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Aims

The purpose of this study was to evaluate the effectiveness of beinaglide on body weight, glycaemic haemoglobin (HbA_{1c}), blood pressure and lipid profile in patients with type 2 diabetes mellitus (T2DM) in a real-world setting in China.

Materials and methods

This study was a multicentre, observational, retrospective, open-label study conducted in China. Data were collected from T2DM patients who started treatment with beinaglide between 2017 and 2018.

Results

A total of 314 patients were included in the study. After 3 months of treatment with beinaglide, there were significant reductions in body weight (−10.05 kg [95% confidence interval −9.29 to −10.80]), HbA_{1c} (−2.87% [−2.62 to −3.11]), 2-h postprandial plasma glucose (−5.46 mmol L^{−1} [−4.96 to −

increasing aension causing their comprehensive effect on both glycaemic control and weight loss in high-risk high-poglycaemia incidence.

Beinaglide (formerly known as benaglide), a GLP-1RA, is a recombinant human glucagon-like peptide-1 and has 100% homology with human GLP-1(7-36) (5). The drug was approved by the China Food and Drug Administration for the treatment of T2DM in December 2016. Beinaglide is one of the GLP-1RA recommended for the treatment of T2DM by the Chinese guideline for the prevention and treatment of type 2 diabetes (2017 edition) (6). The efficacy and safety of beinaglide have been assessed in randomised controlled trial (RCT) in China (7–9). Similar to other GLP-1RA, beinaglide was effective in lowering glycaemic haemoglobin (HbA_{1c}), fasting plasma glucose (FPG) and postprandial plasma glucose (PPG) in patients with T2DM (7,8). In addition, beinaglide reduced body weight and body mass index (BMI) in T2DM patients with overweight and obesity (7,9). The RCT provided evidence of the effectiveness of beinaglide in well-defined patient populations under a strict controlled environment, which is necessary for the real-world data to be analysed. The real-world data are more general patient populations in real-world clinical practice.

Real-world data are an important reference for the evaluation of the performance of new drugs once they reach the market. Such data can complement RCT and achieve their results in a more general patient population. The real-world effect of beinaglide has not been reported so far. Therefore, the purpose of this study was to evaluate the effectiveness of beinaglide on HbA_{1c}, body weight, blood pressure, and lipid profile in a real-world setting in China. The authors hypothesised that the efficacy of beinaglide in RCT will also be observed in the real-world.

Methods

This was a multicentre, observational, retrospective, open-label study conducted in a hospital in Hebei Province (northern China). The GLP-1RA beinaglide was launched in February 2017 in China. Since then, data from T2DM patients treated with beinaglide under routine clinical practice conditions were collected. The collected data were from March 2018, i.e. over a time frame of 14 months. Data were extracted from the electronic medical records and gathered in an Excel database by the researcher. Adult T2DM patients (≥18 years) were eligible for the study. The inclusion criteria were patients with type 1 diabetes mellitus and those who refused to provide informed consent. The following data were collected: baseline and/or three subsequent (after

1, 2 and 3 months of treatment): age, sex, diabetes duration, HbA_{1c}, 2-h PPG, FPG, body weight, BMI, waist circumference (WC), C-peptide, heart rate, systolic blood pressure (SBP), diastolic blood pressure (DBP), triglyceride, low-density lipoprotein cholesterol (LDL-C), high-density lipoprotein cholesterol (HDL-C), antihyperglycaemic and lipid-lowering therapies and history of previous anti-diabetic medication. Moreover, the dosage of beinaglide and concomitant anti-diabetic therapies were recorded. The values of HbA_{1c}, FPG, 2-h PPG, C-peptide, triglyceride, LDL-C and HDL-C were extracted from standardised laboratory reports. Body weight, WC, heart rate, SBP and DBP were measured by professional nursing standard equipment.

The primary objective was to assess the effectiveness of beinaglide in controlling glycaemia after 3 months of treatment. Secondary objectives included assessing changes in body weight, the proportion of patients with weight loss ≥5% and ≥10% and other clinical parameters related to diabetes after 3 months of treatment. Adverse events, hypoglycaemic events and discontinuation of beinaglide were also recorded.

This study was approved by the local ethical committee and performed in accordance with the Declaration of Helsinki (revised in 2013).

