Original article

LMJ 6(1) (2027)

Lombok Medical Journal

http://journal.unram.ac.id/index.php/LMJ

Correlation Between Serum Triglyceride Levels and Blood Pressure Variations as an Indicator of Hypertension Risk Among Women of Reproductive Age in Negeri Laha, Ambon City

Mutmainnah Abbas[1*], Alni Fatwa Mulyani[2], Irwan[2], Vina Z Latuconsina[3], Theresia Natalia Seimahuira[4], Rosdiana Mus[1]

[1*] Department of Biochemistry, Medical Faculty of Universitas Pattimura, Ambon, Indonesia.
[2] Medical Faculty of Universitas Pattimura, Ambon, Indonesia.
[3] Department of Clinical Pathology, Medical Faculty of Universitas Pattimura, Ambon, Indonesia.
[4] Department of Public Health, Medical Faculty of Universitas Pattimura, Ambon, Indonesia.

DOI: https://doi.org/10.29303/j6nxe234

Article Info
Received **: 14 July 2026**
Revised **: 11 September 2026**
Accepted **: 26 October 2026**

Abstract: Hypertension is a global health problem with an increasing prevalence among women of reproductive age. Elevated triglyceride levels are thought to contribute to the pathogenesis of hypertension through mechanisms involving increased vascular resistance and endothelial dysfunction. To analyze the relationship between triglyceride levels and blood pressure among women of reproductive age in the working area of Negeri Laha Public Health Center. This research employed a cross-sectional design involving 61 respondents aged 20–35 years selected through purposive sampling. Data were analyzed using the Spearman correlation test. The most respondents had normal triglyceride levels (59 individuals) and normal blood pressure (41 individuals). The correlation coefficient was r = 0.060 with a p-value of 0.242, indicating no significant relationship between triglyceride levels and blood pressure. This study concludes that triglycerides are no statistically significant association was observed between serum triglyceride levels and blood pressure in the study population; lifestyle, physical activity, and hormonal factors are likely more influential in affecting blood pressure.

Keywords: Blood Pressure, Hypertension, Risk Factors, Triglyceride, Women of Reproductive Age

Citation: Abbas, M., Mulyani, A. F., Irwan, Latuconsina, V. Z., Seimahuira, T. N., Mus, R. (2027). Correlation Between Serum Triglyceride Levels and Blood Pressure Variations as an Indicator of Hypertension Risk Among Women of Reproductive Age in Negeri Laha, Ambon City. *Lombok Medical Journal*, *6*(1), 13-22. https://doi.org/10.29303/j6nxe234

Introduction

Blood pressure is the force exerted by circulating blood against the walls of blood vessels and is determined by the volume of blood flowing through the circulation and the distensibility of the vascular walls. Arterial blood pressure is directly influenced by cardiac output, arterial elasticity, and peripheral vascular resistance.(Sherwood, 2013) Blood pressure is highly dynamic and can fluctuate in response to a wide range of physiological and behavioral activities.(Shahoud et al., 2023) The risk factors associated with elevated blood pressure can be broadly classified into two categories:

Email: mutmainnah.abbas@lecturer.unpatti.ac.id *(*Corresponding Author)*

Copyright © 2027, The Author(s).
This article is distributed under a Lisensi Creative Commons Atribusi 4.0 Internasional.

non-modifiable and modifiable factors. Non-modifiable risk factors include age, sex, race or ethnicity, and genetic predisposition. In contrast, modifiable risk factors encompass overweight and obesity, excessive dietary sodium intake, physical inactivity (sedentary lifestyle), excessive alcohol consumption, adverse effects of certain medications, cigarette smoking, hyperglycemia or diabetes mellitus, impaired renal function, and other lifestyle- and health-related conditions.(Fatchanuraliyah et al., 2024)

One of the factors that may contribute to elevated blood pressure is an increased serum triglyceride concentration. Triglycerides are lipids composed of glycerol and three fatty acids that serve as the primary form of energy storage in the body and are predominantly stored in adipose tissue. A normal fasting serum triglyceride level is defined as <200 mg/dL.(Kaidah et al., 2020) Elevated triglyceride levels play an important role in the pathogenesis of hypertension. Persistent hypertriglyceridemia may promote vascular dysfunction by contributing to lipid deposition within the arterial wall, leading to vascular remodeling, reduced arterial compliance, and luminal narrowing. These structural and functional changes increase peripheral vascular resistance, thereby requiring the heart to generate greater pressure to maintain adequate tissue perfusion. Over time, this sustained hemodynamic burden may result in the development of hypertension.(Sari, 2023)

Women of reproductive age represent a vulnerable population whose health requires particular attention. Women between 20 and 35 years of age are generally considered to be in the optimal reproductive period. However, several epidemiological studies conducted in Indonesia have reported that individuals older than 20 years already exhibit multiple risk factors associated with the development of hypertension. During the reproductive years, circulating estrogen concentrations are relatively high and play a protective role in maintaining cardiovascular health by favorably regulating lipid metabolism, including reducing total cholesterol levels. As long as regular menstrual cycles are maintained, estrogen contributes to the preservation of a healthy lipid profile and vascular function. However, estrogen levels progressively decline with the transition to menopause, diminishing this cardioprotective effect and consequently increasing women's susceptibility to hypertension.(Kusumawaty et al., 2016)

