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### **Research Article**



# Effect of Shenqi Jiangtang Granule and Metformin in the Treatment of Type 2

## **Diabetes Mellitus**

Yuan-Yuan Xing<sup>1,2</sup>, Dan Liu<sup>3</sup>, Zu-Mei Gao<sup>1,⊠</sup>

<sup>1</sup>The First Affiliated Hospital of Yangtze University, Jingzhou, Hubei 434023, China; <sup>2</sup>Health Science Centre, Yangtze University, Jingzhou, Hubei 434023, China; <sup>3</sup>The Seventh Affiliated Hospital of Zhongshan University, Shenzhen, Guangdong 518000, China

### ⊠ Correspondence

Zu-Mei Gao, Department of Nursing, the First Affiliated Hospital of Yangtze University, Jingzhou, Hubei 434023, China. Email:371311306@qq.com. Telephone number: 18972161212.

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### Abstract

**Objective:** To investigate the effects of Shenqi Jiangtang Granule combined with metformin on blood sugar, lipid, immune function, oxidative stress and therapeutic effect in patients with T2DM. Methods: 128 patients with T2DM who were treated in a third-class A hospital in Jingzhou from September 2016 to April 2018 were randomly divided into control group and experimental group, 64 cases in each group by random number table method. The control group received routine symptomatic treatment, namely metformin, while the experimental group received Shenqi Jiangtang Granule on the basis of the control group. The changes of blood sugar, lipid, immune function and oxidative stress were compared between the two groups before and after treatment, and the therapeutic effect was observed. Results: After treatment, the levels of FPG, 2hPBG, HbA1c, TC, TG, CD8<sup>+</sup> and MDA in the two groups were significantly lower than those before treatment, and the levels of CD4<sup>+</sup>, CD4<sup>+</sup>/CD8<sup>+</sup>, T-AOC and GSH-px in the two groups were significantly higher than those before treatment. After treatment, the levels of FPG, 2hPBG, HbA1c, TC, TG, CD8<sup>+</sup> and MDA in the experimental group were significantly lower than those in the control group, while the levels of CD4<sup>+</sup>, CD4<sup>+</sup>/CD8<sup>+</sup>, T-AOC and GSH-px in the experimental group were significantly higher than those in the control group. The total clinical effective rate of the experimental group (92.19%) was significantly higher than that of the control group (73.44%). The differences of the above results were statistically significant (P <0.05). There was no adverse reactions occurred during the treatment. Conclusion: Shenqi Jiangtang Granule combined with metformin can improve the levels of blood sugar and lipid, enhance immune function, reduce oxidative stress response and effectively improve the therapeutic effect of patients with T2DM, so it has clinical popularization significance.

Key words: Shenqi Jiangtang Granule, Metformin, T2DM, Immune Function, Oxidative Stress

### Introduction

Type 2 diabetes mellitus (T2DM) is an endocrine and metabolic disease with complex pathogenesis. T2DM is а common and frequently-occurring disease, it has become the third largest non-communicable disease in developed countries followed cardiovascular diseases and tumors. The number of patients with T2DM in the world is more than 500 million, and the number of patients in China accounts for about one third of them (1,2). At present, western medicine is mainly used to control blood sugar and lipid in the treatment of T2DM. Metformin has the effect of lowering blood sugar, it's the first-line drug for the treatment of T2DM and has been widely used in clinical practice (3,4). Some studies have found that Tianqi Jiangtang Capsule combined with metformin in the treatment of T2DM patients is more effective than metformin alone, and can effectively improve the level of serum related factors in patients (5). Shenqi Jiangtang Granule is a kind of traditional Chinese medicine preparation, which has the effect of tonifying Qi, nourishing Yin, nourishing spleen and tonifying kidney, it has been clinically proved to be effective in the treatment of T2DM (6). To further improve the therapeutic effect of patients with T2DM, this study analyzed the effect of Shenqi Jiangtang Granule combined with metformin on blood sugar, lipid, immune function, oxidative stress and therapeutic effect in patients with T2DM. The report is as follows.

