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Original research

The performance of the Finnish Diabetes Risk Score, a modified Finnish Diabetes Risk Score and a simplified Finnish Diabetes Risk Score in community-based cross-sectional screening of undiagnosed type 2 diabetes in the Philippines

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ABSTRACT

Aim: The performance of the Finnish Diabetes Risk Score (FINDRISC) and 2 modifications in community screening for undiagnosed type 2 diabetes (UDD) in the Philippines was evaluated.

Methods: Active community-based screening for diabetes was conducted where FINDRISC assessment was done. Modified (modFINDRISC) and simplified (simpFINDRISC) versions were rendered based on Asian standards, study results, and local context. Diabetes was diagnosed through 2 separate blood glucose tests. Areas under the receiver operating characteristic curve (ROC-AUC) and statistics for diagnostic tests for FINDRISC and the modifications were analyzed.

Results: Complete data was collected from 1752 people aged 20–92; 8.6% tested positive for diabetes. ROC-AUC for UDD were 0.738 (FINDRISC), 0.743 (modFINDRISC) and 0.752 (simpFINDRISC). The differences between the FINDRISC and the modifications were not statistically significant ($p = 0.172$).

Conclusions: The performance of all 3 risk score calculators in the screening for UDD in the Philippines was good and may be useful in populations having similar characteristics. Considering the setting and resource constraints, the simpFINDRISC is preferred.

1. Introduction

The upsurge in the prevalence of type 2 diabetes over the past 30 years has made it a major public health issue worldwide, more so in Asia. Compared to Caucasians, diabetes develops at least a decade earlier in Asians and has a higher prevalence in the less affluent [1]. Six of the 10 countries projected to have the highest numbers of people with diabetes by the year 2030 are in Asia and the Philippines is one of these [2]. The National Nutrition and Health Survey of the Philippines pegged diabetes prevalence in 2003 at 4.6%; this increased to

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7.2% in 2008 [3,4]. The International Diabetes Federation listed comparative prevalence of diabetes in the Philippines to be 7.7% in 2010 and 9.65% in 2012; and estimated the proportion of undiagnosed diabetes (UDD) at 58.8% [5,6]. The early detection and diagnosis of diabetes in the Philippines is warranted not only because of its rapidly increasing prevalence but also of the significant burden the condition and its complications impose on the population. For renal complications alone, close to 50% of end stage renal disease requiring dialysis in the Philippines is attributable to diabetes [7]. Moreover, diabetes has been constantly in the 10 leading causes of mortality in the Philippines since 1995 [8]. Studies have demonstrated that early interventions prevent or delay the onset of diabetes and its complications [9–12] and a sizable proportion of premature deaths linked to diabetes is preventable [9]. Current screening strategies making use of blood glucose testing may be labor- and resource-intensive if instituted in the general Philippine population. However, certain tools such as risk score calculators can be used for initial screening to identify specific subpopulations on which the blood glucose screening strategies could be carried out more systematically.

The Finnish Diabetes Risk Score (*FINDRISC*) was developed as a risk predictor for future diabetes mellitus type 2 [13]. Composed of 8 factors – age, body mass index (BMI), waist circumference, hypertension, history of high blood glucose, family history of diabetes, daily consumption of vegetables, fruits or berries, and physical activity – the total score ranges from 0 to 26 and the 10-year risk of individuals to develop diabetes is stratified on a 5-step scale that ranges from low to very high [14]. Additionally, its use as a screening tool for hitherto undiagnosed diabetes was explored in the country of origin, in other European countries and in the Americas with good results [15–21]. The utilization of the *FINDRISC* in the screening for UDD and impaired glucose metabolism has been recommended in various guidelines [22–24]. However, there have been no publications found on the validation and use of the *FINDRISC* for screening of UDD in Southeast Asian populations in general and the Philippines in particular. This study measured the validity of the *FINDRISC* and 2 modifications in community screening for UDD in the Philippines.

2. Methods

2.1. Definitions

Diagnosis of diabetes was made based on two separate blood glucose tests. An initial blood glucose test screened for the consideration of either diabetes or prediabetes. A provisional diagnosis of diabetes was made if the initial fasting blood glucose (FBG) was ≥126 mg/dL (7.0 mmol/L) or the casual blood glucose was ≥200 mg/dL (11.1 mmol/L). A provisional diagnosis of prediabetes was made if the initial FBG was between 100 and 125 mg/dL (5.6–6.9 mmol/L) or the casual blood glucose ranged from 140 to 199 mg/dL (7.8–11.0 mmol/L). The diagnosis was confirmed with another blood glucose test on a different day. A definitive diagnosis of diabetes was made if the confirmatory FBG was ≥126 mg/dL (7.0 mmol/L), or the 2-h oral glucose tolerance test (2-h OGTT) was ≥200 mg/dL (11.1 mmol/L). If the confirmatory FBG was within the range of 100–125 mg/dL (5.6–6.9 mmol/L), or the 2-h OGTT was within the range of 140–199 mg/dL (7.8–11.0 mmol/L), a definitive diagnosis of prediabetes was made. Fasting was defined as no caloric intake for at least 8 h; a casual glucose test was defined as blood glucose tested at anytime regardless of caloric intake. A 2-h OGTT involved ingestion of a glucose load containing the equivalent of 75 g anhydrous glucose dissolved in water and a blood glucose test 2 h after [25,26]. We defined dysglycemia as either confirmed diabetes or prediabetes.

Body mass index (BMI) was classified based either on the Europid-based World Health Organization classification of BMI [27] or according to the Asia-Pacific standards [28]. Waist circumferences were classified based on International Diabetes Federation recommendations [29] and suggested Asian waist circumference cut-off values [28] (Table 1).

2.2. Community-based screening

Active community screening for diabetes was conducted in the communities of the City of Batac and the Municipalities of Pagudpud and Vintar in Ilocos Norte, and in selected communities in Quezon City, Metro Manila, the Philippines, from July 2010 until June 2011. Stratified random sampling based on population lists available from the local government health services was done.[1] Community-based health care workers were mobilized to invite people under their care who were included in the study. If and when the person refused the invitation for screening, the next eligible person in the list was considered. Inclusion criteria were age ≥20 years, no previous diagnosis of diabetes, and willingness to undergo interview and blood glucose testing(s). Full written informed consent was obtained prior to the interview and blood glucose determination(s). Trained researchers conducted one-on-one interviews using a prepared questionnaire inquiring on demographical data and medical history; filled up the *FINDRISC* assessment form; and measured anthropometrics (height, weight, waist circumference), blood pressure and blood glucose. Blood glucose was tested in a two-step manner making use of the Abbott Optium Exceed™ glucometer with Abbott MediSense™ test strips (Abbott, Inc., Manila, Philippines) and following a screening algorithm (Fig. 1) [22,25,26].

2.3. Statistics

Statistical analyses were done making use of the statistical package Stata/IC Release 11.0 (StataCorp LP, Texas, USA). Nonparametric Receiver Operating Characteristic (ROC) analyses and comparative ROC analyses of the different risk score calculators were done. Univariate and multivariate analyses of the risk factors were conducted. The sensitivities, specificities, diagnostic accuracy, positive and negative predictive values (PPV, NPV), positive and negative likelihood ratios (LHR), and diagnostic odds ratios (OR) of cut-off points were determined

[1] A community-based health care worker is assigned to care for about 10 families in his/her community. A complete list of all the families and their respective members in a city or municipality, stratified per community-based health care worker, is kept in the local government health centers. This list is usually updated annually.