This study specifically focused on adults of productive age without a history of diabetes mellitus (DM) or kidney disease, thereby providing an opportunity to assess cardiovascular risk factors in a population without major metabolic or renal comorbidities. Previous studies have largely examined hypertension and its associated risk factors among patients with comorbid conditions, particularly diabetes mellitus and kidney disease. Consequently, evidence regarding the early cardiovascular risk profile of apparently healthy adults of productive age remains limited. Furthermore, to the best of our knowledge, this study is among the first to investigate these risk factors in adults of productive age in Laha Village. This population-based approach is important because the identification of modifiable risk factors at an earlier stage may provide an opportunity for preventive intervention before hypertension and its associated complications develop. Early detection and appropriate modification of these risk factors may therefore contribute to reducing the future burden of hypertension as individuals age. The lifestyle characteristics of the Laha Village population also warrant particular attention. The community has dietary habits that include frequent consumption of foods high in fat, sugar, and salt, which may contribute to adverse metabolic and cardiovascular outcomes. In addition to dietary patterns, insufficient physical activity represents another important modifiable risk factor for the development of hypertension. Therefore, evaluating these factors among adults of productive age may provide valuable baseline information for developing targeted health-promotion and hypertension-prevention strategies at the community level.

Despite these physiological protective mechanisms, women of reproductive age may still be at an increased risk of developing hypertension because of inadequate health awareness and unhealthy lifestyle behaviors, including the use of hormonal medications and frequent consumption of energy-dense fast foods.(Rahima et al., 2016) Therefore, the early prevention of hypertension among women of reproductive age should be considered a public health priority.(Goa, 2021) Assessing an individual's future risk of developing hypertension provides an important basis for implementing targeted preventive strategies, thereby enabling more effective interventions, particularly among young women.(Lina & Saraswati, 2019) Gao et al. reported that preventive interventions implemented during the reproductive years (20–35 years) have the potential to prevent or delay the onset of hypertension later in life.(Gao et al., 2021)

Materials and Methods

This study employed an observational analytical research design using a cross-sectional approach and primary data collection. The study was conducted in Negeri Laha, Teluk Ambon District, Ambon City, Indonesia. This study was approved by the Ethics

Committee of the Faculty of Medicine, Universitas Pattimura, Ambon, Indonesia, under ethical approval number 017/FK-KOM.ETIK/III/2025. The study population consisted of 61 women of reproductive age (20–35 years) residing in Negeri Laha, Ambon City. Participants were recruited using a purposive sampling technique. Initially, 105 participants met the predefined age eligibility criterion of 20–35 years and Participants were required to fast for 8–12 hours before blood sample collection. Participants who were currently using oral contraceptive pills or had a history of diabetes mellitus (DM) were subsequently excluded. The Slovin formula was used to determine the minimum required sample size, resulting in a minimum sample size of 52 participants. After application of the inclusion and exclusion criteria, 61 participants were eligible and included in the final analysis. Data were collected through a structured questionnaire, blood pressure measurements, and serum triglyceride assessments.

Blood pressure was measured using a standard adult sphygmomanometer. Serum triglyceride levels were determined using an iLab Aries Clinical Chemistry Analyzer (Instrumentation Laboratory) following the enzymatic colorimetric method. Prior to blood collection, all participants were instructed to undergo an overnight fast for at least 12 hours and to avoid strenuous physical activity during the fasting period to minimize potential variations in triglyceride measurements.

Statistical analysis of the data obtained in this study was performed using Microsoft Excel and Statistical Package for the Social Sciences (SPSS). The normality of the data distribution was assessed prior to further analysis. If the data were normally distributed, parametric bivariate analysis was performed using the Spearman rank correlation test to assess the strength and direction of the relationship between variables. The data remained non-normally distributed after transformation, a non-parametric bivariate analysis was performed using the Spearman rank correlation test. The strength and direction of the association were assessed using the Spearman correlation coefficient (ρ), which ranges from −1 to +1.

Result and Discussion

The study conducted in Laha Village, Ambon City, yielded several findings relevant to the objectives of this study, as follows :

Table 1. The Characteristics of Women of reproductive age in Negeri Laha

Characteristics	N (%)
Ages (Year)	
a. 20-24	8 (14.7%)
b. 25-29	19 (31.15%)
c. 30-35	34 (54.10%)
BMI (kg/m^2)	
a. Underweight (<18.5)	1 (1.64%)
b. Normal (18.5-22.9)	22 (36.06%)
c. Overweight (23-24.9)	35 (57.4%)
d. Obesity (≥25)	3 (4.9%)
History of Hypertension	
a. Yes	27 (44.7%)
b. No	34 (55.73%)

The characteristics of the study participants are presented in Table 1. A total of 61 participants aged 20–35 years were included in the study. The majority of participants were aged 30–35 years, accounting for 34 participants (55.7%), followed by those aged 25–29 years, with 19 participants (31.1%), and those aged 20–24 years, with 8 participants (13.1%). Thus, the study population was predominantly composed of individuals in the later part of the productive-age range.

