

A study to determine the prevalence of oxidised low-density lipoprotein in retinal venous occlusion in a population of West Bengal



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ABSTRACT

Background: Oxidized low-density lipoprotein (ox-LDL) has been implicated in both coronary artery disease and retinal vein occlusion (RVO) because of atherosclerosis. However, there is no study to show the prevalence of ox-LDL in RVO till date. **Aims and Objectives:** This study aimed to find the prevalence of ox-LDL in RVO in a population of West Bengal. **Materials and Methods:** A 2-year prospective cross-sectional study of consecutive, unrelated adult patients, with a diagnosis of RVO, attending the outpatient department in a Medical College, was taken up for study. A pilot study was done to determine the expected prevalence of ox-LDL. Sample size was calculated based on the formula

$$\left[n = \frac{z^2pq}{d^2} \right] (z = 1.96, d = 0.04, p = 0.196, q = 0.804, n = \text{minimum sample size}).$$
 ox-LDL was measured in a total of 512 subjects who were selected based on the inclusion and exclusion criteria. **Results:** In this study, 272 males (aged 50 ± 7.2 years) and 240 females (aged 46 ± 7.7 years) with RVO were screened for ox-LDL. Elevated ox-LDL levels were found in 142 patients out of 512 participants in this study (27.7%). Moreover, 102 cases (19.9%) were found to have both raised LDL and ox-LDL, whereas 40 RVO cases (7.8%) had only elevated ox-LDL among the study participants. 71.8% of 142 RVO cases with elevated ox-LDL levels also had raised LDL levels, whereas remaining 28.2% had normal LDL cholesterol levels. **Conclusion:** It is high time to look beyond the traditional lipid parameters such as ox-LDL cholesterol levels as a risk factor of RVO. This study proved that ox-LDL cholesterol is highly prevalent in RVO cases. Thereby, proper screening of ox-LDL is a must as a tool for risk reduction of RVO cases, especially in a population with normal LDL cholesterol levels.

Key words: Oxidized low-density lipoprotein; Retinal venous occlusion; Prevalence

INTRODUCTION

Retinal venous occlusion (RVO) and diabetic retinopathy were the two most common retinal vascular diseases.¹ Diabetes mellitus, dyslipidaemia, hypertension, hyperhomocysteinemia, and circulating antiphospholipid antibodies contributed to RVO.²⁻⁴

Low-density lipoprotein (LDL) is made up of triglycerides, cholesterol ester, free cholesterol, phospholipids, and

apolipoprotein B-100 protein.⁵ LDL particles can be oxidized by free radicals to form oxidized LDL (ox-LDL) which are unable to bind with the LDL-receptors present in liver, adrenal cortex, etc.⁶ Hence, macrophages will engulf ox-LDL and thereby converting themselves to form foam cells that generate arterial wall inflammation leading to atherosclerosis.⁷

The oxidized LDL-induced atherosclerosis may be responsible for the RVO in the absence of other risk

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factors, as has been proved by our previous study.⁸ Still, there was not enough study to show the exact prevalence of ox-LDL in RVO in any Indian population.

Aims and objectives

This study aimed to find the prevalence of ox-LDL in RVO in a population of West Bengal.

MATERIALS AND METHODS

A 2-year prospective cross-sectional study of consecutive, unrelated adult patients, with a diagnosis of RVO, attending the outpatient department in a Medical College, was taken up for study. A pilot study was done to determine the expected prevalence of ox-LDL. Sample size was calculated based on the formula $\left[n = \frac{z^2 pq}{d^2} \right]$ ($z=1.96$, $d=0.04$, $p=0.196$, $q=0.804$, n =minimum sample size).

The institutional ethics committee ([EC/2014-15/VOL-1] dated on January 03, 2015) approved the study, and informed consent was obtained from all the study populations, in accordance with the Declaration of Helsinki. Family history, social status, and dietary habits, including other habits such as smoking, alcohol intake, history of systemic diseases, other ocular diseases, and drug history were completed by all the study subjects. Patients with liver disorders, congestive cardiac failure, pregnancy, malignancy, renal disorders, and oral contraceptive pills and thyroid dysfunctions were excluded from the study. Patients with known dyslipidemia with or without treatment were also excluded from the study. Ophthalmic examinations of eyes, including visual acuity, relative afferent pupillary defect, electroretinogram, and fundus examination, were used for the clinical diagnosis of RVO. A total of 512 subjects were selected in the study based on the inclusion and exclusion criteria.

