ORIGINAL ARTICLE

Simultaneous control of blood glucose, blood pressure, and lipid among drug-treated Type 2 diabetes patients from Shaanxi province, North-Western China: A multicenter study

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Abstract

Aim: To investigate the percentage of patients with Type 2 diabetes mellitus (T2DM) who achieved simultaneous control of glycated hemoglobin (HbA1c), blood pressure (BP), and low-density lipoprotein cholesterol (LDL-C) and also to assess its determinants in Shaanxi province, North-Western China.

Materials and Methods: This cross-sectional survey was conducted between March and June 2012 in six tertiary hospitals across Shaanxi province. Subjects with known T2DM who had at least one antidiabetic medicine were invited. A questionnaire was used to collect basic information and blood samples were drawn for laboratory measurements. Simultaneous control was defined as HbA1c <7%, BP <130/80 mmHg, and LDL-C <2.6 mmol/L.

Results: A total of 2274 individuals were included, of which 588 individuals (25.9%) achieved good glycemic control (HbA1c <7%) and only 102 (4.5%) attained simultaneous control. The percentage of individuals (24.2%) achieving simultaneous control increased with less stringent goals (HbA1c <8%, BP <140/90 mmHg, and LDL-C <2.8 mmol/L). In addition, multivariate analyses showed that body mass index of 24–28 kg/m^2 (odds ratio [OR]: 0.577, 95% confidence interval [CI]: 0.376–0.886), HbA1c above 8% at diagnosis (pooled OR: 0.392, 95% CI: 0.254–0.531), and insulin treatment (pooled OR: 0.412, 95% CI: 0.225–0.594) were the independent predictors of simultaneous control.

Conclusion: Simultaneous control among drug-treated Type 2 diabetes patients was amazingly low in North-Western China. Our present study confirmed the gap between guideline and practice and provided evidence of the need for aggressive diabetes management.

Key words: Blood pressure, China, control, glycated hemoglobin, low-density lipoprotein cholesterol, Type 2 diabetes mellitus

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Introduction

Due to the rapid change to Western diet and sedentary lifestyle,[1]China has become one of the top countries with the largest number of people suffering from diabetes in the world.[2-4]The most recent two nationwide diabetes surveys indicated that the prevalence of Type 2 diabetes mellitus (T2DM) has reached 9.7% and 11.6%, translating into 92.4 million and 113.9 million patients in China, respectively.[5,6]On the other hand, the control of diabetes remained substantial unsatisfactory. For example, it was estimated that the 35% of individuals with known diabetes had fasting plasma glucose <126 mg/dl in 2000–2001 and only 39.7% of the estimated 113.9 million Chinese adults with diabetes had glycated hemoglobin (HbA1c) <7.0% National Glycohemoglobin Standardization Program units (53 mmol/mol International Federation of Clinical Chemistry units) in 2010.[5,7]

Diabetes contributes greatly but not solely to the development of cardiovascular diseases and chronic complications.[8,9]Hypertension and hyperlipidemia are the two most important remaining risk factors.[10,11]Clinical practice guidelines from professional organizations around the world collectively suggest that patients with diabetes should attain a simultaneous control of their risk factors including hyperglycemia, hypertension, and hyperlipidemia in an aggressive and timely manner.[12-15]Unfortunately, few are successful in achieving these goals. Previous studies have reported comparatively low prevalence rates of simultaneous control, most of which range from 5% to 30%.[16-27]In China, Li *et al.*[28]conducted a hospital-based survey which included 1151 patients with T2DM in Beijing in 2009, and the results showed that the percentage of patients achieving the targets for HbA1c was 37.8%, blood pressure (BP) 65.6%, and low-density lipoprotein cholesterol (LDL-C) was 34.0%, respectively. However, the rate of simultaneous control was not provided. Simultaneous control of HbA1c, BP, and LDL-C is collectively known as the "ABCs of Diabetes." Despite the fact that many researches have examined the individual components of the "ABCs of diabetes," only a few have reported the percentage of simultaneous control,[5,7,28-35] and particularly in China, there lack epidemiologic studies focusing on this point.

