

## A SYSTEMATIC REVIEW OF BLOOD LIPID PROFILES IN VIETNAMESE ADULTS FROM 2010 TO 2023

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### ABSTRACT

**Background:** Dyslipidemia, which is caused by abnormalities blood lipid profiles including increased total cholesterol, triglycerides, LDL-C, and decreased HDL-C, has posed significant health risks including cardiovascular diseases, diabetes mellitus type 2, and other pathologies for people over the world, Vietnam included. The purpose of the systematic review was to focus on the information of blood lipid profiles including the mean value of blood lipid indicators and the prevalence of dyslipidemia among Vietnamese adults in the last 13 years from 2010 to 2023. **Method:** We explored studies reporting data in adults residing in Vietnam based on key terms such as dyslipidemia, blood lipid, cholesterol, LDL, HDL, triglyceride. The included studies were extracted from Pubmed/Medline, Web of Science, Embase, CINANL, and 26 websites of medical-related journals in Vietnam. The publication timeframe of included studies ranged between January 01, 2010, to December 31, 2023. The selected studies had an observational study design. Studies that were published in languages other than Vietnamese and English were not considered for this systematic review. **Findings:** 105 articles were included in the systematic review. The mean value of TC,

TG, HDL-C, and LDL-C of reported data was ranged from 3.38 to 6.79, 1.06 to 4.96, 0.96 to 1.96, and 2.00 to 4.36 mmol/l, respectively. The mean prevalence of dyslipidemia of included articles was 67.6%. The majority of articles (21/49) reported the prevalence of dyslipidemia as more than 75%. The rates of increased TC, TG, and LDL-C were mainly in the range of 25 to less than 50%, while that of decreased HDL-C was mostly less than 25%. **Conclusion:** Dyslipidemia is relatively common among adults in Vietnam. It is imperative to prioritize the identification and management of lipid abnormalities in order to prevent potential severe health problems in the future.

**Keywords:** blood lipid; dyslipidemia; total cholesterol; LDL; HDL; triglyceride.

**Abbreviations:** CVD: cardiovascular disease; HDL-C: high density lipoprotein cholesterol; LDL-C: low density lipoprotein cholesterol; TC: total cholesterol; TG: triglyceride; WHO: World Health Organization.

### I. INTRODUCTION

Dyslipidemia refers to an abnormal blood lipid status characterized by increased levels of plasma total cholesterol (TC), low-density lipoprotein cholesterol (LDL-C), triglycerides (TG), and reduced levels of high-density lipoprotein cholesterol (HDL-C).<sup>1</sup> Dyslipidemia syndrome increases an individual's risk of developing atherosclerosis and cardiovascular disease (CVD), thereby contributing to approximately 17 million deaths globally in 2015 and an increase of 12.5% compared to 2005.<sup>2</sup>

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According to the World Health Organization (WHO), worldwide, the prevalence of dyslipidemia is estimated in Southeast Asia (30.3%) and the Western Pacific (36.7%). This is significantly lower than that in Europe (53.7%) and America (47.7%).<sup>3</sup> In the Asia-Pacific region, due to rapid urbanization, changing diets, high smoking rates and reduced physical activity, CVD is rapidly becoming one of the major health concerns as well as getting worse day by day.<sup>4-6</sup>

In Vietnam, currently, no systematic review of dyslipidemia has been detected in Vietnamese adults. Most of the data are reported through descriptive or analytical studies in some provinces of Vietnam. In Thua Thien Hue, by Ngo Thach Thao et al in 2019, among residents aged 25 and over living in Thua Thien Hue province, 61.1% of individuals had dyslipidemia.<sup>7</sup> In Ca Mau province, Huynh Ngoc Linh et al. (2016) found that among 650 people aged 35 and over, 69.4% had dyslipidemia, 35.7% had hypertriglyceridemia, 41.2% had hypercholesterolemia, 14.3% had high LDL-C, and 16% had low HDL-C.<sup>8</sup> Overall, these findings have made it difficult to inform future recommendations and interventions for all Vietnamese people.

