

Exploring Factors Associated with Self-Management Compliance among Rural Elders with Diabetes

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Abstract

The purpose of the study was to examine the social-ecological factors associated with diabetic self-management compliance among elders with diabetes in China. A total of 2,586 rural elderly residents who were 60-years-old or above participated in the survey. Socio-demographic factors, social support, healthcare accessibility and health risk factors were measured, along with self-reported medication and blood glucose monitoring data. Among the 117 individuals with diabetes, the medication compliance rate was 79.49%. The elderly who had high economic status were more likely to meet medication treatment compliance. Only 58.97% of study participants monitored blood glucose once a month. Younger age (<70-year-old), higher economic status, more social support and better healthcare accessibility were associated with higher blood glucose monitoring compliance odds. Diabetic medication and blood glucose testing tools should be more comprehensively covered by the national insurance program. Healthcare accessibility should be increased through transportation support, building more local facilities, such as mobile labs, and promoting affordable home-visit care. Self-management education programs about diabetes for rural elders should be promoted.

Keywords

China, compliance, diabetes, self-management, social ecological model

- **What do we already know about this topic?**
 - The fast-growing population of people with diabetes has become a health and economic burden for developing countries like China;
 - People with diabetes have high responsibility for self-management, such as lifestyle adjustment and home blood glucose monitoring;
 - It is unclear what factors are associated with self-management compliance among elders with diabetes in rural China.
- **How does your research contribute to the field?**
 - The self-reported medication compliance rate was 79.49%; Only 58.97% of participants monitored blood glucose levels at least once a month;
 - Several factors from the Social Ecological Model were associated with lower blood glucose monitoring compliance, including older age, lower economic status, living without a partner, and further distance from medical facilities;
 - Health behavioral practices, such as drinking and smoking, as well as having other chronic diseases were not associated with compliance rates.
- **What are your research's implications toward theory, practice, or policy?**
 - Comprehensive coverage of the cost of the blood glucose testing tools by the National Health Insurance is the key to increasing compliance among rural elderly patients;
 - Accessibility is a major factor related to compliance rate. Transportation support, building more local facilities and providing affordable home-visit care should be considered;
 - Diabetes self-management education programs at both healthcare institutions and community levels should be in place, with an emphasis on promoting self-management behaviors.



Introduction

Diabetes has become a global health burden. As of 2014, 422 million individuals were diagnosed with diabetes worldwide, which accounts for approximately 8.5% of adults.¹ The number of individuals with diabetes is expected to increase to 439 million worldwide by 2030.²

Due to economic development, urbanization, and lifestyle changes, the prevalence rate of diabetes has increased rapidly in China, from 3.2% to 9.7% between 1990 and 2007.³ The prevalence of either diabetes or prediabetes in Chinese elderly individuals is alarmingly high: 62.3% in those aged 60 to 69 years, 63.6% in those aged 70 to 79 years, and 69.7% in those aged 80 or older.⁴ The total number of individuals with type 2 diabetes mellitus in China is expected to reach 42.3 million by 2030.⁵ Rural elders seem at particular high risk of diabetes. A recent study showed that compared to 2013, the prevalence rate of diabetes in rural areas increased 2.5% in 2018, compared to an increase of only 1% in the urban areas in China.⁶

Diabetes is a chronic disease and patients must accept a high level of personal responsibility for day-to-day self-management.⁷ Self-management in the majority of individuals with type 2 diabetes typically requires lifestyle modifications (e.g., weight loss, dietary changes, and exercise), regular blood glucose monitoring, and adherence to medication.⁸ There is conclusive evidence that effective diabetes self-management leads to an optimal glycemic level, higher sociopsychology functions, and improved quality of life.⁷ Home blood glucose monitoring is the standard of care for patients with diabetes.^{7,8} The frequency of blood glucose measurements is believed to correlate with the degree of metabolic control.^{7,9} Non-compliance is believed to be the most common cause of treatment failure and diabetic complications among patients with diabetes.⁷ Non-compliance leads to the lack of metabolic control, which contributes to the development and acceleration of diabetic complications, as well as a reduced quality of life and higher risk of death.¹⁰ According to Burge,¹¹ compliance is negatively related to the number of physicians' office visits and the number of hospitalizations.

