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Metabolic syndrome in low-income communities/countries: Support vector machine analysis demonstrates a useful and cost-effective two-step screening strategy

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Metabolic syndrome (MS) is common in low-income communities/countries where primary healthcare facilities often have no biochemical blood tests. MS is diagnosed if 3 abnormal findings out of 5 bio-indicators including waist circumference (WC), blood pressure (BP), fasting blood glucose (GLU), triglycerides (TG), and high-density lipoprotein cholesterol (HDL-C). Support Vector Machine (SVM) is a computer algorithm capable of recognizing combinational patterns and differentiating them by sensitivity and specificity (Table 1). Employing SVM's ability of recognizing the best combinations of bio-indicators, this study aimed at establishing a sensitive and cost-effective screening strategy for MS in low-income communities. From 2012-2014 in a typical low-income rural township in China's far-western Xinjiang Province, 3,276 individuals (1,590 males and 1,686 females) aged 18 years without prior diagnoses of MS were physically examined and blood biochemistry tested. MS was first diagnosed as an end result among these individuals based on the Joint-Interim-Statement (JIS) criteria. Following SVM analysis revealed that two non-blood bio-indicators, WC and BP together, were able to detect MS individuals with 57.0% sensitivity and 88.4% specificity. We then used SVM algorithm to analyze abilities of diagnosing MS by WC+BP+TG, WC+BP+HDL-C, and WC+BP+GLU combinations. Interestingly, WC+BP+TG gained the best sensitivity of 72.5% with 88.1% specificity; WC+BP+HDL-C had a lesser sensitivity of 56.8% with 89.5% specificity; and WC+BP+GLU showed the least sensitivity of 56.6% with 90.9% specificity, respectively. Based on these observations, we propose a cost-effective "two-step screening strategy" for MS in low-income developing countries by which the "first screening step" is to use only non-blood indicators, WC+BP, which can be feasibly examined by paramedical personnel in "village/community clinic" and, individuals with abnormal WC+BP are then recommended to go through the "second screening step" of blood testing in secondary hospitals. Due to cost effectiveness, we recommend TG, other than HDL-C and GLU, as the first-line blood test for low-income populations