This systematic review focuses on the information of blood lipid profiles including the mean value of blood lipid indicators and the prevalence of dyslipidemia among Vietnamese adults in the period from 2010 to 2023. Furthermore, the study aims to highlight the necessity for doctors and healthcare professionals to implement timely interventions in order to prevent dyslipidemia and its relevant problems.

## II. METHODS

### 2.1. Study type: systematic review

### 2.2. Eligibility criteria

We selected studies according to POC-S structure as follows: a) conducted on Vietnamese adults aged from 18 and over; b) reported on the prevalence of dyslipidemia (dyslipidemia was defined as increasing bad lipids (TC, TG, LDL-C) or decreasing good lipids (HDL-C) according to any criteria) and/or the average levels of at least one of four blood lipids indicators (TC, TG, LDL-C, HDL-C); c) conducted in Vietnam or reported data in Vietnam; d) were observational studies; e) published in Vietnamese or English language from 2010 to 2023.

The excluded studies included: a) case reports, case series, and ecological studies; b) books, books' chapters, thesis, dissertation repositories, and articles in the media; c) reviews, commentaries, letters to the editor, conference abstracts/ proceedings, perspective/ viewpoint, primer, protocol/ frameworks, replies from the author, and opinion pieces.

### 2.3. Search strategy

A literature search was conducted in four electronic databases including Pubmed/ Medline, Web of Science, Embase, and CINANL for relevant materials from 2010 to 2023 using multiple combinations with Boolean operators. The search strategy was customized for each database by experienced researchers. The keywords or MeSH (Medical Subject Headings) used during the search were 'dyslipidemia', 'dyslipoproteinemia', 'hyperlipidemia', 'blood lipids', 'cholesterol', 'total cholesterol', 'blood cholesterol', 'LDL', 'HDL', 'low density lipoprotein', 'high density lipoprotein', 'non-HDL cholesterol', 'triglyceride', 'phospholipid', 'lipid disorder', 'lipid metabolism disorder', 'hypercholesterol', and 'hypercholesterolemia'.

Regarding to Vietnamese articles, manual searches were performed on the websites of

26 medical-related journals in Vietnam. Both English and Vietnamese keywords were used when searching to obtain more study that may have been published in the Vietnamese language.

After searching, we contacted journals or corresponding authors to retrieve the full-text of selected studies. We also contacted a number of Vietnamese experts and authors of metabolic syndrome/ dyslipidemia studies to identify additional data contained in selected studies or the grey literature. Additionally, reference lists of articles were retrieved, and prior relevant systematic reviews were scanned to determine the additional eligible documents.

### 2.6. Selection of studies

Search results of every database were exported to Zotero version 6.0.36. Then, all references were imported to Covidence website to remove duplicates and screen/select studies.

A selection of the study was conducted in two stages namely title/ abstract screening and full texts screening. In the first stage, two reviewers (L.T.T.L. & D.C.S.) independently conducted the screening process for all titles and abstracts obtained from the literature sources. The purpose was to assess if they met the eligibility criteria. Consequently, all articles that could potentially be relevant were obtained in their entirety for a final selection. In the second stage, we obtained the full texts of all relevant studies. The two reviewers (L.T.T.L. & D.C.S.) independently screened full texts, especially results and methods section of the articles, to select studies that satisfied the eligibility criteria. Reasons for excluding studies included “unavailable full-text”; “wrong outcomes”; “no data in Vietnam”; “wrong study type”; “wrong study design”; “wrong population”.

In any stage, the third investigator (N.L.T.A.) was engaged to resolve any disagreements between the two reviewers

during the screening process through consensus or consultation.

This SR was conducted according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement <sup>9</sup> to describe the flow of the searching and screening process.

