eISSN : 2810 – 0204
Available Online at : http://journal.scientic.id/index.php/sciena/issue/view/34

Comparison of Platelet-to-High-Density Lipoprotein Cholesterol Ratio between Patients with Ischemic Stroke and Healthy Controls

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Abstrak

Background: Ischemic stroke is a major cerebrovascular disorder involving complex interactions between thrombosis, platelet activation, endothelial dysfunction, and lipid abnormalities. The platelet-to-high-density lipoprotein cholesterol ratio (PHR) is a simple composite index combining platelet count and HDL-C, potentially reflecting the interaction between thrombotic and lipid-related vascular processes. However, evidence directly comparing PHR between patients with ischemic stroke and healthy individuals remains limited. **Objective:** To compare the platelet-to-high-density lipoprotein cholesterol ratio between patients with ischemic stroke and healthy controls. **Methods:** This analytical observational study used a case-control design and was conducted at Siti Rahmah Hospital, Padang, Indonesia, using data from 2022–2024. The study included 21 patients with ischemic stroke confirmed by brain computed tomography and 21 healthy controls. Platelet count and HDL-C measurements were obtained from laboratory records. For stroke patients, laboratory measurements obtained on the first day of hospitalization were used. PHR was calculated as platelet count ($\times 10^3/\mu L$) divided by HDL-C (mg/dL). Differences between groups were analyzed using the Mann–Whitney U test for non-normally distributed continuous variables. A p value <0.05 was considered statistically significant. **Results:** The median PHR was significantly higher in patients with ischemic stroke than in healthy controls (5.80 [IQR, 5.27–7.56] vs. 3.61 [IQR, 3.13–5.00], p = 0.001). HDL-C concentrations were significantly lower in the ischemic stroke group (40 [36–51] vs. 59 [45–76] mg/dL, p < 0.001). In contrast, platelet count did not differ significantly between the groups (285 [227–318] vs. 245 [192–289] $\times 10^3/\mu L$, p = 0.119). **Conclusion:** PHR was significantly higher in patients with ischemic stroke than in healthy controls, with the difference appearing to be driven predominantly by lower HDL-C rather than by a significant difference in platelet count. PHR may represent a simple laboratory index reflecting the interaction between platelet-related and lipid-related processes in ischemic stroke. Further studies with larger and well-matched populations are needed to validate these findings.

Keywords: ischemic stroke; platelet-to-HDL ratio; platelet; HDL cholesterol; cerebrovascular disease; case-control study.

Abstract

Latar Belakang: *Stroke iskemik merupakan salah satu penyakit serebrovaskular utama yang melibatkan interaksi kompleks antara aktivasi trombosit, trombosis, disfungsi endotel, dan gangguan metabolisme lipid. Platelet-to-high-density lipoprotein cholesterol ratio (PHR) merupakan indeks sederhana yang menggabungkan jumlah trombosit dan kadar kolesterol HDL (HDL-C), sehingga berpotensi mencerminkan interaksi antara proses trombotik dan faktor vaskular terkait lipid. Namun, bukti mengenai perbedaan PHR antara pasien stroke iskemik dan individu sehat masih terbatas.*
Tujuan: Menganalisis perbedaan platelet-to-high-density lipoprotein cholesterol ratio antara pasien stroke iskemik dan kontrol sehat. ***Metode:*** *Penelitian ini merupakan penelitian observasional analitik dengan desain*

