Performance of existing cardiovascular risk assessment tools in Sub-Saharan Africa: A systematic review

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Introduction

Cardiovascular diseases (CVD) are a major public health concern in low- and middle-income countries. Numerous risk assessment tools have been developed, validated and incorporated into practice in various world regions. However, little is known about the performance of these tools in Sub-Saharan Africa (SSA).

Methods

We conducted a systematic review according to the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guidelines, to identify citations reporting validation data of CVD risk assessment tools SSA. We searched MEDLINE/Pubmed and Embase from inception, through final search updates on May 10, 2021. We also screened the reference lists of included articles. Dual screening, data extraction and risk of bias assessment was conducted. We followed the Critical Appraisal and Data Extraction for Systematic Reviews of Prediction Modelling Studies (CHARMS) checklist and the Prediction Model Risk of Bias Assessment Tool (PROBAST) for data extraction and risk of bias assessment, respectively.

Results

Out of 3,155 unique citations, we identified three risk assessment tools reported in two citations. The three tools included 3,084 participants in total and differed in study design, population, predictors, validation methods and results, and outcome types (table). The INTERHEART Modifiable Risk Score (IHMRs) showed the best discrimination (C-statistic: 0.74 [0.68, 0.79]), followed by the Fasting Cholesterol INTERHEART (FC-IHRS) (C-statistic: 0.66 [0.61, 0.71]), and the Non-Laboratory INTERHEART (NL-IHRS) (C-statistic: 0.62 [0.58, 0.66]).

Table: Main Features of Included Models

<table>
<thead>
<tr>
<th>Study ID</th>
<th>Name of Model</th>
<th>Country/ Nationality of study population</th>
<th>Study design</th>
<th>Name of the population cohort</th>
<th>Population description</th>
<th>Outcome type/ definition</th>
<th>Outcome ratio</th>
<th>Discrimination method</th>
<th>Calibration method</th>
<th>Calibration result</th>
</tr>
</thead>
<tbody>
<tr>
<td>McGorrian 2011</td>
<td>INTERHEART Modifiable Risk Score (IHMRs)</td>
<td>Benin, Botswana, Cameroon, Kenya, Mozambique, Nigeria, Seychelles, South Africa, Zimbabwe</td>
<td>Non-Laboratory INTERHEART</td>
<td>INTERHEART</td>
<td>Individuals with and without myocardial infarction</td>
<td>Major cardiovascular events/death from a cardiovascular cause, MI, stroke, heart failure or revascularization (by either percutaneous coronary intervention or coronary artery bypass surgery)</td>
<td>35-70 years</td>
<td>C-statistic: 0.66 (0.60, 0.70); Slope: 0.9 (0.85, 0.95); Intercept: 0 (0.01, 1.01)</td>
<td>Calibration plots, calibration slopes</td>
<td>Not provided</td>
</tr>
<tr>
<td>Joseph 2018</td>
<td>Fasting Cholesterol INTERHEART</td>
<td>South Africa, Zimbabwe</td>
<td>Prospective cohort</td>
<td>Community-dwelling participants between 35 and 70 years</td>
<td>Individuals with and without myocardial infarction</td>
<td>Major cardiovascular events/death from a cardiovascular cause, MI, stroke, heart failure or revascularization (by either percutaneous coronary intervention or coronary artery bypass surgery)</td>
<td>35-70 years</td>
<td>C-statistic: 0.74 (0.69, 0.79); Slope: 0.64 (0.55, 0.73); Intercept: 0.64 (0.34, 0.94)</td>
<td>Calibration plots, calibration slopes</td>
<td>Not provided</td>
</tr>
<tr>
<td>Joseph 2018</td>
<td>Non-Laboratory INTERHEART</td>
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Conclusion

There is sparse data on the performance of CVD risk assessment tools on populations in SSA. Prospective validation studies on simple and feasible CVD risk assessment tools are needed to guide healthcare providers and policy makers in SSA in addressing the CVD burden.