### 2.7. Data extraction and management

A data extraction form in Excel spreadsheet was piloted by two reviewers (L.T.T.L. & D.C.S.) before applying to all selected studies. If any disagreement between the two reviewers is happened, the third investigator (N.L.T.A.) will engage to resolve these disagreements through consensus or consultation.

The data extraction form consists of:

- (1) General information: study title, authors list, publication year, journal, DOI (if any), study start year – end year, type of research, research location, study objectives
- (2) Subject characteristics: gender, age range, ethnicity, sample size, number of participants, sampling technique, selection criteria, special disease.
- (3) Method: Blood tests examination, method to measure blood tests, criteria to assess dyslipidemia (if any).
- (4) Outcome: the prevalence of dyslipidemia (increased TC, TG, LDL-C, and decreased HDL-C) in total and the mean/ median value of at least one of four indicators (TC, TG, LDL-C, and HDL-C).

After piloting, the extraction was completed by six reviewers (L.T.T.L., D.K.A., N.V.T., D.T.A., N.H.D. & T.L.T.). Finally, primary researcher (L.T.T.L.) double-checked the obtained data by comparing data with the full texts.

### 2.8. Quality assessment of included studies

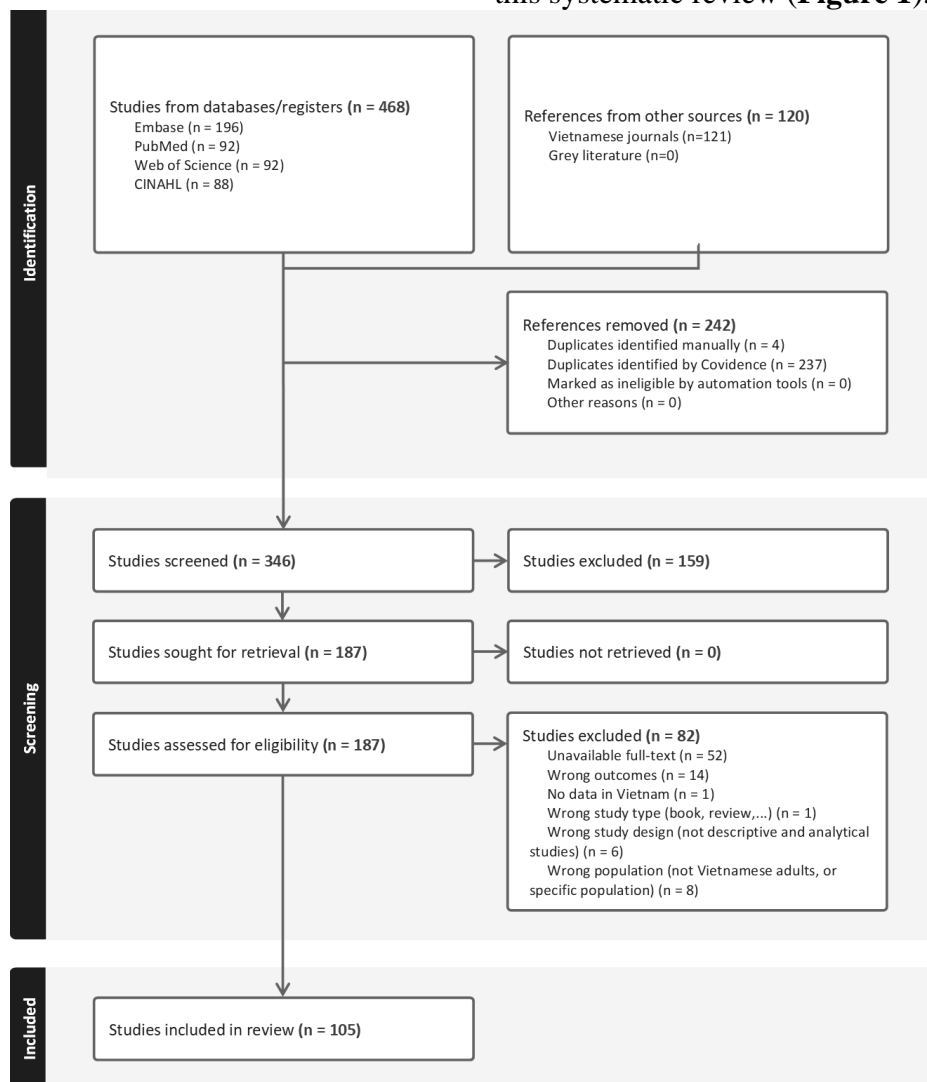
In this study, six reviewers (L.T.T.L., D.K.A., N.V.T., D.T.A., N.H.D. & T.L.T.) independently assessed the quality in included studies using the Newcastle-Ottawa Quality Assessment tool as recommended by the Cochrane Handbook.<sup>10,11</sup> Assessment scores range from 0 to 9, where a score of 9 indicates the highest quality, 0 represents the lowest quality. The overall rating, based on the quality scores for each potential bias is categorized into three levels: good (7-9 points), fair (4-6 points), and weak (0-3 points).