case-control yang dilakukan di Rumah Sakit Siti Rahmah Padang menggunakan data periode 2022–2024. Subjek penelitian terdiri dari 21 pasien stroke iskemik yang diagnosisnya dikonfirmasi melalui pemeriksaan CT-scan otak dan 21 kontrol sehat. Data jumlah trombosit dan HDL-C diperoleh dari pemeriksaan laboratorium. Pada kelompok stroke, pemeriksaan laboratorium yang digunakan adalah hasil pada hari pertama masuk rumah sakit. PHR dihitung dengan membagi jumlah trombosit (×10³/µL) dengan kadar HDL-C (mg/dL). Perbedaan antar kelompok dianalisis menggunakan uji Mann–Whitney, dengan nilai p<0,05 dianggap bermakna. ***Hasil:*** *Median PHR secara signifikan lebih tinggi pada pasien stroke iskemik dibandingkan kontrol sehat, yaitu 5,80 (IQR 5,27–7,56) vs. 3,61 (IQR 3,13–5,00), p=0,001. Kadar HDL-C secara signifikan lebih rendah pada kelompok stroke dibandingkan kontrol (40 [36–51] vs. 59 [45–76] mg/dL, p<0,001). Sebaliknya, jumlah trombosit tidak menunjukkan perbedaan bermakna antara kedua kelompok (285 [227–318] vs. 245 [192–289] ×10³/µL, p=0,119).* ***Kesimpulan:*** *PHR secara signifikan lebih tinggi pada pasien stroke iskemik dibandingkan kontrol sehat. Perbedaan PHR terutama tampak berkaitan dengan kadar HDL-C yang lebih rendah pada kelompok stroke, sementara jumlah trombosit tidak berbeda secara bermakna. PHR berpotensi menjadi indeks laboratorium sederhana yang menggambarkan interaksi antara proses terkait trombosit dan metabolisme lipid pada stroke iskemik. Penelitian dengan jumlah sampel lebih besar dan kelompok yang lebih sebanding diperlukan untuk mengonfirmasi temuan ini.*

Kata kunci: *stroke iskemik; platelet-to-HDL ratio; trombosit; HDL-C; penyakit serebrovaskular; case-control.*

I. BACKGROUND

Stroke remains a major global health problem and is an important cause of mortality and long-term disability. Ischemic stroke accounts for the majority of stroke cases and occurs primarily as a consequence of cerebral arterial occlusion caused by thrombus or embolism. Its pathogenesis involves complex interactions between atherosclerosis, endothelial dysfunction, inflammation, platelet activation, and lipid abnormalities. Consequently, laboratory parameters reflecting thrombotic and vascular processes may provide additional information for understanding the biological characteristics of patients with ischemic stroke.

Platelets have a central role in arterial thrombus formation and therefore contribute directly to the pathogenesis of ischemic stroke. Following endothelial injury or disruption of an atherosclerotic plaque, platelets adhere to the damaged vascular surface, become activated, and aggregate to form an occlusive thrombus. However, platelet count alone may not adequately reflect the complex interaction between platelet-related thrombotic activity and the vascular environment. Recent clinical research has demonstrated that platelet-related parameters are associated with stroke severity and may correlate with lipid abnormalities, supporting the potential importance of integrating platelet characteristics with lipid-related markers in cerebrovascular disease.[1]

High-density lipoprotein cholesterol (HDL-C), in contrast, is generally considered to have several protective effects on the vascular system. HDL-C participates in reverse cholesterol transport and has been associated with anti-inflammatory, antioxidant, and endothelial-protective effects. Alterations in HDL-C may therefore contribute to an unfavorable vascular environment characterized by endothelial dysfunction and atherosclerotic progression. Importantly, the relationship between HDL-C and stroke is complex, and HDL-C concentration alone may not fully capture the interaction between lipid metabolism and thrombotic processes. This has encouraged investigation of composite indices that combine hematological and lipid parameters.

The platelet-to-high-density lipoprotein cholesterol ratio (PHR) is a relatively simple composite index calculated from platelet count and HDL-C concentration. PHR potentially integrates two biological domains relevant to ischemic stroke: platelet-related thrombotic activity and HDL-associated vascular protection. A higher PHR may therefore represent a combination of relatively greater platelet burden and lower HDL-C-related vascular protection. Because platelet count and HDL-C are routinely measured as part of standard hematological and biochemical examinations, PHR can be calculated without additional laboratory testing, making it potentially useful as an accessible research biomarker.

Recent studies have provided increasing evidence regarding the relationship between PHR and cerebrovascular disease. In a large analysis of 27,301 participants from the National Health and Nutrition Examination Survey (NHANES), a higher PHR was independently associated with a greater likelihood of having a history of stroke after adjustment for potential confounding factors. The association was particularly evident at PHR values above an identified threshold, suggesting a potential relationship between PHR and cerebrovascular disease. Furthermore, among stroke survivors, higher PHR was associated with increased cardiovascular mortality.[2]

