

# *Effect of Huanglian Wendan Tang on Diabetes Patients with Nonalcoholic Fatty Liver*

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**Abstract:** How to prove whether Huanglian Wendan Tang is effective in diabetes with non-alcoholic fatty liver disease? At present, there is a lack of large-scale clinical observation and research on the application effect of Huanglian Wendan Tang in diabetes patients with nonalcoholic fatty liver. The purpose of this study was to observe the effect of Huanglian Wendan Tang in patients with diabetes and non-alcoholic fatty liver disease. This article recruited a total of 60 cases that met the inclusion criteria, of which 30 patients received Huanglian Wendan Tang treatment (experimental group), and the other 30 patients received conventional treatment (control group). The experimental group patients took Huanglian Wendan Tang orally, three times a day, and received continuous treatment for four weeks. Two groups of patients underwent clinical examinations and evaluation of laboratory indicators before and after treatment. After several experimental tests, it was found that patients in the experimental group showed significant improvements after treatment. After taking Huanglian Wendan Tang continuously for one month, the blood sugar decreased from 12.85mmol/L to 8.6mmol/L, which can effectively lower the blood sugar in the patient's body.

## 1. Introduction

How to find an effective treatment for diabetes combined with non-alcoholic fatty liver disease? Diabetes combined with nonalcoholic fatty liver is a common metabolic disease. Diabetes patients are prone to fatty liver due to insulin resistance and impaired islet function. Non alcoholic fatty liver is a liver disease caused by the abnormal accumulation of fat in the liver. The coexistence of these two diseases may lead to worsening of the condition and increased health risks. Huanglian Wendan Tang is a traditional Chinese medicine formula widely used in the treatment of liver and gallbladder diseases, with the function of protecting the liver and regulating blood sugar. However the effect of Huanglian Wendan Tang has not been fully studied and verified. Therefore, the purpose of this study was to observe the application effect of Huanglian Wendan Tang in diabetes patients with

nonalcoholic fatty liver disease, and evaluate its impact on blood glucose control, liver function and fatty liver degree.

This article is divided into four parts. First of all, this article introduces the research background and clinical status of diabetes with nonalcoholic fatty liver, and discusses its pathogenesis and harm. Secondly, it outlines the pharmacological effects and clinical applications of Huanglian Wendan Tang, and introduces its potential benefits for liver and blood glucose regulation. Then, this article provides a detailed description of the methods and experimental design of this study, including case recruitment, treatment plans for the experimental and control groups, and evaluation indicators. Finally, this paper presents the research results and discussion, analyzes the application effect of Huanglian Wendan Tang in diabetes with non-alcoholic fatty liver, and discusses its potential mechanism and clinical significance. Through the development of this study, this paper hopes to provide new ideas and evidence for the treatment of diabetes with non-alcoholic fatty liver, and provide scientific basis for the application of Huanglian Wendan Tang in this field. This would help improve the health status of patients and alleviate the adverse effects of the disease on their quality of life and prognosis.

## 2. Related Work

Many scholars have conducted research on diabetes combined with nonalcoholic fatty liver. Among them, Wu Wenxia believes that type 2 diabetes is a false standard; spleen and kidney Yang deficiency is its foundation, liver stagnation, dampness and heat, phlegm turbidity and blood stasis are its standards. The characteristics of the medication are as follows: it warms the spleen and kidneys to treat their roots, regulates liver qi to ensure smooth qi circulation, clears heat and dampness, reduces phlegm and activates blood to treat their symptoms. Based on the “liver-clearing and spleen-strengthening compound” as the basis for dialectical treatment of addition and subtraction, there are many clinically effective tests [1]. Li Xuexia selected 232 patients with T2DM combined with NAFLD admitted to the Endocrinology Department of Xuzhou Cancer Hospital from July 2018 to October 2020 as research subjects, and observed that the patients were given metformin combined with sigliptin and diabetes diet and exercise therapy. The course of treatment for the patients was 24 weeks [2]. Qian Fangfang divided NAFLD patients into NAFLD group (286 cases) and non-NAFLD group (313 cases) based on whether NAFLD was combined. According to the results of abdominal ultrasound examination, NAFLD patients were divided into three groups: mild (111 cases), moderate (105 cases), and severe (70 cases). He compare the differences in general clinical data between the groups [3]. Ma Xiaohui found that serum 25- (OH) D3 levels in patients with T2DM combined with NAFLD are closely related to liver fat content. When patients lack 25- (OH) D3, it may cause poor control of blood sugar and blood lipids, promote liver fat accumulation, and promote liver fibrosis progression [4]. Zhang Haichao found that the gender, age and T2DM course of patients with different conditions were similar ( $P>0.05$ ), and there were differences in waist-hip ratio and body mass index of patients in different groups ( $P<0.05$ ) [5]. The above research has provided great help for the treatment of patients with diabetes combined with nonalcoholic fatty liver. In this article, Huanglian Wendan Tang would be used to further study patients with diabetes combined with nonalcoholic fatty liver.

