

Unveiling the Cardiac Impact of Dyslipidemia through Echocardiography: A Systematic Review

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ADMINISTRATIVE INFORMATION

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Conflicts of interest - None declared.

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Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 25 December 2025 and was last updated on 25 December 2025.

INTRODUCTION

Review question / Objective The aim of this systematic review is to synthesize and evaluate echocardiographic findings utilising both conventional and advanced imaging techniques, in individuals with dyslipidemia. P: Individuals with dyslipidemia (familial or non-familial). I: Presence of dyslipidemia. C: Healthy controls with normal lipid profile. O: Measurement of echocardiographic findings of any modalities (m-mode, 2D, Doppler, STE). S: Human study.

Rationale Current evidence suggests that dyslipidemia, whether arising from genetic disorders (primary dyslipidemia) or secondary to other medical conditions, can induce subclinical cardiac alterations through mechanisms involving lipid infiltration, oxidative stress, and inflammation. In recent years, both conventional echocardiography and advanced speckle-tracking echocardiography (STE) have been increasingly applied to assess cardiac structure and function in

individuals with dyslipidemia across different age groups and disease types. However, findings from these studies remain heterogeneous and fragmented, with substantial variability in reported structural, systolic, and diastolic abnormalities across populations and dyslipidemia subtypes. To date, no comprehensive synthesis has compared echocardiographic findings, particularly advanced deformation parameters, across primary and secondary dyslipidemia in both pediatric and adult populations. This lack of synthesis limits the ability to identify consistent patterns of myocardial involvement and to clarify the extent of subclinical cardiac dysfunction associated with dyslipidemia. Therefore, this systematic review aims to synthesize and evaluate echocardiographic findings on cardiac alterations in individuals with dyslipidemia.

Condition being studied Dyslipidemia, inclusive of primary (genetic factor) and secondary (due to other medical conditions and behavioural factors),

both in adult and pediatric populations, regardless of gender.

METHODS

Search strategy The literature search will be conducted in four electronic databases (PubMed, ScienceDirect, Scopus, and Web of Science), limited to studies published in English between January 2014 and June 2025. The search combined keywords as follows: (dyslipidemia OR hyperlipidemia OR hypercholesterolemia) AND (“echocardiographic parameter*” OR “echocardiography” OR “left ventricular function” OR “diastolic function”).

Participant or population Individuals with dyslipidemia (familial or non-familial).

Intervention Presence of dyslipidemia.

Comparator Healthy controls within studies.

Study designs to be included Observational studies (case-control, cross-sectional, cohort).

Eligibility criteria

- (1) Full-text peer-reviewed original articles published in English
- (2) Observational studies (cross-sectional, case-control, cohort studies) investigating the effects of dyslipidemia towards echocardiographic parameters
- (3) Studies involving individuals with dyslipidemia regardless of age, gender, and types of dyslipidemia (familial or non-familial)
- (4) Studies reporting the association between dyslipidemia and echocardiographic changes.

Information sources The literature search will be conducted in four electronic databases (PubMed, ScienceDirect, Scopus, and Web of Science) through UKM Library website. Then, all articles retrieved will be managed using Mendeley Desktop Version 1.19.8.

Main outcome(s) Echocardiographic parameters assessing both structural and functional aspects of the heart in individuals with dyslipidemia, as measured using conventional and speckle-tracking echocardiography.

Quality assessment / Risk of bias analysis The risk of bias (ROB) of the included studies will be assessed using the Newcastle-Ottawa Scale (NOS) for case-control studies and an adapted version of the NOS for cross-sectional studies. For case-control studies, the NOS assessed three domains:

selection, comparability, and outcome assessment comprising eight items. Each item was awarded a star if the criterion was met, with a maximum total score of 9 stars. Studies will be categorized as high quality (7-9 stars), moderate quality (5-6 stars), and low-quality (≤ 4 stars). For cross-sectional studies, the adapted NOS maintained the same three domains but with modified items relevant to cross-sectional designs. Similarly, each item was awarded a star if the criterion was met, with a maximum total score of 10 stars. Studies will be categorized as high quality (8-10 stars), moderate quality (5-7 stars), and low-quality (≤ 4 stars). All risk of bias assessments were conducted independently by two reviewers (A.A. and N.A.I.), with disagreement resolved through discussion and consensus.

Strategy of data synthesis A narrative synthesis approach will be employed to summarize the information of all included studies. Data will be synthesized in four stages: (1) summarizing study characteristics, (2) extracting and reporting key echocardiographic findings, (3) categorizing the findings according to subgroups (functional domains and study populations), and (4) presenting reported correlations between dyslipidemia and echocardiographic parameters, when available. Studies presenting descriptive or group comparison data were presented qualitatively. A descriptive summary of the synthesis will be tabulated to highlight consistent findings, variability, and subgroup differences.

Subgroup analysis Not applicable.

Sensitivity analysis Not applicable.

Language restriction English.

Country(ies) involved Malaysia.

Keywords dyslipidemia; hyperlipidemia; hypercholesterolemia; “echocardiographic parameter*”; “echocardiography”; “left ventricular function”; “diastolic function”.

Contributions of each author

Author 1 - Nur Akilah Ismail - Author 1 conducted the conceptualization, methodology (literature search, article selection, data extraction), writing of original draft, and editing.

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