Based on BMI, the largest proportion of participants were classified as overweight, comprising 35 participants (57.4%). This was followed by participants with normal BMI, accounting for 22 participants (36.1%). Only one participant (1.6%) was classified as underweight, while three participants (4.9%) were classified as obese. Overall, more than half of the participants had a BMI within the overweight or obese categories.

Regarding family history of hypertension, 27 participants (44.3%) reported having a family history of hypertension, whereas 34 participants (55.7%) reported no family history of hypertension. These findings indicate that a substantial proportion of participants had a familial predisposition to hypertension despite being within the productive-age range.

Table 2. Age Distribution and Serum Triglyceride Levels Among Women of Reproductive Age in Negeri Laha

Ages (Years)	Blood Pressure Category			
	Normal	Pre-Hypertension	Hypertension Grade 1	Hypertension Grade 2
20 - 24	8	0	0	0
25 - 29	13	6	0	0
30 - 35	20	11	1	2

Among women aged 30–35 years, the majority of participants had normal serum triglyceride levels, accounting for 32 individuals (52.47%), while only 2 participants (3.28%) had elevated serum triglyceride levels. In contrast, the 20–24-year age group had the smallest number of participants with normal serum triglyceride levels, comprising 8 individuals (13.1%).

Table 3. Frequency Distribution by Age Group and Blood Pressure Category Among Women of Reproductive Age in Negeri Laha

Ages (years)	Triglyceride Levels	
	Normal (<200 mg/dL)	High (≥ 200 mg/dL)
20-24	8	0
25-29	19	0
30-35	32	2

The 30–35-year age group comprised the largest proportion of participants. Within this age group, the majority had normal blood pressure, accounting for 20 individuals (32.8%), followed by 11 participants with prehypertension, 1 participant with stage 1 hypertension, and 2 participants with stage 2 hypertension. In contrast, the 20–24-year age group included the fewest participants, with a total of 8 individuals (13.1%), all of whom had normal blood pressure.

Table 4. Association Between Serum Triglyceride Levels and Blood Pressure Variations Among Women of Reproductive Age in Negeri Laha

Blood Pressure	Triglyceride Levels		r	p-value
	Normal	High		
Normal	41 (67.21%)	0	**0.060**	**0.242**
Pre-Hypertension	15 (24.59%)	2 (3.28%)		
Hypertension Grade 1	1 (1.64%)	0		
Hypertension Grade 2	2 (3.28%)	0		

r = Correlation coefficient

Correlation analysis demonstrated a weak positive correlation between serum triglyceride levels and blood pressure (r = 0.060), with a p-value of 0.242. The low correlation coefficient indicates a weak association between the two variables, while the p-value exceeding the significance threshold of 0.05 suggests that the observed relationship was not statistically significant.

Table 5. Association Between Serum Triglyceride Levels and Blood Pressure Variations Among Women of Reproductive Age in Negeri Laha

Blood Pressure	Triglyceride Levels		p-value
	Normal	High	
Normal	41 (67.21%)	0	**0.171**
Pre-Hypertension	15 (24.59%)	2 (3.28%)	
Hypertension Grade 1	1 (1.64%)	0	
Hypertension Grade 2	2 (3.28%)	0	

Fisher–Freeman–Halton exact test (p = 0.171 > 0.05)

The analysis showed no statistically significant association between blood pressure category and triglyceride levels among the study participants, as determined by the Fisher–Freeman–Halton exact test (p = 0.171). Descriptively, 59 of 61 participants (96.72%) had normal triglyceride levels, whereas only 2 participants (3.28%) had elevated triglyceride levels. Both participants with elevated triglyceride levels were classified as having prehypertension. In contrast, all participants with normal blood pressure, grade 1 hypertension, and grade 2 hypertension had normal triglyceride levels.

Discussion

This study included 61 women of reproductive age (20–35 years) from Negeri Laha. During the sampling and participant selection process, a census of women of reproductive age in Negeri Laha was conducted, identifying 105 women aged 20–35 years. The potential participants were subsequently screened according to the predefined inclusion and exclusion criteria, resulting in a final sample of 61 eligible participants who agreed to participate in the study. Women of reproductive age (20–35 years) from Negeri Laha, with the majority of participants belonging to the 30–35-year age group (55.75%). Women aged 30–35 years generally experience metabolic and lifestyle

changes that may increase the risk of dyslipidemia, particularly when accompanied by high-energy dietary intake and low levels of physical activity.(Gao et al., 2021) During this age range, most women remain in the premenopausal stage, in which circulating estrogen levels are relatively stable and exert protective effects against endothelial dysfunction and elevated blood pressure.(Sherwood, 2018) However, approaching the age of 35 years, a gradual decline in estrogen concentration may begin, potentially contributing to increased triglyceride levels and the development of insulin resistance.(Karwiti et al., 2024)