Similarly, a prospective cohort study based on the China Health and Retirement Longitudinal Study (CHARLS) evaluated 5,872 individuals without previous stroke and found that participants in the highest PHR quartile had a significantly greater risk

of developing stroke during follow-up. After multivariable adjustment, the highest PHR quartile remained associated with an increased risk of stroke (adjusted HR 1.42, 95% CI 1.06–1.90). These findings suggest that PHR may reflect biological processes associated with future cerebrovascular events.[3]

Evidence is also emerging regarding the relevance of platelet-related indices in patients who have already experienced ischemic stroke. A 2024 study of patients with stroke reported that platelet indices increased with increasing stroke severity and demonstrated relationships with lipid parameters, further supporting the potential interaction between platelet-related and lipid-related abnormalities in stroke pathophysiology.[4] More recent clinical evidence has also reported that higher PHR among patients with acute ischemic stroke is associated with adverse outcomes, including mortality, recurrent stroke, and poor functional outcome, suggesting that PHR may have prognostic relevance after stroke has occurred.[5]

Despite these findings, several gaps remain. **Most previous studies have primarily examined PHR as a predictor of future stroke, a marker associated with self-reported stroke, or a prognostic marker among patients who already have acute ischemic stroke.**[2–5] Relatively limited evidence is available regarding whether PHR is significantly different between patients with imaging-confirmed ischemic stroke and healthy individuals without a history of cerebrovascular disease. Furthermore, the characteristics of PHR may differ according to population, age distribution, cardiovascular risk factors, and laboratory measurement practices. Therefore, evaluating PHR directly in a case-control population may provide complementary evidence to previous longitudinal and prognostic studies.

This issue is particularly relevant in Indonesia, where stroke represents an important health burden, while platelet count and HDL-C are routinely available in hospital laboratories. A simple index derived from these routinely measured parameters could potentially provide an additional laboratory perspective on the hematological and lipid characteristics of patients with ischemic stroke. However, evidence concerning PHR among Indonesian patients with ischemic stroke remains limited.

Therefore, the present study aimed to compare the platelet-to-high-density lipoprotein cholesterol ratio between patients with ischemic stroke and healthy controls at Siti Rahmah Hospital, Padang, Indonesia. By comparing PHR between these two groups, this study sought to determine whether PHR demonstrates a significant difference in patients with ischemic stroke and provide preliminary evidence regarding its potential relevance as a readily available hematological-lipid index in ischemic stroke

II. METHODS

2.1 STUDY DESIGN AND SETTING

This study used an analytical observational case-control design to compare the platelet-to-high-density lipoprotein cholesterol ratio (PHR) between patients with ischemic stroke and healthy controls. The study was conducted at Siti Rahmah Hospital, Padang, West Sumatra, Indonesia, using medical record and laboratory data collected during the period from January 2022 to December 2024.

The study population consisted of patients hospitalized with ischemic stroke and healthy individuals who fulfilled the predefined eligibility criteria. The study was conducted in accordance with the principles of the Declaration of Helsinki and the Strengthening the Reporting of Observational Studies in Epidemiology

(STROBE) recommendations for case-control studies.

2.2 STUDY POPULATION AND PARTICIPANTS

The case group consisted of patients admitted to Siti Rahmah Hospital between 2022 and 2024 with a clinical diagnosis of ischemic stroke confirmed by brain computed tomography (CT). Patients were eligible if they had a documented diagnosis of ischemic stroke, available CT findings supporting the diagnosis, and complete platelet count and HDL-C measurements obtained on the first day of hospital admission.

Patients were excluded if they had hemorrhagic stroke, stroke secondary to intracranial trauma or tumor, recurrent stroke with insufficient clinical information regarding the current event, hematological disorders known to substantially affect platelet count, or incomplete platelet or HDL-C data. Patients with missing essential demographic or laboratory information were also excluded.

The control group consisted of healthy individuals without a documented history of ischemic or hemorrhagic stroke or other major cerebrovascular disease. Controls were eligible if platelet count and HDL-C measurements were available. Individuals with known major cardiovascular or cerebrovascular disease, hematological disorders, or incomplete laboratory data were excluded.

The study included 21 patients with ischemic stroke and 21 healthy controls.

2.3 LABORATORY MEASUREMENTS

Laboratory data were obtained from the hospital medical records. For patients with ischemic stroke, laboratory measurements obtained on the first day of hospital admission were used to represent the baseline laboratory profile and to minimize potential effects of subsequent treatment and clinical changes.

