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ORIGINAL RESEARCH

Evaluation of Capillary Blood Glucose and Chinese Diabetes Risk Score in Screening for Diabetes and Prediabetes Among Elderly Chinese Population: A Cross-Sectional Study

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Background: With the prevalence of diabetes on the rise, healthcare systems worldwide are facing a serious burden. This study aims to explore the performance of fingertip capillary blood glucose (CBG), the Chinese Diabetes Risk Score (CDRS) and their combined application in identifying diabetes and prediabetes using glycosylated hemoglobin as a diagnostic criterion.

Methods: We conducted a cross-sectional study from April to September 2022, involving 6868 urban and rural residents aged 60 and above in Qiyang City, Hunan Province. We utilized a logistic regression model combined with Receiver Operating Characteristic (ROC) curves to analyze and evaluate the effectiveness of using CBG alone or in conjunction with the CDRS for screening diabetes and prediabetes.

Results: The prevalence of diabetes mellitus and prediabetes mellitus was 21.6% and 33.9%, respectively, among the 6868 elderly people. The area under the ROC curve (AUCs) of FCBG (fasting capillary blood glucose), the CDRS≥25 and FCBG+CDRS≥25 for detecting diabetes (prediabetes) were 0.756 (0.571), 0.570 (0.552) and 0.773 (0.590), respectively. The AUCs of RCBG (random capillary blood glucose), the CDRS≥25 and RCBG+CDRS≥25 in identifying diabetes (prediabetes) were 0.769 (0.590), 0.542 (0.526), and 0.775 (0.593), respectively.

Conclusion: In large-scale community screening in China, CBG is more effective than CDRS for detecting diabetes in the elderly. The combination of the CDRS and CBG provides a practical and efficient strategy that could improve community-based screening efficiency for diabetes in the elderly. However, the limited accuracy of CBG and CDRS for prediabetes highlights the need for more specific methods in screening this condition.

Keywords: aged, primary health care, diabetes, prediabetes, Chinese Diabetes Risk Score, fingertip capillary blood glucose

Introduction

Diabetes is a global epidemic that poses a significant threat to human health and the global economy. The situation in China is particularly critical. A recent national survey indicated that the estimated prevalence of diabetes and prediabetes in Chinese adults was 12.8% and 35.2%, respectively, and the prevalence of diabetes was higher in the elderly.[1] The high prevalence of diabetes further contributes to the incidence of various cardiovascular diseases and complications, increasing overall mortality and treatment costs, and resulting in a significant socio-economic burden.[2] Early detection through screening programs and the provision of safe and effective treatments can significantly delay the progression of diabetes and its complications, thus reducing the costs to the healthcare system.[3–6] However, in rapidly developing countries such as China, the issue of an aging population is becoming increasingly serious, along with significant disparities in basic public health services between urban

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and rural areas, placing a considerable burden on health and social care systems.[7,8] With a larger elderly population in the future, and given that the elderly are at high risk for diabetes and susceptible to the coexistence and accumulation of various non-communicable diseases, the dire situation of diabetes in China is exacerbated.[9–11] Therefore, early screening for diabetes and prediabetes in the elderly population is particularly important.

Diabetes risk scores and capillary blood glucose have been used to varying degrees to screen for diabetes and prediabetes.[12–20] While diabetes risk scores are noninvasive, inexpensive and provide immediate results, their precision is limited and may not always apply well to new populations.[21–24] Capillary blood glucose testing (CBG) is relatively inexpensive and provides quick results,[25] but its accuracy may be reduced due to variability in carbohydrate load and time since the last meal. Prediabetes is a high-risk state for the future development of diabetes,[26–29] and screening for this condition is less efficient than screening for established diabetes.[30–35] It requires early detection through screening, followed by medical intervention and lifestyle changes to reduce the risk of progressing to diabetes.[36–39]

Therefore, combining these two methods has been proposed as a strategy to achieve a more comprehensive risk assessment, facilitate early identification of high-risk individuals, and improve the overall accuracy and efficiency of diabetes screening.[40] Despite this rationale, robust evidence supporting the practical application of such a combined strategy remains limited. Existing research is still predominantly focused on evaluating non-invasive risk scores or point-of-care biochemical markers in isolation.[41] There is a notable lack of investigation into the adaptability and incremental value of an integrated approach within real-world primary care settings, particularly for screening the elderly population.