In addition to age, sociodemographic characteristics and health-related behaviors, including dietary fat intake, the frequency of consuming fried foods, and physical activity levels, have been identified as important determinants of lipid profile variability and hypertension risk among women of reproductive age.(Luo et al., 2017)

The majority of participants in the present study had normal triglyceride concentrations (<200 mg/dL), while only a small proportion (3.28%) exhibited hypertriglyceridemia. These findings indicate that most women of reproductive age in Negeri Laha maintained a favorable lipid profile, which may be attributable to the local dietary pattern characterized by relatively low saturated fat intake and frequent consumption of marine fish rich in omega-3 polyunsaturated fatty acids. Triglyceride concentrations in women of reproductive age are influenced by several factors, including the intake of refined carbohydrates and saturated fats, central adiposity, and hormonal factors such as menstrual cycle status and the use of hormonal contraceptives.(Karwiti et al., 2024)

Estrogen, particularly 17β-estradiol, plays a pivotal role in lipid metabolism and contributes to the maintenance of a healthier lipid profile in women of reproductive age, including the regulation of circulating triglyceride levels. At the molecular level, estrogen interacts with estrogen receptors, particularly estrogen receptor alpha (ERα), to enhance the expression of key enzymes involved in lipid metabolism, such as adipose triglyceride lipase (ATGL). This mechanism promotes triglyceride hydrolysis, reduces triglyceride accumulation within adipocytes, and may suppress excessive triglyceride production in adipose tissue.(Luo et al., 2017) Furthermore, estrogen regulates systemic lipid metabolism by modulating lipoprotein lipase activity and hepatic lipogenesis, thereby contributing to more efficient triglyceride homeostasis in reproductive-aged women.(Brisson, 2025)

Moreover, epidemiological evidence has demonstrated that phases of the menstrual cycle characterized by higher estrogen concentrations are associated with a less atherogenic lipid profile than phases with lower estrogen levels, further supporting the protective role of estrogen against dyslipidemia, including hypertriglyceridemia. This protective effect may be further enhanced by dietary omega-3 fatty acids, which have been shown to suppress hepatic triglyceride synthesis while promoting fatty acid oxidation, thereby improving overall lipid metabolism. The combined effects of hormonal regulation and nutritional factors provide a plausible explanation for the generally favorable triglyceride profile observed among women of reproductive age and highlight the potential role of omega-3 fatty acids in reinforcing the cardiometabolic benefits of estrogen in the prevention of dyslipidemia.(Harris & Bulchandani, 2006)

The distribution of triglyceride levels presented in Table 3 demonstrates a relatively low prevalence of elevated triglycerides among women aged 20–24 and 25–29 years, with a slight increase observed in the 30–35-year age group. Based on the study findings, the majority of participants reported consuming fatty foods at least once daily and engaging in insufficient physical activity. Several mechanisms may explain the age-related pattern observed in triglyceride distribution.

First, age itself represents an independent determinant of triglyceride metabolism. Epidemiological evidence suggests that serum triglyceride concentrations gradually increase from early adulthood through middle adulthood. The modest increase in triglyceride levels observed among women aged 30–35 years in the present study is consistent with the natural age-related progression of lipid metabolism.

Second, lifestyle-related factors, including reduced physical activity and unhealthy dietary habits characterized by excessive intake of refined carbohydrates and saturated fats, tend to become more prevalent during the third decade of life. Evidence from a nationwide Korean study demonstrated that the prevalence of hypertriglyceridemia increases substantially during the fourth decade of life and reaches its peak in individuals aged 40–59 years, suggesting that behavioral and metabolic risk factors begin to exert a more pronounced influence during the thirties.(Park et al., 2023) Although only two participants aged 30–35 years in the present study exhibited elevated triglyceride levels, this finding may represent an early indication that adverse lifestyle behaviors and metabolic risk factors have started to influence triglyceride metabolism.

Third, insulin resistance, as reflected by the triglyceride–glucose (TyG) index, may represent an important biological mechanism underlying the age-related increase in triglyceride concentrations. Findings from the Coronary Artery Risk Development in Young

Adults (CARDIA) study demonstrated that an elevated TyG index during young adulthood is associated with an increased risk of future cardiovascular disease and all-cause mortality.(Xu et al., 2022) Consequently, some women aged 30–35 years in the present study may have already developed early insulin resistance despite maintaining triglyceride concentrations within the normal range.

Fourth, in young adult populations, dyslipidemia frequently remains in a subclinical stage. Many individuals aged 20–29 years continue to exhibit normal lipid profiles because metabolic homeostatic mechanisms are still capable of compensating for early metabolic disturbances. A large population-based study involving university students with a mean age of approximately 21 years reported that the prevalence of dyslipidemia increased markedly after the age of 30 years, whereas most younger individuals maintained optimal lipid profiles.(Liu et al., 2023) These findings are consistent with the low prevalence of elevated triglyceride levels observed in the two younger age groups in the present study and suggest that metabolic compensation may delay the clinical manifestation of dyslipidemia until later adulthood.