**2.9. Funding**

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**III. RESULTS**

Of 588 records identified from databases and other sources, 346 remained after elimination of duplicates. After screening titles and abstracts, we found 159 records to be irrelevant and excluded them. We assessed full texts of the remaining 187 papers for eligibility, of which 82 were excluded. Finally, 105 studies included in this systematic review (**Figure 1**).



**Figure 1. PRISMA diagram for study selection**

**Table 1** describes the characteristics of included studies. During the period of 2010 - 2023, the last 3 years published the most articles: 2021 (14.3%), 2022 (16.2%), and 2023 (13.3%). Among 105 studies, the majority of them conducted in Red River Delta (32.4%) and Southeast (30.5%). Most

studies were cross-sectional (91.4%) with primary data (86.7%). The sampling method of selected studies was mainly probability (37.1%). Nearly 70% of studies were hospital based. Regarding the characteristics of selected studies' subjects, type 2 diabetes (19%) is the most common comorbidity.

**Table 1. Characteristics of included studies (n=105)**

Characteristic	Number of articles	Percentage (%)	
<b>Publishing year</b>	2023	14	13.3
	2022	17	16.2
	2021	15	14.3
	2019 – 2020	10	9.5
	2017 – 2018	10	9.5
	2015 – 2016	10	9.5
	2013 - 2014	10	9.5
	2011 - 2012	12	11.5
	2010	7	6.7
<b>Region</b>	Red River Delta	34	32.4
	Southeast	32	30.5
	North Central Coast	14	13.3
	Mekong River Delta	13	12.4
	Other regions	12	11.4
<b>Study design</b>	Cross-sectional analytic study	96	91.4
	Cohort study	3	2.9
	Case-control study	4	3.8
	Longitudinal/time-series	2	1.9
<b>Type of data</b>	Primary data	91	86.7
	Secondary data	14	13.3
<b>Sampling method</b>	Probability	39	37.1
	Non-probability	29	27.6
	Unknown	37	35.3
<b>Setting</b>	Hospital based	72	68.6
	Population based	33	31.4
<b>Comorbidities of study subjects</b>	Undefined	53	50.5
	Hypertension	6	5.7
	Prehypertension	1	1.0
	Type 2 diabetes mellitus	20	19.0
	Pre-diabetes	1	1.0
	Stroke	7	6.7
	Type 2 diabetes mellitus & hypertension	5	4.8
	Ischemic heart disease (IHD)	1	1.0
	Coronary artery disease (CAD)	4	3.8
	Coronary heart disease (CHD)	3	2.9
	Acute coronary syndrome (ACS)	3	2.9
	Metabolic syndrome	1	1.0

**Table 2** shows the mean and median value of blood lipid profiles reported in included studies. The mean value of TC, TG, HDL-C, and LDL-C of reported data was ranged from 3.38 to 6.79, 1.06 to 4.96, 0.96 to 1.96, and 2.00 to 4.36 mmol/l, respectively.