The purpose of this study was to evaluate the performance of capillary blood glucose, alone or in conjunction with the Chinese Diabetes Risk Score, in screening for diabetes and prediabetes among the Chinese senior population using point-of-care (POC) glycosylated hemoglobin (HbA1c) as the diagnostic standard.

Methods

Study Design and Participants

A community-based cross-sectional study was conducted from April to September 2022 in Qiyang City, Hunan Province, China. During a 6-month period, we conducted extensive recruitment from 22 primary healthcare institutions in Qiyang City. Individuals who volunteered and met the following inclusion criteria were invited to participate in the study: 1) Aged 60 years and above; 2) Long-term residents of the community: Individuals who have resided in the Qiyang City, Hunan Province, for more than six months. The exclusion criteria were diagnosed diabetics and those with incomplete or incorrect data. Each individual visited the nearest primary medical service institution for screening, which included a questionnaire survey and a physical examination, as well as biochemical measurements. Participants were categorized into two groups based on their fasting status upon arrival at the screening site: FCBG (fasting capillary blood glucose) Group and RCBG (random capillary blood glucose) Group. We employed a combination of the Chinese Diabetes Risk Score questionnaire and fingertip capillary blood glucose for screening, using point-of-care HbA1c as the diagnostic criterion. This study was approved by the Ethics Committee of the National Clinical Research Center, Xiangya Second Hospital, Central South University. Informed consent was obtained from all subjects and their legal guardians.

Questionnaire and Physical Examination

A team of qualified medical staff completed a face-to-face questionnaire survey, which included basic information, previous disease information, risk factor assessment, treatment recommendation, and on-site physical examinations to measure various indicators such as blood pressure, height, weight, and waist circumference (WC). Following a predetermined protocol, subjects were asked to stand with their feet bare and wear only light clothing, as the height-weight scale was used to measure their height and weight. Trained medical staff measured subjects' weight and height to the nearest 1 kg and 1 cm, respectively. WC was measured at the midpoint between the lowest rib and the iliac crest to the nearest 1 cm while participants were gently breathing. Under the guidance of trained investigators, weight, height, and WC were all measured twice; the average was then used for analysis. Body mass index (BMI) was calculated as weight (kilogram) divided by height squared (square meter). During blood pressure measurement, subjects placed their right arm at heart level, and the measurement was taken once using a standard blood pressure monitor.

The Chinese Diabetes Risk Score (CDRS) is a non-invasive assessment tool developed and validated by Ji et al for the Chinese population to identify individuals at high risk of undiagnosed diabetes and prediabetes. In this study, the CDRS was calculated for each participant based on six variables collected during the survey: age, sex, waist circumference (WC), body mass index (BMI), systolic blood pressure (SBP), and family history of diabetes in first-degree relatives. Each variable was assigned a points value according to predefined strata (eg, age groups, WC ranges). The detailed points assignment scheme is provided in Supplementary Table 1S. The points from all six variables were summed to yield a total CDRS score, which theoretically ranges from 0 to 51.[13] Based on the original validation study, a total CDRS score ≥ 25 was used in this study as the optimal cutoff point to define a "high-risk" individual for the purpose of our screening strategy analysis.

Fingertip Blood Testing

The blood measurements were conducted according to established protocols to ensure consistency and accuracy. Fasting capillary blood glucose was measured with a WL-1 glucose meter (Sinocare Inc, Changsha, China) in the morning after an overnight fast of at least 8 hours. Random capillary blood glucose was measured with a WL-1 glucose meter (Sinocare Inc, Changsha, China) at any time of the day, without regard to the time elapsed since the last meal. Glycated hemoglobin was measured and analyzed with the use of a portable, fully automated, multifunction monitor iCARE-2200 (Sinocare Inc, Changsha, China). The POC HbA1c test (iCARE-2200) for diabetes screening and diagnosis was certified by the National Glycated Hemoglobin Standardization Program (NGSP). All equipment was subjected to laboratory quality control and reference comparison.