The study population consisted of women of reproductive age between 20 and 35 years. Age is a well-established determinant of blood pressure, with advancing age being associated with an increased risk of hypertension. This association is consistent with the findings of Yunus et al., who reported a significant relationship between age and the occurrence of hypertension. As individuals age, progressive physiological changes lead to a decline in the functional capacity of multiple organ systems, while the immune system also becomes less effective than in younger adults, thereby increasing susceptibility to chronic diseases, including hypertension.(Yunus et al., 2021)

The findings presented in Table 4 indicate that women aged 30–35 years had the highest prevalence of hypertension risk (22.95%). Based on the study data, participants within this age group commonly reported having a family history of hypertension, accompanied by unhealthy dietary habits. Risk factors for hypertension can generally be classified into two categories: non-modifiable factors, including age, sex, and genetic predisposition, and modifiable factors, such as dietary habits (including frequent consumption of junk food, excessive sodium intake, and high-fat diets), physical inactivity, and other lifestyle-related behaviors.(Lee et al., 2023)

The association between family history and hypertension observed in the present study is supported by previous investigations. Maring et al. reported a significant relationship between a family history of hypertension and the occurrence of hypertension among individuals in the Naibonat Community Health Center catchment area ($p = 0.002$).(Maring et al., 2022) Similarly, Setiandari et al. conducted a study in Indrasari Village, Banjar Regency, and found a significant association between family history and hypertension ($p = 0.001$).(LO et al., 2020) Both studies concluded that individuals with hypertensive parents have approximately twice the risk of developing hypertension compared with those whose parents have no history of the disease.

A shift in blood pressure status was observed beginning in the 25–29-year age group, in which 9.84% of participants were classified as having prehypertension. The highest prevalence of both prehypertension and hypertension, including Stage 2 hypertension, was observed among women aged 30–35 years. Lifestyle characteristics of the study population may have contributed to these findings. Most participants reported consuming salty foods once daily, while sweet and high-fat foods were consumed one to two days per week. In addition, insufficient physical activity was commonly reported, which may have further increased the risk of elevated blood pressure.

According to the table 6. The absence of a statistically significant association should be interpreted cautiously because the distribution of triglyceride levels was highly imbalanced. Only 2 participants were classified as having high triglyceride levels, while the remaining 59 participants had normal levels. Such an extreme distribution substantially limits the ability of the statistical analysis to detect an association between blood pressure and triglyceride status. In addition, several cells in the contingency table contained zero observations, resulting in very small expected cell counts. Therefore, the Fisher–Freeman–Halton exact test was considered more appropriate than the conventional Pearson's chi-square test for evaluating the association between these categorical variables.

From a biological perspective, elevated triglyceride levels may be associated with cardiometabolic disturbances and may coexist with elevated blood pressure as components of an adverse metabolic profile. However, the relationship between triglyceride levels and blood pressure is complex and may be influenced by several factors, including adiposity, dietary intake, physical activity, insulin sensitivity, age, and other metabolic characteristics. Therefore, the absence of a statistically significant association in the present study does not necessarily indicate that triglyceride levels and blood pressure are unrelated.

The very small number of participants with elevated triglyceride levels represents an important limitation of the present analysis. The limited variability

in triglyceride status reduces statistical power and may increase the possibility of a type II error, whereby a true association may not be detected. Consequently, the findings should be interpreted as indicating that no statistically significant association was demonstrated in this particular sample, rather than concluding that no association exists in the broader population. Further studies involving a larger sample size and a more balanced distribution of triglyceride categories are warranted to provide greater statistical power and more reliable estimates of the relationship between triglyceride levels and blood pressure.

The age-related increase in hypertension observed in this study is supported by previous evidence. Maring et al. emphasized that age is a non-modifiable risk factor for hypertension and recommended that individuals adopt healthy lifestyle practices, including regular physical exercise and appropriate dietary modification, to reduce the risk of developing hypertension.(Maring et al., 2022) Likewise, Nurhayati et al. reported that advancing age is associated with progressive deterioration of cardiovascular function, resulting in a higher incidence of hypertension.(Nurhayati et al., 2023) Collectively, these findings suggest that although age cannot be modified, its adverse effects on blood pressure may be mitigated through healthy lifestyle interventions, particularly among women entering their third decade of adulthood.

The findings reported by Hu et al. demonstrated that women aged 30–34 years exhibit a higher prevalence of elevated blood pressure than younger age groups, although the highest prevalence of hypertension generally occurs among individuals aged ≥45 years. This early increase has been attributed to progressive lifestyle changes that begin during early adulthood.(Hu et al., 2017) These findings are consistent with previous evidence indicating that vascular aging may begin earlier in women who frequently consume high-fat diets, thereby increasing the risk of elevated blood pressure from the early thirties onward.(H.-Y. Chen & Chauhan, 2019)

In the present study, participants within this age group tended to consume salty foods regularly and engage in insufficient physical activity. Among participants with elevated triglyceride concentrations (≥200 mg/dL), two individuals were classified as having prehypertension, whereas no cases of Stage 1 or Stage 2 hypertension were identified. Participants with elevated triglyceride levels also tended to report frequent consumption of high-fat foods and low levels of physical activity.