As an underdeveloped province in China, Shaanxi features a relatively limited health care system and thus may have a less satisfactory diabetes control. Therefore, we conducted a multicenter cross-sectional survey; we aimed to investigate the percentage of patients with T2DM receiving oral drugs or injections who achieved simultaneous control of HbA1c, BP, and LDL-C and also to assess its determinants in Shaanxi province, North-Western China.

Materials and Methods

Study design

This multicenter, cross-sectional survey, as a part of the China HbA1c Surveillance Plan 2012, was conducted between March and June 2012 in six tertiary hospitals across Shaanxi province (i.e. Xijing Hospital of Fourth Military Medical University, Tangdu Hospital of Fourth Military Medical University, First Affiliated Hospital of Xi'an Jiaotong University, Second Affiliated Hospital of Xi'an Jiaotong University, Shaanxi Provincial People's Hospital, and Xi'an Municipal Central Hospital). A sample size of 900–1900 patients was planned to provide an 80% power to detect a 5–10% simultaneous control rate of diabetes (with 95% confidence intervals [CIs], $\alpha = 0.05$, and $\beta = 0.2$) according to previous reports.[23,26,27]

The study was approved by the Ethics Committee of Chinese PLA General Hospital as a sponsor and all the six participating hospitals. All the participants signed written informed consent prior to data collection.

Study population

Each clinic day during the study period, the first seven patients with known T2DM who visited the outpatients Departments of Endocrinology in the six tertiary hospitals and met the eligibility criteria were randomly invited to participate by trained doctors.

Finally, a total of 2274 patients with diabetes receiving oral drugs or injections were included as study population (estimated response rate >80%).

Data collection

A questionnaire was administered by trained doctors to collect the data of basic information, glycemic profile at diabetes diagnosis, treatment regimen, concomitant disease (i.e., hypertension, dyslipidemia coronary, heart disease, and cerebrovascular disease), and diabetes complications (i.e., diabetic retinopathy, diabetic neuropathy, diabetic nephropathy, and diabetic foot). The details can been seen in Appendix 1. Height and weight were measured with the participants without shoes and with light dress according to a standard protocol. Body mass index (BMI) was calculated as weight in kilograms divided by height in meters squared. BP was measured using a standardized mercury sphygmomanometer in the sitting position after at least 5 min of rest; two consecutive readings of BP were taken on the same arm, and the mean of the two measurements were recorded.

All laboratory evaluation was performed in the local hospitals where the interview was conducted. Fasting blood samples were collected to measure HbA1c, fasting plasma glucose, triglyceride, total cholesterol, and

LDL-C level. Two-hour postprandial blood samples were also collected after a meal to measure 2 h postprandial plasma glucose level. HbA1c (%) was measured in fresh EDTA blood samples by using high-performance liquid chromatography (Tosoh Automated Glycohemoglobin Analyzer, Tosoh Corporation, Japan). Plasma glucose, triglyceride, total cholesterol, and LDL-C were analyzed enzymatically by using an Auto Biochemical Analyzer (MODULAR-000GS; Roche, Basel, Switzerland). LDL-C was determined by a commercial homogeneous direct measurement method (Reagent: Shanghai Fosun Long March Medical Science Co., Ltd., Shanghai, China). The laboratory variation coefficient of triglyceride, total cholesterol, and LDL-C was 4.2%, 1.7%, and 3.8%, respectively. All blood samples were analyzed within 4 h after being collected.

Definitions

Simultaneous control was defined by using the 2013 guideline from the American Diabetes Association as HbA1c <7%, BP <130/80 mmHg, and LDL-C <2.6 mmol/L (100 mg/dl).[12] To evaluate the effect of individualized control goal on the proportion achieving simultaneous control, several sets of targets were set and the corresponding control rates were calculated [Table 1].[16]

Statistical analysis

Statistical analysis was performed in SPSS 18.0 (SPSS Inc., Chicago, IL, USA) and data were expressed as a mean ± standard deviation, median with interquartile range, or percentage as suitable. The comparison between groups was analyzed by *t*-test or Mann–Whitney U-test for measurement data and Chi-square test for enumeration data.

