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Profile of Low Density Lipoprotein Levels and Distribution of Hypertension Degrees in Hypertension Patients at the Internal Medicine Polyclinic of RSI Siti Rahmah Padang in 2024

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ABSTRACT

Hypertension is one of the major health problems associated with an increased risk of cardiovascular disease. Low-density lipoprotein (LDL) is an important lipid profile parameter in assessing cardiovascular risk, making the evaluation of LDL levels in hypertensive patients essential for identifying associated risk factors. This study aimed to determine the profile of LDL levels and the distribution of hypertension degrees among hypertensive patients at the Internal Medicine Polyclinic of RSI Siti Rahmah Padang in 2024. This descriptive study employed a cross-sectional design using secondary data obtained from the medical records of 104 hypertensive patients who received outpatient care at the Internal Medicine Polyclinic of RSI Siti Rahmah Padang during 2024. The variables examined included age, gender, LDL levels, and degree of hypertension. Data were analyzed descriptively and presented as frequency distributions, percentages, means, and medians. Of the 104 patients, the largest age group was 45–60 years, comprising 54 patients (51.9%), while women accounted for the majority of participants, with 76 patients (73.1%). Regarding the degree of hypertension, 67 patients (64.4%) were classified as having prehypertension, 31 (29.8%) had first-degree hypertension, and 6 (5.8%) had second-degree hypertension. In terms of LDL levels, 57 patients (54.8%) had normal LDL levels, whereas 47 (45.2%) had elevated LDL levels. The mean LDL level was 130.57 ± 38.16 mg/dL, with a median of 127.5 mg/dL and a range of 30–243 mg/dL. In conclusion, the hypertensive patients treated at the Internal Medicine Polyclinic of RSI Siti Rahmah Padang in 2024 were predominantly women and individuals aged 45–60 years. Most patients were classified as having prehypertension and had normal LDL levels, although the proportion of patients with elevated LDL levels remained substantial. These findings highlight the importance of routine lipid profile monitoring as part of comprehensive cardiovascular risk assessment in hypertensive patients.

Keyword: *Low Density Lipoprotein; LDL; hypertension; lipid profile; RSI Siti Rahmah.*

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INTRODUCTION

Hypertension is a major global public health concern and an important risk factor for cardiovascular morbidity and mortality. According to the World Health Organization (WHO), approximately 1.4 billion adults aged 30–79 years had hypertension in 2024, representing about 33% of the population in this age group. Hypertension is associated with an increased risk of stroke, ischemic heart disease, heart failure, and chronic kidney disease. Despite the availability of effective treatments, hypertension remains a substantial health challenge worldwide (WHO, 2025). Hypertension is a major risk factor for coronary heart disease, stroke, heart failure, chronic kidney disease, and premature death due to cardiovascular disease (Global Health Metrics, 2019)

In Indonesia, hypertension also represents a significant public health problem (Padma et al., 2021). The 2023 Indonesian Health Survey (Survei Kesehatan Indonesia/SKI) reported a hypertension prevalence of 30.8% among adults aged 18 years and older based on blood pressure measurements. This figure highlights the importance of early detection, regular blood pressure monitoring, and comprehensive cardiovascular risk assessment. In addition to age and lifestyle-related factors, metabolic abnormalities, including dyslipidemia, are relevant to cardiovascular risk evaluation in patients with hypertension (Kemenkes, 2023)

The increase in the incidence of hypertension is influenced by various factors, including increasing age, obesity, unhealthy diet, lack of physical activity, excessive salt consumption, smoking, and metabolic disorders such as dyslipidemia (Xie et al., 2022). Dyslipidemia is a lipid metabolism disorder characterized by an increase in total cholesterol, triglycerides, and Low Density Lipoprotein (LDL) levels, or a decrease in High Density Lipoprotein (HDL) levels. Among various lipid parameters, LDL is known as the lipoprotein that plays the most role in the atherosclerosis process. Increased LDL levels cause cholesterol accumulation on the walls of blood vessels which triggers endothelial dysfunction, oxidative stress, vascular inflammation, and the formation of atherosclerosis plaques (Dzobo et al., 2022; Jebari-Benslaiman et al., 2022; Kim et al., 2022). This process can increase the risk of cardiovascular disease in hypertensive patients (Chruściel et al., 2022).

