Challenges in dementia risk prediction in low-income and middle-income countries

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With the increasing number of people with dementia worldwide, it is more important than ever to have adequate risk prediction models. Researchers in high-income countries (HICs) are working on models that allow reliable risk prediction.[1] However, the greatest increase in the number of people with dementia will be in developing countries,[2] for which research on dementia is often limited or non-existent. Blossom Stephan and colleagues' study[3] in *The Lancet Global Health* fills this research gap. The authors selected five dementia risk prediction models developed in HICs and assessed their validity in low-income and middle-income countries (LMICs), using data from the 10/66 Study. The findings are a first step for starting initiatives to screen for people at high risk for dementia in LMICs.

A major challenge in dementia risk prediction in LMICs is that many assessment methods used in HICs are not available. For instance, imaging facilities are either rare or too expensive for the local health-care system or the patients, and their use requires a skilled labour force.[4] In such scenarios, it is necessary to rely on simple screening tools that are easy to use and to interpret. Moreover, screening tools must be inexpensive because health-care systems in LMICs have few financial resources.[5] A strength of Stephan and colleagues' study is the investigation of only risk prediction models with large-scale applicability in LMICs. In addition, the population-based sampling used in the study included rural areas and poorer population groups; therefore, the results come with a better validity for the general population than studies in clinical settings that use convenience sampling.

The external validity of dementia risk prediction models does not always receive the necessary attention, as some models have been tested in only one cohort and it remains unclear whether they can be applied in different population groups or countries. Stephan and colleagues' study contributes greatly by testing the validity of five different models in seven different countries. The results show that, despite country-specific variations, three out of five models make good predictions, with concordance (c)-statistics similar to those seen the respective development cohorts in HICs: the Brief Dementia Screening Indicator (BDSI; $0{\cdot}62 \leq c \leq 0{\cdot}78$ across study sites *vs* $0{\cdot}68 \leq c \leq 0{\cdot}78$ in the development cohort), the Australian National University Alzheimer's Disease Risk Index (ANU-ADRI; $0{\cdot}66 \leq c \leq 0{\cdot}78$ *vs* $0{\cdot}65 \leq c \leq 0{\cdot}73$), and the Rotterdam Study Basic Dementia Risk Model ($0{\cdot}66 \leq c \leq 0{\cdot}78$ *vs* $0{\cdot}75 \leq c \leq 0{\cdot}78$). Additionally, the ANU-APRI and BDSI models showed good calibration. What those two models have in common, in contrast to the other models, is that they incorporate diabetes and depression. Both diabetes and depression are important risk factors for dementia,[6,7] so it is unsurprising that including these factors as predictors improves the models. The validity of the models reported in the study highlights the relevance of lifestyle and mental health factors in risk prediction. In particular, the findings for the ANU-APRI model, which includes the most lifestyle factors and has a good predictive ability and good calibration, emphasise the importance of lifestyle in prediction of risk of future dementia, even across country income levels. Although many risk prediction models focus on biomarkers and neglect lifestyle, the inclusion of lifestyle factors in such models has the advantage that these factors are modifiable and can be directly addressed in prevention programmes.

Despite the good predictability of the models assessed, there is room for improving accuracy, especially in high-risk groups, as the authors report. Between-country variation could be one factor affecting accuracy. Country-specific aspects, such as the cultural and socioeconomic systems, might moderate the weight of each factor in the prediction model and therefore should be calibrated separately for each country. Furthermore, people living in low-income countries are often subjected to enormous amounts of deprivation that are not comparable to that seen in HICs, or even in MICs. Although people with low socioeconomic status have a high risk for dementia,[8] measures of social and economic deprivation are not included in the risk prediction models. Furthermore, if a person lives in a less developed country and is subject to deprivation, they might be exposed to completely different risk factors that are not relevant in more developed countries. Such

factors have been neglected so far. New research studies should consider alternative risk factors that might be particular to the context of LMICs and could help to improve the accuracy of the risk prediction models.

Stephan and colleagues' study provides important information on screening people for high risk of developing dementia in LMICs. However, it remains to be determined what happens after the identification of such high-risk groups, with regard to how dementia risk can be mitigated, what prevention programmes are available, and how health-care systems in LMICs could finance such types of initiative. More research is necessary to develop effective strategies and programmes to assist LMICs with dealing with the increasing number of dementia cases in the coming years.

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