However, only about 50% of patients with type 2 diabetes comply with long-term treatment,¹² while approximately 20% do not buy the medication prescribed by their doctors to treat the disease.¹³ A recent study showed that HbA1c was controlled at the target level by only 35.82% of patients in

China.¹⁴ Many patients with diabetes in China do not meet self-management responsibilities and glycemic control. Only 13% of patients with diabetes in China perform glucose self-testing daily¹⁵ and 59.2% of diabetic patients reported that they occasionally, rarely, or never self-monitor blood glucose.¹⁶

The Social Ecological Model (SEM)¹⁷ is widely used to understand the factors linked to behavioral practices. According to SEM, individual behavior is shaped by multiple level factors, including personal (e.g., social economic status, education level), interpersonal (e.g., social support), institutional/community (e.g., environmental support, accessibility), and cultural and policy factors. Previous studies have shown that 1 or multiple factors under SEM were associated with compliance with diabetic self-management compliance. For instance, patients with higher levels of education have a better understanding of how to manage their diabetes, and hence higher treatment compliance.¹⁸ In addition, patients with higher education display more favorable attitudes toward treatment protocols, which is also an important predictor of diabetes compliance.¹⁰ Accordingly, a U.S. review supported the effectiveness of self-management education for patients with chronic diseases including diabetes.¹⁹ Studies have also reported that higher cognitive functioning is associated with higher rates of compliance,^{18,20} especially among older individuals.²¹ Socioeconomic status also influences compliance through access to care, quality of care, social support, and community resources for individuals with diabetes.²² Studies have shown that low socioeconomic status is associated with poor glycemic control and higher diabetes morbidity and mortality.^{23,24}

As for the interpersonal level, the results from previous research are inconsistent. DiMatteo reported that social support from family provides patients with practical help, increases their self-esteem, and can buffer the effects of the stresses of living with an illness such as diabetes.²⁵ Some empirical studies have found that social support, including perceived informational, affective, tangible, and appraisal support, was related to compliance among diabetic patients.¹⁸ However, other studies showed that social support did not directly predict patients' self-management behaviors.²⁶ In addition, a U.K. study revealed that doctor-patient trust was a primary factor that influenced medication adherence among patients with diabetes.²⁷

In conclusion, in spite of the increasing number of diabetic patients, few studies have been conducted to understand

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factors under the SEM framework that influence diabetic compliances among elders in China. Considering the increasing number of Chinese individuals with diabetes, as well as China's unique sociocultural characteristics, it is critical to gain more insight on this topic. The current study aims to identify factors that are related to compliance among rural Chinese elders with diabetes under the SEM framework. Specifically, demographic, socioecological, and health risk factors, social support, access to healthcare and health insurance were examined.

Methods

Data Source

This cross-sectional study used data from Fujian Province from the Fifth National Health Services Survey in China, 2013. The study was exempted from Institutional Review Board approval as the data were from an existing database that divulged no personal identification. Briefly, the survey uses a representative sample of the Chinese population selected by a multistage probability design that measured socio-demographic characteristics, self-reported illness and functions, health behavior, and healthcare services utilization. All participants were interviewed in their homes. Fujian is located in southeastern China and is relatively developed. In 2013, Fujian had 37.74 million residents, 14.81 million of whom lived in rural areas. According to National Bureau of Statistics of China (2014),²⁸ the per capita gross domestic product (GDP) was RMB 57 856 (~\$8265 U.S. dollars), higher than the national average of RMB 41 908 (~\$5 987 U.S. dollars). Using multi-stage random sampling, the Fujian Province survey involved 8 counties, 40 townships (districts), 80 villages (communities), 4800 households and 14 393 residents who provided effective answers, of whom 2586 were rural residents aged 60-years-old or older. Of these, 117 individuals (4.52%) who reported having diabetes were included in the analysis.

Measures

Adherence to medication treatment. Participants were asked how often they used medicines (oral medication, insulin injection, or both) to control their blood glucose level (i.e., used it daily following a doctor's recommendation; used it irregularly; and never used it). Participants who chose the daily option were classified as the treatment compliance group and the latter 2 groups were classified as the non-compliance group.

Blood glucose monitoring compliance. Participants were asked the last time they had their blood glucose level measured (i.e., within a month, within 3 months, within half a year, and more than half a year). Although individuals with diabetes

should monitor their blood glucose level daily,⁸ many rural residents in China either do not have regular access to health-care facilities, or cannot afford a blood glucose self-monitoring tool which they can use at home.¹⁵ As a result, many doctors have suggested that patients should monitor their blood glucose level at least once a month.¹⁵ Given this situation, those who measured their blood glucose level at least monthly were classified as the compliance group and the remainder were classified as the non-compliance group.

