparation, with VKW and MA responsible for editing and review. All authors have read and agreed to the published version of the manuscript.

## Aknowledgements

The authors would like to express their gratitude to the Rector of Universitas Megarezky and Universitas Pattimura, the Head of Medical Laboratory Technology Study Program at Universitas Megarezky, the dean of Faculty of Medicine at Universitas Pattimura, and the people of Bitoa Village, Manggala District.

## Funding

There is no specific funding for this study.

## Ethical approval statement

## Conflicts of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

## Supplementary materials

No supplementary material available.

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