A similar study conducted by Ikawati et al. concluded that higher triglyceride concentrations were associated with greater severity of hypertension.(Ikawati et al., 2019) Likewise, longitudinal evidence has demonstrated that elevated triglyceride levels are associated with hemodynamic and metabolic alterations that contribute to the progressive transition from normotension to prehypertension and eventually to established hypertension.(S. Chen & Cheng, 2022)

This mechanism is biologically plausible through activation of the renin–angiotensin–aldosterone system (RAAS), which is commonly observed in individuals with dyslipidemia. Activation of the RAAS promotes vasoconstriction, sodium and fluid retention, and increased peripheral vascular resistance, all of which contribute to the development of prehypertension and subsequent hypertension.(Patel, 2021) Therefore, maintaining optimal triglyceride concentrations through healthy lifestyle practices, including reduced intake of saturated fats and regular physical activity, represents an important preventive strategy for reducing the risk of hypertension.(Ardiansyah & Wirawanni, 2021)

Bivariate analysis demonstrated a correlation coefficient of $r = 0.060$ with a p-value of 0.242, indicating a very weak and statistically non-significant association between triglyceride levels and blood pressure. In the present study, 41 participants (67.21%) had both normal triglyceride concentrations and normal blood pressure. Although these participants reported relatively frequent consumption of salty, sweet, and high-fat foods, they generally maintained adequate levels of physical activity. Likewise, participants with normal triglyceride concentrations frequently consumed sweet and cholesterol-rich foods but also demonstrated relatively good physical activity levels, which may have contributed to maintaining normal blood pressure and lipid profiles.

Physical activity encompasses any bodily movement that increases energy expenditure and caloric consumption. Insufficient physical activity is a well-recognized risk factor for hypertension, with lower levels of physical activity being associated with a greater risk of elevated blood pressure. Regular physical activity of at least 30 minutes per day is recommended because it improves cardiovascular efficiency, reduces cardiac workload, and helps maintain stable blood pressure. Individuals with sedentary lifestyles generally exhibit higher resting heart rates, requiring the heart to pump blood more forcefully and more frequently, thereby increasing the risk of hypertension.(Maring et al., 2022)

Two participants (3.28%) exhibited both elevated triglyceride concentrations and prehypertension. Most participants with elevated triglyceride levels reported frequent consumption of salty, sweet, and high-fat

foods. Similarly, participants classified as prehypertensive commonly reported unhealthy dietary habits and had a family history of hypertension. Elevated triglyceride concentrations may contribute to increased blood pressure through the development of atherosclerotic plaques resulting from lipid accumulation within arterial walls. Progressive plaque formation narrows the arterial lumen, increases peripheral vascular resistance, and ultimately contributes to the development of hypertension. This mechanism has also been described by Witi et al.(Karwiti et al., 2024)

In contrast, Elon Y et al. reported no significant association between triglyceride concentrations and either systolic or diastolic blood pressure, despite both the mean triglyceride levels and blood pressure values exceeding normal reference ranges.(Elon & Paul, 2020) These findings suggest that elevated triglyceride concentrations do not necessarily correspond to increased blood pressure in all populations. Similar observations have been reported in large cross-sectional epidemiological studies, which demonstrated that triglyceride levels were not significantly associated with systolic or diastolic blood pressure after adjustment for multiple cardiovascular risk factors.(Bønaa & Thelle, 1991) These findings indicate that triglyceride concentration may not function as an independent predictor of blood pressure elevation.

Several participants with normal triglyceride concentrations were nevertheless classified as having Stage 1 or Stage 2 hypertension. This finding may be explained by the presence of other established hypertension risk factors despite normal lipid profiles. These participants frequently consumed salty and high-fat foods, had a positive family history of hypertension, and reported low levels of physical activity. Thus, factors other than triglyceride concentration, particularly excessive sodium intake and genetic predisposition, may substantially contribute to elevated blood pressure while triglyceride levels remain within the normal range. Likewise, most participants with prehypertension reported frequent consumption of salty, sweet, and fatty foods and had a family history of hypertension.

Farameita et al. similarly reported significant associations between excessive sodium and fat intake, family history, and the occurrence of hypertension. In their study, prehypertension represented the second most common blood pressure category after hypertension. Both prehypertensive and hypertensive participants exhibited excessive sodium intake and a positive family history of hypertension. Excessive dietary sodium promotes renal sodium retention, leading to increased extracellular fluid volume and elevated blood pressure. Furthermore, individuals with a family history of hypertension were found to have a 1.417-fold greater risk of developing hypertension than those without such a history.(Wati et al., 2022)

The limitation of this study is that a statistical power analysis was not performed; therefore, the study could not adequately determine whether the effect size was sufficient to detect a true association between the variables under investigation.

