

Research progress on the effect of traditional Chinese medicine on glycolipid metabolism diseases

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Abstract: Glycolipid metabolism disease (GLMD) is a group of diseases that appear single or combined with hyperglycemia, dyslipidemia, non-alcoholic fatty liver disease, overweight, hypertension, atherosclerosis, etc., and need to be prevented and controlled as a whole. At present, the research and development and application of western medicine are still mostly studied for a single disease, the comprehensive compliance rate is low, and traditional Chinese medicine has unique advantages in the treatment of GLMD.

Keywords: Traditional Chinese medicine treatment; Glycolipid metabolic disease; research progress

1. Introduction

Glycolipid metabolism disease (GLMD) is characterized by glucose and lipid metabolism disorders, with neuroendocrine disorders, insulin resistance, oxidative stress, chronic inflammatory reactions, and intestinal flora imbalance as the core pathogenesis, and single or combined clinical manifestations such as hyperglycemia, dyslipidemia, non-alcoholic fatty liver disease, overweight, hypertension, atherosclerosis, etc. [1]. According to the latest epidemiological data, the prevalence of diabetes mellitus (DM) in people aged 18 and above in China has climbed to 11.2% and 72% [2], and the prevalence of dyslipidemia and non-alcoholic fatty liver disease (NAFLD) is also high 40.4% [3], 24.8% [4]. Conditions such as DM, lipid metabolism abnormalities, hypertension, and NAFLD are often comorbid or comorbid, as reported in CCMR-3B studies Type 2 diabetes mellitus (T2DM) Occurs in 72% of patients with dyslipidemia and hypertension 1 or 2 (see figure 1). A survey of 316 hospitalized patients with hyperlipidemia found that only 15.82% of patients with simple hyperlipidemia were combined with DM, hypertension, fatty liver, and metabolic syndrome. Compared with patients with T2DM alone, T2DM patients with dyslipidemia and hypertension have a 6-fold higher risk of cardiovascular disease, and DM, dyslipidemia and NAFLD Comorbidity greatly increases the risk of microvascular complications in patients with DM. However, at present, most of the above-mentioned diseases related to glucose and lipid metabolism are diagnosed and treated by subspecialty single diseases, and the comprehensive compliance rate is low, only 5.6%. Therefore, it is necessary to carry out comprehensive and integrated understanding and prevention and control of GLMD to improve the comprehensive prevention and control level of this disease. Combined with the pathogenesis and disease characteristics of traditional Chinese medicine, GLMD should belong to the category of "turbidity" in traditional Chinese medicine, and in recent years, the treatment of DM, dyslipidemia, hypertension, and NAFLD from sputum stasis has also been paid more and more attention by many doctors, and traditional Chinese medicine for the prevention and treatment of GLMD. It has the advantage of overall regulation.