Diagnostic Criteria for Diabetes and Prediabetes

Given the limited healthcare resources and large sample size in rural areas of China, we opted to use POC HbA1c as the diagnostic standard instead of the Oral Glucose Tolerance Test (OGTT). In our study, we utilized chairside HbA1c testing certified by PTS Diagnostics, known for its high accuracy when correlated with venous blood HbA1c testing. According to the 2025 diagnostic criteria of the ADA,[14] diabetes was diagnosed when HbA1c was ≥6.5%, and prediabetes was diagnosed when HbA1c was between 5.7% and 6.4%.

Statistical Analysis

All statistical analyses were performed with SPSS 25.0 and MedCalc 20.0.10 software. A normality test was performed before the data analysis. Analysis of variance (ANOVA) or the Mann–Whitney test was used to compare specific differences between the studied groups, while the chi-square test was used to compare categorical data. Furthermore, we applied a logistic regression model using the two screening methods as predictive variables to calculate the probability of positive results. We then plotted the Receiver operating characteristic (ROC) curve using the positivity rate and calculated the area under the curve. Additionally, ROC analysis allowed us to find the optimal cutoff value, and calculate statistical indicators such as sensitivity and specificity at this cutoff value.

The Youden index (= sensitivity + specificity - 1) is a metric that provides a balanced measure of a test's overall discriminative power by equally weighting the ability to correctly identify cases (sensitivity) and non-cases (specificity). The maximal Youden index serves as the screening cutoff point for both fingertip blood glucose tests and the combined prediction of fingertip blood glucose with CDRS. The sensitivity, specificity and Youden index of different screening strategies were calculated. The ROC curve and area under the ROC curve (AUC) were used to analyze the cutoff point and accuracy of fingertip capillary blood glucose separately or in cooperation with CDRS in detecting diabetes and prediabetes. In our study, we categorize diagnostic performance based on AUC as follows: low ($0.5 \le AUC < 0.7$), moderate ($0.7 \le AUC < 0.9$), and high ($AUC \ge 0.9$).

To evaluate the robustness of our findings, we performed sensitivity analyses addressing issues related to missing data and outliers. We focused on variables such as height, weight, waist circumference, and systolic blood pressure, identifying cases with missing values and outliers. Missing data were addressed using mean imputation, implemented with SPSS 25.0. Additional methodological details are provided in the Supplementary file 1.

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Table 1 Characteristics of the Study Participants (N=6868)

Characteristics	Normal Glycemia N=3053 (44.5%)	Prediabetes N=2329 (33.9%)	Diabetes N=1486 (21.6%)	Statistical Test Results	*P* value
Men (%)	1553 (50.9%)	970 (41.6%)	556 (37.4%)	87.56[b]	<0.001
Age (years)	72.9±5.9	72.8±6.1	72.4±6.0	3.87[a]	0.020
SBP (mmHg)	139.3±19.8	141.9±20.4	139.6±21.0	11.69[a]	<0.001
WC (cm)	76.3±9.2	77.4±9.7	78.2±10.0	22.33[a]	<0.001
BMI (kg/m^2)	22.4±3.2	23.2±6.2	23.4±3.3	33.00[a]	<0.001
CBG group					
FCBG (%)	2193 (71.8%)	1760 (75.6%)	1098 (73.9%)	9.60[b]	0.008
RCBG (%)	860 (28.2%)	569 (24.4%)	388 (26.1%)		
CBG					
FCBG (mmol/L)	5.8±1.0	6.0±1.2	7.5±2.6	485.81[a]	<0.001
RCBG (mmol/L)	7.5±1.8	8.1±2.1	10.9+4.3	222.07[a]	<0.001
CDRS	29.5±5.0	30.4±5.1	30.6±5.6	27.33[a]	<0.001
HbA1c (mmol/L)	5.2±0.4	6.0±0.2	7.7±1.5	5687.41[a]	<0.001

Note: The data are presented as either percentages (%) or as the means±standard deviations (SD). [a]Analysis of variance. [b]Chi-square test.
Abbreviations: CBG, capillary blood glucose; CDRS, Chinese Diabetes Risk Score; FCBG, fasting capillary blood glucose; RCBG, random capillary blood glucose.

Results

Basic Characteristics of the Study Population

A total of 10038 community residents were recruited within six months, among whom 9294 subjects aged 60 years and older were included in the study. After excluding 1952 diagnosed diabetes, and then excluding 474 subjects with incomplete or erroneous data, the final sample size was 6868 cases. The characteristics of the study participants are summarized in Table 1. Using HbA1c as the diagnostic standard, 1486 (21.6%) were newly diagnosed diabetes, 2329 (33.9%) were prediabetes, and 3053 (44.5%) were people with normal glucose tolerance (Figure 1). Table 1 summarizes the characteristics of participants according to the different classifications of diabetes.