Platelet count was obtained from the complete blood count and expressed as $\times 10^3/\mu L$. HDL-C was measured using the hospital's routine clinical chemistry method and expressed as mg/dL.

Because the study used routinely collected clinical laboratory data, blood samples in the stroke group were not necessarily obtained under fasting conditions. This characteristic was considered when interpreting lipid-related findings.

2.4 CALCULATION OF PLATELET-TO-HDL CHOLESTEROL RATIO

The primary study variable was the platelet-to-high-density lipoprotein cholesterol ratio (PHR). PHR was calculated by dividing the platelet count by the HDL-C concentration:
A higher PHR therefore represented a relatively higher platelet count in relation to HDL-C concentration.

The use of explicit units in the calculation is important because published PHR values may differ substantially depending on whether platelet count is reported as $\times 10^3/\mu L$ or $\times 10^9/L$ and whether HDL-C is reported in mg/dL or mmol/L. Recent studies have similarly calculated PHR from platelet count and HDL-C, although different units and analytical approaches have been used across studies.

2.5 STUDY VARIABLES

The primary variable was PHR. The primary outcome was the presence of ischemic stroke, defined according to the clinical diagnosis and supported by brain CT findings.
Additional variables included age, sex, platelet count, and HDL-C concentration. These variables were evaluated to describe

the characteristics of the study population and to provide context for differences in PHR between the two groups.

2.6 STATISTICAL ANALYSIS

Statistical analyses were performed using appropriate statistical software. Continuous variables were assessed for normality using the Shapiro–Wilk test. Normally distributed variables were presented as mean ± standard deviation (SD), whereas non-normally distributed variables were presented as median and interquartile range (IQR). Categorical variables were presented as frequencies and percentages.

Baseline characteristics were compared between the ischemic stroke and healthy control groups. For continuous variables, an independent-samples t-test was used when the data were normally distributed, whereas the Mann–Whitney U test was applied for non-normally distributed variables. Categorical variables were compared using the chi-square test or Fisher's exact test, as appropriate.

The primary analysis compared PHR between patients with ischemic stroke and healthy controls. Because the observed PHR values were non-normally distributed, the Mann–Whitney U test was used to assess differences between groups. The magnitude and direction of the difference were reported together with the corresponding p value.
A two-sided p value <0.05 was considered statistically significant.

2.7 ETHICAL CONSIDERATIONS

The study protocol was submitted to and approved by the appropriate Health Research Ethics Committee before data analysis. Because the study used previously recorded clinical and laboratory data, patient confidentiality was maintained by removing personal identifiers from the analytical dataset. Access to medical records was restricted to the research team, and the study was conducted in accordance with applicable ethical principles and institutional regulations.

III. RESULT

3.1 CHARACTERISTICS OF THE STUDY PARTICIPANTS

A total of 42 participants were included in the analysis, comprising 21 patients with ischemic stroke and 21 healthy controls. The median age was 62 years (IQR, 56–66) in the ischemic stroke group and 65 years (IQR, 62–71) in the control group. The age distribution differed significantly between the two groups (p = 0.016).

A significant difference was also observed in sex distribution. Male participants accounted for 71.4% (15/21) of the ischemic stroke group compared with 19.0% (4/21) of the healthy control group (p = 0.002). These differences in age and sex were considered when interpreting the comparison of laboratory parameters and PHR.

3.2 PLATELET COUNT, HDL-C, AND PHR

The median platelet count was higher in patients with ischemic stroke than in healthy controls, although the difference did not reach statistical significance (285 vs. 245 $\times 10^3/\mu L$, p = 0.119).
In contrast, HDL-C concentration was significantly lower in patients with ischemic stroke than in healthy controls. The median HDL-C concentration was 40 mg/dL (IQR, 36–51) in the ischemic stroke group compared with 59 mg/dL (IQR, 45–76) in the control group (p < 0.001).

The combination of platelet count and HDL-C into the PHR demonstrated a more pronounced difference between groups. The median PHR was 5.80 (IQR, 5.27–7.56) among patients with ischemic stroke compared with 3.61 (IQR, 3.13–5.00) among

healthy controls. This difference was statistically significant (p = 0.001).