Logistic regression analyses were conducted to identify the association between all potential predictors and the achievement of glycemic control and simultaneous control. The covariables in each step entered the model by a backward method. *P* value was two-tailed with a significance level of 0.05.

Results

A total of 2274 patients with diabetes receiving oral drugs or injections were included in the study, of which 1269 (55.8%) were patients with diabetes only, 762 (33.5%) were patients with diabetes plus one risk (hypertension or dyslipidemia), and 243 (10.7%) were patients with two risks (hypertension and dyslipidemia). In total, 588 patients (25.9%) achieved good glycemic control (HbA1c <7%) and only 102 (4.5%) attained simultaneous control of HbA1c <7%, BP <130/80 mmHg, and LDL-C <2.6 mmol/L. The simultaneous control remained unsatisfactory although the rate increased with less stringent goals. Almost 5-fold as many individuals simultaneously achieved less stringent goals (HbA1c <8%, BP <140/90 mmHg, LDL-C <2.8 mmol/L, 24.2%) and

Table 1: Effect of varying goal on the percentage of glycemic control and simultaneous control

Variable	Glycemic control	Simultaneous control	
		BP <130/80 mmHg LDL-C <100 mg/dl	≤140/90 mmHg ≤110 mg/dl
HbA1c <6.5%	267 (11.7)	51 (2.2)	126 (5.5)
HbA1c <7.0%	588 (25.9)	102 (4.5)	270 (11.9)
HbA1c <7.5%	954 (42.0)	160 (7.0)	455 (20.0)
HbA1c <8.0%	1211 (53.3)	195 (8.6)	550 (24.2)

BP=Blood pressure; LDL-C=Low-density lipoprotein cholesterol; HbA1c=Glycated hemoglobin