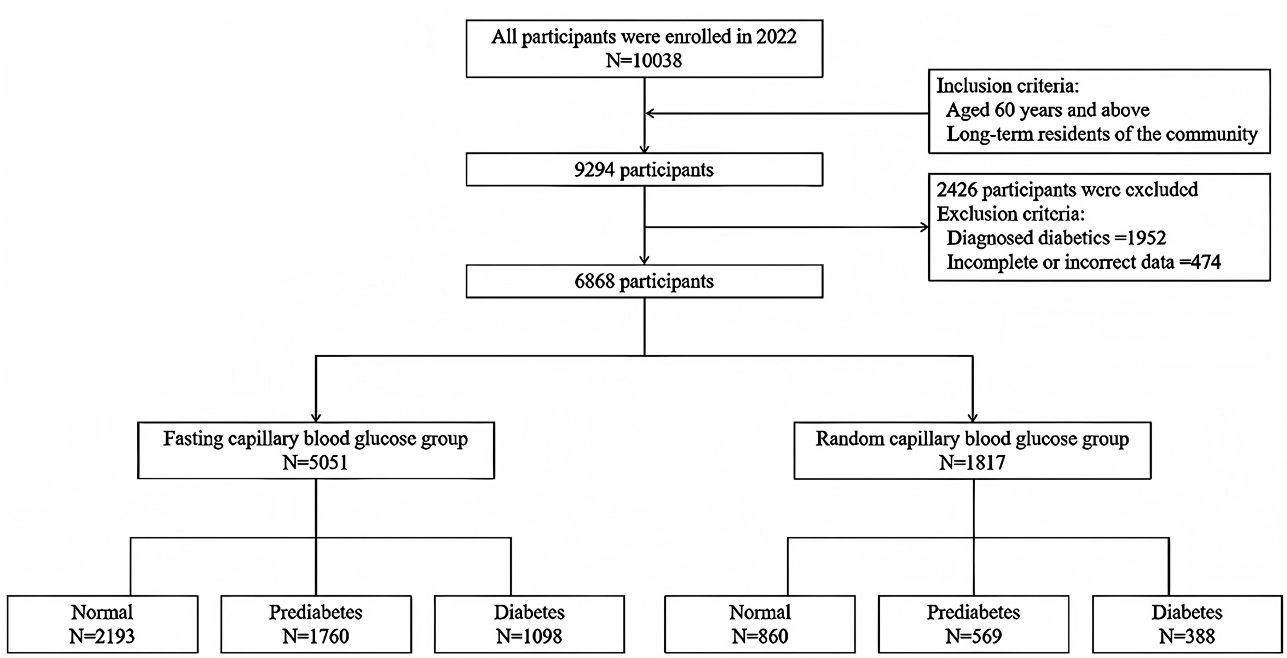

Figure 1 The flowchart of the study.

Evaluation Results of Different Methods for Screening Diabetes

In our research, the optimal cutoff point for screening diabetes using FCBG was found to be 6.4 mmol/L. This resulted in a sensitivity and specificity of 59.6% and 81.3%, respectively, with an AUC of 0.756. Meanwhile, CDRS≥25 points showed high sensitivity (83.2%) but low specificity (19.8%) and an AUC of 0.570. When FCBG+CDRS≥25 points were used to screen diabetes, the FCBG cutoff point for the maximal Youden index was 6.9 mmol/L. The combined screening approach had a sensitivity of 63.5% and a specificity of 79.4%, with an AUC of 0.773 (Figure 2A). Compared to FCBG≥6.4 mmol/L and CDRS≥25 points, the AUC for FCBG+CDRS≥25 points increased by 1.7% and 20.3%, respectively. The evaluation results of each screening method are shown in Table 2.