The interaction between hypertension and hypercholesterolemia has a close pathophysiological relationship through the activation of the renin-angiotensin-aldosterone (RAAS) system. Grassi et al. (2022) in the Italian Society of Hypertension consensus explain that increased cholesterol levels, specifically Low-Density Lipoprotein (LDL), can improve the stability of type 1 angiotensin II receptor mRNA. This condition triggers hyperexpression of AT receptors on the walls of vascular blood vessels, which then leads to an over-vasoconstriction response to angiotensin II and synergistically accelerates endothelial dysfunction and atherosclerosis progressivity. Therefore, the coexistence of these two conditions demands higher clinical vigilance than if each of the risk factors stood alone (Grassi et al., 2022)

Hypertension and dyslipidemia are often found simultaneously in the adult and elderly populations. The combination of these two conditions can increase the risk of cardiovascular events synergistically compared to if only one of the risk factors is found. Therefore, evaluation of lipid profiles in hypertensive patients is an important part of risk stratification and prevention of cardiovascular complications. The European Society of Cardiology (ESC) and the European Atherosclerosis Society (EAS) guidelines place LDL level control as one of the main targets in efforts to prevent atherosclerotic cardiovascular disease (Mach et al., 2025).

Low-density lipoprotein cholesterol (LDL-C) is an important lipid parameter in the assessment and management of atherosclerotic cardiovascular disease. Elevated LDL-C contributes to cholesterol accumulation in arterial walls and the development of atherosclerotic lesions (Malekmohammad et al., 2021). Hypertension and dyslipidemia may coexist and contribute to an increased overall cardiovascular risk (Kong et al., 2022; Roth et al., 2020; Sadeghi et al., 2021). Previous studies have examined the relationship between lipid parameters and hypertension, although the findings have varied across populations and age groups (Chruściel et al., 2022; Xie et al., 2022). Current European guidelines also emphasize the importance of assessing and managing LDL-C according to an individual's overall cardiovascular risk (Mach et al., 2025).

Although previous studies have investigated lipid profiles in patients with hypertension, local data describing LDL-C levels alongside the distribution of hypertension grades among patients attending the Internal Medicine Clinic of Siti Rahmah Hospital, Padang, remain limited. Previous research at this hospital described lipid profiles among hypertensive outpatients in an earlier period; however, updated descriptive data from 2024 are needed to characterize the distribution of LDL-C levels and hypertension grades in the study population. Such information may provide a local clinical overview and support the assessment of cardiovascular risk factors in routine care.

Therefore, this study aimed to describe LDL-C levels and the distribution of hypertension grades among patients attending the Internal Medicine Clinic of Siti Rahmah Hospital, Padang, in 2024. The study also described the patients' age and sex characteristics and the distribution of LDL-C levels across age groups.

Although the relationship between hypertension and dyslipidemia has been extensively researched, data on the profile of LDL levels in hypertensive patients in hospital-level health care facilities in West Sumatra are still limited. Information on the characteristics of LDL levels and the distribution of degrees of hypertension is important to provide an overview of cardiovascular risk factors in the local population and to be the basis for the planning of cardiovascular disease prevention and control programs.

METHOD

This study is a descriptive observational study with a cross-sectional design conducted at the Internal Medicine Polyclinic of Siti Rahmah Islamic Hospital Padang. The study uses secondary data from the medical records of hypertension patients who underwent examination of Low Density Lipoprotein (LDL) levels during the January-December 2024 period.

The research population is all hypertension patients who are treated at the Internal Medicine Polyclinic of RSI Siti Rahmah Padang in 2024. The research sample was selected using a total sampling technique based on inclusion criteria in the form of hypertension patients who have complete blood pressure data and LDL test results. A total of 104 patients met the criteria and were included in the study.

The observed variables included age, gender, LDL levels, and degree of hypertension. Age data were grouped into five categories, namely 18–25 years, 26–44 years, 45–60 years, 61–75 years, and >75 years. The degree of hypertension was classified based on blood pressure data recorded in medical records. Data analysis was carried out descriptively. Categorical data were presented in the form of frequency and percentage, while numerical data were presented in the form of averages, standard deviations, medians, minimum values, and maximums. The analysis was carried out using spss version 25.

RESULT AND DISCUSSION

This study involved 104 hypertension patients who were treated at the Internal Medicine Polyclinic of RSI Siti Rahmah Padang in 2024. The characteristics of respondents based on age and gender are presented in Table 1.