**Table 2. The mean/ median values of blood lipid indicators of included studies (n=105)**

	Number of articles <sup>(1)</sup>	Mean (SD)	Min - Max	Number of articles <sup>(2)</sup>	Median (95% CI)
TC (mmol/l)	54	5.04 (1.33)	3.38 – 6.79	8	4.02 (3.27 - 5.22)
TG (mmol/l)	50	2.36 (1.60)	1.06 – 4.96	11	1.41 (0.96 - 2.19)
HDL-C (mmol/l)	52	1.26 (0.38)	0.96 – 1.96	9	1.43 (1.00 - 2.27)
LDL-C (mmol/l)	45	3.01 (0.95)	2.00 – 4.36	7	2.98 (1.89 - 5.13)

(1) Number of articles reporting mean values of the respective indicators

(2) Number of articles reporting median values of the respective indicators

**Table 3** shows cutoff points of detecting dyslipidemia in included studies. The most used cutoff points for TC, TG, and LDL-C were 5.2 mmol/l (30.5%), 1.7 mmol/l (29.5%), and 3.4 mmol/l (17.1%), respectively. Regarding to HDL-C, most studies identified the abnormalities with the cutoff point of 1.03 mmol/l in men and 1.29 mmol/l in women (18.1%).

**Table 3. The cutoff points of detecting abnormalities in blood lipid profiles of included studies (n=105)**

Indicator	Range	Number of studies	Percentage (%)
<b>TC</b>			
Cutoff one	≥ 5.0 mmol/L (193 mg/dl)	2	1.9
Cutoff two	≥ 5.2 mmol/l (200 mg/dL)	32	30.5
Cutoff three	≥ 6.2 mmol/L (240 mg/dL)	8	7.6
	Undefined	63	60.0
<b>TG</b>			
Cutoff one	≥ 1,5 mmol/L (130 mg/dL)	1	1.0
Cutoff two	≥ 1,7 mmol/L (150 mg/dL)	31	29.5
Cutoff three	≥ 1,9 mmol/l (168 mg/dL)	2	1.9
Cutoff four	≥ 2,2 mmol/l (195 mg/dL)	5	4.8
Cutoff five	≥ 2,26 mmol/L (200 mg/dL)	7	6.7
Cutoff six	≥ 2,9 mmol/l (259 mg/dl)	1	10
	Undefined	59	56.2
<b>HDL-C</b>			
Cutoff one	≤ 0,9 mmol/L (35 mg/dl)	9	8.6
Cutoff two	≤ 1,03 mmol/L (40mg/dL)	16	15.2
Cutoff three	≤1.03 mmol/l (40 mg/dL) in men and ≤1.29 mmol/l (50 mg/dL) in women	19	18.1
Cutoff four	≤ 0,9 mmol/l (35 mg/dl) in men and ≤1,16 mmol/l (45 mg/dl) in women	3	2.9
	Undefined	59	56.2



Indicator	Range	Number of studies	Percentage (%)
<b>LDL-C</b>			
Cutoff one	≥ 2,58 mmol/l (100 mg/dL)	4	3.8
Cutoff two	≥ 3,2 mmol/L (124 mg/dL)	1	1.0
Cutoff three	≥ 3,3 mmol/L (128 mg/dL)	2	19
Cutoff four	≥ 3,4mmol/L (130mg/dL)	18	17.1
Cutoff five	≥ 4.1 mmol/L (160 mg/dL)	5	4.8
Cutoff six	≥ 4,9 mmol/L (190 mg/dL)	3	2.9
	Undefined	73	69.5

**Table 4** shows the prevalence of abnormal blood lipid profiles in included articles. Most (21/49 articles) reported the prevalence of dyslipidemia as more than 75%. The mean prevalence of dyslipidemia of included articles was 67.6%. The rates of increased TC, TG, and LDL-C were mainly in the range of 25 to less than 50 %, while that of decreased HDL-C was mainly less than 25%. Among the articles reported data, the average prevalence of dyslipidemia, increased TC, increased TG, decreased HDL-C, and increased LDL-C was 67.6%, 37.1%, 43.0%, 32.9%, and 32.1%, respectively.