Socio-demographic factors. Age, gender, education, and socioeconomic status were measured. Socioeconomic status was determined by the annual household income per capita and the annual household expenditure per capita, respectively. Some authorities have suggested that, for developing countries, expenditure data are a better proxy of household economic status than income data since the latter are likely to be under-reported.¹⁵ We classified all participants to high, median, and low-income groups according to above 33.3%, 33.3% to 66.7%, below 66.7%.

Health risk factors. Health risk factors included: having at least 1 chronic disease, being a smoker, not exercising at least once a week, drinking alcohol in the last 12 months, being unable to move by themselves, being unable to take care of themselves, being unable to undertake house chores, suffering from pain, and being unable to identify an acquaintance at a distance of 20 m.

Interpersonal level. Social support was measured by whether the patient had a partner, or lived alone, and the source of their income (i.e., self, spouse, or children).

Institution/community level. Distance from a medical facility was used as a healthcare accessibility parameter.

Policy level. Participants were asked whether they were covered under the Chinese New Rural Cooperative Medical Scheme health insurance program. This program is provided specifically for rural residents. It was initially funded by annual premiums of RMB10–20 (approximately U.S.\$1.43–\$2.86) per person with matched contributions from local and central governments.²⁹ In 2013, the insurance premium per capita increased to RMB 340 (approximately U.S.\$48.57), including a government subsidy of RMB 280 (approximately U.S.\$40.00).³⁰

Data Analysis

All data were analyzed using SPSS 21.0. Compliance with diabetic medication and blood glucose monitoring were treated as binary dependent variables. A Chi-square test was implemented to examine whether the factors were associated with the compliance behaviors. For the factors that were found to be related to either medication or blood glucose

Table 1. Factors Associated with Compliance with Diabetic Medication.

Parameters	N (%)		P-value
	Not taking regular dose (n=24)	Taking regular dose (n=93)	
Socio-demographic factors			
Age			>.05
60-69	11 (45.8%)	60 (64.5%)	
70-79	11 (45.8%)	27 (29%)	
≥80	2 (8.3%)	6 (6.5%)	
Gender			>.05
Female	15 (62.5%)	59 (63.4%)	
Education			>.05
Elementary school	19 (79.2%)	78 (83.9%)	
Junior High and above	5 (20.8%)	15 (16.1%)	
Economic status(per capita annual household income)			>.05
Low (below 67.7%)	13 (54.2%)	39 (41.9%)	
Median (33.3-67.6%)	8 (33.3%)	20 (21.5%)	
High (above 33.3%)	3 (12.5%)	34 (36.6%)	
Economic status(per capita annual household expenditure)			<.05
Low (below 67.7%)	12 (50.0%)	27 (29.0%)	
Median (33.3-67.6%)	9 (37.5%)	26 (28.0%)	
High (above 33.3%)	3 (12.5%)	40 (43.0%)	
Social support			
Having a partner	16 (66.7%)	72 (77.4%)	>.05
Living alone	6 (25%)	15 (16.1%)	>.05
Source of income			>.05
Self or spouse	7 (30.4%)	28 (32.2%)	
Children	14 (60.9%)	55 (63.2%)	
Other	2 (8.7%)	4 (4.6%)	
Healthcare accessibility			
Distance from a medical facility			>.05
<1 km	14 (58.3%)	55 (59.1%)	
1-2 km	4 (16.7%)	20 (21.5%)	
>2 km	6 (25%)	18 (19.4%)	
Risk factors			
Having at least 1 chronic disease	19 (79.2%)	70 (75.3%)	>.05
Smoker	0 (0%)	11 (11.8%)	>.05
Not exercising at least once a week	20 (83.3%)	82 (88.2%)	>.05
Drinking alcohol in last 12 months	2 (8.3%)	8 (8.6%)	>.05
Unable to move by themselves	7 (29.2%)	25 (26.9%)	>.05
Unable to take care of themselves	3 (12.5%)	20 (21.5%)	>.05
Unable to do house chores	3 (12.5%)	23 (24.7%)	>.05
Suffering from pain	10 (41.7%)	39 (41.9%)	>.05
Unable to identify acquaintances at 20 meters	6 (26.1%)	31 (35.6%)	>.05

monitoring compliance, a binary logistic regression test was performed to reveal the magnitude of the parameters.