TABLE 1. BASELINE CHARACTERISTICS OF PATIENTS WITH ISCHEMIC STROKE AND HEALTHY CONTROLS

Variable	Ischemic stroke (n=21)	Healthy controls (n=21)	*p* value
Age, years, median (IQR)	62 (56–66)	65 (62–71)	**0.016**
Male sex, n (%)	15 (71.4)	4 (19.0)	**0.002**
Female sex, n (%)	6 (28.6)	17 (81.0)	—

TABLE 2. COMPARISON OF PLATELET COUNT, HDL-C, AND PHR BETWEEN ISCHEMIC STROKE PATIENTS AND HEALTHY CONTROLS

Variable	Ischemic stroke (n=21)	Healthy controls (n=21)	*p* value
Platelet, $\times 10^3/\mu L$	285 (227–318)	245 (192–289)	0.119
HDL-C, mg/dL	40 (36–51)	59 (45–76)	**<0.001**
PHR	**5.80 (5.27–7.56)**	**3.61 (3.13–5.00)**	**0.001**

III. DISCUSSION

The present study demonstrated that the platelet-to-high-density lipoprotein cholesterol ratio (PHR) was significantly higher in patients with ischemic stroke than in healthy controls. The median PHR was 5.80 (IQR, 5.27–7.56) in patients with ischemic stroke compared with 3.61 (IQR, 3.13–5.00) in healthy controls (p = 0.001). Interestingly, this difference occurred despite the absence of a statistically significant difference in platelet count between the two groups. In contrast, HDL-C concentrations were substantially lower in patients with ischemic stroke than in controls (p < 0.001). These findings suggest that the higher PHR observed in ischemic stroke in this study was driven more prominently by the lower HDL-C component than by an isolated increase in platelet count.

The significantly higher PHR among patients with ischemic stroke is biologically plausible because both components of the ratio are involved in processes relevant to ischemic cerebrovascular disease. Platelets play a central role in arterial thrombus formation, while HDL-C is involved in several vascular protective mechanisms, including cholesterol efflux, modulation of endothelial function, anti-inflammatory effects, and inhibition of platelet activation. Thus, PHR may provide an integrated representation of the balance between platelet-related thrombotic potential and HDL-associated vascular protection. Previous literature has proposed PHR as a marker reflecting inflammatory and hypercoagulable states, although its biological interpretation should remain cautious because platelet count and HDL-C concentration do not directly measure platelet function or HDL functionality.

The finding of significantly lower HDL-C levels in the ischemic stroke group is consistent with previous evidence linking HDL-C to ischemic cerebrovascular disease. A systematic review and dose–response meta-analysis involving 62 prospective cohort studies and more than 900,000 participants found an inverse association between HDL-C concentration and ischemic stroke risk. The pooled relative risk for ischemic stroke was 0.75 (95% CI, 0.69–0.82) per 1-mmol/L increase in HDL-C, supporting the possibility that lower HDL-C is associated with greater ischemic stroke risk.[1] Furthermore, a Mendelian randomization study published in Annals of Neurology reported that lower HDL-C and apolipoprotein A-I levels were associated with increased risk of ischemic stroke, including large-artery and small-vessel stroke subtypes.[2] These findings provide epidemiological and genetic support for the lower HDL-C observed in our ischemic stroke population.

Several mechanisms may explain the potential protective role of HDL against

ischemic vascular events. Beyond its classical role in reverse cholesterol transport, HDL has anti-inflammatory, antioxidant, endothelial-protective, and antithrombotic properties. HDL can promote endothelial nitric oxide and prostacyclin production, both of which inhibit platelet activation. HDL may also reduce platelet hyperreactivity by facilitating cholesterol efflux from platelets and modulating signaling through receptors such as scavenger receptor class B type 1 (SR-B1).[3,4] Consequently, reduced HDL-C may contribute to an environment that is more permissive to platelet activation, endothelial dysfunction, and thrombus formation. In the setting of ischemic stroke, these processes may facilitate cerebral arterial occlusion and tissue ischemia.

An important finding of the present study is that platelet count alone did not differ significantly between patients with ischemic stroke and healthy controls. The median platelet count was 285 $\times 10^3/\mu L$ in the stroke group and 245 $\times 10^3/\mu L$ in controls ($p = 0.119$). This observation is important because the pathophysiological role of platelets in ischemic stroke is not necessarily reflected by platelet number alone. Platelet activation, adhesion, aggregation, and platelet–endothelial interactions may occur without substantial changes in circulating platelet count. Therefore, a normal or statistically similar platelet count does not exclude an important contribution of platelet-mediated thrombosis to ischemic stroke.