### 1. Materials and Methods

### **1.1 General information**

128 patients with T2DM were selected from September 2016 to April 2018 in a third-class A hospital in Jingzhou. The patients were divided into control group and experimental group according to the random table method, 64 cases in each group. Inclusion criteria: All subjects met the relevant diagnostic criteria of T2DM (3), fasting plasma glucose (FPG)≥7.0 mmol/L, 2h postprandial blood glucose (2hPBG)  $\geq$  11.1 mmol/L, glycosylated hemoglobin (HbA1c)  $\geq 6.5\%$ ; the experimental group had not received similar treatment before; age: 40-75 years old; active cooperation. Exclusion criteria: allergic to the drugs used in our study; with severe complications such as diabetic ketoacidosis, systemic infection and heart failure. There was no significant difference in general data between the two groups (P > 0.05), which was comparable (Table 1). All included patients had signed the relevant informed consent, and this study had been approved by the Hospital Ethics Committee.

#### **1.2 Interventions**

Two groups of patients with T2DM received routine treatment, such as healthy diet, reasonable exercise and acid-base balance regulation. While the control group received metformin tablets (Shanghai China Pharmaceutical Co., Ltd., Chinese Pharmaceutical Standard H31020316), 0.25g each time, three times a day, the experimental group received Shenqi Jiangtang Granule (Lunan Houpu Pharmaceutical Co., Ltd., Chinese Medicine Standard Z10950075), 1g each time, three times a day on the basis of the control group. Both groups were treated continuously for 2 months.

### **1.3 Observation Indicators**

One day before treatment and one day after treatment, venous blood of patients with T2DM was

collected, FPG and 2h PBG were measured by oxidase method (kit provided by Beckman Kurt Company), HbA1c was measured by automatic biochemical analyzer, total cholesterol (TC) and triglyceride (TG) were measured by double reagent enzyme method (kit provided by Beijing Baioleibo Technology Co., Ltd.). T lymphocyte subsets (CD4+, CD8+) were measured by cytometer (provided by Partec Company of Germany). Total antioxidant capacity (T-AOC), malondialdehyde (MDA) and glutathione peroxidase (GSH-px) were measured by enzyme-linked immunosorbent assay provided by Shanghai (kit Enzyme-linked Biotechnology Co., Ltd.).

### 1.4 Evaluation of therapeutic effect

Referring to the relevant literature, the criteria for evaluation of therapeutic effect were formulated(7). Significantly effective: FPG and 2h PBG decreased to normal level or decreased by 40% before treatment; HbA1c decreased to normal level or decreased by 30% before treatment. Effective: FPG and 2h PBG decreased by 20% and HbA1c decreased by 10% before treatment. Ineffective: Clinical symptoms and related signs did not change significantly, or even worsened. Total effective rate is the sum of significantly effective rate and effective rate.

### 1.5 Adverse reactions

Observe and record the adverse reactions of two groups of patients with T2DM during treatment. If any adverse reactions occur, they should be eliminated in time.

### **1.6 Statistical Analysis**

The experimental data was collected and analyzed by SPSS 22.0 software. To ensure the accuracy of the data, it was input after verification 4

by two people. The measurement data was described by  $x\pm s$ , t test or variance analysis were used for normal distribution, and Mann-Whitney U test was used for non-normal distribution. The enumeration data was expressed by cases and percentages and analyzed by X2 test. P < 0.05 was statistically significant.

#### 2. Results

# 2.1 Comparison of blood sugar and lipid between two groups

After treatment, the levels of FPG, 2hPBG, HbA1c, TC and TG in the two groups were significantly lower than those before treatment (P < 0.05), and the levels of FPG, 2hPBG, HbA1c, TC and TG in the experimental group were significantly lower than those in the control group (P < 0.05) (**Table 2**).

# 2.2 Comparison of immune indices between two groups

After treatment, CD4+, CD4+/CD8+ in both groups were significantly higher than those before treatment (P < 0.05), while CD8+ was significantly lower than that before treatment (P < 0.05); and after treatment, CD4+, CD4+/CD8+ in the experimental group was significantly higher than that in the control group (P < 0.05), and CD8+ was significantly lower than that in the control group (P < 0.05), and CD8+ was significantly lower than that in the control group (P < 0.05), and CD8+ was

