Diabetes screening revisited: issues related to implementation

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Hong Kong Med J 2020;26:283–5
https://doi.org/10.12809/hkmj205103

Diabetes induces a substantial global burden of disease. The World Health Organization reported that the number of people with diabetes increased from 108 million in 1980 to 422 million in 2014, and the global prevalence of diabetes escalated from 4.7% in 1980 to 8.5% in 2014.[1] The mortality rate due to complications of diabetes has been predicted to double between 2005 and 2030.[1] It has been estimated that almost half of all patients with diabetes (49.7%) remain undiagnosed and unaware of their conditions.[2] The American Diabetes Association recommends that people aged ≥45 years should be screened for diabetes or prediabetes, especially individuals who are overweight or obese.[3] Patients with risk factors of diabetes should receive screening at an earlier age or at more frequent intervals. Laboratory-based criteria for diagnosing diabetes and prediabetes include fasting plasma glucose (FPG) level, glycated haemoglobin (HbA1c) level, and 75-g Oral Glucose Tolerance Test.[3] In asymptomatic individuals, two abnormal glycaemic results are required to establish a diagnosis of diabetes.[3] The United States Preventive Services Task Force recently updated recommendations and proposed screening from age 40 to 70 years at 3-year intervals, with all three tests being suitable as screening modalities.[4] The Hong Kong Reference Framework for Diabetes Care for Adults in Primary Care Settings[5] of the Primary Healthcare Office, the Hong Kong Government recommends that screening should begin at age 45 years, and should be conducted every 1 to 3 years, based on the presence of diabetes risk factors.[5] Other authorities such as the Canadian Task Force on Preventive Health Care[6] recommend screening based on HbA1c levels in high-risk individuals only, and those at low to moderate risk should complete a validated risk calculator such as FINDRISC[7] or CANRISK[8] to determine subsequent screening arrangements. Early diagnosis and proper treatment of type 2 diabetes mellitus reduces cardiovascular morbidity and mortality.[9] Early detection also enables quality care to slow disease progression, prevent complications, and reduce the hospital care burden and healthcare costs.

In this issue of the *Hong Kong Medical Journal*, Chan and colleagues[10] retrospectively studied 1566 patients who underwent total knee arthroplasties (TKAs) at an institution where universal diabetes screening was implemented. Among them, 46.6% received HbA1c screening during preoperative assessment of TKAs 2 to 3 months before the scheduled operation, and all patients with HbA1c level ≥7.5% were referred to an endocrinologist for optimisation of glycaemic control before the scheduled TKA. The other 53.4% who did not receive HbA1c screening acted as historical controls. The authors found that up to 38% of patients had undiagnosed prediabetes or diabetes as identified by the universal HbA1c screening programme. In addition, the incidence of prosthetic joint infections after surgery was significantly lower in patients who received HbA1c screening than in those who did not (0.2% vs 1.0%, P=0.027). These findings suggest that universal HbA1c screening seems justifiable for all patients before they undergo TKA. Although only 17 patients were referred to an endocrinologist, the lower rate of prosthetic joint infections among patients who had HbA1c screening may be attributed to the more meticulous perioperative care for those identified as having dysglycaemia. Whether HbA1c screening of dysglycaemia directly led to the lower rate of prosthetic joint infections remains uncertain, since the infection rate in the cohort before universal screening was introduced in March 2017 was similar for patients with diabetes or prediabetes and those without diabetes. The yield of screen-detected diabetes mellitus since 2017 was also low in this study, with most having prediabetes, most of whom were not referred to an endocrinologist for treatment. The major limitations of the study include its retrospective nature, single-centre design, lack of randomisation between groups, and the possibility of missing variables which could be confounders. Nevertheless, the findings contribute to a solid foundation where future prospective studies may offer more definitive practice-changing recommendations for clinical guidelines. Because diabetes is a silent condition and many people with diabetes remain undiagnosed, increased clinical awareness of the condition with screening using

HbA1c level, particularly before major operations such as TKA, appears to be a justifiable approach.

Universal diabetes screening in the general population may also be worthwhile. However, several issues must be considered before formal implementation of population-based screening programmes. First, a systematic review and meta-analysis including 49 studies of screening tests and 50 intervention trials showed that HbA1c level has only average sensitivity of 0.49 (95% confidence interval [95% CI]=0.40-0.58) and specificity of 0.79 (95% CI=0.73-0.84),[11] whereas FPG level is specific (0.94, 95% CI=0.92-0.96) but not sensitive (0.25, 95% CI=0.19-0.32). The diagnostic accuracy of HbA1c level for diabetes has also been challenged—in a cohort of 5764 adult patients without diagnosed diabetes, the sensitivity of HbA1c ≥6.5% was only 43.3% and 28.1% when FPG and 2-hour plasma glucose, respectively, were used as criteria.[12] Although HbA1c level has advantages of greater convenience (not requiring fasting) and fewer day-to-day variations, HbA1c level may be affected by assay interference due to haemoglobinopathies and conditions altering red blood cell turnover such as recent blood loss. Second, diabetes screening fulfils the Wilson and Jungner criteria,[13] but one of the most important determinants of programme success includes screening uptake and persistent adherence over time. Although a variety of cancer screening programmes, such as for colorectal and cervical cancer, have been implemented to the local population to address the rapidly rising burden on Hong Kong's healthcare system, the uptake rate remains suboptimal. Conversely, few programmes have specifically targeted metabolic diseases such as diabetes. The Hong Kong Government's effort to enhance the provision of primary care and encourage the uptake of preventive care among the elderly people through the Elderly Health Care Voucher Scheme was launched on 1 January 2009, and was regularised into a recurrent programme in 2014. Eligible residents aged ≥65 years are entitled to an annual voucher of HK$2000 to utilise private sector primary care preventive services. However, it has been shown that a majority of elderly people in Hong Kong thought the Scheme would encourage them to utilise acute services rather than preventive care or chronic disease management in the private sector.[14]

Before a universal diabetes screening programme for the general public can be successful, the perceptions of, attitudes to, enablers of, and barriers to diabetes screening should be explored among various stakeholders, including prospective programme participants, physicians practising in various sectors, and policy makers. These will identify pertinent variables that could enhance screening participation and programme design. Furthermore, the cost-effectiveness of screening using different test modalities starting at different age-groups should be evaluated. More work is needed, as effective community-based interventions are required to enhance screening uptake and improve the impact of diabetes screening through further evaluations to inform policy formulation and implementation.

Author contributions

All authors contributed to the editorial, approved the final version for publication, and take responsibility for its accuracy and integrity.

Conflicts of interest

All authors have disclosed no conflicts of interest.

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