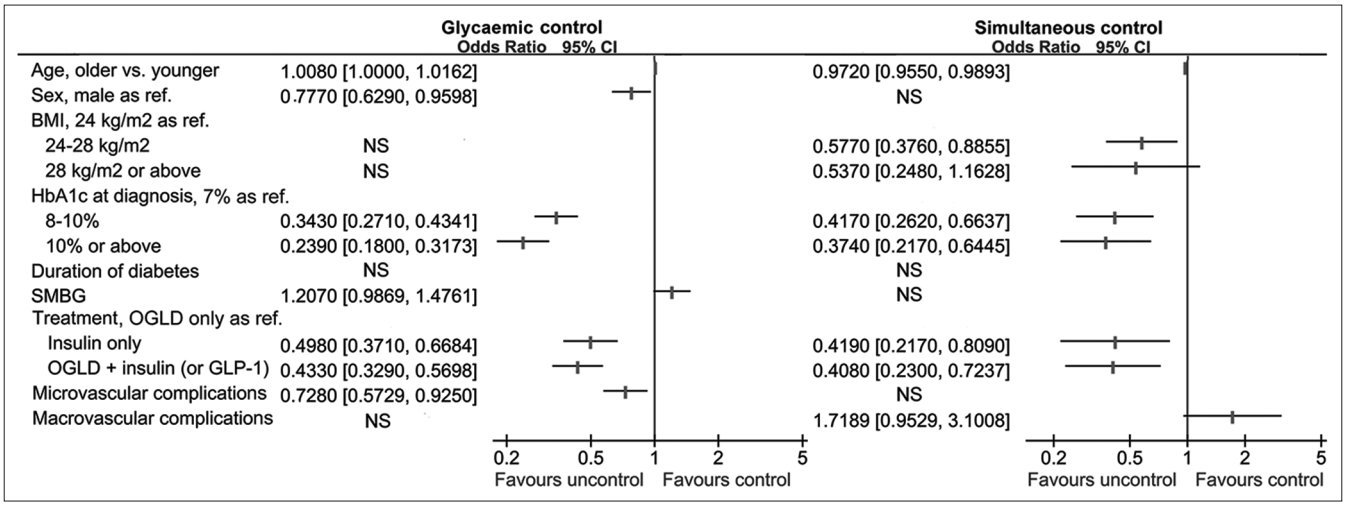

Figure 1: Potential predictive factors for glycemic control and simultaneous control. The covariables in each step enter the model by a forward method. NS=Not significant; Glycemic control=Glycated hemoglobin <7%; Simultaneous control=Glycated hemoglobin <7%; blood pressure <130/80 mmHg; low-density lipoprotein cholesterol <2.6 mmol/L; BMI=Body mass index; DM=Diabetes mellitus; SMBG=Self-monitoring of blood glucose; OGLD=Oral glucose-lowering drug; GLP=Glucagon-like peptide

Table 2: Clinical profile and laboratory results of the study population

Variable	Total	Glycemic control		Simultaneous control	
		Yes	No	Yes	No
n	2274	588	1686	102	2172
Age (year)	57.3±12.5	57.6±12.6	57.1±12.5	53.9±14.1**	57.4±12.4
Sex (male), *n* (%)	1426 (62.7)	376 (63.9)	1050 (62.3)	61 (59.8)	1365 (62.8)
BMI (kg/m^2)	24.5±2.8	24.4±2.7	24.5±2.8	23.8±2.9**	24.5±2.8
HbA1c (%)	8.3±2.0	6.4±0.5**	9.0±1.9	6.3±0.5**	8.4±2.0
Fasting plasma glucose (mmol/L)	8.4±2.6	6.8±1.3**	9.0±2.6	6.6±1.2**	8.5±2.7
2-h PPG (mmol/L)	11.8±3.9	9.5±2.2**	12.6±4.0	9.7±2.1**	11.9±3.9
Systolic blood pressure (mmHg)	130.4±16.4	130.8±16.00	130.2±16.5	116.3±6.8**	131.0±16.4
Diastolic blood pressure (mmHg)	78.8±10.2	78.6±10.7	78.9±10.0	69.4±4.9**	79.3±10.2
Triglycerides (mmol/L)	2.1±1.6	1.9±1.6**	2.1±1.5	1.5±0.8**	2.1±1.5
Total cholesterol (mmol/L)	4.5±1.6	4.4±1.3	4.5±1.7	3.9±0.9**	4.5±1.6
LDL-C (mmol/L)	2.6±1.3	2.4±1.2**	2.7±1.4	1.9±0.5**	2.7±1.4

**P<0.01. Glycemic control=HbA1c <7%; Simultaneous control=HbA1c <7%; Blood pressure <130/80 mmHg; LDL-C <2.6 mmol/L. BMI was calculated as weight (in kg) divided by height (in m) squared. PPG=Postprandial plasma glucose; LDL-C=Low-density lipoprotein cholesterol; HbA1c=Glycated hemoglobin; BMI=Body mass index