# 2.3 Comparison of oxidative stress indices between two groups

After treatment, the levels of T-AOC and

**Table 1**. General data comparison between experimental group and control group

	Experimental	Control group	Statistics	D	
	group	Control group	Statistics	Г	
Age (year, $\bar{x}\pm s$ )	52.58±7.55	50.91±7.65	1.244 <sup>1)</sup>	0.216	
Gender (number, %)					
Male	33 (51.6)	34 (53.1)	0.0312)	0.080	
Female	31 (49.4)	30 (47.9)			
Course of disease (month, $\bar{x}\pm s$ )	9.89±2.31	9.44±2.29	1.1121)	0.268	
Blood Sugar (mmol/L,)					
FPG	$11.85 \pm 1.60$	11.63±1.68	2.8741)	0.458	
HbA1c	8.90±1.64	9.45±1.57	1.939 <sup>1)</sup>	0.055	
Blood Fat (mmol/L, $\bar{x}\pm s$ )					
TC	7.85±0.74	7.80±0.63	0.4081)	0.652	
TG	3.94±0.32	4.04±0.34	1.736 <sup>1)</sup>	0.085	
Antioxidant capacity ( $\bar{x}\pm s$ )					
MDA (µmol/L)	30.50±2.57	31.13±2.43	1.5671)	0.112	
T-AOC (U/mL)	25.77±2.99	26.13±2.88	0.6911)	0.491	
GSH-px (pg/mL)	52.90±3.67	54.13±4.44	1.7051)	0.091	

1): the value of t 2): the value of  $X^2$ 

**Table 2.** Comparison of blood sugar and lipid between two groups after treatment  $(\overline{x} \pm s)$ 

titer treatment (	)			
Indicators	Control group	Experimental group	t	Р
FPG (mmol/L)	11.63±1.68	7.10±1.07	18.139	< 0.001
2hPBG (mmol/L)	15.54±2.33	11.82±1.75	10.193	< 0.001
HbA1c (%)	9.45±1.57	7.16±1.10	9.545	< 0.001
TC (mmol/L)	7.80±0.63	5.80±0.59	18.326	< 0.001
TG (mmol/L)	4.04±0.34	2.17±0.28	33.728	< 0.001

GSH-px in the two groups were significantly higher than those before treatment (P < 0.05), while the levels of MDA were significantly lower than those before treatment (P < 0.05); and after treatment, the levels of T-AOC and GSH-px in the experimental group were significantly higher than those in the control group (P < 0.05), while the levels of MDA were significantly lower than that in the control group (P < 0.05) (**Table 4**).

# 2.4 Comparison of clinical efficacy between two groups

After treatment, the total clinical effective rate of the experimental group (92.19%) was significantly better than that of the control group (73.44%) (P < 0.05) (**Table 5**).

### 2.5 Adverse reactions

There were no related adverse reactions in the two groups of patients with T2DM.

### **3. Discussion**

The incidence of T2DM has been increasing year by year, endangering the health of patients and increasing the financial burden of the families(8,9). The main treatments of T2DM include lifestyle intervention and drug therapy. Lifestyle intervention includes monitoring blood sugar, healthy diet, smoking cessation, reasonable exercise and health education management. Drug therapy mainly includes some hypoglycemic drugs, such as biguanides, α -glycosidase. inhibitors, SGLT2 inhibitors, sulfonylureas and glinides, among which metformin is the 
 Table 3. Comparison of immune

indices between two groups after

treatment  $(\overline{x} \pm s)$ 

Indicators	Control group	Experimental group	t	Р
CD4+ (%)	40.95±3.22	48.26±3.55	12.129	< 0.001
CD8+(%)	29.32±1.53	28.25±1.34	4.184	< 0.001
CD4+/CD8+	1.39±0.22	1.72±0.34	-6.519	< 0.001

**Table 4.** Comparison of oxidative stress indices between two groups after treatment  $(\bar{x} \pm s)$ 

Indicators	Control group	Experimental group	t	Р
T-AOC (U/mL)	38.93±5.12	54.07±6.28	24.285	< 0.001
$\text{MDA}~(\mu\text{mol}/L)$	18.40±2.58	12.17±2.06	34.001	< 0.001
GSH-px (pg/mL)	66.81±7.20	82.01±8.53	4.285	< 0.001

**Table 5**. Comparison of clinical efficacy between two groups [n (%)]

Group	Significantly		T	Total effective	<b>v</b> <sup>2</sup>	D
	effective	Effective	Ineffective	rate (%)	Λ-	Ρ
Control group	25 (39.06)	22 (34.38)	17 (26.56)	73.44	0.233	0.183
Experimental group	32 (50.00)	27 (42.19)	5 (7.81)	92.19	6.736	0.034

the first drug for the treatment of T2DM. By reducing liver glucose output and improving peripheral insulin resistance, metformin can effectively lower the level of blood sugar(3). T2DM belongs to the category of "diabetes" in traditional Chinese medicine. Its pathogenesis is related to dryness-heat and Yin deficiency. Dryness-heat is the criterion and yin deficiency is the basis. Shenqi Jiangtang Granule is a traditional Chinese medicine preparation composed of Ginsenoside, Schisandra chinensis, Yam, Rehmannia, Raspberry, Astragalus, Ophiopogon japonicus, Poria cocos, Alisma, Trichosanthin and Wolfberry. It has the effect of tonifying Qi and Yin, nourishing spleen and kidney. It has been found that Shenqi Jiangtang Granule combined with insulin can effectively improve the symptoms of glucose and lipid metabolism disorder of patients with T2DM(10). 6