Table 1. Characteristics of Respondents by Age and Gender

Characteristic	n	%
Age (Years)		
18–25	2	1,9
26–44	15	14,4
45–60	54	51,9
61–75	31	29,8
>75	2	1,9
Gender		
Male	28	26,9
Female	76	73,1

Based on Table 1, most of the respondents were in the age group of 45–60 years as many as 54 people (51.9%), followed by the age group of 61-75 years as many as 31 people (29.8%). Based on gender, the majority of respondents were women as many as 76 people (73.1%).

Tabel 2. Distribusi Derajat Hipertensi pada Pasien Hipertensi

Derajat Hipertensi	n	%
Prehypertensive	67	64,4
Hypertension Grade 1	31	29,8
Hypertension Grade 2	6	5,8
Total	**104**	**100**

Table 2 shows that most of the respondents are included in the prehypertension category as many as 67 people (64.4%), while degree 2 hypertension is the category with the least number of 6 people (5.8%).

Table 3. Overview of Low Density Lipoprotein (LDL) Levels in Hypertensive Patients

Parameter	Nilai
Average ± SD (mg/dL)	130,57 ± 38,16
Median (Min–Maks)	127,5 (30–243)
LDL normal, n (%)	57 (54,8)
LDL High, n (%)	47 (45,2)

Based on Table 3, the average LDL level of hypertensive patients was 130.57 ± 38.16 mg/dL with a median of 127.5 mg/dL. The lowest LDL value was 30 mg/dL and the highest was 243 mg/dL. A total of 57 patients (54.8%) had normal LDL levels, while 47 patients (45.2%) had high LDL levels.

Table 4. Distribution of LDL Levels by Age Group

Age (Tahun)	n	X ± SD (mg/dL)
18–25	2	122,0 ± 130,1
26–44	15	117,8 ± 32,7
45–60	54	135,3 ± 42,0
61–75	31	128,5 ± 25,9

>75	2	139,0 ± 21,2
Total	**104**	**130,6 ± 38,2**

DISCUSSION

Age Characteristics

The results showed that the age group of 45-60 years was the largest group, namely 54 patients (51.9%). Overall, most patients were in the age group of ≥45 years. These findings show that hypertension patients who are treated at the Internal Medicine Polyclinic of RSI Siti Rahmah Padang in 2024 are dominated by the age group of late adults to the elderly. The dominance of this age group was also found in previous studies on hypertension patients at RSI Siti Rahmah.

Donni et al. reported that the age group of 61–75 years was the largest group of hypertensive patients treated at the hospital (Donni et al., 2023). The difference in the most age groups between the two studies can be related to differences in data collection periods and sample characteristics. Age increase is one of the important characteristics in hypertensive patients because the aging process is related to changes in the structure and function of blood vessels. However, because this study is descriptive, the age distribution found cannot be used to conclude a relationship between age and the degree of hypertension.

Gender Characteristics

Based on gender, female patients were the largest group, namely 76 patients (73.1%), while men were 28 patients (26.9%). These results show that hypertension patients in this study are dominated by women. These findings have a similar pattern to previous research at Siti Rahmah Hospital. Donni et al. reported that women were the largest group of hypertensive patients, which was 53.36% of the total sample (Donni et al., 2023). Although the proportion of women in the current study is higher, both studies show the dominance of women in the population of hypertension patients at Siti Rahmah Hospital.

The difference in proportion by gender can be influenced by the characteristics of the study population, age distribution, pattern of visits to health care facilities, and other risk factors that were not analyzed in this study. Therefore, the high proportion of women in this study is more appropriately seen as a sample characteristic and cannot be interpreted as evidence that women have a higher risk of hypertension based on this study.

Distribution of Degrees of Hypertension

The results showed that most of the patients were in the prehypertension category, namely 67 patients (64.4%), followed by 31 patients (29.8%) and 6 patients with type 2 hypertension (5.8%). Thus, the prehypertension category was the most dominant group in this study.

The distribution showed that most of the patients in the study had an increase in blood pressure that was not included in the category of degree 1 or degree 2 hypertension based on the classification used in the study. This condition is important to note because patients with increased blood pressure still need monitoring and control of risk factors to prevent disease progression.