Table 3: The complications and treatment profile of the study population

Variable	Total	Glycemic control		Simultaneous control	
		Yes	No	Yes	No
n	2274	588	1686	102	2172
Age at diagnosis (year)	51.8±11.9	52.6±11.7*	51.0±11.8	51.4±11.6	52.3±11.7
HbA1c at diagnosis (%)	9.9±2.3	8.9±2.2**	10.2±2.3	8.8±2.1**	9.9±2.3
Duration of diabetes (year)	3.4 (1.1-8.6)	2.4 (0.8-7.2)**	4.4 (1.2-8.4)	2.0 (0.6-5.4)**	4.6 (1.1-8.5)
SMBG, *n* (%)	1101 (48.4)	310 (52.7)*	791 (46.9)	53 (52.0)	1048 (48.3)
Microvascular complications, *n* (%)	1082 (47.6)	188 (32.0)**	894 (53.0)	35 (34.3)**	1047 (48.2)
Diabetic retinopathy	442 (19.4)	69 (11.7)**	373 (22.1)	14 (13.7)**	428 (19.7)
Diabetic neuropathy	837 (36.8)	141 (24.0)**	696 (41.3)	26 (25.5)**	811 (37.3)
Diabetic nephropathy	383 (16.8)	46 (7.8)**	337 (20.0)	6 (5.9)**	377 (17.4)
Diabetic foot	60 (2.6)	8 (1.4)*	52 (3.1)	3 (2.9)	57 (2.6)
Macrovascular complication, *n* (%)	343 (15.1)	86 (14.6)	257 (15.2)	17 (16.7)	326 (15.0)
Coronary heart disease	299 (13.1)	75 (12.8)	224 (13.3)	13 (12.7)	286 (13.2)
Cerebrovascular disease	103 (4.5)	17 (2.9)*	86 (5.1)	4 (3.9)	99 (4.6)
Treatment, *n* (%)					
OGLD only	1165 (51.3)	411 (70.1)**	754 (44.7)	76 (74.5)**	1089 (50.2)
Insulin only	477 (21.0)	79 (13.5)**	398 (23.6)	11 (10.8)**	466 (21.5)
OGLD + insulin (or GLP-1)	629 (27.7)	96 (16.4)**	533 (31.6)	15 (14.7)**	614 (28.3)
Comorbidities, *n* (%)					
Hypertension	701 (30.8)	176 (29.9)	525 (31.1)	10 (9.8)**	691 (31.8)
Dyslipidemia	547 (24.1)	109 (18.5)**	438 (26.0)	8 (7.8)**	539 (24.8)

*P<0.05; **P<0.01. Glycemic control=HbA1c <7%; Simultaneous control=HbA1c <7%; Blood pressure <130/80 mmHg; LDL-C <2.6 mmol/L. SMBG=Self-monitoring of blood glucose; OGLD=Oral glucose-lowering drugs; GLP=Glucagon-like peptide; HbA1c=Glycated hemoglobin

half as many individuals simultaneously achieved stringent goals (HbA1c <6.5%, BP <130/80 mmHg, LDL-C <2.6 mmol/L, 2.2%) than standard control goals (HbA1c <7%, BP <130/80 mmHg, LDL-C <2.6 mmol/L, 4.5%) [Table 1].

Compared with individuals with poor glycemic control, the individuals with good glycemic control were older at diagnosis, had higher HbA1c level at diagnosis, longer duration of diabetes, and lower proportion of microvascular complications. The proportion of only oral glucose-lowering drugs treatment in the individuals with good glycemic control was higher than that in individuals with poor glycemic control. Meanwhile, significant differences were observed in all variables except sex, age at diagnosis, self-monitoring of blood glucose, and macrovascular complication between individuals with simultaneous control and those without simultaneous control [Tables 2 and 3].

Multivariate analyses were conducted to identify the association between glycemic control and simultaneous control with all potential predictors. Male (odds

ratio [OR]: 0.777, 95% CI: 0.629–0.960), HbA1c above 8% at diagnosis (pooled OR: 0.287, 95% CI: 0.243–0.330), insulin treatment (pooled OR: 0.454, 95% CI: 0.351–0.553) and having microvascular complications (OR: 0.728, 95% CI: 0.573–0.925) were the independent predictors of glycemic control, while BMI of 24–28 kg/m^2 (OR: 0.577, 95% CI: 0.376–0.886), HbA1c above 8% at diagnosis (pooled OR: 0.392, 95% CI: 0.254–0.531), and insulin treatment (pooled OR: 0.412, 95% CI: 0.225–0.594) were the independent predictors of simultaneous control [Figure 1].

Discussion

This multicenter survey confirmed the gap between guideline and practice in North-Western China. Around a quarter of patients with T2DM achieved good glycemic control and only 4.5% attained good simultaneous control of HbA1c, BP, and LDL-C. Although we found that less stringent goals enhanced the proportion achieving simultaneous control, individualized strategies among different patients did not provide satisfactory simultaneous control. Moreover, we found that male, HbA1c above 8% at diagnosis, insulin treatment and having microvascular complications were all independently associated with poor glycemic control; we also found that BMI of 24–28 kg/m^2, HbA1c above 8% at diagnosis and insulin treatment were the independent predictors associated with poor simultaneous control. This discrepancy of predictive factors seemed to highlight the important relationship of body weight with simultaneous control rather than with glycemic control.