## 3. Method

### 3.1 Huanglian Wendan Tang

Many people may not have heard of Huanglian Wendan Tang, but diabetics are familiar with it, because patients often have to take this medicine. The components in Huanglian Wendan Tang

have a hypoglycemic effect, and Huanglian contains components such as berberine, which can increase insulin sensitivity, promote glucose utilization and absorption, and thus lower blood sugar levels. Its components can improve the function and metabolic status of pancreatic islet cells, promote insulin secretion and release [6-7]. The components such as baicalin and baicalin in *Scutellaria baicalensis* have a protective effect on pancreatic islet cells, which helps to maintain the normal operation of pancreatic islet function. The components in Huanglian Wendan Tang can alleviate the degree of insulin resistance, and berberine in Huanglian has anti-inflammatory and antioxidant effects, which can reduce the inflammatory response of pancreatic tissue and lower insulin resistance. Diabetes is often accompanied by an increase in inflammatory reaction, and the ingredients of *Coptis chinensis* and *Phellodendron chinense* in Huanglian Wendan Tang have anti-inflammatory effects, which can reduce inflammatory reaction and improve the condition of diabetes [8-9].

### 3.2 Diabetes with Nonalcoholic Fatty Liver

Diabetes combined with nonalcoholic fatty liver disease means that diabetes and nonalcoholic fatty liver disease exist at the same time. Diabetes is a metabolic disease, characterized by insufficient insulin secretion or poor insulin function in the body, leading to elevated blood sugar. Non alcoholic fatty liver is a liver disease characterized by abnormal accumulation of fat in the liver, but not caused by alcohol [10-11]. There is an interactive relationship between diabetes and nonalcoholic fatty liver. Due to insulin resistance or insufficient insulin secretion, patients with diabetes are prone to increase blood sugar and metabolic abnormalities, thus increasing fat deposition in the liver and aggravating non-alcoholic fatty liver. At the same time, nonalcoholic fatty liver can also affect insulin sensitivity and secretion function, and aggravate the development of diabetes. Strategies for managing diabetes with nonalcoholic fatty liver disease are as follows:

(1) Control of blood sugar level: the blood sugar level can be controlled by means of standardized diet, exercise and drug treatment to reduce the adverse effects of diabetes on non-alcoholic fatty liver.

(2) Weight management: It can reduce weight and fat content, improve insulin resistance and fatty liver disease through reasonable dietary control and moderate physical exercise [12-13].

(3) Fat metabolism regulation: Measures can be taken to improve lipid metabolism abnormalities, including controlling dietary fat intake, limiting cholesterol intake, and increasing food intake rich in Omega-3 fatty acids.

(4) Control of hypertension and dyslipidemia: diabetes patients with nonalcoholic fatty liver are often accompanied by hypertension and dyslipidemia. Timely control of blood pressure and blood lipid levels would help to improve the metabolic status of the liver and the whole body.

(5) Drug treatment: some drugs may be used to control diabetes and nonalcoholic fatty liver disease according to the condition and doctor's suggestions, such as insulin sensitizers, insulin secretion enhancers, cholesterol lowering drugs, etc. [14-15].

### 3.3 Design and Experimental Organization

#### Research Design

a. Prospective, randomized controlled trial designs can be used to ensure the reliability and comparability of the results.

b. Single blind and double blind designs can be considered to reduce the impact of subjective bias.

#### Experimental organization

a. Research location: This article selects medical institutions or research centers as the location

for conducting the study.

b. Recruitment of subjects: In this study, recruit patients who meet the selection criteria as research subjects.

c. Random grouping: It randomly assigns subjects to the experimental group and the control group, ensuring the balance of baseline characteristics between the two groups.

d. The experimental group received Huanglian Wendan Tang intervention treatment.

e. The control group received standard treatment for comparison with the experimental group.

f. Intervention period: This article determines the treatment cycle and frequency of Huanglian Wendan Tang, such as daily use, weekly or monthly continuous treatment [16-17].

g. Follow up and data collection: This article develops a follow-up plan and regularly collects clinical data and related indicators from subjects.

h. Interruption or withdrawal criteria: This article defines the criteria for subjects to interrupt or withdraw from the study, such as adverse reactions or voluntary withdrawal.

i. Compliance with ethical requirements: It ensures that the research complies with the review and ethical requirements of the ethics committee.