The dominance of the prehypertension category (64.4%) in this study underscores the often insidious nature of blood pressure increases in productive age. These findings are in line with the latest epidemiological evidence in the working population in the Asian region; Karki et al. (2026) reported a high prevalence of hypertension (62.1%) and prehypertension (23.8%), where only 7.5% were aware of their hypertensive status early on. Karki et al. showed that lifestyle factors such as processed food consumption habits and central obesity as well as low health literacy in self-management and communication with medical personnel, contribute significantly to uncontrolled blood pressure (Karki et al., 2026).

According to the newly updated 2024 ESC Guidelines for the management of elevated blood pressure and hypertension, blood pressure readings between 120–139 mmHg systolic and 70–89 mmHg diastolic are categorized as 'elevated BP' rather than a benign state (McEvoy et al., 2024). In our cohort, 64.4% of patients fell within this elevated/prehypertension spectrum. The ESC 2024 guidelines emphasize that individuals with elevated BP who present with concomitant atherogenic risk factors, particularly dyslipidemia and elevated LDL-C, carry a significantly accelerated risk of developing overt atherosclerotic cardiovascular disease (ASCVD), warranting early cardiovascular risk estimation and proactive risk factor modification (McCarthy et al., 2024)

This study only describes the distribution of hypertension degrees in patients who are the study sample. Therefore, these results cannot explain the factors that cause a patient to be at a certain degree of hypertension. Factors such as age, nutritional status, diet, physical activity, drug use, family history, and comorbidities were not analyzed in this study.

LDL Level Profile

The results showed that 57 patients (54.8%) had LDL levels in the normal category, while 47 patients (45.2%) had high LDL levels. The mean values of LDL levels were 130.57 ± 38.16 mg/dL, with a median of 127.5 mg/dL and a range of 30–243 mg/dL. Thus, although patients with normal LDL were the largest group, almost half of the patients had LDL levels categorized as high.

These results show that high LDL levels are still quite prevalent in hypertension patients who are treated at the Internal Medicine Polyclinic of RSI Siti Rahmah. This condition has clinical relevance because LDL is one of the lipid parameters that is important in cardiovascular risk assessment. LDL assessment in clinical practice needs to be done together with overall cardiovascular risk assessment, not just based on LDL values separately (Mach et al., 2025).

The synergistic danger of elevated LDL-C in hypertensive patients stems from shared cellular pathways within the vascular endothelium. As reviewed by Dąbrowska & Narkiewicz (2023), hypertension and atherogenic dyslipidemia act as interconnected partners in endothelial injury. Chronic mechanical strain increases oscillatory wall stress and endothelial permeability, facilitating the infiltration, entrapment, and subsequent oxidation of LDL-C particles in the subendothelial space. Oxidized LDL further induces endothelial nitric oxide synthase (eNOS) uncoupling and oxidative stress, thereby suppressing nitric oxide-mediated vasodilation and worsening peripheral vascular resistance(Dąbrowska & Narkiewicz, 2023)

The results of this study can also be compared with the study of Donni et al. conducted on hypertension patients at Siti Rahmah Hospital in 2021. In the study, 47.06% of patients had LDL <130 mg/dL, while 34.45% were in the range of 130–159 mg/dL and 18.49% had LDL ≥160 mg/dL (Donni et al., 2023). These findings show that in previous and current studies, the group with LDL levels that were not included in the high category was the largest group, although the proportion of patients with high LDL levels remained quite large. The difference in these proportions needs to be considered in the context of the characteristics of each sample and the study period. In addition, LDL levels in patients can be affected by diet, physical activity, metabolic status, comorbidities, and the use of lipid-lowering drugs which are not all available in the data of this study.

In this study, the average LDL level of patients was recorded at 130.57 ± 38.16 mg/dL, with 45.2% of patients in the high LDL category. Although 54.8% of patients were categorized as having normal LDL based on conventional laboratory reference values, this interpretation needs to be addressed carefully in the cardiovascular clinical context. Referring to the C-CHANGE 2022 guidelines, LDL-C control targets in individuals with cardiovascular risk factors are now recommended to be stricter, namely below 2.0 mmol/L (approximately 77 mg/dL) for intermediate-high risk primary prevention, and below 1.8 mmol/L (approximately 70 mg/dL) in patients with evidence of vascular disease. This indicates that LDL levels that are conventionally considered 'normal' (e.g. below 130 mg/dL) may still exceed the optimal threshold for long-term vascular protection in hypertensive patients, so pharmacological management and intensive lifestyle modifications still need to be considered (Jain et al., 2022).

