

COMPARISON OF LDL LEVELS: KIT INSERT METHOD VERSUS FRIEDEWALD EQUATION

Madhvi Trivedi¹, Gunjan Kumar Mandal², Arvind Trivedi³

¹Associate Professor, Department of Biochemistry, GS Medical College and Hospital, Hapur, UP, India

²Associate Professor, Department of Biochemistry, Shri Ramkrishna Institute of Medical Sciences and Sanaka Hospital, Durgapur, WB, India

³Principal, Government Medical College, Orai, UP, India

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Corresponding Author:

Dr. Gunjan Kumar Mandal,

Email: gunjangumarmandal@gmail.com

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Abstract

Background: The correct method for estimation of low density lipoprotein cholesterol (LDL) is key for managing patients from cardiovascular events which occur due to high lipid level. LDL is estimated by kit insert method or it is calculated by using Friedewald equation. **Materials and Methods:** Present work was done in the Department of Biochemistry in combination with Medicine Department, GS medical college and Hospital, Hapur, UP, India. The study includes 60 subjects. Among 60 subjects LDL levels were compared between kit insert methods versus Friedewald equation. **Result:** The Kit Insert method produced slightly higher LDL values on average compared to the Friedewald Equation. There is a noticeable variation in values, with a mean difference of approximately 13.75 mg/dL between the two methods. **Conclusion:** Both methods of LDL calculation are widely used, but the choice of method should consider the patient's overall lipid profile and triglyceride levels. For patients with elevated triglycerides, direct measurement (Kit Insert) may be more reliable than the Friedewald estimation.

INTRODUCTION

Low density lipoprotein (LDL) which is historically classified on the basis of hydrated density which is determined by ultracentrifugation.^[1] The serum level of LDL is very important parameter which is used for assessment of cardiovascular risk.^[2] The correct analysis of low density lipoprotein cholesterol (LDL) in blood is extremely essential. Because a randomized trials from large scale evidence found that statin drug treatment decreases the threat of atherosclerotic cardiovascular disease (CVD).^[3] There are various direct estimation methods are available for the determination of LDL.^[4]

A latest method for the calculation of LDL was proposed by William Friedewald in 1972. This method eliminates the requirement of ultracentrifugation and that why it is convenient and cost-effective.^[1] From lipid profile, namely total cholesterol (TC), triglyceride (TG), and high density lipoprotein (HDL), LDL cholesterol values is routinely calculated by using friedewald equation is $LDL = TC - HDL - (TG/5)$ mg/dl.^[5]

Friedewald equation is one of the typically calculated for LDL in general peoples and is quite correct and shows an extremely strong association with homogeneous assay for LDL direct estimation. When triglyceride is less than 4.5 mmol/l, friedewald equation can done for calculation of

LDL, but when triglyceride levels is more than 4.5mmol/l direct kit method should be done for estimation of LDL levels.^[3] At the early childhood, CVD and atherosclerosis may occur, so that why lipid status should pay attention and appreciated.^[6]

Aims & Objectives

1. Assay of LDL levels by kit insert method and Friedewald Equation.
2. The aims of this study are to compare these two methods to understand their reliability and any potential differences in the results.

MATERIALS AND METHODS

The study has been conducted between April 2024 to September 2024.

Study Area: The present study was conducted in the department of Biochemistry in collaboration with department of Medicine, GS medical college and Hospital, Hapur, UP, India.

Study Population: 60 normal subjects were selected randomly.

Informed consent has been taken from the participants in the study.

Ethical Considerations: The proposed study has been approved by Institutional Ethics Committee.

Inclusion Criteria

- Normal subjects above 18 years of age.

Exclusion Criteria

- Any history of liver disease
- Thyroid disease
- Pregnancy

Statistical Analysis: Data obtained was analysed by using SPSS 23 version software. Descriptive statistics such as mean, standard deviation, and range were computed and compare between LDL values from the Kit Insert method and the Friedewald Equation.

RESULTS

From the [Table 1] the mean and standard deviation of LDL levels by kit insert method are 102.18 ± 26.29 mg/dl and by friedewald equation is 88.43 ± 33.58 mg/dl. The minimum LDL levels by kit method is 59.9 mg/dl and by Friedewald Equation is 27.96 mg/dl and maximum LDL levels by kit insert method is 142.7 mg/dl and by Friedewald Equation is 151.12 mg/dl.

The Kit Insert method produced slightly higher LDL values on average compared to the Friedewald Equation. There is a noticeable variation in values, with a mean difference of approximately 13.75 mg/dL between the two methods.



Figure 1: Bar diagram showing comparison between LDL values from the Kit Insert method and the Friedewald Equation.

Table 1: Comparison between LDL values from the Kit Insert method and the Friedewald Equation.

LDL	Kit Insert Method	Friedewald Equation
Mean (mg/dl)	102.18	88.43
SD (mg/dl)	26.29	33.58
Minimum (mg/dl)	59.9	27.96
Maximum (mg/dl)	142.7	151.12

DISCUSSION

The results indicate a significant difference between the two methods of calculating LDL. The Kit Insert method tends to give slightly higher values than the Friedewald Equation. This could be due to the fact that the Friedewald Equation is an indirect estimation, and its accuracy may decrease in certain cases (e.g., patients with very high triglycerides). It is also worth noting that Friedewald's method is not applicable when triglyceride levels exceed 400 mg/dL, which could explain the discrepancies observed at higher values in our dataset.

It is proved that correct analysis of LDL is essential in ensuring right assessment of dyslipidemia patients and CVD risk, targeted at decreasing their LDL level.^[7]

From long periods of time calculation of LDL levels was done by Friedewald formula by taking fixed ratio of triglyceride: cholesterol, without taking chylomicrons which have more triglyceride than VLDL. This is not likely to be correct in clinical practice, because patients are not fasted every day. So Friedewald formula is possible to miscalculate LDL and VLDL in hypertriglyceridemia states and thus it has been shown to be increasingly incorrect at triglyceride levels between 2.3 to 4.5mmol/L.^[8]

CONCLUSION

In clinical practice, both methods of LDL calculation are widely used, but the choice of method should consider the patient's overall lipid

profile and triglyceride levels. For patients with elevated triglycerides, direct measurement (Kit Insert) may be more reliable than the Friedewald estimation. Further research could involve larger datasets and explore the potential clinical impact of choosing one method over the other.

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