Simultaneous control of HbA1c, BP, and LDL-C is collectively known as the "ABCs of diabetes."[17]Diabetes, hypertension, and dyslipidemia all cause vascular damage, and simultaneous control of all these risk factors should be the goal standard in patient care. Emphasis on vascular health has now given rise to a new discipline called vascular medicine. The simultaneous control rate has been previously reported with a range from 5% to 30%. For example, using data from the National Health and Nutrition Examination Survey (NHANES) 1988–1994,[23]NHANES 1999–2000,[23] NHANES 1999–2002,[26]NHANES 2003–2004,[27] Look Action for Health in Diabetes 2001–2004,[21] Community-based Endocrinology Practice 2000–2004,[19] and Iowa City Veterans Affairs 2008–2009,[17]the rate was 5.2%, 7.3%, 7.0%, 13.2%, 10.1%, 22.0%, and 17.3%, respectively. Schroeder *et al*.[16]performed a retrospective cohort study from 2000 to 2008 and reported that 16–30% individuals achieved simultaneous control. In our present study, the percentage of individuals with simultaneous control was only 4.5%, which was much lower than those in previous studies. Although the rate increased with less stringent goals, the simultaneous control remained unsatisfactory. An important point must be stated that we only included the patients with at least one antidiabetic medication and excluded those on lifestyle modification. It likely reduced the proportion of patients achieving achievement of A1c, blood pressure, and cholesterol targets and the simultaneous control rate may be underestimated. Despite this, we showed that China may face a sharper challenge of simultaneous control in diabetic patients compared with Western countries although it is not suitable to directly compare studies due to the differences in patient samples and study methodology. In addition, our results showed that there may be a regional difference in glycemic control in China. For example, our present study identified a good glycemic control rate of 25.9% in North-Western China, whereas Xu *et al*.[5]conducted a nationwide survey in 2010 and reported that 39.7% of individuals with previous diagnosed T2DM had good glycemic control.

Potential risk factors associated with simultaneous control were previously discussed.[16,19,21,22]Factors such as age, duration of diabetes, insulin treatment, and diabetic complications were all well-described, of which age in our study showed a weak association and insulin treatment were significantly associated with simultaneous control. Actually, since cross-sectional design cannot decide a causal relationship, insulin treatment as a risk factor, for example, was really likely a reflection of the disease process rather than an indictment of insulin *per se*. However, because risk factors for glycemic control and simultaneous control were both explored and listed together for comparison, we found two important and interesting phenomena in our present study. One was HbA1c at diagnosis as a factor, which, rather than duration of diabetes, was the strongest significant predictor of both control rates, suggesting that physicians should put emphasis on the patients with a higher HbA1c at diagnosis. Another was BMI as a factor, which differed in the association with glycemic control and simultaneous control. We found that BMI (24–28 kg/m^2) was significantly associated with poor simultaneous control, whereas there was no significant association between BMI and glycemic control. The phenomenon is common in clinical practice that an obese patient with T2DM has the possibility to gain glycemic control but is hard to maintain BP or lipids control. This discrepancy of risk factors seemed to highlight the importance of body weight as a modifiable risk factor associated with simultaneous control rather than with glycemic control.

Several limitations in the study should be addressed. First, the cross-sectional nature decides a possible deficiency of causal inferences, particularly in the relationship between predictive risk factors and diabetes control. Second, as our study was a hospital-based survey, potential selection bias should be considered and the results observed in our study may not be generalized to general population. Third, some data (e.g. HbA1c at diagnosis) which were collected from patient interviews and self-reports may result in recalling bias, although patient interviews are the most practical way

of gaining such information in China. Last, we could not obtain a wide variety of socioeconomic and demographic data (e.g., educational level, physical activities, diet, and smoking status) as most of other related studies did,[19,20,22,23] which therefore limits the robustness of the multivariate analyses.

