

Systematic Literature Review for Evaluating the Effectiveness of Dyslipidemia Examination*

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ABSTRACT

The purpose of this study is to identify the potential for prevention of cardiovascular diseases when examinations of dyslipidemia are conducted for high-risk groups of cardiovascular diseases. A systematic literature review was carried out in accordance with the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analysis) Group's systematic literature review reporting guidelines, and the search keyword was set to this : dyslipidemia and screening and high and risk and group and prevention and (CHD OR CAD OR CVD OR cardio heart disease OR coronary artery disease OR cardio vascular disease) As a result of the review, patients with diabetes and abnormal cholesterol levels were selected as high-risk groups, and the results of the examination of dyslipidemia in high-risk groups could reduce the possibility of cardiovascular disease. Hence, it is also believed that examination should be conducted in consideration of high-risk groups, and it is suggested that the cost effect of dyslipidemia examination for high-risk groups of cardiovascular diseases will continue.

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1. Introduction

Cardiovascular disease is the most common cause of death worldwide, with statistics showing an upward trend, rising from 50.2 per 100,000 people in 2013 to 62.4 in 2018. (Statistics Korea, 2018) According to this report, cardiovascular disease is likely to have a continuous increase in mortality rates, and there is a need to manage risk factors related to cardiovascular disease.

Dyslipidemia is a major risk factor for cardiovascular disease along with high blood pressure, diabetes and obesity (Pignone et al. 2001). Currently, Korea's high-risk classification of dyslipidemia is considered a risk factor for age (Male \geq age 45, Female \geq age 55), early coronary artery disease, family history of early onset, high blood pressure, smoking, and low HDL cholesterol (The Korean Society of Lipid and Atherosclerosis, 2018).

Currently, the national health examination for dyslipidemia, which measures total cholesterol (TC), total cholesterol, HDL (HDL) and triglyceride (TG) through blood tests, is more than 240 mg/dl (high), 200-239 mg/d (highly high), 200 mg/d (high) and 500 mg/d (high, trigly) (The Korean Society of Lipid and Atherosclerosis, 2018).

Dyslipidemia can be prevented from cardiovascular disease by improving the lipid concentration in the blood. (Han. et al, 2012). Early examination of dyslipidemia is cost effective, such as a 39 mg/dl reduction in LDL-C (Trials et al., 2010) resulting in a decrease in mortality from cardiovascular diseases. Thus, the treatment and management of dyslipidemia is one of the most important projects in improving national health.

Recently, Korea's dyslipidemia examination has been changed from two to four years for men and 40 years for women, according to the results of the "cost-effect analysis report for abnormal lipid examination among national health examinations." (Ministry of Health and Welfare, 2018). However, it is controversial that the analysis does not consider the criteria for determining neutral, low-density lipoprotein (LDL) and high-density lipoprotein (HDL), and that additional cost-effectiveness analysis is needed considering high-risk groups (carotid, peripheral vascular disease, abdominal and diabetes).

As we looked at, in the United States, the validity of the examination of dyslipidemia is recognized when it is targeted at high-risk groups of coronary artery disease (Pignone et al., 2001). Early examinations of dyslipidemia can also be effectively diagnosed in groups with risk factors, and in men, smoking, drinking, body mass index, and diabetes are age, menopause, body mass index, and high blood pressure, which can reduce the prevalence of dyslipidemia (Han et al., 2012).

Accordingly, the current study conducted a systematic literature review to determine the potential for preventing cardiovascular diseases when examining for dyslipidemia in high-risk groups of cardiovascular diseases.

2. Method of Study

2.1 Study Design

We conduct a review of the systematic literature in accordance with the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analysis) group's systematic literature reporting guidelines to assess whether the incidence of CHD, CVD, and CAD disease is reduced in screening for dyslipidemia (Moher et al., 2009).

2.2 Research Strategies for Literature

A literature research strategy that is consistent with the research objective is to refine the key research question into a patient-intervention-comparator-outcome (PICO) and select search terms based on it. First, the target patient (P) is a CHD CVD CAD generation high-risk group. Interventional procedures (I) are for dyslipidemia examinations, and comparative procedures (C) are for groups that have not examined or treated for dyslipidemia, and studies (O) are for CHD, CVD, and CAD. The literature research strategy used comprehensive search keywords to increase the sensitivity of the search.

2.3 Literature Search and Selection Process

Literature searches were conducted with foreign databases, and databases were selected according to the characteristics of the research topics. The database used PubMed and the date of the literature search was 6 January 2020. The selection of the literature was conducted independently by two researchers, and the title and the abstract of the paper were checked to select the first, and if the two researchers differed, the full text was secured and the second was selected. Dyslipidemia and screening and high and risk and group and prevention and (CHD OR CAD OR CVD OR cardio heart disease OR coronary artery disease OR cardio vascular disease) is the keyword of the search.

