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From biochemical screening to psychosocial intervention: the role of community-based fasting plasma glucose and OGTT in managing health anxiety and uncertainty in high-risk populations

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Abstract: The early detection of hyperglycemic states, while clinically beneficial, often introduces significant psychological burden and health-related anxiety due to the uncertainty of a pre-diagnostic phase. This study aims to evaluate the diagnostic utility of combining Fasting Plasma Glucose (FPG) and Oral Glucose Tolerance Test (OGTT) in a community setting, and to discuss how this screening strategy, when integrated into a structured community management program, can serve as a psychosocial intervention to alleviate health-related anxiety and uncertainty in a high-risk population. In an experimental study, 1,586 high-risk individuals for type 2 diabetes in Jiading Town, Shanghai, were screened. Those with FPG levels between 5.6 mmol/L and 8.0 mmol/L ($n = 321$) underwent further FVBG and 2-hour OGTT testing. The diagnostic performance of these tests was evaluated using ROC curves. The findings were interpreted within the framework of community-based psychosocial support and chronic disease management to reduce patient distress. The prevalence of hyperglycemia was 13.62%, with prediabetes accounting for over half of these cases (56.02%). ROC analysis demonstrated that FVBG (AUC = 0.850) and OGTT2h (AUC = 0.981) were highly effective diagnostic tools, whereas FPG alone (AUC = 0.666) showed limited value. The community management system, by providing clear diagnostic pathways, helped mitigate the distress associated with ambiguous health statuses, particularly in older adults (≥ 55 years) and males, who exhibited higher rates of diabetes. The combined use of FPG and OGTT in community-based screening is not only a clinically effective diagnostic strategy but also a vital component of a broader psychosocial intervention model. By providing clear and definitive diagnostic information, it reduces health-related uncertainty and anxiety, empowering patients to engage in proactive health management. This model highlights the importance of integrating mental health considerations into primary care chronic disease management.

Keywords: diabetes; prediabetes; health anxiety; community health services; psychosocial intervention

1. Introduction

The global burden of diabetes is staggering, with China experiencing a particularly rapid rise in both diabetes and prediabetes prevalence. The 2018 national data indicated a 12.4% prevalence of diabetes, with prediabetes now affecting an estimated 382 million individuals [1–3]. The insidious onset of diabetes, with an average 6-year delay between onset and clinical diagnosis, contributes significantly to this burden, as a large proportion of cases remain undiagnosed and untreated [4,5].

While the clinical imperative for early detection is clear—to delay disease progression and prevent complications—it is crucial to recognize the significant psychological toll that this “pre-diagnostic” or “at-risk” state imposes on individuals [6,7].

The diagnosis of prediabetes, or even the knowledge of being at high risk, often introduces a state of persistent health-related anxiety and existential uncertainty. Individuals grapple with an ambiguous health status, leading to fear of progression, worry about future complications, and a sense of loss of control over their health [8]. This psychological burden can paradoxically hinder engagement in the very lifestyle modifications needed to mitigate risk, creating a vicious cycle of anxiety and inaction. In the context of China’s “Healthy China 2030” strategy, while the clinical management of chronic diseases has been prioritized, the psychosocial dimensions of chronic disease prevention remain largely underexplored and under-resourced [9].

Beyond the immediate psychological burden of glycemic uncertainty, the association between diabetes and cancer risk adds another layer of concern for high-risk populations. Accumulating epidemiological evidence has established that diabetes significantly increases the risk of several malignancies, including hepatocellular, pancreatic, colorectal, and breast cancers, with risk increases ranging from 25% to 250% in individuals with overt diabetes or even prediabetes. [10] These insights have important implications for community-based screening: programs that identify hyperglycemic individuals may simultaneously serve as entry points for cancer risk awareness and surveillance, as diabetes and prediabetes are now recognized as integral components of a broader cardio-renal-metabolic-cancer continuum.[11] Furthermore, the psychological burden experienced by individuals with prediabetes or diabetes—including health anxiety, uncertainty about future health trajectories, and fear of complications—is comparable to that faced by individuals at elevated cancer risk. [12] This overlapping psychological distress can paradoxically hinder engagement in the very lifestyle modifications needed to mitigate both glycemic and cancer risks. Therefore, integrating mental health support into community-based screening programs is essential: clear diagnostic pathways combined with psychosocial support not only address the clinical imperative of early detection but also attend to the psychological well-being of high-risk populations, aligning with the principles of integrated, patient-centered chronic disease care. This approach is particularly critical in primary care settings where chronic disease and mental health comorbidity is prevalent but often under-recognized.