This finding may explain why the composite PHR was significantly different despite the nonsignificant difference in platelet count. Because PHR incorporates platelet count and HDL-C into a single index, a substantial reduction in HDL-C can increase the ratio even when platelet count remains within a relatively similar range. In the present study, the median HDL-C was approximately 32% lower in the ischemic stroke group than in controls, whereas the difference in platelet count was not statistically significant. Therefore, the significant increase in PHR may primarily reflect the marked difference in HDL-C between the two groups. This interpretation is supported by the concept that composite hematological-lipid indices may capture interactions between different biological pathways that are less apparent when individual laboratory variables are examined separately.

Our findings are consistent with emerging epidemiological evidence concerning PHR and stroke. Zhang et al. analyzed 27,301 participants from NHANES and reported that a higher PHR was independently associated with self-reported stroke after adjustment for multiple potential confounders. Each standard-deviation increase in PHR was associated with an odds ratio of 1.13 (95% CI, 1.03–1.24; $p = 0.01$) for stroke. Importantly, the association was stronger above a specific PHR threshold, while HDL-C alone was not significantly associated with stroke after adjustment in their analysis.[3] These findings support the possibility that combining platelet count and HDL-C into PHR may provide information that differs from either parameter considered independently.

Similarly, a prospective cohort study based on the China Health and Retirement Longitudinal Study evaluated 5,872 participants without previous stroke and found that individuals in the highest PHR quartile had a significantly increased risk of subsequent stroke compared with those in the lowest quartile. After multivariable adjustment, the highest PHR quartile remained associated with a 42% higher risk of stroke (adjusted HR, 1.42; 95% CI, 1.06–1.90).[4] Although that study examined future stroke risk rather than differences between established ischemic stroke and healthy controls, its findings provide complementary evidence supporting the relevance of PHR to cerebrovascular disease.

The present study differs from these previous investigations in an important way. Previous studies have predominantly evaluated PHR as a risk marker for incident stroke or as a prognostic marker among patients who have already experienced stroke, whereas our study directly compared PHR between patients with CT-confirmed ischemic stroke and healthy controls. This case-control approach therefore provides a different perspective by demonstrating that PHR is not merely associated with future stroke risk but is also significantly different at the time of hospitalization for ischemic stroke. However, because of the case-control design, the present findings should not be interpreted as establishing a causal relationship between elevated PHR and ischemic stroke.

The clinical relevance of these findings lies primarily in the simplicity and accessibility of PHR. Both platelet count and HDL-C are routinely measured in many hospital laboratories, and PHR does not require an additional specialized assay. This may be particularly relevant in resource-limited clinical settings where advanced inflammatory or molecular biomarkers are not routinely available. Nevertheless, PHR should currently be regarded as a research and adjunctive laboratory index rather than an independent diagnostic test for ischemic stroke. Neuroimaging and clinical assessment remain essential for diagnosis, and PHR cannot replace established diagnostic procedures.

Several limitations should be considered when interpreting the present findings. First, the sample size was relatively small, with only 21 patients with ischemic stroke and 21 healthy controls. This limits statistical power and precision and increases the possibility that the observed effect may not be generalizable to broader populations. Second, the study used a retrospective hospital-based case-control design, which limits the ability to establish temporal or causal relationships. Third, the stroke and control groups differed significantly in age and sex. The median age was 62 years in the stroke group and 65 years in controls ($p = 0.016$), while males accounted for 71.4% of the stroke group compared with 19.0% of controls ($p = 0.002$). Because age and sex can influence platelet and lipid profiles, residual confounding cannot be excluded. Fourth, laboratory samples in the stroke group were obtained on the first day of hospital admission and were not necessarily collected in a fasting state. Acute illness and non-fasting status may influence lipid measurements and should therefore be considered when interpreting HDL-C and PHR. Finally, PHR is based on platelet count rather than direct platelet function testing and uses HDL-C concentration rather than measures of HDL functionality; consequently, it should not be interpreted as a direct measure of thrombogenic activity or HDL biological function.