### 3.4 Administration Plan and Observation Indicators of Huanglian Wendan Tang

The experimental group received Huanglian Wendan Tang treatment while undergoing monitoring and evaluation. Huanglian Wendan Tang should be consumed 45 minutes after meals, with the following dosage and frequency of administration: Coptis chinensis (4g), Scutellaria baicalensis (4g), Phellodendron amurense (3g), Coptis chinensis gypsum (3g), Poria cocos (4g), Alisma orientalis (4g), and licorice (3g); 1 bag/time, 3 times/day, the duration of the experiment is 30 days [18-19].

To verify the effectiveness of Huanglian Wendan Tang, this study measured fasting blood glucose (FBG) and serum aspartate aminotransferase (AST) levels in liver function. In the experiment, there were 30 patients in the experimental group and 30 patients in the control group. This article conducts experiments on patients based on the design of indicators, uses ORINGIN 2021 for statistical analysis, and visualizes [20].

## 4. Results and Discussion

### 4.1 FBG

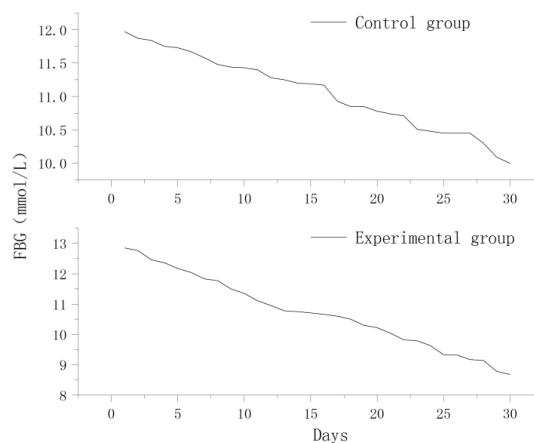


Figure 1: FBG

According to the standards of the World Health Organization, the American diabetes Association and other institutions, the level of FBG can be used for the diagnosis of diabetes. Generally, if the patient's FBG is greater than or equal to 126 mg/dl (7.0 mmol/L), it can be diagnosed as diabetes. For patients with known diabetes, FBG can be used to assess the control of blood sugar. Under normal circumstances, the FBG of diabetes patients should be controlled within the target range, usually between 70-130 mg/dl (3.9-7.2 mmol/l). Figure 1 shows the changes in FBG between the experimental group and the control group within 30 days.

The figure records the changes in FBG levels in two groups of patients within 30 celestial bodies. The initial average blood glucose level in the experimental group was 12.85mmol/L, and after taking Huanglian Wendan Tang continuously for one month, the blood glucose level decreased to 8.6mmol/L. The control group received normal treatment for blood sugar but did not take Huanglian Wendan Tang, and their blood sugar decreased from an average of 11.97mmol/L to 10mmol/L.

Eight patients were selected from the experimental group and the control group, and their postprandial blood glucose levels were measured 2 hours after meals. The measurement results are shown in Table 1:

Table 1: Measurement Results

Patient	Experimental group		control group	
	Before treatment	After treatment	Before treatment	After treatment
1	10.81	6.32	11.54	7.83
2	9.96	6.11	11.84	7.88
3	11.21	6.84	12.13	8.10
4	9.45	7.21	11.59	8.03
5	9.36	6.95	12.16	7.58
6	11.12	7.01	12.27	7.68
7	9.98	6.12	11.57	8.25
8	10.58	6.51	11.99	7.89

This result suggests that Huanglian Wendan Tang has the function of regulating blood sugar and can help control the blood sugar level of diabetes patients. A better decrease in blood sugar levels may mean that Huanglian Wendan Tang can improve insulin sensitivity, promote glucose utilization, or reduce the release of liver glycogen, thereby lowering blood sugar levels.