Fasting Plasma Glucose (FPG) and the Oral Glucose Tolerance Test (OGTT) are the cornerstone of diabetes screening. However, their value extends beyond mere clinical diagnosis. These tests, when applied systematically and interpreted with clarity, provide a concrete and definitive answer to a state of profound medical ambiguity. A clear diagnostic outcome—whether normal, prediabetic, or diabetic—can serve as a powerful tool to reduce the psychological distress associated with uncertainty and to empower patients to take decisive action. Currently, China lacks effective, well-adhered prediabetes prevention and psychosocial support programs, and primary care services often struggle to engage high-risk groups [13,14].

Community-based screening models offer a unique opportunity to integrate clinical assessment with psychosocial support. Jiading Town has pioneered a long-term, community-based diabetes management program, utilizing “Internet+” information management for high-risk individuals for two decades. This project seeks

to evaluate the diagnostic efficacy of combined FPG and OGTT screening in this high-risk population, but more importantly, to conceptualize this process not merely as a clinical intervention but as a psychosocial intervention. By providing clear, actionable diagnostic information and integrating it into a supportive community management framework, we hypothesize that this model can alleviate the anxiety associated with disease uncertainty and foster a more adaptive and proactive approach to health.

2. Materials and methods

2.1. Objects

From October 2022 to September 2024, 1586 high-risk individuals of type 2 diabetes who were newly included in the information management system of diabetes community in Jiading Town and had not undergone high-risk screening for diabetes and blood glucose testing were selected. Among them, 321 people with $5.6 \text{ mmol/L} \leq \text{FFG} < 8.0 \text{ mmol/L}$ were further tested for FVBG and OGTT2h. The high-risk group of type 2 diabetes was defined as having any one or more of the following [1]: ① age ≥ 40 years; ② with a history of pre-diabetes; ③ overweight and/or central obesity; ④ sedentary lifestyle; ⑤ diabetes family time; ⑥ women with history of gestational diabetes mellitus; ⑦ hypertension or receiving antihypertensive treatment; ⑧ dyslipidemia or receiving lipid-lowering therapy; ⑨ patients with atherosclerotic cardiovascular disease; ⑩ history of transient steroid diabetes; patients with polycystic ovary syndrome or with a clinical condition associated with insulin resistance; long-term treatment with antipsychotics, antidepressants, or lipid-lowering medications with statins.

This study was reviewed by the Ethical review Committee of Jiading District Center for Disease Control and Prevention, and all subjects signed the informed consent.

2.2. Methods

2.2.1. Specimen Collection

The FFG of 1586 high-risk subjects were detected by Terumo FR201BC fast blood glucose meter and MEDISAFE FIT blood glucose test strip. The results were displayed in 9 seconds and the blood glucose values were recorded. Subjects with $\text{FFG} < 5.6 \text{ mmol/L}$ or $\geq 8 \text{ mmol/L}$ were excluded from further testing. A total of 321 subjects underwent OGTT for $5.6 \text{ mmol/L} \leq \text{FFG} < 8.0 \text{ mmol/L}$. The 321 subjects were further asked to drink 75 grams of anhydrous glucose powder dissolved in 300 ml of water within 3 minutes. The time of taking the first mouth of glucose was recorded and timed. Two hours later, 3ml blood was collected from the elbow vein of the same side again.