Results

Among the 117 individuals who reported having diabetes, 71 were aged between 60 and 69 years (60.7%), 74 were female (63.2%), 97 had attended elementary school or below (82.9%), 88 had a partner (75.2%), 80 were classified having median or low household economic status by the annual

household income per capita criterion (68.3%), 74 were classified having median or low household economic status by the annual household expenditure per capita criterion (63.2%). The vast majority (96.5%) were covered by the New Rural Cooperative Medical Scheme health insurance or other social insurance.

Ninety-three diabetes patients (79.5%) were compliant with medication. The most important factor affecting medication compliance was economic status (see Table 1). High economic status patients were 6 times more likely to

Table 2. Association Between Income and Medication Compliance.

Parameters	OR	95% CI	P-value
Economic status (per capita annual household living expenditure)			<.05
Low (below 67.7%)	1		
Median (33.3-67.6%)	1.28	0.46-3.55	>.05
High (above 33.3%)	5.92	1.52-22.99	<.05

be medication compliant than the low economic status groups (OR=5.92, CI=1.52-22.99, $P < .05$). See Table 2). Medication compliance was not associated with age, gender, education, social support, healthcare accessibility groups, or different health risk factors.

Sixty-nine diabetes patients (58.9%) monitored their blood glucose level regularly. The 60 to 69 age group were the most compliant with blood glucose measurement (See Table 3). Blood glucose monitoring compliance was higher among the highest economic status groups than the middle and low groups ($P < .01$). Social support was also associated with blood glucose monitoring compliance. Diabetes patients with a partner measured blood glucose more regularly than those without a partner ($P < .01$), while patients living alone were less likely to be compliant ($P < .05$). Individuals who had their own incomes or received income from their partner tended to measure blood glucose regularly ($P < .05$). Those who lived near a medical facility were more likely to measure blood glucose regularly ($P < .05$). There were no significant differences in blood glucose monitoring between different genders, educational level, or different health risk factors groups (See Table 3).

Logistic regression showed that the 70 to 79-year-old group were less likely to be blood glucose monitoring compliant than the 60 to 69-year-old group ($P = .003$; OR=0.17, CI=0.06-0.54). Patients living in high economic status households were 3.6 times more likely to comply with blood glucose monitoring than the low economic group (OR=3.63, CI=1.13-11.61, $P < .05$). In addition, those who lived further from a medical facility were less compliant; those living between 1 to 2 km, and further than 2 km from the medical facility were less likely to monitor their blood glucose than those living less than 1 km (OR=0.24, CI=0.07-0.81, $P < .05$, OR=0.28, CI=0.08-0.90, $P < .05$, respectively). After controlling other demographic and economic factors, social support was not significantly related to blood glucose monitoring (see Table 4).

Discussion

This study examined the demographic, socioeconomic, and other related factors under the SEM framework that were associated with diabetic medication and blood glucose monitoring compliance among elders living in the rural areas in Fujian Province in China. The diabetes rate among study participants was 4.52%, lower than the national

average.³¹ A recent clinical study assessed 75 880 adults from urban and rural areas in China, of whom 12.8% (9,772) were diagnosed with diabetes. However, almost 50% of those individuals were unaware of their diagnosis prior to the study.⁶ This indicates that the true prevalence rate of diabetes in the current study could be much higher.

The major factors related to diabetic medication compliance were economic status, while the factors related to blood glucose monitoring compliance were age, economic status, social support, and distance from a medical facility. As mentioned above, the definition of blood glucose monitoring compliance in this study was once a month because of the relatively low accessibility to healthcare and monitoring tools in rural China.¹⁵ Yet, only 58.97% of study participants monitored their blood glucose level once a month. Compared to the blood glucose monitoring compliance rate, the medication compliance rate was much higher, at 79.49%. The medication compliance rate revealed in this study is higher than that reported in other developing countries, such as India and Indonesia.^{32,33}

Annual household expenditure per capita was associated with both medication and blood glucose monitoring compliance, with higher expenditure level associated with higher odds of compliance. Annual household income per capita was also associated with blood glucose monitoring compliance, but not medication treatment compliance. There was a trend that individuals with medication treatment compliance were more likely to be in the higher family economic status group (i.e., >67.7%) than those who were not compliant (37.6% vs 16.7%). Higher socioeconomic status not only makes treatment and care more affordable, but is also associated with a higher level of motivation to obtain regular care.^{34,35} The results confirmed that socioeconomic status was a strong predictor of diabetic medication and blood monitoring compliance, which is consistent with previous studies conducted in other countries including U.S.,³⁶ Spain,³⁷ and France.³⁸