The appropriate cutoff point for screening diabetes using RCBG was 8.5 mmol/L, with a sensitivity of 62.4% and a specificity of 79.4%, resulting in an AUC of 0.769. The optimal cutoff for screening diabetes with CDRS was 32 points, with a sensitivity and specificity of 50.5% and 58.6%, respectively, and an AUC of 0.542. The use of the Chinese Diabetes Society (CDS) standard with a CDRS score of ≥25 resulted in a sensitivity of 78.6%. However, the specificity was low at 20.2%, resulting in a higher false-positive rate and lower efficacy in screening diabetes. The best cutoff point for screening diabetes with RCBG and CDRS was identified as 9.6 mmol/L and 20 points, with a sensitivity and specificity of 61.9% and 80.4%, respectively, and an AUC of 0.775. As shown in Figure 2B, compared to the use of RCBG alone and the use of CDRS alone, the AUC for the combination of RCBG and CDRS increased by 0.6% and 23.3%, respectively. Table 2 presents the evaluation outcomes for each screening test.

Collectively, for diabetes screening, the AUC values for strategies based on capillary blood glucose (either alone or combined with CDRS) fell within the moderate range of discrimination (0.70–0.90), whereas the CDRS alone showed low discriminatory accuracy (AUC < 0.7).

Evaluation Results of Different Methods for Screening Prediabetes

The optimal cutoff point for using FCBG alone to predict prediabetes was found to be 6 mmol/L in our study. The sensitivity and specificity rates were 43.0% and 68.9%, respectively, with a corresponding AUC of 0.571. When using CDRS alone to screen for prediabetes, the cutoff point was 25 points, with sensitivity and specificity rates of 84.4% and 19.8%, respectively, and an AUC of 0.552. The suitable cutoff point for recognizing prediabetes using both FCBG and CDRS was 5.6 mmol/L and 32 points, corresponding to an AUC of 0.59, with sensitivity and specificity rates of 52.2% and 61.4%, respectively (Figure 2C). The sensitivity and specificity rates of RCBG alone or combined with CDRS were poor, and the AUC was less than 0.6 (Figure 2D). The assessment results of each screening procedure are shown in Tables 3.

Overall, the AUC values for prediabetes screening were all below 0.6, indicating low discriminatory accuracy for all tested strategies in this population.

Sensitivity Analysis

To assess the robustness of our primary findings against missing data, we conducted a sensitivity analysis using mean imputation for variables with missing values (height, weight, waist circumference, and systolic blood pressure). The extent of missing data for key variables (height, weight, waist circumference, and systolic blood pressure) is summarized in Supplementary Table 2S. Imputation expanded the analytic cohort from 6868 to 7095 participants. The baseline characteristics of this cohort are presented in Supplementary Table 3S. Repeating all primary analyses on this larger sample produced consistent results. Specifically, the predictive performance of the Chinese Diabetes Risk Score combined with capillary blood glucose for newly diagnosed diabetes and prediabetes remained unchanged, as detailed in Supplementary Tables 4S and 5S and visually summarized in Supplementary Figure 1S. This confirms the stability of our main conclusions.

Discussion

In the present study, CBG, the CDRS, and POC HbA1c levels were measured in an elderly population undergoing physical examinations. Our findings found that CBG (FCBG, RCBG) was a more effective screening tool for diabetes than CDRS, with