Conclusion

In summary, we found that around a quarter of patients with T2DM receiving oral drugs or injections were able to achieve good glycemic control but only 4.5% attained good simultaneous control of HbA1c, BP, and LDL-C. Although less stringent goals had a relatively large effect on the proportion of patients achieving control, the simultaneous control rate remained amazingly low and unsatisfactory. Our present study confirmed the gap between guideline and practice in North-Western China and also provided evidence of need for aggressive diabetes management including HbA1c, BP, and lipid, which contributed to a reduction of cardiovascular disease.

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Conflicts of interest

There are no conflicts of interest.

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Appendix

Appendix 1: Glycated hemoglobin surveillance registration form 2012

Instructions

This questionnaire consists of three pages. The objective is to collect your general information, diabetes treatment information, and other relevant disease information. Please answer the following questions that are relevant to your diabetes status. Some questions might not be applicable to you, or some questions may seem similar, but please make sure to answer each question.

Please read each question and provide the answer that you believe is correct. If you are not sure how to respond, please give us your best answer in your opinion. All the information you provided will be confidential and will be used for scientific research. There will be no link between your information and your identity.

Collecting this information will not affect your current or future treatment.

This questionnaire will take you 10 min. Thank you for your participation and support.

Participant signature

Has the subject met the following inclusion/exclusion criteria? (1) Yes □, (2) No □.

If "yes," please go on with the survey. If "no," please stop.

Inclusion criteria

1. Type 2 diabetes, male or female, age≥18 years
2. Currently under one of the following treatments for diabetes: Oral antidiabetics drug (OAD) only, insulin only, or OAD combined with insulin (or glucagon-like peptide-1 receptor agonists)
3. At least one outpatient medical record for diabetes
4. Live in local area for at least 6 consecutive months
5. For community hospitals, a patient must have glycated hemoglobin examination from the same community hospital where he/she is recruited, and did not visit referral hospital in the last 3 months
6. The first seven patients who visit the investigator each day will be eligible.

Exclusion criteria

1. Secondary diabetes
2. Lifestyle intervention only
3. Chinese herbal medicine only
4. Inpatients
5. Type 1 diabetes
6. Pregnant, breastfeeding women
7. Mental incapacity or other reasons precluding adequate understanding or cooperation in the study.

Visit date (compulsory): □□□□ (year)□□ (month)□□ (day)

Basic information (compulsory):
Sex: (1)□ Male (2)□ Female, Age: ____ (years), Height: ____ (cm), Weight: ____ (kg), Systolic blood pressure/Diastolic blood pressure: ____/____ (mmHg) (still).

Lipid profile (latest in recent 3 months): Triglycerides: ____ (mmol/L), Total cholesterol: ____ (mmol/L), Low-density lipoprotein: ____ (mmol/L)

Date of diabetes diagnosis (compulsory): □□□□ (year)□□ (month).

Glycemic control at diagnosis (compulsory):
Glycated hemoglobin: ____ (%), Fasting plasma glucose: ____ (mmol/L), 2-h postprandial plasma glucose: ____ (mmol/L).

Current glycemic control (compulsory):

Parameters	Values	Date (latest in recent 3 months)
HbA1c	____ (%)	□□□□ (year) □□ (month) □□ (day)
FPG	____ (mmol/L)	□□□□ (year) □□ (month) □□ (day)
2h PPG	____ (mmol/L)	□□□□ (year) □□ (month) □□ (day)
Did you test your blood sugar in the last week? (1) □ Yes, (2) □ No. If "yes," please fill in how many times you tested last week: ____ time(s)		

HbA1c=Glycated hemoglobin; FPG=Fasting plasma glucose; PPG=Postprandial plasma glucose

Treatment regimen[a] (compulsory):

