Laboratory-based versus non-laboratory-based World Health Organization risk equations for assessment of cardiovascular disease risk

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Abstract

Background: The WHO model has laboratory-based and non-laboratory-based versions for 10-year risk prediction of cardiovascular diseases. Due to the fact that in some settings, there may not be the necessary facilities for risk assessment with a laboratory-based model, the present study aimed to determine the agreement between laboratory-based and non-laboratory-based WHO cardiovascular risk equations.

Methods: In this cross-sectional study, we used the baseline data of 6796 individuals without a history of cardiovascular disease and stroke who participated in the Fasa cohort study. The risk factors of the laboratory-based model included age, sex, systolic blood pressure (SBP), diabetes, smoking and total cholesterol, while the non-laboratory-based model included age, sex, SBP, smoking and BMI. Kappa coefficients was used to determine the agreement between the grouped risk and Bland–Altman plots were used to determine the agreement between the scores of the two models. Sensitivity and specificity of non-laboratory-based model were measured at the high-risk threshold.

Results: In the whole population, the agreement between the grouped risk of the two models was substantial (percent agreement = 79.0%, kappa = 0.68). The agreement was better in males than in females. A substantial agreement was observed in all males (percent agreement = 79.8%, kappa = 0.70) and males < 60 years old (percent agreement = 79.9%, kappa = 0.67). The agreement in males ≥ 60 years old was moderate (percent agreement = 79.7%, kappa = 0.59). The agreement among females was also substantial (percent agreement = 78.3%, kappa = 0.66). The agreement for females < 60 years old, (percent agreement = 78.8%, kappa = 0.61) was substantial and for females ≥ 60 years old, (percent agreement = 75.8%, kappa = 0.46) was moderate. According to Bland–Altman plots, the limit of agreement was (95%CI: -4.2% to 4.3%) for males and (95%CI: -4.1% to 4.6%) for females. The range of agreement was suitable for both males < 60 years (95%CI: -3.8% to 4.0%) and females < 60 years (95%CI: -3.6% to 3.9%). However, it was not suitable for males ≥ 60 years (95% CI: -5.8% to 5.5%) and females ≥ 60 years (95%CI: -5.7% to 7.4%). At the high-risk threshold of 20% in non-laboratory and laboratory-based models, the sensitivity of the non-laboratory-based model was 25.7%, 70.7%, 35.7%, and 35.4% for males < 60 years, males ≥ 60 years, females < 60 years, and females ≥ 60 years, respectively. At the high-risk threshold of 10% in non-laboratory-based and 20% in laboratory-based models, the non-laboratory model has high sensitivity of 100% for males ≥ 60 years, females < 60 years, females ≥ 60 years, and 91.4% for males < 60 years.

Conclusion: A good agreement was observed between laboratory-based and non-laboratory-based versions of the WHO risk model. Also, at the risk threshold of 10% to detect high-risk individuals, the non-laboratory-based model has acceptable sensitivity for practical risk assessment and the screening programs in settings where resources are limited and people do not have access to laboratory tests.

Keywords: *Laboratory-based, Non-laboratory-based, WHO, Cardiovascular disease, Risk prediction, Sensitivity, Specificity*