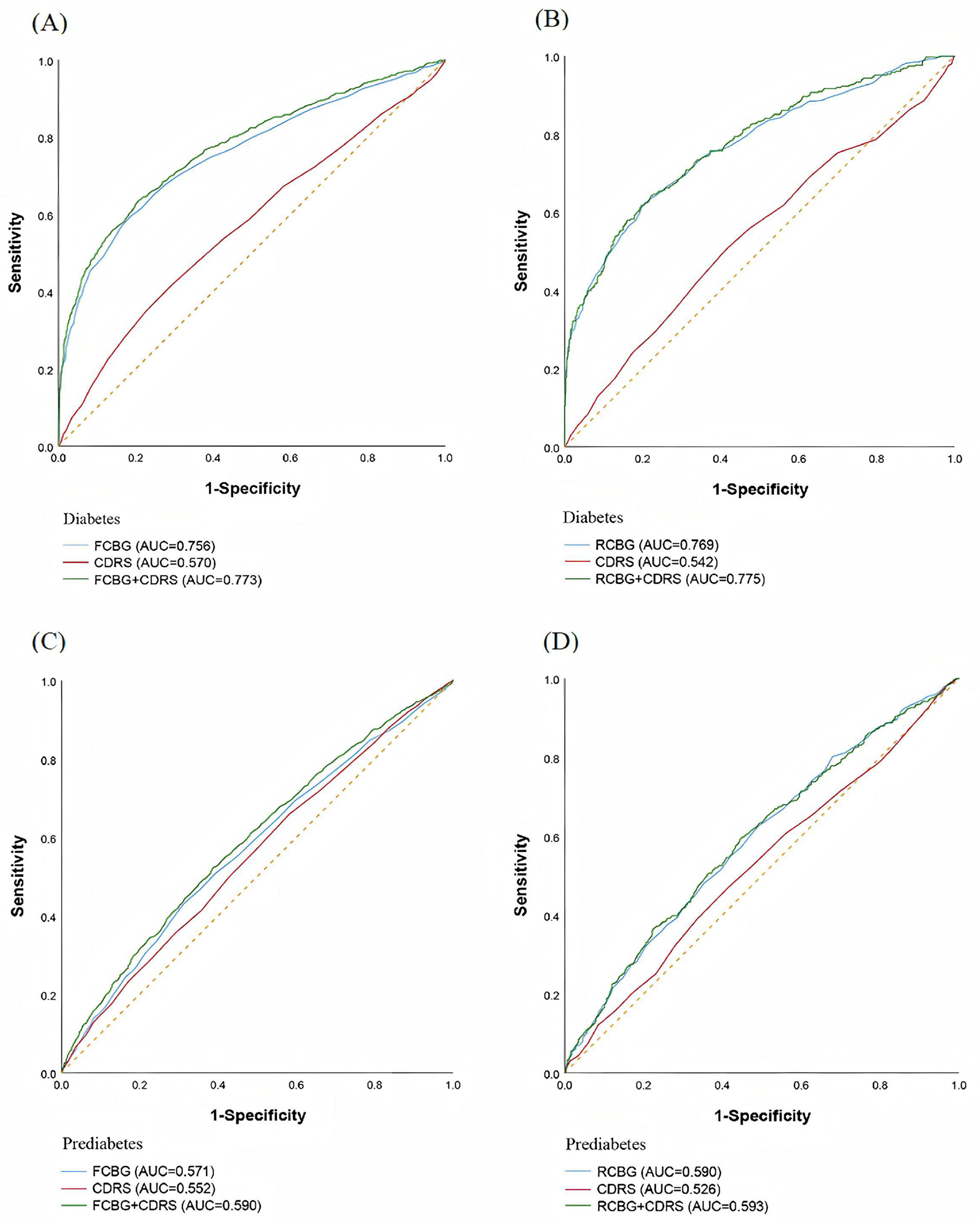

Figure 2 Efficiency of the CDRS and Capillary Blood Glucose in screening for diabetes and prediabetes. The screening performance of FCBG, CDRS, and the combination of FCBG+CDRS in detecting diabetes and prediabetes is shown in Figure (**A–C**), respectively. Similarly, the screening performance of RCBG, CDRS, and the combination of RCBG+CDRS in detecting diabetes and prediabetes is shown in Figure (**B–D**), respectively.

Table 2 Predictive Capacity of Capillary Blood Glucose Combined with Chinese Diabetes Risk Score for Diabetes

Screening Strategies	Angle of cut Point	Optimal cut Point	Sensitivity (%)	Specificity (%)	Youden index
FCBG	Max Youden index	6.4 mmol/L	59.6	81.3	0.408
CDRS	Standard	25 points	83.2	19.8	0.030
FCBG+CDRS	Max Youden index	6.9 mmol/L / 25 points	63.5	79.4	0.429
	Recommendation	6.9 mmol/L / 25 points	63.5	79.4	0.429
RCBG	Max Youden index	8.5 mmol/L	62.4	79.4	0.418
CDRS	Standard	25 points	78.6	20.2	−0.012
RCBG+CDRS	Max Youden index	9.6 mmol/L / 20 points	61.9	80.4	0.422
	Recommendation	8.9 mmol/L / 25 points	64.2	77.6	0.417

Abbreviations: FCBG, fasting capillary blood glucose; RCBG, random capillary blood glucose; CDRS, Chinese Diabetes Risk Score.