The Chinese Guidelines for the Prevention and Treatment of Type 2 Diabetes (2017) pointed out that FPG, 2hPBG, HbA1c, TC and TG were important indicators for assessing the changes of the condition of patients with T2DM(3). The experimental group received the treatment with Shenqi Jiangtang combined Granule with metformin, and the results showed that the levels of FBG, 2hPBG, HbA1c, TC and TG in the two groups were significantly lower than before treatment, and after treatment, these indicators in the experimental group were significantly lower than those in the control group after treatment, suggested that on the basis of metformin treatment, combined with Shenqi Jiangtang Granule can significantly improve the blood sugar and lipid levels of patients, and has a positive significance in controlling the disease variety. The reason may be that the traditional Chinese medicine ingredients contained in Shenqi Jiangtang Granules have certain blood sugar regulating effects, such as Astragalus embranaceus,

Schisandra chinensis, Ophiopogon japonicus, Rehmannia glutinosa, Ginsenoside, Wolfberry, Yam, etc. Among them, Astragalus membranaceus, Rehmannia glutinosa and Ginseng saponins can promote the repair of islet B cells and enhance insulin sensitivity(11,12,13). In addition, many studies have shown that astragalus memb and it is active ingredients can regulate blood lipids (14,15).

Some studies have found that the immune function of patients with T2DM is low, especially the elderly and the patients with many basic diseases, which will increase the difficulty of treatment(16,17). CD4+, CD8+ and other immune factors can effectively reflect the immune function of patients, the higher the value of CD4+/CD8+, the stronger the immune function of the body. After treatment the levels of CD4+ and CD4+/CD8+ were significantly higher than those before treatment, while CD8+ was significantly lower. After treatment the levels in the experimental group for CD4+, CD4+/CD8+ were higher than that in the control group, and CD8+ was lower than that in the control group, the differences were statistically significantly. It suggested that Shenqi Jiangtang Granule combined with metformin can effectively enhance the immune function of patients, which may be related to that the components of Shenqi Jiangtang Granules such as Astragalus has immunoregulatory function. Studies have shown that oxidative stress can affect insulin secretion, and the state of hyperglycemia and hyperlipidemia of patients with T2DM can aggravate the occurrence of oxidative stress(18). T-AOC can effectively reflect the body's total antioxidant capacity, and its level is positively correlated with the body's antioxidant capacity. MDA is a metabolite of peroxidation, the higher its value is, the more serious oxidative stress damage is. GSH-px is a peroxidase, its value can reflect the body's antioxidant capacity. This study found that after treatment, the levels of T-AOC and GSH-px for both groups were significantly higher than those before treatment, while the level of MDA was significantly lower than that before treatment. And after treatment, there was a significant difference in the levels of T-AOC, GSH-px and MDA between the two groups. It suggested that the combining use of Shenqi Jiangtang Granule and metformin can reduce the oxidative stress reaction of patients and play a positive role in controlling disease condition, may be related to the improvement of blood glucose and lipid levels, but the specific reasons need to be further studied. At the same time, this study also found that the therapeutic efficiency of the experimental group was significantly higher than that of the control group, it further proved the superiority of combination therapy in the treatment of T2DM.

In conclusion, Shenqi Jiangtang Granule combined with metformin can improve the levels of blood sugar and lipid, enhance immune function, reduce oxidative stress response and effectively improve the therapeutic effect of patients with T2DM, so it has clinical popularization significance.

#### **Declarations**

#### 1) Consent to publication

We declare that all authors agreed to publish the manuscript at this journal based on the signed Copyright Transfer Agreement, and followed publication ethics.

- 2) Ethical approval and consent to participants We declare that our research protocol involving humans were approved by our Institutional Ethics Committee and we obtained Informed Consent from Participants enrolled in this study.
- Disclosure of conflict of interests
   We declare that no conflict of interest exists.
- *4) Funding* None
- Availability of data and material We declare that the data supporting the results reported in the article are available in the published article.
- 6) Authors' Contributions

Authors contributed to this paper with the design (YYX and DL), literature search (YYX and DL), drafting (YYX and DL), revision (YYX and ZMG), editing (YYX) and final approval (YYX).