Despite these limitations, the study has several strengths. The diagnosis of ischemic stroke was supported by CT imaging, reducing the likelihood of misclassification between ischemic and hemorrhagic stroke. Laboratory measurements were obtained at the first hospital admission, providing a standardized baseline measurement before substantial hospital-based treatment could alter the laboratory profile. In addition, the use of a healthy control group allowed direct comparison of PHR and its individual components in individuals without clinically evident cerebrovascular disease.

Overall, the findings indicate that PHR was significantly higher in patients with ischemic stroke than in healthy controls, while HDL-C was significantly lower and platelet count alone did not differ significantly. The results support the concept that PHR may capture an interaction between lipid-related vascular protection and platelet-related thrombotic mechanisms that is not fully reflected by platelet count alone. These findings are consistent with recent population-based and

cohort studies linking higher PHR with stroke risk and adverse cerebrovascular outcomes.[3,4] However, larger multicenter studies with appropriately matched controls and adjustment for important cardiovascular risk factors are required to determine whether the observed difference in PHR remains independent of age, sex, metabolic comorbidities, and other potential confounders.

IV. CONCLUSION

In this case-control study, the platelet-to-high-density lipoprotein cholesterol ratio (PHR) was significantly higher in patients with ischemic stroke than in healthy controls. Although platelet count alone did not differ significantly between the groups, HDL-C was substantially lower among patients with ischemic stroke, contributing to the higher PHR. These findings suggest that PHR may reflect the combined influence of platelet-related and lipid-related vascular processes in ischemic stroke. However, given the small sample size and differences in age and sex between groups, further studies with larger, well-matched populations and appropriate adjustment for potential confounders are warranted to validate the clinical relevance of PHR in ischemic stroke..

DAFTAR PUSTAKA

[1]. Pan Y, Wang M, et al. Dose–response association between high-density lipoprotein cholesterol and stroke: a systematic review and meta-analysis of prospective cohort studies. J Am Heart Assoc. 2021;10:e019229.
[2]. Yuan S, Larsson SC. Circulating lipoprotein lipids, apolipoproteins and ischemic stroke. Ann Neurol. 2020;88:1229–1236.
[3]. Zhang H, Xu Y, Xu Y. The association of the platelet/high-density lipoprotein cholesterol ratio with self-reported stroke and cardiovascular mortality: a population-based observational study. Lipids Health Dis. 2024;23:121. doi:10.1186/s12944-024-02115-y.
[4]. Hou X, Zhu M, Zhu Z, Li Y, Chen X, Zhang X. Association between platelet-to-high-density lipoprotein cholesterol ratio and future stroke risk: a national cohort study based on CHARLS. Front Neurol. 2024;15:1479245. doi:10.3389/fneur.2024.1479245.
[5]. Thakkar H, et al. Changing perspectives on HDL: from simple quantity measurements to functional quality assessment. J Lipids. 2021;2021:5585521.
[6]. Pownall HJ, Rosales C, Gillard BK, Gotto AM Jr. High-density lipoproteins, reverse cholesterol transport and atherogenesis. Nat Rev Cardiol. 2021;18:712–723.
[7]. van der Stoep M, et al. High-density lipoproteins during sepsis: from bench to bedside. Crit Care. 2020;24:386.
[8]. Santos-Gallego CG, et al. Advances in HDL: much more than lipid transporters. Int J Mol Sci. 2020;21:732
[9]. Rajakumar I, et al. Platelet indices as prognostic markers of ischemic stroke and their correlation with lipid profile. Clin Neurol Neurosurg. 2024;237:108119. doi:10.1016/j.clineuro.2024.108119.
[10]. Platelet to high-density lipoprotein cholesterol ratio predicts clinical outcomes after acute ischemic stroke: a prospective cohort study. [Publication indexed in PubMed, 2026].
[11]. Anggraini, D., Haiga, Y., & Sjaaf, F. (2023). Risk Factors for Cerebrovascular Disease (Stroke) in Elderly. Scientific Journal, 2(1), 38-43.
[12]. Anggraini, D., Oktora, M. Z., & Hasni, D. (2025). Peran Indeks Aterogenik sebagai Penanda Komplikasi pada Diabetes Melitus Tipe 2: Tinjauan Pustaka. Scientific Journal, 4(2), 91-99.