Table 3 Predictive Capacity of Capillary Blood Glucose Combined with Chinese Diabetes Risk Score for Prediabetes

Screening Strategies	Angle of cut Point	Optimal cut Point	Sensitivity (%)	Specificity (%)	Youden index
FCBG	Max Youden index	6 mmol/L	43.0	68.9	0.119
CDRS	Standard	25 points	84.4	19.8	0.042
FCBG+CDRS	Max Youden index	5.6 mmol/L / 32points	52.2	61.4	0.136
	Recommendation	6.2 mmol/L / 25 points	72.3	38.5	0.108
RCBG	Max Youden index	7.2 mmol/L	62.6	50.9	0.135
CDRS	Standard	25 points	78.7	20.2	−0.010
RCBG+CDRS	Max Youden index	7.7 mmol/L / 27 points	59.6	55.2	0.148
	Recommendation	8 mmol/L / 25 points	57.6	56.6	0.143

Abbreviations: FCBG, fasting capillary blood glucose; RCBG, random capillary blood glucose; CDRS, Chinese Diabetes Risk Score.

areas under the ROC curve that were 20.3% and 23.3% greater than that of the CDRS, respectively. However, combining the two methods did not significantly increase screening efficiency for elderly diabetes. This implies that in primary healthcare practice, routine fingertip blood glucose detection can identify the elderly diabetic population relatively well, while also saving energy and time for primary healthcare workers and conserving medical resources.

The use of diabetes risk scores for screening individuals with abnormal blood glucose levels is controversial, because the results may vary depending on the population being studied. While some studies have shown that certain tools, such as the Finnish Diabetes Risk Score and CDRS, are applicable in specific populations,[15,16] other foreign studies have found them to be ineffective in managing diabetes or identifying those with elevated blood glucose levels, especially in older adults.[21,24] Two studies in Henan Province and Jiangsu Province of China are consistent with our findings, and these studies reported similar trends.[22,23] Our research found that the CDRS alone had high sensitivity but low specificity for screening elderly Chinese diabetics. When CDRS scores were combined with CBG measurement, specificity was significantly improved, but at the cost of reducing sensitivity. Combining the two strategies will undoubtedly increase the positive rate of screening, but the increase is minimal, and the AUC also improves only slightly. Such small increments can essentially be disregarded, as these minute changes hold no significant practical value or effect in practical affairs. It seems that there is a consensus among the majority of studies that fingertip capillary blood glucose is better than diabetes risk scores in identifying undiagnosed diabetes in the general population.[17,25,36–38] However, there is some disagreement in regard to combining fingertip capillary blood glucose and the CDRS as a screening method. A research study suggested that fingertip capillary blood glucose testing alone is more efficient in detecting undiagnosed diabetes than combining it with the diabetes risk score.[36] The potential reasons may include that the CDRS is based on risk factors rather than providing immediate physiological data like CBG testing.

Our study also found that CBG (FCBG, RCBG), the CDRS, and CBG (FCBG, RCBG) +CDRS were not sensitive or specific enough in screening for prediabetes, with an AUC of less than 0.6. This suggests that neither CBG nor the CDRS, whether used alone or together, is effective in detecting prediabetes. Research from another country has shown

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that while the Finnish Diabetes Risk Score is effective in identifying diabetes among the working population on campus, it is not effective in identifying prediabetes.[30] The poor performance of the CDRS in screening for prediabetes in our research was consistent with the findings of a Canadian study.[24] Another study similarly demonstrated that while CBG screening for diabetes is reliable, CBG screening for prediabetes is not very accurate.[31]

One reason for this low effectiveness is that glucose variability decreases during the early stages of dysglycemia, resulting in missed detection of prediabetic patients when monitoring random glucose levels. Additionally, discrepancies may exist in the definition of prediabetes between HbA1C, plasma blood glucose, and the oral glucose tolerance test, leading to inconsistency in identifying individuals using specific tests.[32,33] Studies have shown that older adults with prediabetes are less likely to progress to type 2 diabetes, and more commonly either return to normoglycemia or pass away.[29] Additionally, studies have reported that patients who test positive for prediabetes screening often do not proceed with further diagnosis and treatment.[28] Nonetheless, the detection of prediabetes in the elderly should not be overlooked, as it may also signal a heightened risk of serious health issues, including cardiovascular diseases and increased rates of hospitalization.[26,27] A domestic cohort study found that testing for the metabolic score for insulin resistance in addition to routine blood glucose measurements may enhance the identification of high-risk groups for diabetes, yet the effect is not pronounced.[39] Based on our findings, CBG or CDRS screening may not be suitable for detecting prediabetes among elderly individuals in the Chinese population. It is essential to re-evaluate the efficacy of these screening techniques for senior citizens and explore alternative screening tools, such as India's Prediabetes Risk Evaluation Scoring System or noninvasive skin fluorescence spectroscopy, to identify undiagnosed prediabetes.[34,35,40,41] Some studies have constructed models using various machine learning methods to achieve higher predictive accuracy and lower detection costs.[12,20]