Consistent with previous research,^{18,39} age was associated with blood glucose monitoring compliance. Younger patients (i.e., those aged 60-69 years) were significantly more likely to monitor their blood glucose level once a month than the 70 to 79 and >80-year-old groups. This may be because older patients had more difficulties accessing a medical facility, and lower cognitive function levels may act as a barrier to follow recommendations.¹

Children provided the major source of income for approximately two-thirds of study participants since many

Table 3. Factors Associated with Compliance with Blood Glucose Monitoring.

Parameters	N (%)		P-value
	No regular blood glucose monitoring (n = 48)	Regular blood glucose monitoring (n = 69)	
Socio-demographic factors			
Age			<.001
60-69	18 (37.5%)	53 (76.8%)	
70-79	24 (50%)	14 (20.3%)	
≥80	6 (12.5%)	2 (2.9%)	
Gender			>.05
Female	33 (68.8%)	41 (59.4%)	
Education			>.05
Elementary school	40 (83.3%)	57 (82.6%)	
Junior High and above	8 (16.7%)	12 (17.4%)	
Economic status (per capita annual household income)			<.05
Low (below 67.7%)	29 (53.7%)	23 (36.5%)	
Median (33.3-67.6%)	14 (25.9%)	14 (22.2%)	
High (above 33.3%)	11 (20.4%)	26 (41.3%)	
Economic status (per capita annual household expenditure)			<.01
Low (below 67.7%)	20 (41.7%)	19 (27.5%)	
Median (33.3-67.6%)	19 (39.6%)	16 (23.2%)	
High (above 33.3%)	9 (18.8%)	34 (49.3%)	
Social support			
Having a partner	30 (62.5%)	58 (84.1%)	<.01
Living alone	13 (27.1%)	8 (11.6%)	<.05
Source of income			<.05
Self or spouse	9 (19.1%)	26 (41.3%)	
Children	33 (70.2%)	36 (57.1%)	
Other	5 (10.6%)	1 (1.6%)	
Healthcare accessibility			
Distance from a medical facility			<.05
< 1 km	22 (45.8%)	47 (68.1%)	
1-2 km	12 (25%)	12 (17.4%)	
>2 km	14 (29.2%)	10 (14.5%)	
Risk factors			
Having at least 1 chronic disease	35 (72.9%)	54 (78.3%)	>.05
Smoker	4 (8.3%)	7 (10.1%)	>.05
No exercise at least once a week	43 (89.6%)	38 (85.5%)	>.05
Drinking alcohol in last 12 months	3 (6.3%)	7 (10.1%)	>.05
Unable to move by themselves	14 (29.2%)	18 (26.1%)	>.05
Unable to take care of themselves	11 (22.9%)	12 (17.4%)	>.05
Unable to do house chores	13 (27.1%)	13 (18.8%)	>.05
Suffering from pain	21 (43.8%)	28 (40.6%)	>.05
Unable to identify acquaintances at 20 meters	20 (42.6%)	17 (27%)	>.05

young adults have migrated from rural to urban areas for employment. Currently, among the 564 million rural population in China, approximately 288 million (51%) have migrated to cities for employment.⁴⁰ In addition, more than half of the rural-urban migrant population are adults under 40 years of age, leaving their elders in the rural areas.⁴⁰ However, source of income did not make any difference to compliance rates, after adjusting for other demographic and socioeconomic factors. This indicates

that the amount is more important than the source of income in terms of compliance rates. This result differs from previous studies. For example, Feng et al.,³⁹ reported that having a partner significantly increased the chance of both urban and rural Chinese patients with diabetes or high blood pressure seeking medical services. Nevertheless, our results suggest that different types of social support (financial support, psychological support, etc.), having a partner or having financial support from a

Table 4. Factors that Associated with Regular Blood Glucose Monitoring.