The high proportion of patients with high LDL-C levels (45.2%) and prehypertension category (64.4%) in this study underscores an important intervention window for early clinical alertness. In a longitudinal cohort study of 14,215 male workers in Asia, Otsuka et al. (2016) proved that an increase in lipid profile independently predicts the risk of developing hypertension in the future.

Specifically, subjects in the highest LDL-C quintile had a significant increased risk of developing hypertension compared to the lowest quintile (*hazard ratio* [HR]: 1.27; 95% CI: 1.05–1.53, after multivariate adjustment). In addition, subjects with high LDL-C based on clinical limits had a 1.13-fold greater risk (95% CI: 1.01–1.27) of developing hypertension. These longitudinal findings reinforce that atherogenic dyslipidemia is not just an comorbidity condition, but plays an active role in triggering the development and increase of blood pressure through endothelial dysfunction and arterial wall stiffness (Toshiaki et al., 2016).

LDL Profiles by Age Group

Based on age group, the highest average LDL level was found in the age group >75 years, which was 139.0 mg/dL, while the average LDL in the 45–60 age group was 135.3 mg/dL and the age group 61–75 years was 128.5 mg/dL. In the age group of 26–44 years, the average LDL level was 117.8 mg/dL.
Descriptively, there is variation in LDL levels between age groups. However, interpretation of the >75 year age group needs to be done carefully because the group consists of only two patients. Therefore, the higher average values in this group cannot be considered to describe the LDL levels of the elderly population in general. Previous research has shown that the relationship between lipid parameters and hypertension risk can differ by age group. Xie et al. (2022), for example, found an association between several lipid parameters and the risk of hypertension in the age group under 55 years, while the association was not found in the older age group. The findings suggest that age may be one of the characteristics to consider when interpreting lipid and hypertension profiles. However, because this study is descriptive, the results of the study cannot currently be used to conclude that there is a pattern of relationship between age and LDL levels (Xie et al., 2022).

Clinical Implications

The results of the study provide an overview that hypertension patients at the Internal Medicine Polyclinic of RSI Siti Rahmah Padang in 2024 are dominated by the age group of 45–60 years and women. In addition, most patients are in the prehypertension category and have LDL levels in the normal category, but the proportion of patients with high LDL is still quite large, which is 45.2%.

The findings suggest the importance of comprehensive monitoring of cardiovascular risk factors in patients with elevated blood pressure. LDL screening can be part of cardiovascular risk evaluation, while its interpretation and management need to be tailored to the total cardiovascular risk and clinical condition of each patient (Mach et al., 2025).

Most of the respondents in this study were in the prehypertension category (64.4%). Referring to the C-CHANGE 2022 consensus, the prehypertension phase and early-stage hypertension are a crucial window of opportunity for health behaviour modification-based interventions to prevent

disease progression and target organ damage. The guidelines recommend limiting daily sodium intake to below 2,000 mg (equivalent to 5 g of salt per day), increasing the consumption of plant-based protein, and moderate to vigorous aerobic physical activity for 30–60 minutes almost every day of the week. In addition, for advanced health care facilities such as RSI Siti Rahmah, the findings of a high proportion of prehypertension patients with LDL abnormalities underscore the need for the implementation of an integrated global cardiovascular risk assessment on a regular basis, rather than focusing only on partial blood pressure control (Jain et al., 2022).

Thus, the results of this study can provide an initial overview of the LDL profile and degree of hypertension in patients who receive services at RSI Siti Rahmah and become the basis for the evaluation of cardiovascular risk factors in this population.

CONCLUSION

In conclusion, this study of 104 hypertensive patients at the Internal Medicine Polyclinic of RSI Siti Rahmah Padang in 2024 found that the majority of patients were aged 45–60 years (51.9%) and female (73.1%). Most patients were classified as prehypertensive (64.4%), while 29.8% had grade 1 hypertension and 5.8% had grade 2 hypertension. Regarding LDL levels, 54.8% of patients had levels categorized as normal, whereas 45.2% had elevated LDL levels, with a mean of 130.57 ± 38.16 mg/dL and a median of 127.5 mg/dL. The highest mean LDL level was observed in patients aged over 75 years, although this finding should be interpreted cautiously because the group consisted of only two patients. Overall, these findings highlight the importance of routine blood pressure monitoring, lipid profile assessment, and comprehensive cardiovascular risk evaluation, particularly among patients with elevated blood pressure and potentially unfavorable lipid profiles. Since this study used a descriptive design, further analytical research is needed to investigate the relationships between age, gender, LDL levels, and the degree of hypertension..