**Table 4. The prevalence of abnormal blood lipid profiles in included studies (n=105)**

The prevalence	Number of articles	Percentage (%)	
Dyslipidemia <sup>(1)</sup>	> 75%	21	42.9
	50 - 75%	19	38.8
	25 - <50 %	8	16.3
	< 25%	1	2.0
	Total	49	100
	Mean (%)	67.6	
	Min – Max (%)	12.2 - 100	
Increased TC	> 75%	0	0
	50 - 75%	8	17.4
	25 - <50 %	29	63.0
	< 25%	9	19.6
	Total	46	100
	Mean (%)	37.1	
	Min – Max (%)	3.0 - 65.9	
Increased TG	> 75%	2	3.5
	50 - 75%	18	31.6
	25 - <50 %	29	50.9
	< 25%	8	14.0
	Total	57	100
	Mean (%)	43.0	
	Min – Max (%)	1.3 – 87.0	

The prevalence	Number of articles	Percentage (%)	
Decreased HDL-C	> 75%	1	2.0
	50 - 75%	9	18.4
	25 - <50 %	18	36.7
	< 25%	21	42.9
	Total	49	100
	Mean (%)	32.9	
	Min – Max (%)	0 – 79.7	
Increased LDL-C	> 75%	0	0
	50 - 75%	8	18.2
	25 - <50 %	23	52.3
	< 25%	13	29.6
	Total	44	100
	Mean (%)	32.1	
	Min – Max (%)	0.29 – 67.6	

(1) *Dyslipidemia refers to at least one abnormal blood lipid (increased TC, TG, LDL-C, decreased HDL-C)*

#### IV. DISCUSSION

To the best of our knowledge, this systematic review has been one of the first highlighting blood lipid profiles as well as the prevalence of dyslipidemia in Vietnamese adults. This study has provided the most accurate and up-to-date evidence on blood lipid profiles of adults in Vietnam, thereby helping doctors, clinicians and managers determine the right direction of intervention and solutions, contributing to improving Vietnamese people's health.

Most articles reported the quite high prevalence of dyslipidemia among Vietnamese population. The mean prevalence of dyslipidemia of included articles in this systematic review was higher than that in a systematic review in China by Huang et al. (2014).<sup>12</sup> Similarly, our finding was larger than the overall pooled prevalence of dyslipidemia in Africa, according to a systematic review and meta-analysis by Obsa et al. (2022).<sup>13</sup> Typically, abnormal levels of blood lipid profiles indicate significant health issues among individuals of Vietnamese

descent. Dyslipidemia is one of the major risk factors of CVD,<sup>14</sup> so our report also partly shows the increased risk of cardiovascular problems in Vietnamese people. In addition, dyslipidemia is recognized as common among diabetes people.<sup>15</sup> Therefore, detecting and treating dyslipidemia contributes to preventing diabetes as well as cardiovascular problems in Vietnamese adults.

Regarding to strengths, this study used both international and Vietnamese medical databases to access as many reports as possible on blood lipid profiles of Vietnamese adults. The review also showed how the criteria for determining dyslipidemia are currently used in Vietnam. However, some limitations have been observed. Because our resources have been restricted and primary authors have not been contacted, we cannot access enough the full texts of all relevant articles, so there has been some lack of presenting data at some levels. Moreover, the data quality of each article is difficult to fully verify. Finally, our research has not



fully considered related factors to dyslipidemia. Therefore, further performance of a meta-analysis is necessary to better explore the factors related to abnormalities in blood lipid profiles of adults in Vietnam.

## V. CONCLUSION

Dyslipidemia is relatively common among adults in Vietnam. It is imperative to prioritize the identification and management of lipid abnormalities in order to prevent potential severe health problems in the future.

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