2.2.2. Specimen Processing

The collected blood samples were stored in anticoagulant tubes, and immediately mixed upside down to prevent blood coagulation, but not violent shaking. All samples were sent to the test within 2 hours. The samples were centrifuged at 3000 r/min for 5 min after delivery. After centrifugation, the upper layer of serum was taken for detection, and FVBG and OGTT blood glucose values were detected by Abbott Laboratories automatic biochemical analyzer ACCZLZRATORa3600. All the above operations were carried out by professionally trained laboratory doctors in strict accordance with the operating procedures.

2.3. Determination Criteria

The criteria for prediabetes in China follow the World Health Organization (WHO) 1999 classification of glucose metabolism status and the American Diabetes Association (ADA) 2022 diagnostic criteria for prediabetes [3]. The WHO criteria used in our center are [15]: ① Impaired fasting glucose (IFG): $6.1 \text{ mmol/L} \leq \text{FVBG} < 7.0 \text{ mmol/L}$, and OGTT2h blood glucose $< 7.8 \text{ mmol/L}$; ② Impaired glucose tolerance (IGT): $\text{FVBG} < 7.0 \text{ mmol/L}$, and $7.8 \text{ mmol/L} \leq \text{OGTT2h blood glucose} < 11.1 \text{ mmol/L}$.

The diagnostic criteria of diabetes mellitus were as follows [1,2]: ① With typical diabetes symptoms (polydipsia, polyuria, polyphagia, unexplained weight loss) and random venous blood glucose $\geq 11.1 \text{ mmol/L}$ or $\text{FVBG} \geq 7.0$ or $\text{OGTT2h blood glucose} \geq 11.1 \text{ mmol/L}$; ② In the absence of typical diabetes symptoms, two blood glucose indicators at the same time point or two different blood glucose indicators at the same time point should meet or exceed the diagnostic cut-off points (excluding random blood glucose) to diagnose diabetes. In this project, $\text{FVBG} \geq 7.0 \text{ mmol/L}$ and $\text{OGTT2h blood glucose} \geq 11.1 \text{ mmol/L}$ were required.

Suspected diabetes: $\text{FVBG} \geq 7.0 \text{ mmol/L}$ or $\text{OGTT2h blood glucose} \geq 11.1 \text{ mmol/L}$ according to the requirements of Shanghai Center for Disease Control and Prevention for primary chronic disease management; ② When $\text{FFG} \geq 8 \text{ mmol/L}$, it was temporarily labeled as suspected diabetes.

2.4. Indicator Interpretation

Fasting state in this item: refers to at least 8 hours without eating calories [1].

Blood glucose status: ① normal fasting blood glucose: $\text{FFG} < 5.6 \text{ mmol/L}$; ② Normal venous blood glucose: $\text{FVBG} < 6.1 \text{ mmol/L}$ and $\text{OGTT 2 h blood glucose} < 7.8 \text{ mmol/L}$; ③ Hyperglycemia status: impaired fasting glucose (IFG), impaired glucose tolerance (IGT), diabetes mellitus and suspected diabetes mellitus. Among them, IGF and IGT are collectively referred to as impaired glucose regulation, also known as pre-diabetes [1].

2.5. Data Processing

SPSS 25.0 software was used for statistical analysis. Measurement data were expressed as (mean $\pm$ SD), and comparison of count data between groups was analyzed using the χ^2 test. The S-K test was used for normal distribution. The receiver operating characteristic (ROC) curve and the area under the ROC curve (AUC) were used to determine the effect of different blood glucose values on diabetes and prediabetes, and the sensitivity and specificity were used to evaluate the efficacy. $P < 0.05$ was considered statistically significant.

3. Results

3.1 Basic Information

A total of 1586 people at high risk of diabetes participated in the project, including 293 males (18.47%) and 1293 females (81.53%). The average age was 66.53 ± 8.66 years (range, 30-85 years), 20 (1.26%) were less than 35 years old, 137 (8.64%) were 35-44 years old, 293 (18.47%) were 45-54 years old, 702 (44.26%) were 55-64 years old, and 434 (27.36%) were 65 years old and above. As shown in Table 1.