Conclusion

Based on the findings of this study conducted among women of reproductive age attending the Negeri Laha Community Health Center, most participants were between 30 and 35 years of age, whereas fewer participants belonged to the 20–24-year age group. The majority of participants exhibited normal blood pressure and triglyceride concentrations within the normal reference range. The Fisher–Freeman–Halton exact test showed no statistically significant association between blood pressure category and triglyceride levels ($p = 0.171$). Of the 61 participants, 59 (96.72%) had normal triglyceride levels and 2 (3.28%) had high triglyceride levels. Both participants with high triglyceride levels were classified as having prehypertension. Furthermore, statistical analysis demonstrated no statistically significant association was demonstrated between blood pressure category and triglyceride levels.

Acknowledgements

The authors would like to express their sincere gratitude to all participants who took part in this study. The authors also gratefully acknowledge the Balai Laboratorium Kesehatan dan Kalibrasi Alat Kesehatan, BLKKAK for its valuable partnership and technical support in the analysis of the research samples.

References

Ardiansyah, A., & Wirawanni, Y. (2021). Hubungan Profil Lipid dengan Tekanan Darah pada Dewasa. *J Gizi Indonesia*, *10*(2), 89–95.

Bønaa, K. H., & Thelle, D. S. (1991). Association between blood pressure and serum lipids in a population. The Tromsø Study. *Circulation*, *83*(4), 1305–1314.

Brisson, D. (2025). Sex hormones and lipid metabolism: Estrogen effects on lipoprotein and triglyceride metabolism. *Atherosclerosis*, *405*, 119213.

Chen, H.-Y., & Chauhan, S. P. (2019). Hypertension among women of reproductive age: Impact of 2017 American College of Cardiology/American Heart Association high blood pressure guideline. *International Journal of Cardiology Hypertension*, *1*, 100007.

Chen, S., & Cheng, W. (2022). Relationship Between Lipid Profiles and Hypertension: A Cross-Sectional Study of 62,957 Chinese Adult Males. *Frontiers in Public Health*, *10*, 895499. https://doi.org/10.3389/fpubh.2022.895499

Elon, Y., & Paul, R. D. (2020). Lipid Profile Dan Tekanan Darah Pada Wanita Dewasa Berdasarkan Pemeriksaan Bmi Dan Lp. *Jurnal Keperawatan Silampari*, *3*(2), 576–586.

Fatchanuraliyah, Subronto, Y. W., & Febrianora, M. (2024). *Pedoman Pengendalian Hipertensi Di Fasilitas Kesehatan Tingkat Pertama*. Kementerian Kesehatan RI.

Feng, L., Nian, S., Tong, Z., Zhu, Y., Li, Y., Zhang, C., Bai, X., Luo, X., Wu, M., & Yan, Z. (2020). Age-related trends in lipid levels: A large-scale cross-sectional study of the general Chinese population. *BMJ Open*, *10*(3), e034226.

Gao, L., Faller, J., Majmudar, I., Nguyen, P., & Moodie, M. (2021). Are interventions to improve cardiovascular disease risk factors in premenopausal women effective? A systematic review and meta-analysis. *BMJ Open*, *11*(7), e042103.

Goa, M. Y. (2021). Perilaku Pencegahan Hipertensi pada Wanita Usia Subur (WUS) di Kota Kupang. *JURNAL ILMIAH OBSGIN: Jurnal Ilmiah Ilmu Kebidanan & Kandungan P-ISSN: 1979-3340 e-ISSN: 2685-7987*, *13*(4), 80–85.

Harris, W. S., & Bulchandani, D. (2006). Why do omega-3 fatty acids lower serum triglycerides? *Current Opinion in Lipidology*, *17*(4), 387–393.

Hu, L., Huang, X., You, C., Li, J., Hong, K., Li, P., Wu, Y., Wu, Q., Bao, H., & Cheng, X. (2017). Prevalence and risk factors of prehypertension and hypertension in Southern China. *PloS One*, *12*(1), e0170238.

Ikawati, K., Hadimarta, F. P., & Widodo, A. (2019). Hubungan kadar kolesterol total dan trigliserida terhadap derajat tekanan darah. *Cendekia Journal of Pharmacy*, *3*(1), 53–59.

Kaidah, S., Adiputro, D. L., Achmad, H., Sukmana, B. I., Tri Putri, D. K., Wasiaturrahmah, Y., Dewi, R. K., Aspriyanto, D., Hatta, I., & Winias, S. (2020). Effect of Total Cholesterol Levels and Triglycerides on Blood Pressure Hypertension Patients Overview against Puskesmas Banjar Ethnic Group in Cempaka Banjarmasin. *Systematic Reviews in Pharmacy*, *11*(4).

Karwiti, W., Rezekiyah, S., Aprianti, A. D., Umizah, L. P., Kurniasih, D., & Lestari, W. S. (2024). Relationship Between Cholesterol Levels and Triglycerides in Hypertension Patients at UPTD Laboratory Health Of Jambi City. *Journal of Community Health*, *10*(2), 429–434.

Kusumawaty, J., Hidayat, N., & Ginanjar, E. (2016). Hubungan jenis kelamin dengan intensitas hipertensi pada lansia di Wilayah Kerja Puskesmas Lakbok Kabupaten Ciamis. *Mutiara Medika: Jurnal Kedokteran Dan Kesehatan*, *16*(2), 46–51.