Your current treatment regimen	(1) □ 1 OAD only, (2) □ 2 OADs, (3) □ 3 OADs, (4) □ ≥4 OADs, (5) □ OAD + insulin, (6) □ OAD + GLP-1	
Please tick the drug you are using now (please multi-select if you are using several OADs)	(1.1) □ Gliclazide, (1.2) □ Glimepiride, (1.3) □ Glibenclamide, (1.4) □ Xiaokewan (combination pill of glibenclamide and Chinese herb), (1.5) □ Glipizide, (1.6) □ Gliquidone, (1.7) □ Repaglinide, (1.8) □ Nateglinide, (1.9) □ Mitiglinide, (1.0) □ Metformin, (1.11) □ Rosiglitazone, (1.12) □ Pioglitazone, (1.13) □ Acarbose, (1.14) □ Voglibose, (1.15) □ Miglitol, (1.16) □ Sitagliptin, (1.17) □ GLP-1 (non-OAD), (1.18) □ Others (please specify) ____	
The date of beginning of the treatment? □□□□ (year) □□ (month)		
If you are receiving OAD + insulin treatment, please tick the type of the insulin you are using (please multi-select if you are using several insulins)	Short-acting human insulin	(2.1) □ Novolin R, (2.2) □ Humulin R, (2.3) □ Ganshulin R, (2.4) □ SciLin R, (2.5) □ Wanbanglin R (biosimilar)
	Intermediate-acting human insulin	(2.6) □ Humulin N, (2.7) □ Novolin N, (2.8) □ Ganshulin N, (2.9) □ SciLin N, (2.10) □ Wanbanglin N (biosimilar)
The date of insulin initiation: □□□□ (year) □□ (month)	Premixes, human insulin	(2.11) □ Novolin 30R, (2.12) □ Novolin 50R, (2.13) □ Humulin 70/30, (2.14) □ Ganshulin 30R, (2.15) □ SciLin M30, (2.16) □ Wanbanglin 30R (biosimilar)
The reason for insulin initiation (1) □ OAD ineffective (2) □ Complication (3) □ Patient requests (4) □ Other reason	Rapid-acting insulin analog	(2.17) □ NovoRapid, (2.18) □ Humalog
	Long-acting insulin analog	(2.19) □ Levemir, (2.20) □ Lantus, (2.12) □ Basalin
	Insulin analog premixes	(2.22) □ NovoMix 30, (2.23) □ Humalog 25, (2.24) □ Humalog 50
	Animal insulin	Please specify the brand name____
	Other insulin	Please specify the brand name____
	Total dosage of insulin per day: ____ (U/day)	

OAD=Oral antidiabetics drug; GLP-1=Glucagon-like peptide-1

Concomitant disease (compulsory):

Do you have the following disease (s)? (1) □ Yes, (2) □ No, (3) □ Don't know If "yes," please tick the diagnosis (multi-selectable) and date

(1) □ Hypertension	Diagnosis date: □□□□ (year)	□□ (month) or (3) □ Don't know
(2) □ Coronary heart disease (angina pectoris, MI, etc.)	Diagnosis date: □□□□ (year)	□□ (month) or (3) □ Don't know
(3) □ Dyslipidemia	Diagnosis date: □□□□ (year)	□□ (month) or (3) □ Don't know
(4) □ Cerebrovascular disease: Cerebral infarction (stroke, hemiplegia, etc.)	Diagnosis date: □□□□ (year)	□□ (month) or (3) □ Don't know
(5) □ Diabetic retinopathy	Diagnosis date: □□□□ (year)	□□ (month) or (3) □ Don't know
(6) □ Diabetic neuropathy	Diagnosis date: □□□□ (year)	□□ (month) or (3) □ Don't know
(7) □ Diabetic nephropathy	Diagnosis date: □□□□ (year)	□□ (month) or (3) □ Don't know
(8) □ Diabetic foot (uncured/unhealed ulcer)	Diagnosis date: □□□□ (year)	□□ (month) or (3) □ Don't know
(9) □ Other diagnosed disease (s), please specify: _____	Diagnosis date: □□□□ (year)	□□ (month) or (3) □ Don't know

[a]Note: Drug names have been supplied in English where possible. MI=Myocardial infarction

Investigator signature: