INPLASY

Association between composite lipid index (AIP, VAI, LAP) and Carotid Atherosclerosis with plaque : a Systematic review and Meta-analysis

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ADMINISTRATIVE INFORMATION

Review Stage at time of this submission - Completed but not published.

Conflicts of interest - None declared.

INPLASY registration number: INPLASY202550082

Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 27 May 2025 and was last updated on 27 May 2025.

INTRODUCTION

Review question / Objective Carotid atherosclerosis with plaque is a vital pathological basis for ischemic stroke and cardiovascular events, and its occurrence is closely related to lipid metabolism disorders, inflammatory responses, and visceral fat distribution. According to global epidemiological data, in 2020, the prevalence of carotid plaque among people aged 30-79 was as high as 21.1%, which significantly increased with age, and men had a higher risk of developing the condition than women. The stability of plaque significantly affects clinical outcomes: unstable plaque, characterized by a thin fibrous cap, large lipid core, and intraplaque hemorrhage, has a rupture risk 6-8 times higher than that of stable plaque . Traditional lipid indicators such as LDL-C, though widely used for risk assessment, have limited explanatory power for plaque heterogeneity . In recent years, composite lipid indices—the Atherogenic Index of Plasma (AIP), Visceral Adiposity Index (VAI), and Lipid Accumulation Product (LAP)—have been considered to more comprehensively reflect the vascular damage caused by metabolic disorders due to their integration of lipid spectrum and body composition parameters.

This study aims to clarify the correlation of AIP, VAI, and LAP with the presence, stability, and compositional characteristics of carotid atherosclerotic plaque through systematic review and meta-analysis, and to explore their clinical applicability as non-invasive biomarkers. The study results are expected to provide new ideas for individualized risk assessment and evidence-based basis for the selection of lipid-lowering treatment targets.

Condition being studied We have included 7 studies, involving 3 VAI studies, 4 AIP studies, and 1 LAP study. These studies cover 4 studies on Carotid artery plaque and 4 studies on Carotid atherosclerosis.

METHODS

Participant or population The study subjects are patients with carotid atherosclerosis or carotid artery plaque.

Intervention The study subjects are patients with carotid atherosclerosis or carotid artery plaque. There is no restriction on the type of study. The study needs to report the correlation between at least one lipid index and the incidence of carotid atherosclerosis or carotid artery plaque, and provide the corresponding result indicators, such as OR/HR/RR. These statistical results need to be adjusted for other confounding factors through logistic regression or Cox regression analysis.

Comparator No.

Study designs to be included To address this, we conducted subgroup analyses based on lipid index, type of study, type of carotid atherosclerosis, sample population and gender.

Eligibility criteria Exclusion Criteria: Cohort studies that only conducted univariate analyses were excluded, as these studies did not take into account potential confounding factors, which may lead to inaccurate results. Studies that did not report relevant data were excluded. Studies that were published repeatedly were excluded. Conference abstracts, reviews, case reports, animal experiments, and so on were excluded.

Information sources We conducted a computerassisted search of the following databases: PubMed, Embase, Cochrane, and Web of Science. The search focused on studies related to the correlation between composite lipid index (AIP, VAI, LAP) and carotid atherosclerosis with plaque. The search spanned from the inception of each database to may 2025.

Main outcome(s) Are composite lipid indices (AIP, VAI, LAP) correlated with carotid atherosclerosis with plaque?

Quality assessment / Risk of bias analysis Quality assessment was conducted using the Agency for Healthcare Research and Quality (AHRQ) criteria, a widely recognized framework for evaluating the methodological rigor of health research studies. The AHRQ criteria provide a comprehensive set of standards to assess the quality of studies in various domains, including study design, sample size, risk of bias, measurement methods, and the appropriateness of statistical analyses. This framework helps to ensure that the studies included in the analysis are robust and reliable, minimizing the risk of bias and enhancing the validity of the findings.

Strategy of data synthesis The extracted data were subjected to meta-analysis using STATA 18.0 software. The specific procedures are as follows:
Effect Size Selection: The odds ratio (OR) was used for analysis, and its 95% confidence interval (CI) was calculated.
Heterogeneity Test: Heterogeneity was assessed using P-values and I^2 statistics. If $P > 0.1$ and I^2 $\leq 50\%$, heterogeneity was considered low, and a fixed-effect model (FE) was used for analysis. If $P \leq 0.1$ and $I^2 > 50\%$, heterogeneity was considered high, and a random-effect model (RE) was used for analysis.
Assessment of Publication Bias: Funnel plots and Egger's test were used to evaluate the possibility of publication bias in the literature on the correlation between composite lipid indices (AIP, VAI, LAP) and carotid atherosclerosis with plaque.
Sensitivity Analysis: A sensitivity analysis was conducted using the exclusion method to assess the stability of the results for the literature on the correlation between composite lipid indices (AIP, VAI, LAP) and carotid atherosclerosis with plaque.
Meta-Regression and Subgroup Analysis: Metaregression and subgroup analyses were performed to identify sources of heterogeneity and to assess the impact of heterogeneity on the study results in the literature on the correlation between composite lipid indices (AIP, VAI, LAP) and carotid atherosclerosis with plaque.alcohol consumption and atherosclerosis.

Subgroup analysis To address this, we conducted subgroup analyses based on lipid index, type of study, type of carotid atherosclerosisc ountry, sample population and gender.

Sensitivity analysis Sensitivity analysis confirmed that the results remained consistent even after sequentially excluding each study, demonstrating the robustness of the findings.

Country(ies) involved China.

Keywords AIP, VAI, LAP, carotid atherosclerosis, carotid artery plaque.

Contributions of each author
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