The inclusion and exclusion criteria in the literature were observations or RCT studies of CHD, CAD, CVD incidence risk factors, including dyslipidemia, identifying or identifying the resulting occurrence of CHD, CAD, CVD occurrence risk factors. If only abstract of the paper was published or there was no comparison group, it was excluded from the optional literature, and if the family history was included as a risk factor, it was excluded because it was determined that the occurrence of cardiovascular disease could not be reduced even if dyslipidemia was examined in terms of genetics. Out of a total of 339 studies in the retrieved literature, the results of the review excluded six studies that only target specific groups (Benson et al., 2016; Welch et al., 2017) or do not include dyslipidemia as the main content. Finally, two literature were included in the assessment Figure 1.

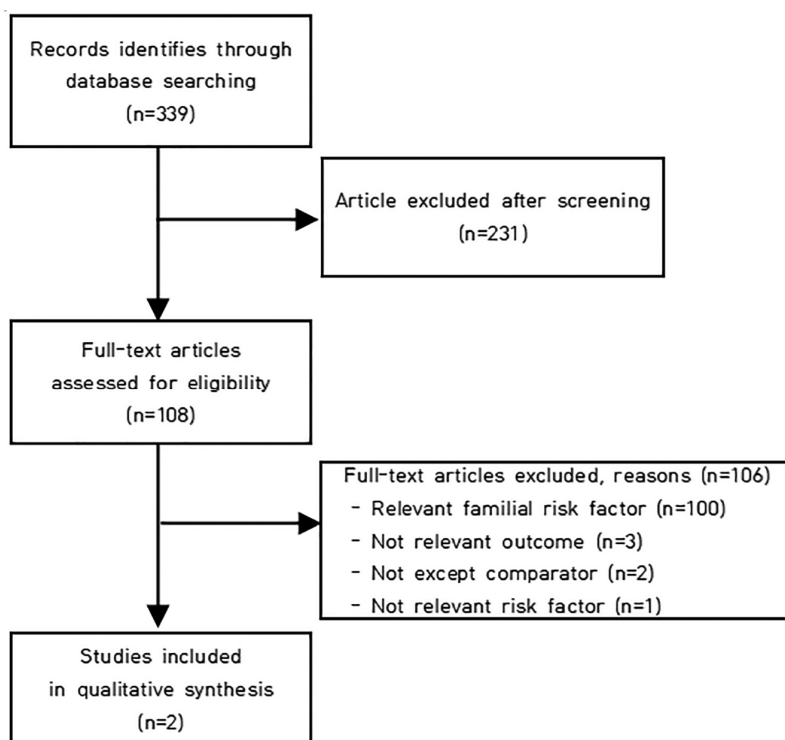


Fig. 1. Flowchart of literature selection process of studies examining the effectiveness of screening dyslipidemia on CHD CVD CAD high risk group

2.4 Evaluation of the Quality of Literature

The quality assessment of the final selected literature was independently conducted by two researchers using a methodological checklist from the Scottish Intercollegiate Guidelines Network (SIGN). The SIGN criteria provide the level of evidence in the literature considering the research design and the potential for bias (Table 1). Among the basis-level criteria, research design is a particularly important factor, and RCT(randomized controlled trial) generally provides a stronger basis than observational studies. (Kim et al., 2011). The final two studies selected for the evaluation of the effects of dyslipidemia examinations were RCT, cohort study. The quality of the RCT study, which defined high-risk groups for CHD disease groups, was rated '1+' (RCTs with low risk of biases) and the quality of the cohort study, which studied high-risk group definitions and disease prevention, was evaluated as '2++' (high quality systematic reviews of case-control or cohort or studies). Based on these results, the recommended rating for the examination of dyslipidemia was evaluated according to the SIGN criteria (Table 2) (Harbour & Miller, 2001).

Table 1. Scottish Intercollegiate Guideline Network criteria for assignment of levels of evidence (Benson et al., 2016).

Level	Description
1++	High quality meta-analyses, systematic reviews of RCTs, or RCT with a very low risk of bias
1+	Well-conducted meta-analyses, systematic reviews, or RCTs with a low risk of bias
1-	Meta-analyses, systematic reviews, or RCTs with a high risk of bias
2++	High quality systematic reviews of case-control or cohort or studies high quality case-control or cohort studies with very low risk of confounding or bias and high probability that the relationship is causal
2+	Well-conducted case-control or cohort studies with a low risk of confounding or bias and a moderate probability that the relationship is causal
2-	Case-control or cohort studies with a high risk of confounding or bias and a significant risk that the relationship is not causal
3	Non-analytic studies, e.g., case reports, case series
4	Expert opinion

RCT, randomized controlled trial.