Statistical analysis

The Kolmogorov–Smirnov test was used to determine if data were normally distributed. Data for continuous variables were expressed as the mean (standard deviation [SD]). Data for categorical variables were expressed as percentages (%). Baseline characteristics are reported on the basis of the full analysis (FAS), which included all patients who met the eligibility criteria and had baseline measures for HbA_{1c} or weight. Efficacy analysis included all patients who received at least one dose of beinaglide and had at least one postbaseline measurement for HbA_{1c} or body weight. Missing data were imputed using the last observation carried forward (LOCF) method. For paired samples, the paired *t*-test or Wilcoxon matched-pairs signed-rank test was used for time points, and repeated-measures analysis of variance or the Friedman test followed by Dunn's multiple-comparison test was used for multiple time points. The mean (SD), mean difference, standard error (SE) and 95% confidence interval (CI) were calculated for each time point. Subgroup analysis for paired samples was performed with the same statistical method. The change in HbA_{1c} and weight were assessed by analysis of covariance, adjusting for baseline measures and the dose of beinaglide as a covariate. A multiple linear regression model was applied to identify determinants

of HbA_{1c} reduction and weight loss. Independent variables included age, sex, diabetes duration, baseline HbA_{1c}, BMI, SBP, triglyceride, LDL-C, HDL-C and the dose of being at risk. $p < 0.05$ was considered statistically significant (two-tailed). Data were analysed using SPSS 23.0 software (IBM SPSS, USA).

Based on the data, the impact on for missing data (i.e. observed data only), a sensitivity analysis was conducted to see whether the LOCF method for handling missing data might have influenced any critical conclusion.

Results

Baseline characteristics of patients

From January 2017 to March 2018, data from 323 patients treated with being at risk were extracted from the electronic medical record system. Of those, nine patients lacked baseline data for HbA_{1c} and body weight (unknown reason) and were excluded from the analysis. The remaining 314 patients were included in the FAS (see flow chart in Figure 1). There were 163 (51.9%) men and 151 (48.1%) women, with an overall mean age of 47.6 (10.5) years. Most patients (60.3%) had a diabetes duration < 5 years. On average, baseline body weight

was 77.94 (10.91) kg, BMI was 27.95 (4.07) kg m⁻², HbA_{1c} was 9.05 (1.48)%, 2-h PPG was 14.23 (3.23) mmol L⁻¹ and FPG was 9.25 (1.77) mmol L⁻¹. Baseline characteristics of the FAS population are summarised in Table 1. Approximately 27.7% of the FAS population were drug-naïve patients who were newly diagnosed with T2DM. Regarding the history of pre-existing diabetic medication before initiating being at risk, 30.3% of patients had been treated previously with metformin, 14.0% with repaglinide, 12.7% with acarbose, 10.8% with glimepiride, 8.6% with short-acting insulin, 7.0% with basal insulin, 1.9% with DPP4 inhibitor and 1.0% with liraglutide. In addition, 48.1% of patients had received one anti-diabetic agent, 21.0% received two anti-diabetic agents and a small proportion (3.2%) received three anti-diabetic agents prior to being at risk treatment. Regarding diabetic complications, 12.7% and 1.3% of patients pre-existed with a peripheral history of coronary heart disease and brain infarction, respectively. Diabetic peripheral neuropathy, nephropathy and retinopathy were present in 40.4%, 13.7% and 2.2% of patients, respectively. A total of 10.5% of patients pre-existed with both diabetic peripheral neuropathy and nephropathy, and a small proportion (0.1%) pre-existed with diabetic peripheral neuropathy, nephropathy and retinopathy. Hypertension was present in 51.9% of patients, 84.0% of whom

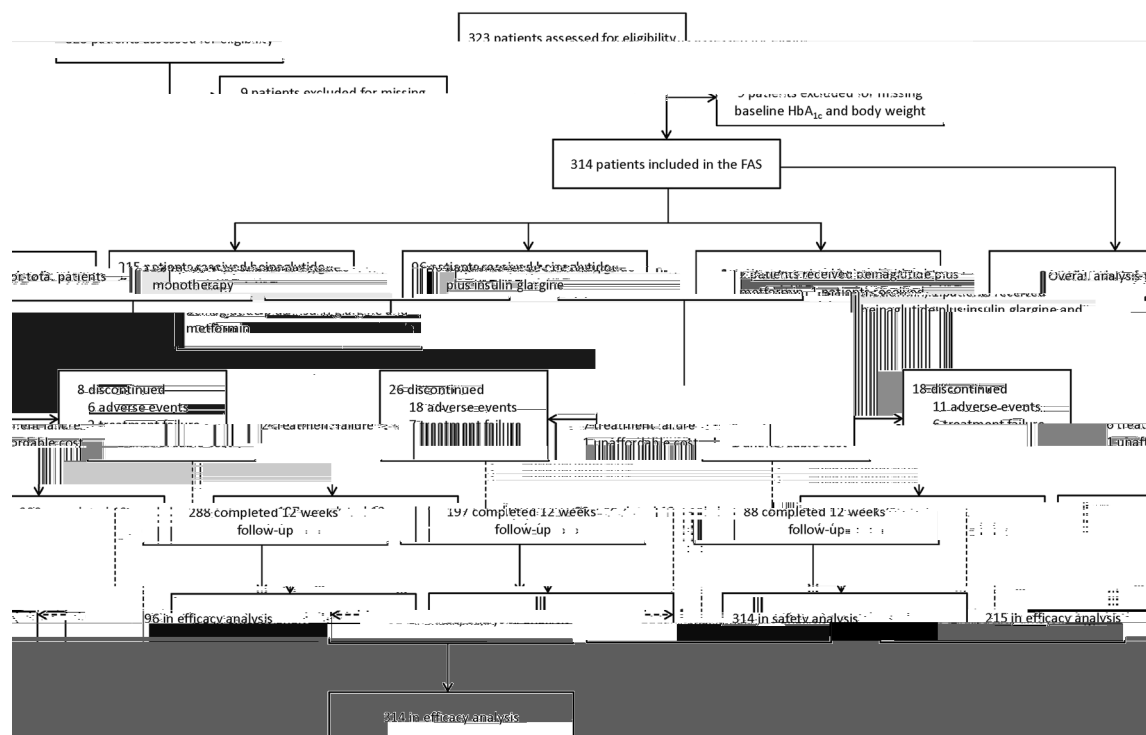


Figure 1 Study flow chart. FAS, full analysis set; HbA_{1c}, glycosylated haemoglobin.

meformin and one (0.3%) in combination with insulin glargine and meformin. At baseline, 37.6% of the patients were prescribed a daily dose of 0.2 mg, 52.3% received 0.3 mg, 5.5% received 0.4 mg, 0.5% received 0.45 mg and 4.1% received 0.6 mg of beinaglide. Following a period of dose escalation of 1–2 weeks, prescription of 0.2, 0.3, 0.4, 0.42, 0.48 and 0.6 mg of beinaglide were given to 31.2%, 5.7%, 2.1%, 11.3%, 22.7% and 27.1% of the patients, respectively. In addition, 96.0% of patients carried out complementary lifestyle intervention.

Clinical outcome after 3 months of beinaglide treatment

Clinical parameters at baseline and the 3-month follow-up are presented in Table 2. Compared with baseline, after 3 months of treatment, the patients had significant reduction in body weight, HbA_{1c}, 2-h PPG, FPG, BMI, WC, heart rate, SBP, DBP, triglyceride and LDL-C and a significant elevation in HDL-C (all $p < 0.0001$). In subgroup, patients receiving beinaglide monotherapy or beinaglide in combination with insulin glargine had similar results ($p < 0.001$). C-peptide had a significant reduction from baseline to 3 months in the overall population of patients ($p = 0.0016$) and the patients who received monotherapy ($p < 0.0001$), but not in those receiving beinaglide in combination with insulin glargine ($p = 0.4464$).

Temporal trends in body weight change are shown in Figure 2. Significant weight loss was observed at all time points. For the overall population of patients, body weight was decreased by -10.05 kg (-9.29 to -10.80) and -12.90% (-12.02 to -13.78) after 3 months (all $p < 0.0001$). After 3 months, 84.96% and 72.18% of patients attained weight loss of $\geq 5\%$ and $\geq 10\%$, respectively. Subgroup analyses had similar results. After 3 months, body weight was decreased by -9.98 kg (-8.97 to -10.99) and -12.81% (-11.64 to -13.97) in beinaglide monotherapy patients and by -10.30 kg (-9.43 to -11.16) and 13.33% (-12.28 to -14.38) when administered in combination with insulin glargine (all $p < 0.0001$). Furthermore, at 3 months, the proportion of patients with weight loss of $\geq 5\%$ and $\geq 10\%$ were 80.75% and 68.45% for monotherapy and 97.37% and 85.53% for the combination therapy with insulin glargine, respectively.

Temporal trends in HbA_{1c}, 2-h PPG and FPG are shown in Figure 3. For the overall population of patients, the average change in HbA_{1c} after 3 months of treatment was -0.7 (95% CI -0.8 to -0.6), 2-h PPG was -1.2 (95% CI -1.3 to -1.1) and FPG was -1.2 (95% CI -1.3 to -1.1).

received an intervention in the treatment. Diabetes-related lipid-lowering treatment was prescribed in 33.4% of patients, 79.0% of whom received lipid-lowering treatment.

Beinaglide administration

At baseline, 215 patients (68.5%) used beinaglide monotherapy, 96 (30.6%) used beinaglide in combination with insulin glargine, and 0 (0.6%) in combination with

Table 2 Clinical parameters compared in the baseline after 3-month treatment in beinagli tide responders

Variable	Total (N = 314)				Beinagli tide (N = 215)				Beinagli tide + inulin glargine (N = 96)			
	To all		S subgroup		Beinagli tide		Beinagli tide + inulin glargine		Beinagli tide		Beinagli tide + inulin glargine	
	N	Baseline	After treatment	p	N	Baseline	After treatment	p	N	Baseline	After treatment	p
Body weight, kg	266	77.84 (10.70)	67.80 (10.42)	<0.0001	187	77.63 (11.19)	67.65 (10.75)	<0.0001	76	77.49 (8.28)	67.19 (8.10)	<0.0001
HbA _{1c} , %	208	9.02 (1.53)	6.16 (0.87)	<0.0001	134	8.78 (1.36)	5.96 (0.93)	<0.0001	73	9.46 (1.72)	6.52 (0.63)	<0.0001
2-h PPG, mmol L ⁻¹	255	14.21 (3.29)	8.75 (1.99)	<0.0001	186	14.41 (3.11)	8.98 (2.21)	<0.0001	67	13.36 (3.31)	8.12 (0.95)	<0.0001
FPG, mmol L ⁻¹	256	9.24 (1.79)	6.20 (1.00)	<0.0001	187	9.11 (1.65)	6.13 (1.09)	<0.0001	67	9.42 (1.76)	6.33 (0.59)	<0.0001
C-peptide, nmol L ⁻¹	97	0.98 (0.45)	0.86 (0.20)	0.0016	35	1.13 (0.30)	0.94 (0.10)	<0.0001	62	0.89 (0.50)	0.82 (0.23)	0.4464
BMI, kg m ⁻²	262	27.93 (4.11)	24.05 (2.95)	<0.0001	187	27.96 (4.47)	24.03 (2.90)	<0.0001	76	27.64 (2.48)	23.85 (2.33)	<0.0001
WC, cm	244	95.84 (14.63)	86.01 (12.50)	<0.0001	177	100.20 (13.96)	89.04 (12.78)	<0.0001	67	84.37 (9.17)	78.01 (7.09)	<0.0001
Heart rate, bpm	105	76.55 (6.78)	73.86 (4.27)	<0.0001	39	76.56 (7.24)	73.87 (4.12)	0.0029	66	76.55 (6.54)	73.85 (4.39)	<0.0001
SBP, mmHg	178	143.60 (19.04)	128.50 (8.78)	<0.0001	108	147.70 (16.61)	129.60 (8.37)	<0.0001	69	136.60 (20.45)	126.80 (9.27)	<0.0001
DBP, mmHg	178	87.97 (8.29)	81.95 (5.02)	<0.0001	108	88.92 (7.84)	81.91 (5.05)	<0.0001	69	86.55 (8.86)	82.32 (4.34)	<0.0001
Triglyceride, mmol L ⁻¹	188	3.09 (1.78)	1.52 (0.65)	<0.0001	115	3.18 (1.87)	1.55 (0.66)	<0.0001	73	2.95 (1.63)	1.46 (0.65)	<0.0001
LDL-C, mmol L ⁻¹	148	3.38 (0.94)	1.84 (0.83)	<0.0001	79	3.44 (0.80)	2.03 (0.84)	<0.0001	69	3.31 (1.07)	1.62 (0.77)	<0.0001
HDL-C, mmol L ⁻¹	147	1.31 (0.54)	2.30 (1.02)	<0.0001	78	1.18 (0.47)	1.91 (0.97)	<0.0001	69	1.46 (0.59)	2.74 (0.88)	<0.0001

Data are expressed as mean (SD).

BMI, body mass index; bpm, beats min⁻¹; DBP, diastolic blood pressure; FPG, fasting plasma glucose; HbA_{1c}, glycosylated haemoglobin; HDL-C, high-density lipoprotein cholesterol; LDL-C, low-density lipoprotein cholesterol; PPG, postprandial glucose; SBP, systolic blood pressure; SD, standard deviation; WC, waist circumference.

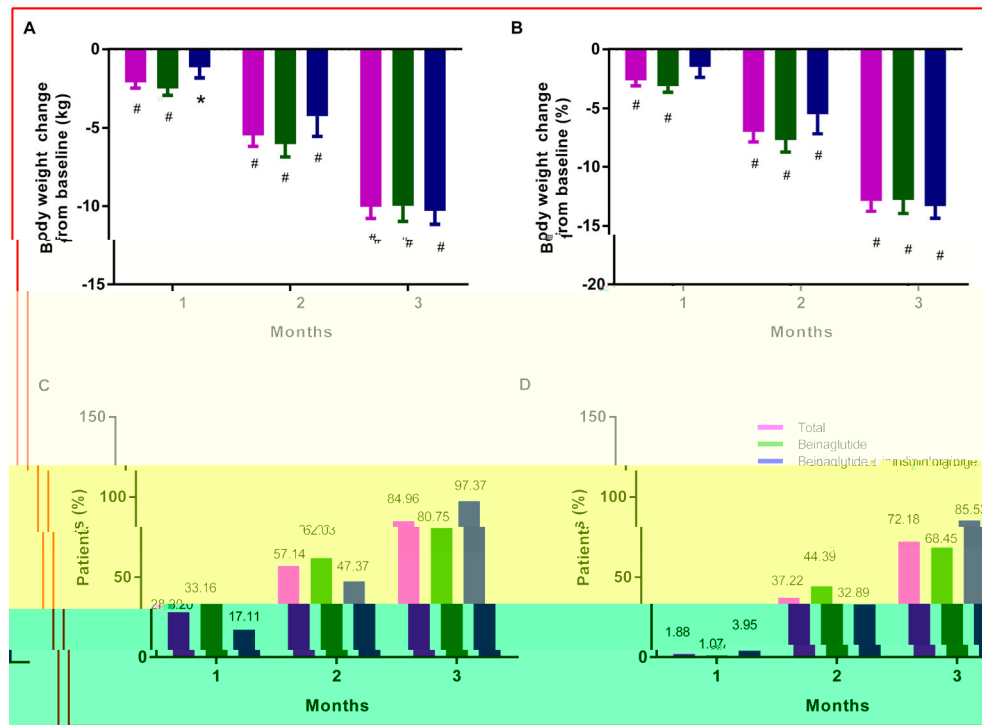


Figure 2 Temporal trends in body weight change between baseline and 3 months. (A) Absolute change in body weight (kg). (B) Relative change in body weight (%). (C) The proportion of patients with weight loss of $\geq 5\%$. (D) The proportion of patients with weight loss of $\geq 10\%$. The bar height represents limit of 95% CI. Significant change from baseline are indicated (* $p < 0.01$, # $p < 0.0001$). [Correction added on 10 Jul 2019, after first online publication: Figure 2 has been replaced in this version.]

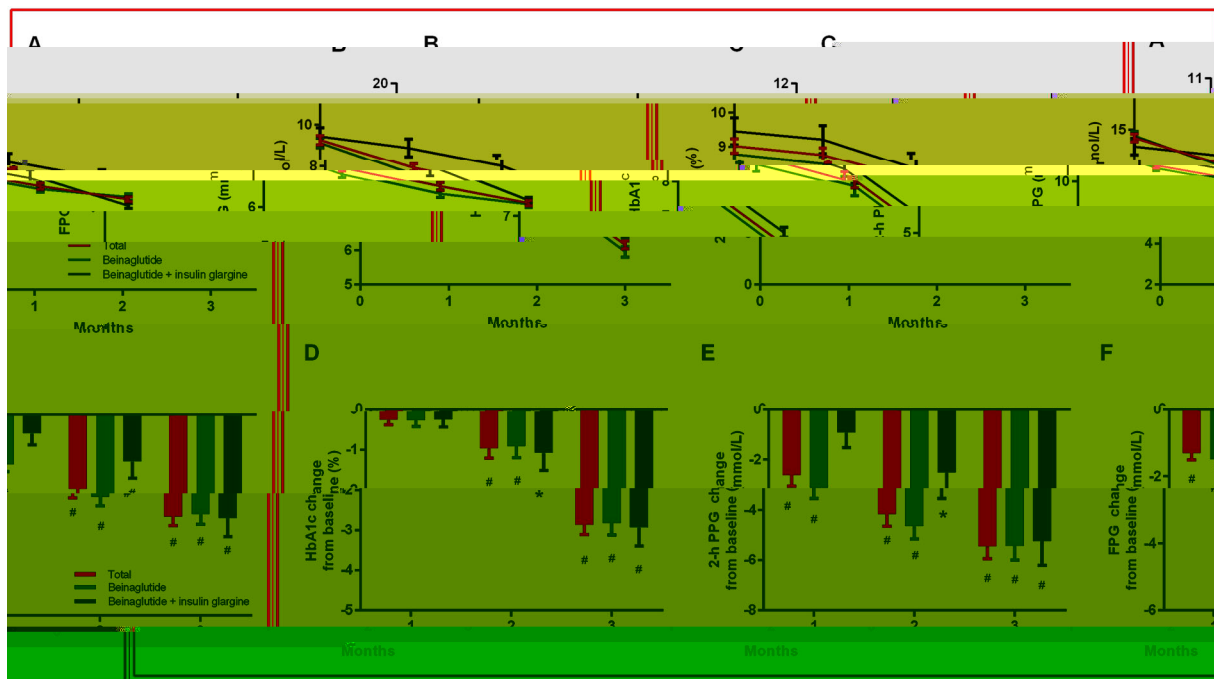


Figure 3 Temporal trends of glycaemic parameters between baseline and 3 months. (A) Mean value of HbA_{1c}. (B) Mean value of PPG. (C) Mean value of FPG. (D) Mean change in HbA_{1c}. (E) Mean change in PPG. (F) Mean change in FPG. The bar height represents limit of 95% CI. Significant change from baseline are indicated (* $p < 0.01$, # $p < 0.0001$). FPG, fasting plasma glucose; HbA_{1c}, glycated haemoglobin; PPG, postprandial glucose.

change in 2-h PPG and FPG after 3 months reached $-5.46 \text{ mmol L}^{-1}$ (-4.96 to -5.95) and $-3.04 \text{ mmol L}^{-1}$ (-2.78 to -3.31) (all $p < 0.0001$), respectively. The similarity of the subgroup showed a similar trend. For patients receiving beaglipide monotherapy, the average change in HbA_{1c} , 2-h PPG and FPG gradually decreased over 3 months and reached -2.83% (-2.53 to -3.12), $-5.44 \text{ mmol L}^{-1}$ (-4.88 to -5.99) and $-2.97 \text{ mmol L}^{-1}$ (-2.67 to -3.27) (all $p < 0.0001$) after 3 months of treatment, respectively. For patients receiving combination therapy with beaglipide and insulin glargine, the average change in HbA_{1c} , 2-h PPG and FPG after 3 months reached -2.94% (-2.49 to -3.39), $-5.24 \text{ mmol L}^{-1}$ (-4.27 to -6.21) and $-3.10 \text{ mmol L}^{-1}$ (-2.55 to -3.64) (all $p < 0.0001$), respectively.

Deailed result (mean difference, standard error and 95% CI) of the temporal trend in HbA_{1c} , 2-h PPG, FPG and body weight are reported in Table S1–S3.

Change in body weight and HbA_{1c} according to baseline characteristics and the dose of beaglipide

The change in body weight did not show significant difference ($p = 0.097$), age ($p = 0.157$), diabetes duration ($p = 0.157$) or baseline HbA_{1c} category ($p = 0.949$). The change in HbA_{1c} also did not show significant difference ($p = 0.471$), age ($p = 0.249$), diabetes duration ($p = 0.169$) or baseline BMI category ($p = 0.964$). However, the change in body weight was significantly greater in patients with $\geq 28 \text{ kg m}^{-2}$ of baseline BMI and in patients receiving beaglipide 0.60 mg ($p = 0.007$ and $p < 0.0001$, respectively); and the change in HbA_{1c} was significantly greater in patients with $\geq 9.0\%$ baseline HbA_{1c} and in patients receiving beaglipide of 0.40 – 0.48 mg (all $p < 0.0001$) (Figure S1).

Determinants of weight loss and HbA_{1c} reduction

The result of multiple linear regression model showed that weight loss from baseline to 3 months positively correlated with baseline BMI level and the dose of beaglipide, and the HbA_{1c} reduction from baseline to 3 months positively correlated with baseline HbA_{1c} level and the dose of beaglipide (Table S4 and S5).

Adverse events, hypoglycaemic events and discontinuation

Among patients in the FAS, the most common adverse events were gastrointestinal symptoms, including nausea (51.0%) and vomiting (18.2%). Other reported adverse events were dizziness (17.2%) and headache (8.3%).

The adverse events mainly occurred in the first month after initiation of treatment, and most were mild to moderate. A total of 14 symptomatic hypoglycaemic events were recorded within the 3 months prior to beaglipide treatment, but no changes were reported after beaglipide treatment. A total of 26 patients (8.3%) discontinued beaglipide therapy within 3 months owing to gastrointestinal adverse effects (5.7%), treatment failure (2.2%) or nonaffordable cost (0.3%).

Sensitivity analysis performed on the completed data with LOCF imputation was generally consistent with the conclusion of the aforementioned results (data not shown).

Discussion

The present study is the first multicentre, observational, retrospective, open-label analysis of beaglipide effectiveness in T2DM patients, mostly with overweight and obesity, in China. The data demonstrated a mean weight loss of 10.05 kg and a mean reduction of 2.87% in HbA_{1c} after 3 months of treatment. The observational confirmed the effectiveness of beaglipide in a real-world setting.

The patients included in the present study represented a general T2DM population in a real-world setting in China. Baseline data indicated that beaglipide therapy was a commonly prescribed for patients with overweight and obesity who had a relatively high diabetes duration. Notably, 27.7% of the patients were newly diagnosed with T2DM, indicating that beaglipide was generally accepted as a second-line treatment.

For Chinese people, a BMI between 24.0 and 27.9 kg m^{-2} is defined as overweight, and a BMI $\geq 28.0 \text{ kg m}^{-2}$ is categorized as obese (10). In the present study, 56.5% of patients were overweight, 41.2% were obese and only 2.3% were normal weight. When analysing the weight-loss effect of beaglipide on the basis of baseline BMI, patients with overweight and obesity experienced greater weight-loss effect. This BMI-dependent effect was similar to that in a previous study of liraglutide (11,12). Data for normal-weight Chinese patients were only available for identification, making the results for this subgroup unreliable. Similar to other studies of GLP-1RA (13,14), the weight-loss effect of beaglipide was dose-dependent, with the highest dose (0.6 mg) providing the greatest weight loss. In addition, baseline age, sex, age and diabetes duration had no impact on drug efficacy with regard to either glycaemic control or weight loss, which was consistent with the previous study of GLP-1RA (11,15).

The mean reduction in HbA_{1c} in this study was higher than mean reduction reported in the previous RCT of

beinaglide, in which mean reduction from baseline been 0.7% and 1.2% have been reported (7,9). This result was also seen in the ongoing because HbA_{1c} reduction in real-world group have all been smaller than those in RCT according to Edelman and Polonsky's study (16). Previous studies have reported that baseline HbA_{1c} level might predict an early response to GLP-1RA in terms of HbA_{1c} reduction (15,17). In the present study, HbA_{1c} reduction was positively correlated with baseline HbA_{1c} level; that is, i.e. patients with higher baseline HbA_{1c} level had a greater HbA_{1c} reduction after 3 months of treatment. Compared with previous RCT of beinaglide (mean baseline HbA_{1c} been 7.97% and 8.05%) (7,9), the higher baseline HbA_{1c} level (9.02%) in this study may be an important reason for the increased efficacy observed with beinaglide treatment.

This discrepancy might also be explained by a change in the formulation of beinaglide. In previous RCT, beinaglide lophyllid powder was used for injection; that is, i.e. the powder had to be dissolved and then subcutaneously injected with a disposable syringe (7–9). This formulation increased the difficulty for patients to use the drug, and the accuracy of the drug dose and patient compliance were affected. However, a new formulation (beinaglide injection) was developed before entering the market. In clinical practice, patients can easily use an injection pen for subcutaneous administration, providing greater convenience for patients prescribed beinaglide. Thus, the change in the formulation may be another reason for the increased efficacy of beinaglide treatment in the real-world setting. In addition, the HbA_{1c} reduction was more significant in the relatively high-dose group (0.40–0.48 and 0.60 mg), and this finding was consistent with that of previous studies of GLP-1RA (18,19).

Decreased fasting C-peptide level after beinaglide monotherapy suggested potential efficacy for improving hyperlinaemia and β -cell release. A short-acting meal-time GLP-1RA, beinaglide has a short half-life (15 min) and duration of action (2 h) (6). Beinaglide is mainly absorbed in the intestine in a glucose-dependent manner (20), but the inotropic effect is not maintained in the fasting state owing to rapid degradation of the drug. This may come from a beneficial because β -cell release is a process of β -cell again stimulation and improvement of function (21,22). This phenomenon of β -cell release was also observed in previous studies of GLP-1 (7–36) and exendin-4 in the postprandial state (23–25). For patients receiving beinaglide plus in linagliptin, here was a decrease in C-peptide level, but here was no significant difference, which might be due to lower baseline C-peptide level (i.e. poor β -cell function) in this group.

The present study also provided new information about the benefit of beinaglide on other health indicators in a real-world setting. After 3 months of treatment, significant reduction in heart rate, SBP, DBP, total cholesterol and LDL-C were observed, whereas HDL-C increased significantly. The improvement in cardiovascular and lipid profile was related to beinaglide treatment and not partially contributed by concomitant antihypertensive or lipid-lowering treatment. The beneficial effects with beinaglide implied a positive impact of beinaglide on overall cardiovascular outcome. However, this comprehensive beneficial efficacy was not unexpected, as indicated by previous studies of GLP-1RA (13,26).

The aforementioned characteristics of beinaglide were also consistent with previous findings of GLP-1RA (27–29). Gastrointestinal adverse events were common but mild in nature. No symptomatic hypoglycaemia events were reported during the 3-month treatment, which may be explained by the glucose-dependent inotropic effect and short half-life of beinaglide. The main cause of beinaglide discontinuation was adverse events (5.7%), which was similar to previous studies of GLP-1RA (30,31).

The present study has significant strengths, such as extensive clinical information and minimal exclusion criteria, resulting in more fidelity data gained from a wide range of T2DM patients. A major observational and retrospective study, the lack of randomization and a control group are the main limitations of this study. In addition, the follow-up period was limited to the first 3 months from the start of beinaglide. Additional RCT and real-world studies are needed to evaluate the effectiveness and safety of long-term beinaglide treatment.

In summary, this study confirmed the effectiveness of beinaglide on Chinese T2DM patients in a real-world setting. Significant improvement was observed in body weight, HbA_{1c}, blood pressure and lipid profile after 3 months of treatment with beinaglide. A trend of improvement in hyperlinaemia and β -cell release also emerged. Such benefits were observed despite a wide range of patient baseline characteristics. The observational results suggest that beinaglide may be an effective treatment for T2DM, especially for patients with overweight and obesity, in clinical practice.

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The authors have declared that they have no conflict of interest associated with this study.

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