Table 1. Prevalence of diabetes and prediabetes in 1586 people at high risk of diabetes in Jiading Town [n(%)]

Project	Diabetes n(%)	Suspected diabetes n(%)	Prediabetes		FVBG Normal, n(%)	FFG Normal, n(%)	Total n(%)
			IFG, n(%)	IGT, n(%)			
Gender							
Male	21(7.17)	10(3.41)	2(0.68)	26(8.87)	31(10.58)	203(69.28)	293(18.47)
Memale	34(2.63)	30(2.32)	5(0.39)	88(6.81)	74(5.72)	1062(82.13)	1293(81.53)
Age(years)							
< 35	4(0.25)	0 (0.00)	0(0.00)	1(0.06)	0(0.00)	15(0.95)	20(1.26)
35-44	1(0.06)	1 (0.06)	0(0.00)	1(0.06)	2(0.13)	132(8.32)	137(8.64)
45-54	3(0.19)	1 (0.06)	0(0.00)	4(0.25)	9(0.57)	276(17.40)	293(18.47)
55-64	4(0.25)	10(0.63)	0(0.00)	31(1.95)	36(2.27)	621(39.16)	702(44.26)
≥ 65	43(2.71)	28(1.77)	7(0.44)	77(4.85)	58(3.66)	221(13.93)	434(27.36)
Total	55(3.47)	40(2.52)	7(0.44)	114(7.19)	105(6.62)	1265(79.76)	1586(100.00)

A total of 216 people (13.62%) were screened for hyperglycemia, including 121 people (56.02%) with pre-diabetes, 40 people (18.52%) with suspected diabetes, and 55 people (25.46%) with diabetes. There were 59 males in high glucose state, accounting for 20.14% of the total male population. 157 were female, accounting for 12.14% of the total female. Regardless of clinical symptoms, 21 cases were male, accounting for 7.17% of the total male cases. There were 34 female cases, accounting for 2.63% of the total female cases. There were 28 males in prediabetes, accounting for 9.56% of the total number of males. 93 (7.19%) were female. The prevalence of prediabetes and diabetes in males was higher than that in females in Jiading town, and the difference of prediabetes was not statistically significant, but the difference of diabetes was statistically significant. As shown in **Table 2**.

Table 2. Comparison of the incidence of hyperglycemia status between different genders in high-risk populations of diabetes in Jiading Town [n(%)]

Project	Gender		χ^2 value	P-value
	Male n(%)	Female n(%)		
Hyperglycemia	59(20.14)	157(12.14)	12.98	0.001
Normal	234(79.86)	1136(87.86)		
Diabetes	21(7.17)	34(2.63)	14.69	< 0.001
Normal	272(92.83)	1259(97.37)		
Prediabetes	28(9.56)	93(7.19)	1.894	0.169
Normal	265(90.44)	1200(92.81)		

3.2 Distribution of FFG, FVBG and the difference between FVBG and FFG (Difference between FFG-FVBG)

The FFG, FVBG and the venous-final difference (the difference between fasting venous blood glucose and FFG) of the high-risk group of diabetes were tested for normality. The K-S test showed that the three values were significant ($p < 0.05$), and the hypothesis of normal distribution of data was rejected. As shown in **Table 3**.

Table 3. FFG, FVBG and static-final difference normality test analysis results

tems	Sample size	Average	Standard deviation	Degree of deviation	Degree of kurtosis	Kolmogorov-Smirnov test		Shapiro-Wilk test	
						Statistic value <i>D</i>	<i>p</i>	Statistic value <i>W</i>	<i>p</i>
FFG	321	6.590	0.704	0.344	-1.145	0.134	0.0001	0.931	0.0001
FVBG	321	6.060	1.419	1.905	4.660	0.152	0.0001	0.827	0.0001
FFG-FVBG	321	-0.530	1.161	2.250	6.688	0.158	0.0001	0.796	0.0001