Table 2. Scottish Intercollegiate Guideline Network criteria for assignment of levels of grades of recommendation (Welch et al., 2017)

Levels	Description
A	At least one meta-analysis, systematic review, or randomized controlled trial rated as 1++, and directly applicable to the target population; or a body of evidence consisting principally of studies rated as 1+, directly applicable to the target population, and demonstrating overall consistency of results
B	A body of evidence including studies rated as 2++, directly applicable to the target population, and demonstrating overall consistency of results; or extrapolated evidence from studies rated as 1++ or 1+
C	A body of evidence including studies rated as 2+, directly applicable to the target population and demonstrating overall consistency of results; or extrapolated evidence from studies rated as 2++
D	Evidence level 3 or 4; or extrapolated evidence from studies rated as 2+

2.5 Data Extraction

After reviewing the literature selected for evaluation, data on the characteristics of the study subjects and the final results were extracted.

3. Study Outcome

3.1 Characteristics of Selected Studies

A total of two literatures were selected to check if the possibility of cardiovascular disease can be reduced when examining for dyslipidemia for high-risk groups of cardiovascular diseases.

In both studies, the examination was for diabette cellitus in patients with dyslipidemia. Furthermore, these studies conducted a minimum of one year of examinations for the experimental group, and cohort studies reported therapy through mobile phone applications and biometric indicators on a day-to-day basis, while clinical experimental studies provided treatment based on the Chronic Care Model (CCM). In addition, the examination was regularly evaluated every three months. Both studies did not perform examination on comparators or only treatments for routine dietary control were taken (Table 3).

Table 3. Study characteristics of included studies examining the effectiveness of screening with dyslipidemia patient (Gitt et al., 2016)

Author (year)	Study design	Location	High risk	Outcome	Level of evidence
Ruescas-Escolano (2014)	RCT	Spain	Diabete Mellitus	Derease CHD, CVD risk	1+
Bhanpuri NH (2018)	Cohort	USA	Type 2 Diabetes	Decrease CVD risk	2++

3.2 Risk Factors

The assessment of risk factors for cardiovascular diseases was based on the risk factors described in the two studies.

In Cohort study (Bhanpuri et al., 2018). In the United States, 44% of patients with diabetes have died from cardiovascular disease (CVD). The risk of cardiovascular disease is 2 to 4 times higher for diabetics, and one of the risk factors for cardiovascular disease is called dyslipidemia, which is being examined for high probability in diabetics. Accordingly, it is judged that adjusting the LDL-C and HDL-C levels reduces the risk of cardiovascular disease. Diabetes and dyslipidemia (LDL-C and HDL-C levels) were selected as factors for cardiovascular disease.

RCT studies (Ruescas-Escolano et al., 2014) show that cardiovascular disease is one of the major causes of chronic disease (37.1%) in Spain and is the number one cause of death. In the course of the study, 145 interfering groups and 1,461 control groups were recruited with a high risk of developing cardiovascular and congenital heart disease (CHD), and the possibility of developing cardiovascular and congenital heart disease was defined as having dyslipidemia, diabetes, and arterial hypertension. Patients with these characteristics were screened to manage diabetes, dyslipidemia (LDL-C), and high blood pressure to reduce the risk of cardiovascular and congenital heart disease (Table 4).

Table 4. Summary of high risk group in the studies examining the effectiveness of screening on high-risk group patients (Kotseva et al., 2012)

Author (year)	Intervention (no. of patients)	Comparator (no. of patients)	CVD CAD CHD High risk group
Ruescas-Escolano (2014)	Intervention group (145)	Control group (1,461)	Diabetes mellitus, dyslipidemia (LDL-C) smoking, SBP
Bhanpuri NH (2018)	CCI group (262)	UC group (87)	Diabetes mellitus, dyslipidemia (LDL-C, HDL-C)

3.3 Risk Factors Management

The effectiveness of CHD CVD CAD in screening for dyslipidemia for high-risk groups of cardiovascular diseases was evaluated based on the prevention ratio presented in the random clinical trial study and based on clinical comparisons between continuous control groups and non-critical groups.