#### 4.2 AST

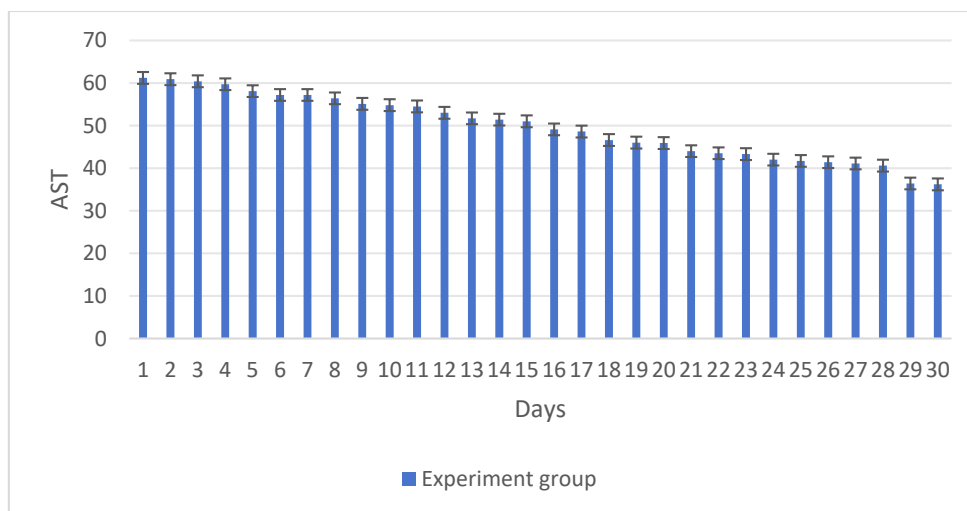


Figure 2: Experimental group AST

AST (aspartate aminotransferase) is an enzyme that exists in various tissues, including the liver, heart, muscles, and kidneys. It is an enzyme released from liver tissue. When liver cells are damaged, they are released from the cells into the bloodstream. In non-alcoholic fatty liver disease, fat deposition in the liver may lead to liver cell damage and inflammatory response. Therefore, an increase in AST levels may indicate impaired liver function, which can to some extent reflect the degree of liver inflammation and fibrosis. The increase in AST levels in non-alcoholic fatty liver patients is related to the degree of inflammation and fibrosis progression. Figures 2 and 3 show the AST test results of the experimental group and the control group.

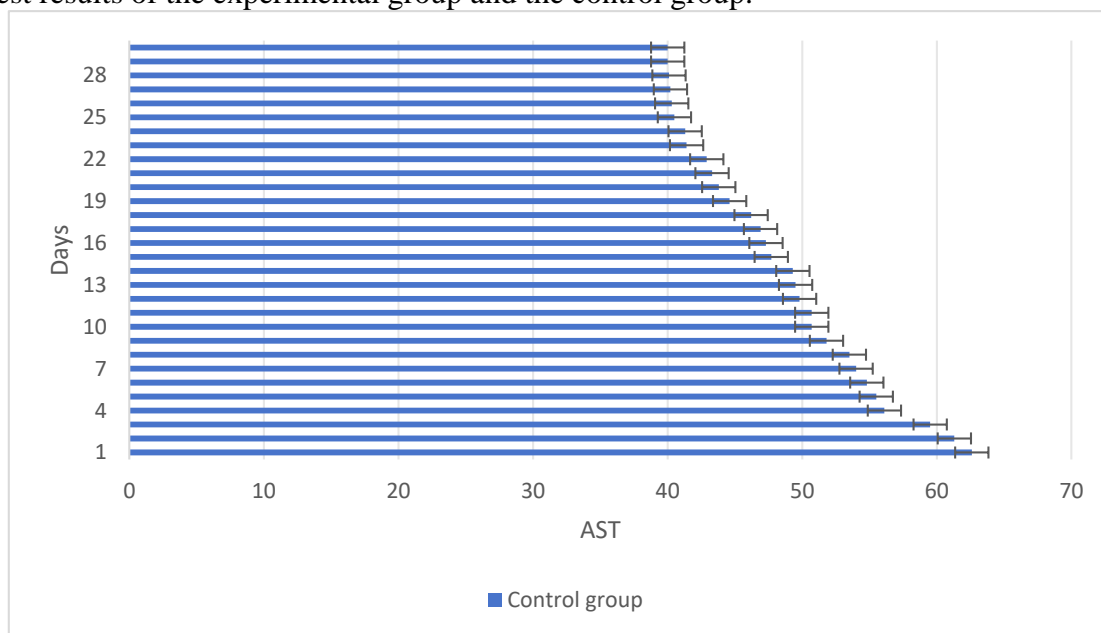


Figure 3: Control group AST

During the 30 day experiment, the AST concentration in the patient's body decreased from 61.2 to 36.2. The AST concentration in the control group decreased from 62.6 to 40.0. The experimental group can better reduce the AST concentration in the patient's body, and lower AST concentrations suggest less damage to liver cells or improved liver function. This indicates that Huanglian Wendan Tang has a protective effect on the liver, reducing liver cell damage and inflammatory response, thereby reducing the release of AST. This indicates that Huanglian Wendan Tang has certain anti-inflammatory and antioxidant effects, and has a positive impact on liver health.

## 5. Conclusions

Huanglian Wendan Tang has the potential effect of improving blood glucose control in diabetes patients with nonalcoholic fatty liver disease. The observation group showed a significant decrease in fasting blood glucose and postprandial blood glucose levels after treatment, indicating that Huanglian Wendan Tang has a blood glucose regulating effect. Huanglian Wendan Tang also has a positive impact on liver function, and the AST level of liver function indicators in the experimental group patients significantly decreased after treatment, indicating that Huanglian Wendan Tang has certain benefits in improving liver function. Due to limitations such as limited sample size and short observation period in this study, further large-scale and long-term follow-up clinical studies are needed to verify the above conclusions. In addition, the mechanism of action and safety of Huanglian Wendan Tang also require further in-depth research.

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