3.3 ROC curve, sensitivity and specificity

FVBG and OGTT2h blood glucose were used as the gold standard for the diagnosis of diabetes and prediabetes. The ROC curve of FFG, FVBG and OGTT2h can be used to evaluate the diagnostic value of hyperglycemia. The results showed that: ① FFG: AUC = 0.666(95%CI: 0.606-0.726%), the corresponding optimal cut-off value was 0.333(the sensitivity was 0.495, the specificity was 0.838), which means that the value of FFG alone in the clinical diagnosis of hyperglycemia was low; ② FVBG: AUC = 0.85(95%CI: 80.94%-88.99%), the corresponding optimal cut-off value was 0.571(the sensitivity was 0.676, the specificity was 0.895), and the relative diagnostic value was high; ③ OGTT2h: AUC = 0.981(95%CI: 96.54%-99.59%), and the corresponding optimal cut-off value was 0.963(the sensitivity was 0.963, the specificity was 1.000), the diagnostic value was very high. Therefore, simultaneous detection of FVBG and OGTT2h is the most beneficial for the diagnosis and classification of diabetes and prediabetes. As shown in **Table 4** and **Figure 1**.

Table 4. AUC values and sensitivity and specificity analysis of FFG, FVBG and OGTT2h

Items	AUC	Standard error	<i>p</i>	95% CI	Optimal	sensitivity	specificity	Cut-off
				boundary value				
FFG	0.666	0.030	0.0001	0.606 ~ 0.726	0.333	0.495	0.838	6.700
FVBG	0.850	0.021	0.0001	0.809 ~ 0.890	0.571	0.676	0.895	5.650
OGTT2h	0.981	0.008	0.0001	0.965 ~ 0.996	0.963	0.963	1.000	7.790

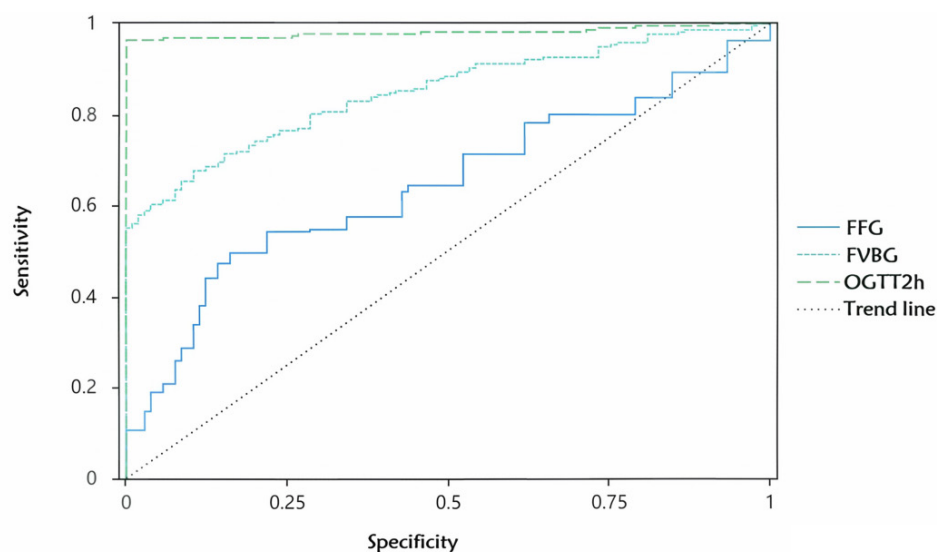


Figure 1. Receiver operating characteristic (ROC) curves for FFG, FVBG, and OGTT2h in screening for diabetes and prediabetes

Abbreviations: FFG, fasting fingertip glucose; FVBG, fasting venous blood glucose; OGTT2h, 2-hour oral glucose tolerance test blood glucose; AUC, area under the curve. The diagonal reference line represents an AUC of 0.5 (no discriminative ability). FFG (AUC = 0.666, 95% CI: 0.606–0.726) demonstrated limited diagnostic value, whereas FVBG (AUC = 0.850, 95% CI: 0.809–0.890) and OGTT2h (AUC = 0.981, 95% CI: 0.965–0.996) showed high and very high diagnostic accuracy, respectively.