In cohort studies, continuous care intervention (CCI), i.e. changes in numbers were identified by ongoing care. Continuous care was provided through applications on mobile phones, and through the application figures, experts conducted care via nutritional (calorie-limited) prescription or medication (ACE, ARB, statin). The continuous care group had a LDL-C level of 113 ±3 before the start, but the number was reduced to 111 ±3 and the usual care group (UC) only reduced the error range from 90 ± 5 to 90 ±4. The study determined that the higher the LDL-C level, the higher the risk of cardiovascular disease. That is, the decrease in the likelihood of disease occurring in the high-risk group was reasonable as a result of the decrease in the number.

In the RCT study, the Intervention group was given treatment training to patients, and a examination was conducted to provide Mediterranean diet, drug use (ACE inhibitors, ARA, Statins), and care of smoking, LDL-C, and diabetes. As a result, the intervention group had a 15.7x lower smoking rate (aRR 15.7, CI: 4.20 - 58.70 and P<0.001) compared to the control group, LDL-C < 100 mg/dL was 2.98x higher (aRR: 2.98, 95% CI: 1.48 - 6.02, P<0.002). Also, systolic blood pressure (SBP)<140mmHg Intervention group was 1.97x (aRR : 1.97, 95% CI : 1.21 - 3.23, P<0.007) higher than control group. The study indicates that smoking, LDL-C, and improvements in SBP can reduce the possibility of CHD and CVD pathogenesis (Table 5).

Table 5. Summary of results in the studies examining the effectiveness of screening on high-risk group patients

Author (year)	Intervention (no. of patients)	Comparator (no. of patients)	Used Drug	Interval change	
				Intervention	Comparator
Ruescas-Escolano (2014)	Intervention group (145)	Control group (1,461)	ACE inhibitor ARA Statins	LDL C Decrease (aRR : 2.98, 95% CI :1.48 - 6.02, P<0.002) Smoking rate Decrease (aRR 15.7, CI : 4.20 - 58.70, P<0.001) SBP Decrease (aRR : 1.97, 95% CI : 1.21 - 3.23, P<0.007)	
Bhanpuri NH (2018)	CCI* group (262)	Usual care group (87)	ACE ARB Statins	LDL C (1yr before → after) 113±3→ 111±3	90±5 → 90±4

*CCI: Charlson Comorbidity Index

4. Conclusion and Implication

In this study, a systematic literature review was conducted to identify the potential for prevention of cardiovascular diseases when screening for dyslipidemia was conducted for high-risk groups of cardiovascular diseases. Because the study was not conducted through accurate clinical information of patients, there is a disadvantage of having limitations on the ambiguity of side effects or numerical measurement criteria, and there is a limitation that only two literatures were finally selected. However, Systematic literature review has the advantage of reviewing the entire literature related to the examination of cardiovascular diseases and dyslipidemia to ensure that the results of the primary studies are consistent with each other.

Finally, after conducting the systematic literature review, the number of literature included in this study was two. First of all, in both studies, the common risk factors for cardiovascular diseases were those with diabetes and those with abnormal cholesterol levels (LDL-C, HDL-C) as high-risk groups. On the other hand, high-pressure patients and smokers were selected as high-risk groups, in addition to diabetes and cholesterol levels among the high-risk groups selected in the study. Other prior studies also define high-risk groups of cardiovascular diseases as carotid, peripheral vascular diseases, and obesity.(The Korean Society of Lipid and Atherosclerosis, 2018) Therefore, diabetes, cholesterol levels (LDL-C, HDL-C) anomalies, high blood pressure, smokers, carotid diseases, peripheral vascular diseases, obesity, and dyslipidemia can be defined as high-risk groups of cardiovascular diseases.

Both studies, which were confirmed through systematic literature review, were divided into treatment group and non-treatment group for patients in high-risk group, and there was a statistically significant difference between treatment group and non-treatment group. The decrease in probability of occurrence in high-risk groups was reasonable as a result of the decrease in the number. The RCT study (Ruescas-Escolano et al., 2014) provided treatment training to the intervention group, which shows that improvements of smoking and LDL-C and SBP can reduce the likelihood of CHD and CVD pathogenesis. Accordingly, the recommendation rating for the current research topic was rated the highest, which means that the treatment is applicable to representative population groups (Table 2) (Harbour & Miller, 2001).

In this study, when the examination of dyslipidemia was conducted on the high-risk group of cardiovascular diseases, it was evaluated that the prevention potential of cardiovascular diseases could be reduced. However, Korea is not considering high-risk groups of cardiovascular diseases (carotid artery disease, peripheral vascular disease, abdominal aneurysm, and diabetes) when examining dyslipidemia. Since the examination of high-risk groups has concluded that cardiovascular diseases are less likely to occur, it is suggested that Korea should also conduct a screening considering high-risk groups, which should be followed by a cost-effect analysis of dyslipidemia examination for high-risk groups of cardiovascular diseases.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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