- 7) *Acknowledgement* None
- 8) Authors' biography None

### References

1. Liu Y, Chen R, Yu SJ, et al. Advances in the pathogenesis of type 2 diabetes with non-alcoholic fatty liver. Basic & Clinical Medicine, 2018; 38(8): 1163-1167.

2. Weng J, Pozzilli P. Diabetes Metabolism: Research and Reviews--Chinese Diabetes Society special issue: A small but encouraging step toword the successful control of diabetes in China. Diabetes Metab Res Rev, 2014, 30(6): 445-446.

3. Jia WP. China Guideline for Type 2 Diabetes(2017), Chinese Diabetes Society, 2017; 8(4): 292-298.

4. Tang Y, Li J. Research on Treating Syndrome of Endogenous Heat Due to Yin Deficiency Type 2 Diabetes Patients with Liuwei Dihuang Bolus Combined Metformin Hydrochloride Tablets. Journal of Hunan Normal University (Medical Science), 2015; 12(4): 28-31. 5. Cao Y, Wang HY, Xu C. The effects of Tianqi jiangtang capsule combined with Metformin on the levels of interleukin-6,tumor necrosis factor  $\alpha$  and C-reactive protein in patients with type 2 diabetes mellitus. Chinese Journal of Diabetes, 2015; 23(8): 739-741.

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6. Guo SH, Lu JL. Efficacy and Safety of Shenqi Jiangtang Particles and Glimepiride in Treatment of Diabetic Outpatients. Liaoning Journal of Traditional Chinese Medicine, 2016; 43(11): 2323-2325.

7. Zhen XY. Guiding Principles for Clinical Research of New Chinese Traditional Medicines. China Medical Science Press, 2002.

8. Dai W, Ye L, Liu A, et al. Prevalence of nonalcoholic fatty liver disease in patients with type 2 diabetes mellitus: A meta-analysis. Medicine, 2017; 96(39): e81-e79.

9. Defronzo R A, Ferrannini E, Groop L, et al. Type 2 diabetes mellitus[J]. Nat Rev Dis Primers, 2015; 1(41); 15019.

10. Zhen ZF, Ji MX. Effect of Shenqi Jiangtang Granules Combined with Insulin on the Glucolipid Metabolism and Hypoglycemia of Type 2 Diabetes Patients with Sulfonylureas Secondary Failure. China Pharmacy, 2015; 26(15): 2065-2067.

 Meng FL, Su XT, Zhen YN. Effects of Ginsenoside Rb3 on Antihyperglycemia and Antioxidation in Diabetic Mice. Journal of South China Agricultural University, 2013; 34(4): 553-557.

12. Ye TT. Clinical Observation of Shenqi Jiangtang Granule Combined with Conventional Therapy in the Treatment of Type 2 Diabetes with Qi-yin Deficiency Syndrome. Journal of New Chinese Medicine, 2016; 48(4): 76-78.

13. Huang ST, Liu X, Liu HN, et al. Systematic Review about the Effect and Safety of Shenqi Jiangtang Granule for 2 Diabetes Mellitus of Qi-yin Deficiency. Journal of Jiangxi University of Traditional Chinese Medicine, 2015; 27(4): 35-40.

14. Liu XR, Li J. Antihypertensive and lipid-lowering effects of active ingredients of Astragalus membranaceus.Chinese Journal of Gerontology, 2015; 35(17): 4800-4801.

15. Xu F, Yu H, Lu C. Study on Alisols Hypolipidemic Effect and Molecular Mechanism. Journal of Nanjing

University of Traditional Chinese Medicine, 2016; 32(5): 451-455.

16. Zhu YQ, Hu Y, Mao XM. The research progress of immune disorders in type 2 diabetes mellitus. Chinese Journal of Diabetes, 2015, 23(9): 859-861.

17. Liu L, Chen LW, Wu QX. T cell subsets immune imbalance and its intervention in aged chronic obstructive pulmonary disease patients complicated with type 2 diabetes. Practical Journal of Cardiac Cerebral Pneumal and Vascular Disease, 2015; 23(6): 45-47.

18. Haxhi J, Leto G, Di PA, et al. Exercise at lunchtime: effect on glycemic control and oxidative stress in middle-aged men with type 2 diabetes[J]. European Journal of Applied Physiology, 2015; 116(3): 573-582.