Biochemical estimations

Measurement of circulating ox-LDL was done by precipitation method.⁹ Total cholesterol (cholesterol oxidase-peroxidase method), triglyceride (glycerophosphate oxidase-peroxidase method), HDL cholesterol (direct method), and LDL cholesterol (direct method) were measured by enzymatic assays.¹⁰⁻¹³ Elevated ox-LDL and

LDL level is considered with the value of ≥ 47.8 mol/L⁸ and 100 mg/dL, respectively.

Statistics

Data were entered into Microsoft excel and presented as tables.

RESULTS

In this study, 272 males (aged 50 ± 7.2 years) and 240 females (aged 46 ± 7.7 years) with RVO were screened for ox-LDL. Elevated ox-LDL levels were found in 142 patients out of 512 participants in this study (27.7%). Moreover 102 cases (19.9%) were found to have both raised LDL and ox-LDL whereas 40 RVO cases (7.8%) had only elevated ox-LDL among the study participants [Table 1]. A total of 142 RVO cases (71.8%) with elevated ox-LDL levels also had raised LDL levels whereas remaining 28.2% had normal LDL cholesterol levels [Table 2].

DISCUSSION

The association between circulating ox-LDL and atherosclerotic cardiovascular disease are well established.¹⁴ Trpkovic et al., have identified the role of ox-LDL as a biomarker of cardiovascular diseases.¹⁵ ox-LDL by virtue of arterial wall inflammation, endothelial injury, expression of adhesion molecules, leukocyte recruitment and retention, as well as thrombus formation,¹⁶⁻¹⁹ are responsible for the atherosclerosis which is also the major risk factor for RVO. A retinal arteriole and its corresponding vein share a common adventitial sheath. Thickening of the arteriole appears to compress the vein. This causes secondary changes; including venous endothelial cell loss, thrombus formation, and potential occlusion.¹ Our previous study has proved that ox-LDL is a risk factor in retinal vascular disease.⁸

There was no study to assess the prevalence of ox-LDL in RVO in any Indian population; hence, our study is the first to find out high prevalence of elevated ox-LDL levels (27.7%) in RVO patients although only 19.9% of RVO cases had both elevated ox-LDL and LDL level but 40 RVO cases

Table 1: The prevalence of ox-LDL among 512 RVO cases

Parameters	Elevated ox-LDL level	Normal ox-LDL level	Elevated ox-LDL level with raised LDL level	Elevated ox-LDL level with normal LDL level
Prevalence	27.7%	72.3%	19.9%	7.8%
Number	142	370	102	40
Gender	74 M 68 F	198 M 172 F	54 M 48 F	20 M 20 F

LDL: Low-density lipoprotein, ox-LDL: Oxidized Low density lipoprotein, M: Male, F: Female, RVO: Retinal venous occlusion

Table 2: The prevalence of raised LDL among 142 RVO cases with elevated ox-LDL

Parameters	Elevated ox-LDL level with raised LDL	Elevated ox-LDL level with normal LDL	
Prevalence	71.8%	28.2%	
Number	102	40	
Gender	54 M	48 F	20 M 20 F

LDL: Low-density lipoprotein, ox-LDL: Oxidized-low density lipoprotein

(7.8%) had only elevated ox-LDL level with normal LDL level among the study participants [Table 1]. A total of 142 RVO cases (71.8%) with elevated ox-LDL levels also had raised LDL, whereas remaining 28.2% had normal LDL level [Table 2]. Hence, screening of traditional LDL cholesterol is not enough to assess the risk of retinal vein occlusion.

Limitations of the study

The causal association of ox-LDL with different RVO etiologies (confounding factors) could not be ascertained hence future study is needed to comment on that.

CONCLUSION

It is high time to look beyond the traditional lipid parameters such as ox-LDL cholesterol levels as a risk factor of RVO. This study proved that ox-LDL cholesterol is highly prevalent in RVO cases. Thereby, proper screening of ox-LDL is a must as a tool for risk reduction of RVO cases, especially in a population with normal LDL cholesterol levels.

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Authors Contribution:

KDL- Definition of intellectual content, Literature survey, Prepared first draft of manuscript, implementation of study protocol, data collection, data analysis, manuscript preparation and submission of article; **KDL, AKG, UKB**- Concept, design, clinical protocol, manuscript preparation, editing, and manuscript revision; **KDL, AKG, UKB**- Design of study, statistical Analysis and Interpretation; **KDL, AKG, UKB**- Review Manuscript; **KDL**- Review Manuscript; **KDL, UKB**- Literature survey and preparation of Figures; **KDL**- Coordination and Manuscript revision.

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