Age is an independent risk factor for both the progression from normal glucose levels to prediabetes and from prediabetes to diabetes.[9] In China, there remains a substantial elderly population. Compared to urban areas, diabetes patients in rural regions have less access to public health services for diabetes management.[8] We propose using a single CBG measurement instead of the CDRS screening tool to identify undiagnosed diabetes in older adults. This practical advantage makes single CBG screening particularly feasible for integration into routine workflows in resource-conscious rural primary care settings, as supported by the following considerations: First, our data and those of other studies indicate that in detecting older people with diabetes, fingertip capillary glucose is much more accurate than the diabetes risk score.[17,25,36–38] Second, our entire population was composed of elderly individuals (≥60 years old), which would result in higher scores, and using a CDRS≥25 as the cutoff point would reduce the efficiency of screening diabetes. Comprehensive training of healthcare professionals is essential to ensure reliable CDRS screening results, while studies indicate that CDRS incurs substantially higher costs compared to CBG screening.[25] Furthermore, free health management services in China provide blood glucose measurements during physical examinations for individuals aged 65 or above, making CBG measurement a convenient option. Finally, CBG measurements only take 2–3 minutes to complete, whereas the CDRS necessitates filling out a questionnaire that typically takes 5–10 minutes.

Our study has several limitations: First, the generalizability of our findings may be constrained by several factors. The study was conducted solely among the elderly population of Qiyang City, Hunan Province, and the geographic, socioeconomic, and environmental diversity across China's vast rural landscape limits extrapolation. Additionally, the performance and optimal cutoffs may vary if different point-of-care devices are used. Finally, the cross-sectional design inherently restricts causal inference and assessment of long-term predictive value.

Conclusion

Our findings indicate that CBG testing outperforms the CDRS in screening for diabetes among the elderly population within primary care settings in China. Additionally, combining CBG with the CDRS has little impact on the effectiveness of primary screening and does not significantly improve it. For prediabetes screening, CBG, the CDRS, and CBG+CDRS are of limited use. These results support prioritizing point-of-care CBG testing within existing community health programs, such as annual elderly physical examinations, for pragmatic diabetes case-finding. Future studies should validate this approach across diverse regions and assess its long-term cost-effectiveness.

Abbreviations

ADA, American Diabetes Association; AUC, area under the ROC curve; BMI, body mass index; CBG, capillary blood glucose; CDRS, Chinese Diabetes Risk Score; FCBG, fasting capillary blood glucose; POC, point-of-care; POC HbA1c, point-of-care glycosylated hemoglobin; RCBG, random capillary blood glucose; ROC, receiver operating characteristic; SBP, systolic blood pressure; WC, waist circumference.

Data Sharing Statement

The datasets used and/or analysed during the current study are available from the corresponding author, Xiajie Shi, on reasonable request.

Ethics Approval and Informed Consent

This study was reviewed and approved by the independent Ethics Committee of the National Clinical Medical Research Center at the Second Xiangya Hospital, Central South University (Approval No. (2022) Guo Lun Shen [Ke] No. (006)). The committee's composition and operations are compliant with ICH-GCP and Chinese regulations. All procedures were performed in accordance with the ethical standards of the institutional research committee and with the principles of the Declaration of Helsinki.

The Ethics Committee granted a waiver of written informed consent for this study due to the following reasons: (1) the research presented no more than minimal risk to participants, and (2) obtaining written consent from all 6868 elderly participants was not practicable given the large-scale community-based screening design. Verbal informed consent was obtained from all participants prior to data collection, and this procedure was approved by the ethics committee.

Acknowledgments

We declare that throughout the entire process of composing the manuscript, we did not use ChatGPT or any other generative language models, and we take full responsibility for the content of the manuscript.

Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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