Parameters	OR	95% CI	P-value
Socio-demographic factors			
Age			<.01
60-69	1		
70-79	0.17	0.06-0.54	<.01
≥80	0.19	0.03-1.32	>.05
Economic status(per capita annual household expenditure)			>.05
Low (below 67.7%)	1		
Median (33.3-67.6%)	1.0	0.32-3.05	>.05
High (above 33.3%)	3.62	1.13-11.61	<.05
Social support			
Having a partner	1.06	0.25-4.49	>.05
Living alone	1.29	0.27-6.16	>.05
Source of income			>.05
Self or spouse	1		
Children	0.69	0.23-2.05	>.05
Other	0.08	0.01-1.12	>.05
Healthcare accessibility			
Distance from a medical facility			<.05
<1 km	1		
1-2 km	0.24	0.07-0.81	<.05
>2 km	0.28	0.08-0.90	<.05

partner are more likely to influence glucose monitoring compliance indirectly through economic status.

A shorter distance (<1 km) to a medical facility was related to significantly higher odds of blood monitoring compliance. Transportation barriers are often cited as barriers to healthcare access.⁴¹ Due to the low affordability of blood glucose testing tools, most diabetic patients in rural China did not monitor their blood glucose level regularly at home. Instead, they have to go to the nearby medical facility to have their blood glucose level checked at long time intervals.¹⁶ A recent study reported that the distance to a medical facility was ranked as the most important factor that patients with diabetes in China considered when choosing healthcare services.⁴² Similarly, a study in Bangladesh showed that 12% of patients with diabetes in rural areas reported that proximity to a clinic influenced the compliance rate.⁴³ No doubt, increasing accessibility will facilitate more frequent visits to medical facilities and a higher compliance rate.

In this study, 96.5% of participants were covered under the New Rural Cooperative Medical Scheme health insurance or other social insurance. Under the New Rural Cooperative Medical Scheme system, diabetes is considered as a “disease in the special category,” providing 90% reimbursement of the cost of visits to a community health center. However, the 10% co-insurance and out-of-pocket cost, if exceeding RMB3000 (approximately U.S.\$428.57) per year, as well as the cost of a home blood glucose meter, may still be significant barriers associated with poor medication compliance among the elderly, especially those in rural areas with low economic status.⁴⁴ For example, the price of a home

blood glucose meter is about RMB 250 (approximately U.S.\$35.71), and if blood glucose is monitored once a day, the cost of a home blood glucose test strip for 1 year is about RMB 1285 (approximately U.S.\$183.57). Given that the median household annual medical cost was RMB 1500 (approximately U.S.\$214.29) in our sample, it is not surprising that the compliance rate was low. Other studies show that the New Rural Cooperative Medical insurance program has increased inpatient treatment among the high-income group, but not the middle and low-income groups.⁴⁵ The high cost and lack of insurance coverage for the glucose monitoring tool are major factors related to low compliance among diabetic patients in rural China.

Interestingly, no health risk factors (i.e., drinking alcohol and not exercising), or having other chronic diseases, were related to compliance. This may be because the overall exercise, smoking, and drinking alcohol rates were low (i.e., 12.8%, 9.4%, 8.5% respectively), while having at least 1 other chronic disease was high (76.1%), making it more difficult to observe statistical differences between groups.

There were several limitations of the study. First, the study sample was drawn only from Fujian province, so was not representative of the overall Chinese rural elder population. In addition, the study used self-reports instead of clinic assessment of the diabetes diagnosis, possibly resulting in underestimation of the diabetes prevalence rate. Third, neither the types nor number of diabetic medications were reported, factors that influence the optimal frequency of blood glucose level monitoring. Last, although the study examined risk factors related to diabetic medication and

blood glucose monitoring compliance, it is not clear if there are any median or moderation effects among those factors, which should be examined in future studies.

Conclusion

The increasing diabetes rate among the adult population will continue to be a major public health challenge in China. While there are multiple approaches in the fight against diabetes, comprehensive coverage of medication and blood glucose testing tools by the national insurance program may be one of the most effective means of increasing compliance rates among rural elderly patients. The government should consider providing transportation support, building more local facilities, such as creating mobile labs, and providing affordable home-visit care to improve accessibility to healthcare services to patients who live at inaccessible distances from medical facilities. It is very important to have diabetes self-management education programs at both healthcare facilities and community levels, with an emphasis on promoting and enhancing self-management behaviors.

Author Contributions

LRY and LYP data analysis and drafted the manuscript. ZZQ data collection and drafted the manuscript. ZY data analysis and drafted the manuscript.

Declaration of Conflicting Interests

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