4. Discussion

Our findings confirm that the combined use of FVBG and OGTT2h is significantly superior to FFG alone for screening hyperglycemia in high-risk populations. This has direct clinical implications, but the psychological implications are equally significant. The high sensitivity (0.963) and specificity (1.000) of OGTT2h mean that this test can provide a definitive diagnosis, which is the most effective way to resolve the anxiety inherent in an ambiguous pre-diagnostic state. By using this robust screening strategy, healthcare providers are not just identifying disease; they are offering patients a clear and certain answer—thereby reducing the mental anguish of “not knowing.”

The high prevalence of diabetes (7.17%) in males compared to females (2.63%) is a critical finding with psychosocial overtones. This higher biological risk likely compounds with potential psychosocial barriers, such as health-related stigma, lower health literacy, and a reluctance to seek care. The community-based screening model, embedded in a familiar setting, may be particularly effective in reducing these psychosocial barriers for this high-risk male population, making it an integral component of a tailored intervention.

The program’s “Internet+” community chronic disease management model in Jiading Town serves as an exemplary psychosocially-informed intervention. Our discussion highlights that the data management, which has been operational for 20 years, is not just administrative; it provides continuous support and monitoring, thereby serving as a psychological safety net for high-risk patients. This model directly addresses the issue of “information islands” and ensures that individuals are not lost to follow-up, which is a major source of patient anxiety. By tracking patients over time, the program reinforces a sense of being “looked after,” reducing the fear of being forgotten or of their condition worsening unnoticed.

Furthermore, the fact that over half of the hyperglycemic cases identified were prediabetic (56.02%) highlights a key window for psychosocial and behavioral intervention. This finding aligns with the Healthy China Initiative, which identifies prediabetes as a high-risk state requiring urgent action. [14] It is precisely in this group that the psychological distress of being “at-risk” is most acute. The community health system can leverage this moment to not only provide lifestyle advice but also to offer targeted psychological support. Through sustained health education, self-management training, and coping skills enhancement, the program can empower this cohort to reverse their condition, reducing both their clinical risk and their health-related anxiety, thereby promoting a return to a normal glucose metabolism and a healthier mental state.[16]

The limitations of this study, such as its reliance on diagnostic data without directly measuring psychological outcomes, are noted. However, the implications for practice are clear. Building on the “National Guidelines for the prevention and management of diabetes in Primary care,” Jiading Town’s experience suggests a

scalable model. By expanding this framework to include explicit psychosocial support components—such as group-based stress reduction or motivational interviewing—other regions can replicate this success. This would transform a primarily clinical screening tool into a comprehensive psychosocial intervention. The objective problems of high expenditure and lack of cooperation encountered in this project only reinforce the need for robust health communication strategies and policy support to build trust and reduce psychological resistance to screening. In conclusion, this study demonstrates that a community-based screening program using FPG and OGTT does more than detect disease; it functions as a critical psychosocial intervention that reduces health-related uncertainty, alleviates anxiety, and empowers patients to manage their health proactively.

5. Conclusion

This study demonstrates that a community-based screening program using FPG and OGTT does more than detect disease; it functions as a critical psychosocial intervention that reduces health-related uncertainty, alleviates anxiety, and empowers patients to manage their health proactively. Integrating mental health considerations into primary care chronic disease management is essential for improving both clinical outcomes and patient well-being.

Author contributions: Yan M translated: conducted the study, collected the data, analyzed the statistics, interpreted the data, and drafted the manuscript; Luo C: preparation and design of the experiment, critical review of the intellectual content of the article, statistical analysis, obtaining research funding, administrative, technical or material support, and guidance; He F: research implementation, technical or material support and guidance; Xu D and Li G: planning and designing experiments and obtaining research funding.

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Ethical approval: This study was reviewed and approved by the Ethical Review Committee of Jiading District Center for Disease Control and Prevention (Approval No. JDCDC-2021-08), and all subjects provided written informed consent prior to participation.

Informed consent statement: Informed consent was obtained from all subjects involved in the study.

Data availability statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

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Conflict of interest: The authors declare no conflict of interest.

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