REFERENCES

Chruściel, P., Stemplewska, P., Stemplewski, A., Wattad, M., Bielecka-dąbrowa, A., Maciejewski, M., Penson, P., & Bartlomiejczyk, M. A. (2022). Clinical research Associations between the lipid profile and the development of hypertension in young individuals – the preliminary study. Arch Med Sci, 1(1), 25–35.

Dąbrowska, E., & Narkiewicz, K. (2023). Hypertension and Dyslipidemia: the Two Partners in Endothelium-Related Crime. Current Atherosclerosis Reports, 25(9), 605–612. https://doi.org/10.1007/s11883-023-01132-z

Donni, Y. R., Adelin, P., Triyana, R., & Susanti, M. (2023). Overview of the lipid profile of hypertension patients at the installation of the Siti Rahmah RSI Padang outpatient clinic in. Sience Midwifery, 10(6), 4757–4765.

Dzobo, K. E., Kraaijenhof, J. M., Stroes, E. S. G., Nurmohamed, N. S., & Kroon, J.

(2022). Lipoprotein(a): An underestimated inflammatory mastermind. Atherosclerosis, 349(May 2022), 101–109. https://doi.org/10.1016/j.atherosclerosis.2022.04.004

Global Health Metrics. (2019). Global , regional , and national comparative risk assessment of 84 behavioural , environmental and occupational , and metabolic risks or clusters of risks for 195 countries and territories , 1990 – 2017 : a systematic analysis for the Global Burden of Dis. The Lancet, 392(10), 1990–2017. https://doi.org/10.1016/S0140-6736(18)32225-6

Grassi, G., Del Pinto, R., Agabiti Rosei, C., Agnoletti, D., Borghi, C., Cicero, A. F. G., De Ciuceis, C., Desideri, G., Grassi, D., Muiesan, M. L., Paini, A., Salvetti, M., Tocci, G., Veglio, F., Volpe, M., & Ferri, C. (2022). Reduction of High Cholesterol Levels by a Preferably Fixed-Combination Strategy as the First Step in the Treatment of Hypertensive Patients with Hypercholesterolemia and High/Very High Cardiovascular Risk: A Consensus Document by the Italian Society of Hypertension. High Blood Pressure and Cardiovascular Prevention, 29(2), 105–113. https://doi.org/10.1007/s40292-021-00501-6

Jain, R., Stone, J. A., Agarwal, G., Andrade, J. G., Bacon, S. L., Bajaj, H. S., Baker, B., Cheng, G., Dannenbaum, D., Gelfer, M., Habert, J., Hickey, J., Keshavjee, K., Kitty, D., Lindsay, P., L'Abbé, M. R., Lau, D. C. W., Macle, L., McDonald, M., … Tobe, S. W. (2022). Canadian Cardiovascular Harmonized National Guideline Endeavour (C-CHANGE) guideline for the prevention and management of cardiovascular disease in primary care: 2022 update. CMAJ. Canadian Medical Association Journal, 194(43), E1460–E1480. https://doi.org/10.1503/CMAJ.220138

Jebari-Benslaiman, S., Galicia-García, U., Larrea-Sebal, A., Olaetxea, J. R., Alloza, I., Vandenbroeck, K., Benito-Vicente, A., & Martín, C. (2022). Pathophysiology of Atherosclerosis. International Journal of Molecular Sciences, 23(6), 1–38. https://doi.org/10.3390/ijms23063346

Karki, S., Budhathoki, S. S., Paudel, S., Khatri, D., Ghimire, A., Yadav, D. K., & Pokharel, P. K. (2026). Hypertension and Its Determinants Among White-Collar Workers : A Cross-Sectional Study Focusing on Lifestyle Risk Factors and Health Literacy. Wiley Biomed Research International, 1–10. https://doi.org/10.1155/bmri/3545756

Kemenkes, B. (2023). Survei Kesehatan Indonesia (SKI).