Lee, M., Lee, H., Park, J., Kim, H. J., Kwon, R., Lee, S. W., Kim, S., Koyanagi, A., Smith, L., & Kim, M. S. (2023). Trends in hypertension prevalence, awareness, treatment, and control in South Korea, 1998–2021: A nationally representative serial study. *Scientific Reports*, *13*(1), 21724.

Lina, N., & Saraswati, D. (2019). Deteksi dini penyakit jantung koroner di pos pembinaan terpadu penyakit tidak menular (posbindu PTM). *Jurnal Kesehatan Komunitas Indonesia*, *15*(2).

Liu, L.-Y., Aimaiti, X., Zheng, Y.-Y., Zhi, X.-Y., Wang, Z.-L., Yin, X., Pan, Y., Wu, T.-T., & Xie, X. (2023). Epidemic trends of dyslipidemia in young adults: A real-world study including more than 20,000 samples. *Lipids in Health and Disease*, *22*(1), 108.

LO, E. S., Widyarni, A., & Azizah, A. (2020). Analisis hubungan riwayat keluarga dan aktivitas fisik dengan kejadian hipertensi di Kelurahan Indrasari Kabupaten Banjar. *Jurnal Ilmiah Universitas Batanghari Jambi*, *20*(3), 1043–1046.

Luo, F., Huang, W., Guo, Y., Ruan, G., Peng, R., & Li, X. (2017). 17β-estradiol lowers triglycerides in adipocytes via estrogen receptor α and it may be attenuated by inflammation. *Lipids in Health and Disease*, *16*(1), 182.

Maring, F. N. A., Purnawan, S., & Ndun, H. J. N. (2022). Faktor Risiko Kejadian Hipertensi Pada Wanita Usia Subur Di Wilayah Kerja Puskemas Naibonat. *Jurnal Riset Rumpun Ilmu Kesehatan*, *1*(1), 19–26.

Nurhayati, U. A., Ariyanto, A., & Syafriakhwan, F. (2023). Hubungan usia dan jenis kelamin terhadap kejadian hipertensi. *Prosiding Seminar Nasional Penelitian Dan Pengabdian Kepada Masyarakat LPPM Universitas' Aisyiyah Yogyakarta*, *1*, 363–369.

Park, K.-Y., Hong, S., Kim, K.-S., Han, K., & Park, C.-Y. (2023). Trends in prevalence of hypertriglyceridemia and related factors in Korean adults: A serial cross-sectional study. *Journal of Lipid and Atherosclerosis*, *12*(2), 201.

Patel, R. (2021). Dyslipidemia and RAAS Activation in Cardiometabolic Disorders. *Curr Hypertens Rep*, *23*(8), 52.

Rahima, D., Rahmawati, W., & Wirawan, N. N. (2016). Asupan Kolesterol dan Tekanan Darah pada WUS Hipertensi Suku Madura di Kota Malang (Cholesterol Intake and Blood Pressure in WRAâ€™s Hypertension of Madurese Ethnic Group in Malang). *Indonesian Journal of Human Nutrition*, *3*(2), 75–83.

Sari, N. (2023). *Gambaran Kadar Trigliserida Pada Penderita Hipertensi Di Puskesmas Cukir Jombang*. ITSKes Insan Cendekia Medika Jombang.

Shahoud, J. S., Sanvictores, T., & Aeddula, N. R. (2023). Physiology, arterial pressure regulation. In *StatPearls [Internet]*. StatPearls Publishing.

Sherwood, L. (2013). *Fisiologi Manusia* (8th ed.). Cengage Learning.

Sherwood, L. (2018). Fisiologi Sistem Reproduksi. In *Fisiologi Manusia: Dari Sel Ke Sistem* (9th ed.). EGC.

Wati, D. A., Ayu, R. N. S., & Pratiwi, A. R. (2022). Hubungan Asupan Natrium, Kalium dan Lemak, Kebiasaan Olahraga, Riwayat Keluarga dan Kualitas Tidur dengan Kejadian Hipertensi: The Correlation of Intake of Sodium, Potassium and Fat, Exercise Habits, Family History and Quality of Sleep with The Incidence of Hypertension. *Jurnal Gizi Dan Kesehatan*, *14*(2), 207–215.

Xu, X., Huang, R., Lin, Y., Guo, Y., Xiong, Z., Zhong, X., Ye, X., Li, M., Zhuang, X., & Liao, X. (2022). High triglyceride-glucose index in young adulthood is associated with incident cardiovascular disease and mortality in later life: Insight from the CARDIA study. *Cardiovascular Diabetology*, *21*(1), 155.

Yunus, M., Aditya, I. W. C., & Eksa, D. R. (2021). Hubungan usia dan jenis kelamin dengan kejadian hipertensi di puskesmas haji pemanggilan kecamatan anak tuha kab. Lampung Tengah. *Jurnal Ilmu Kedokteran Dan Kesehatan*, *8*(3), 229–239.