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Plasma Low-Density Lipoprotein Cholesterol Estimated by Friedewald Compared to Martin-Hopkins Equation in Nigerian Population

Cholestérol des lipoprotéines de basse densité plasmatique estimé par Friedewald par rapport à l'équation Martin-Hopkins dans la population Nigériane

B. E. Orimadegun*†, F. Ogah‡, O. B. Oyedele‡, O. O. Daodu‡

ABSTRACT

BACKGROUND: Friedewald equation for estimation of plasma low-density lipoprotein cholesterol (LDL-C) has recently been the subject of controversies. We investigated the agreement between LDL-C calculated with the Friedewald equation (LDL-C_F) and novel Martin-Hopkins formula (LDL-C_{MH}), and the influence of sex, age, and triglyceride stratification on the level of biases.

METHODS: We used convenience sample of data from records of 7151 adults who underwent test for plasma lipid profile from 2014 to 2017 at a tertiary Hospital in Nigeria. During the period automated standard enzymatic methods were used for determination of plasma lipids. The Bland-Altman plot was used to evaluate the agreement between the two equations.

RESULTS: Participants were 2953 males and 4198 females. The age of the subjects ranged from 21 to 91 years with overall mean age of 54.2±12.1 years. The discrepancy between LDL-C_{MH} and LDL-C_F ranged from -0.05 to 0.93 mmol/L (median = 0.16) with a mean value of 0.172 ± 0.094 mmol/L. The Bland-Altman analysis showed an estimated bias of 6.38% (95% CI = -5.02, 20.0). The bias in males and females was 8.3% (95% CI = -5.6, 22.2) and 6.9% (95% CI = -4.4, 18.3), respectively. At an average LDL-C less than 1.81 mmol/L, estimated bias became increased to 16.6% (95% CI = -6.1, 39.2). The calculated LDL-C_{MH} were significantly higher than LDL-C_F irrespective of the level of triglyceride.

CONCLUSION: Although both showed excellent reliability, the Friedewald equation resulted in a clinically lower LDL-C than the Martin-Hopkins formula. It may be necessary to pay attention to biological sex differences. *WAJM 2021; 38(3): 255–261.*

Keywords: Martin-Hopkins formula, Low-density lipoprotein, Friedewald equation, Bland-Altman.

ABSTRAIT

CONTEXTE: L'équation de Friedewald pour l'estimation du cholestérol plasmatique des lipoprotéines de basse densité (LDL-C) a récemment fait l'objet de controverses. Nous avons étudié l'accord entre le LDL-C calculé avec l'équation de Friedewald (LDL-C_F) et la nouvelle formule de Martin-Hopkins (LDL-C_{MH}), et l'influence du sexe, de l'âge et de la stratification des triglycérides.

MÉTHODES: Nous avons utilisé un échantillon de commodité de données provenant d'enregistrements de 8926 adultes qui ont subi un test de profil lipidique plasmatique de 2014 à 2017 dans un hôpital tertiaire au Nigeria. Au cours de la période, des méthodes enzymatiques standard automatisées ont été utilisées pour la détermination des lipides plasmatiques. Le graphique de Bland-Altman a été utilisé pour évaluer la concordance entre les deux équations.

RÉSULTATS: Les participants étaient 2953 hommes et 4198 femmes. L'âge des sujets variait de 21 à 91 ans avec un âge moyen global de 54,2 ± 12,1 ans. L'écart entre le LDL-C_{MH} et le LDL-C_F variait de -0,05 à 0,93 mmol / L (médiane = 0,16) avec une valeur moyenne de 0,172 ± 0,094 mmol / L. L'analyse de Bland-Altman a montré un biais estimé de 6,38% (IC à 95% = -5,02, 20,0). Le biais chez les hommes et les femmes était de 8,3% (IC à 95% = -5,6, 22,2) et 6,9% (IC à 95% = -4,4, 18,3), respectivement. À un LDL-C moyen inférieur à 1,81 mmol / L, le biais estimé est passé à 16,6% (IC à 95% = -6,1, 39,2). Le LDL-C_{MH} calculé était significativement plus élevé que le LDL-C_F quel que soit le niveau de triglycéride.

CONCLUSION: Bien que les deux aient montré une excellente fiabilité, l'équation de Friedewald a abouti à un LDL-C inférieur cliniquement inacceptable que la formule de Martin-Hopkins. Il peut être nécessaire de prêter attention aux différences biologiques entre les sexes. *WAJM 2021; 38(3): 255–261.*

Mots clés: Formule de Martin-Hopkins, lipoprotéine de basse densité, équation de Friedewald, Bland-Altman