Kim, S. H., Cho, Y. K., Kim, Y. J., Jung, C. H., Lee, W. J., Park, J. Y., Huh, J. H., Kang, J. G., Lee, S. J., & Ihm, S. H. (2022). Association of the atherogenic index of plasma with cardiovascular risk beyond the traditional risk factors: a nationwide population-based cohort study. Cardiovascular Diabetology, 21(1), 1–11. https://doi.org/10.1186/s12933-022-01522-8

Kong, P., Cui, Z. Y., Huang, X. F., Zhang, D. D., Guo, R. J., & Han, M. (2022). Inflammation and atherosclerosis: signaling pathways and therapeutic intervention. Signal Transduction and Targeted Therapy, 7(1). https://doi.org/10.1038/s41392-022-00955-7

Mach, F., Koskinas, K. C., Roeters van Lennep, J. E., Tokgözoğlu, L., Badimon, L., Baigent, C., Benn, M., Binder, C. J., Catapano, A. L., De Backer, G. G.,

Delgado, V., Fabin, N., Ference, B. A., Graham, I. M., Landmesser, U., Laufs, U., Mihaylova, B., Nordestgaard, B. G., Richter, D. J., … van Lennep, J. R. (2025). 2025 Focused Update of the 2019 ESC/EAS Guidelines for the management of dyslipidaemias. European Heart Journal, 46(42), 4359–4378. https://doi.org/10.1093/eurheartj/ehaf190

Malekmohammad, K., Bezsonov, E. E., & Rafieian-Kopaei, M. (2021). Role of lipid accumulation and inflammation in atherosclerosis: Focus on molecular and cellular mechanisms. Frontiers in Cardiovascular Medicine, 8(September), 1–16. https://doi.org/10.3389/fcvm.2021.707529

McCarthy, C. P., Bruno, R. M., Brouwers, S., Canavan, M. D., Ceconi, C., Christodorescu, R. M., Daskalopoulou, S. S., Ferro, C. J., Gerdts, E., Hanssen, H., Harris, J., Lauder, L., McManus, R. J., Molloy, G. J., Rahimi, K., Regitz-Zagrosek, V., Rossi, G. P., Sandset, E. C., Scheenaerts, B., … McEvoy, J. W. (2024). 2024 ESC Guidelines for the management of elevated blood pressure and hypertension. European Heart Journal, 45(38), 3912–4018. https://doi.org/10.1093/eurheartj/ehae178

Padma, M., Putri, D., Gede, I. P., Ariawan, E., & Budiapsari, P. I. (2021). Hubungan antara Dislipidemia dengan Kejadian Hipertensi di Bali Tahun 2019. Aesculapius Medical Journal, 1(1).

Roth, G. A., Mensah, G. A., Johnson, C. O., Addolorato, G., Ammirati, E., Baddour, L. M., Barengo, N. C., Beaton, A., Benjamin, E. J., Benziger, C. P., Bonny, A., Brauer, M., Brodmann, M., Cahill, T. J., Carapetis, J. R., Catapano, A. L., Chugh, S., Cooper, L. T., Coresh, J., … Fuster, V. (2020). Global Burden of Cardiovascular Diseases and Risk Factors, 1990-2019: Update From the GBD 2019 Study. Journal of the American College of Cardiology, 76(25), 2982–3021. https://doi.org/10.1016/j.jacc.2020.11.010

Sadeghi, M., Heshmat-Ghahdarijani, K., Talaei, M., Safaei, A., Sarrafzadegan, N., & Roohafza, H. (2021). The predictive value of atherogenic index of plasma in the prediction of cardiovascular events; a fifteen-year cohort study. Advances in Medical Sciences, 66(2), 418–423. https://doi.org/10.1016/j.advms.2021.09.003

Toshiaki, O., Hirotaka, T., Yasuhiro, N., Eitaro, K., Yoshiyuki, S., Katsuhito, K., & Tomoyuki, K. (2016). Dyslipidemia and the Risk of Developing Hypertension in a Working-Age Male Population. Journal of the American Heart Association, 1–9. https://doi.org/10.1161/JAHA.115.003053

Xie, H., Zhuang, Q., Mu, J., Sun, J., Wei, P., Zhao, X., Chen, Y., Dong, J., Chen, C., Wei, L., Yin, Y., & Yang, S. (2022). The relationship between lipid risk score and new-onset hypertension in a prospective cohort study. September, 1–12. https://doi.org/10.3389/fendo.2022.916951