Disease Type	Prevalence Rate
DM	11.20%
HL	40.40%
NAFLD	24.80%
GLMD	72%

Figure 1: The incidence of GLMD

2. Understanding of Glycolipid Metabolism Diseases in TCM

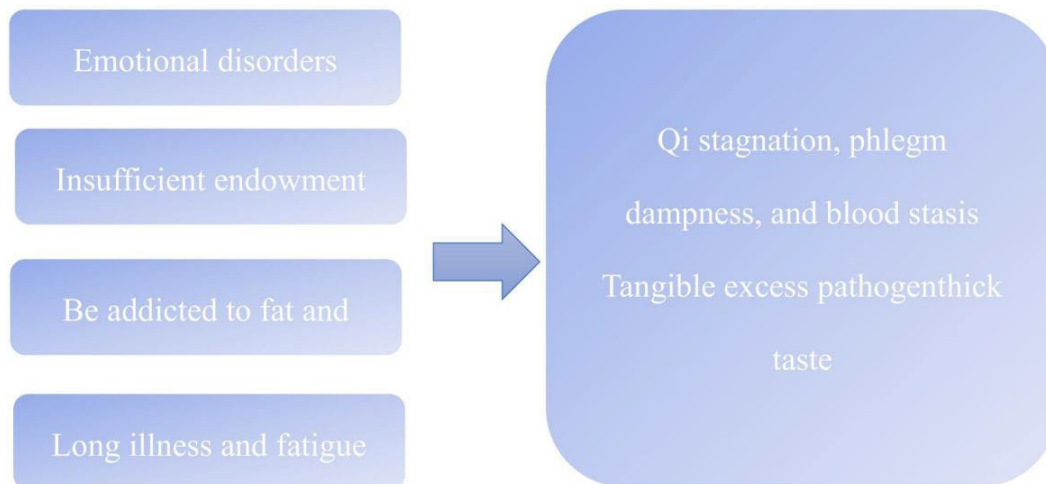


Figure 2: Cause of GLMD

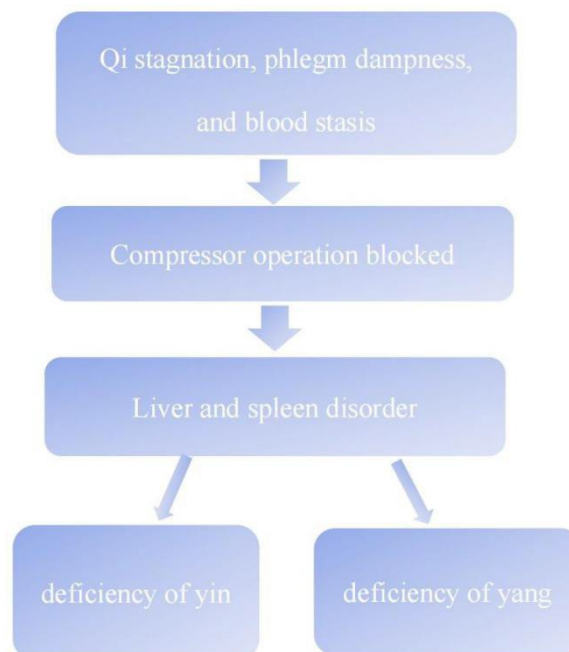


Figure 3: Pathogenesis of GLMD

There is no name for "glycolipid metabolism disease" in ancient Chinese medicine, and according to its clinical manifestations and disease characteristics, it belongs to the categories of "quenching fever", "thirst" and "ointment" in traditional Chinese medicine, and the pathogenesis is more complex. The causes are mostly congenital insufficiency, acquired emotional disorders, poor diet, and long-term illness and organ deficiency (see Figure 2). Jia Lianqun and other scholars believe that GLMD is based on liver loss and spleen loss as the key pathogenesis, and is microscopically embodied through the intestinal microecology, with poor operation of qi and blood, abnormal micro-infusion of water valley, and the generation of phlegm and blood stasis, thereby inhibiting the internal organs meridians as the basic pathogenesis (see Figure 3). Therefore, the method of thinning the liver and strengthening the spleen should be used to regulate the intestinal microecology, so as to achieve the purpose of preventing and treating GLMD; Wang Yi'e, Zhao Xinxiang^[5] and others believe that quenching thirst for a long time causes yin damage and yang, so it is manifested as kidney yang deficiency, and it should be used to nourish yin and benefit the kidney; Huang Yaoqiang and others believe that this disease is developed on the basis of qi and yin deficiency, and its pathological basis is the basic treatment of qi and yin, so the treatment should be based on the basic treatment of qi and yin; Wang Zhikuan et al. treated "phlegm", believing that phlegm is the target of dyslipidemia, and the root of dyslipidemia when the spleen is insufficient, so the treatment should be based on strengthening the

spleen and regulating lipids . Li Yasong and others believe that liver depression and stasis and blood stasis, resulting in hypercoagulability, are the basis of diabetes and vascular complications.

Therefore, the treatment should be to relieve depression in the liver, activate blood and remove stasis as the treatment; Wang Ruzhen and others treated thirst and its complications from the theory of "poison", and believed that the connotation of poison and evil is the fundamental cause of thirst, so the treatment should be based on clearing heat and detoxification, nourishing yin and rejuvenating jin. In summary, the TCM pathogenesis of glycolipid metabolism disease is not unrelated to spleen loss of healthy luck, liver loss and leakage, qi and yin deficiency and yin and yang deficiency, and leads to glycolipid metabolism disorders due to the production of pathological products such as poison, blood stasis, phlegm and dampness.

3. Study on the effect of traditional Chinese medicine on glycolipid metabolism diseases

3.1. Current status of traditional Chinese medicine compound intervention in GLMD

According to the pathogenesis and pathogenesis of glycolipid metabolism diseases, treatment should be carried out from the liver, spleen and kidney, and can be combined with pathological products such as qi and yin deficiency and sputum stasis. (see Figure 4)

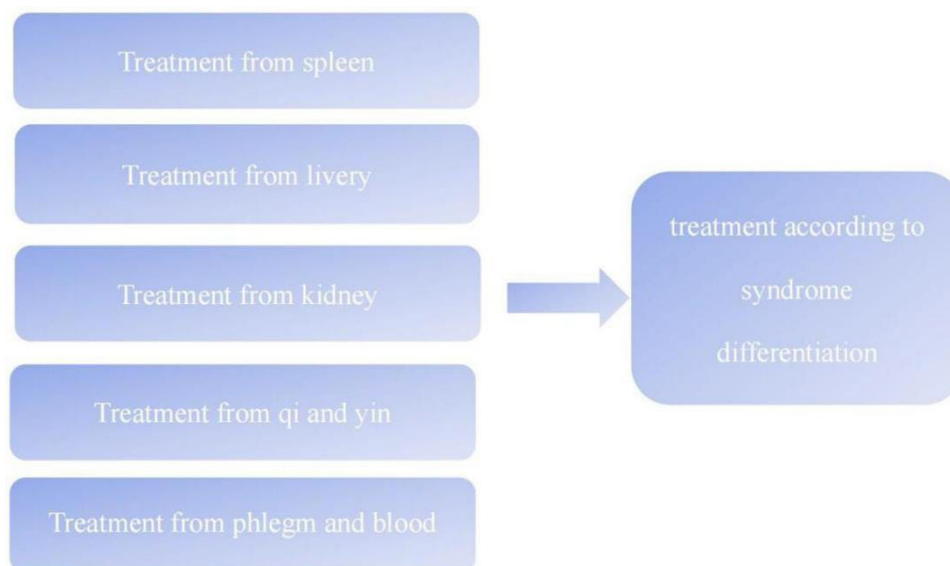


Figure 4: The main idea of Chinese medicine treatment of GLMD

(a) Treatment from the spleen Shi Jinmo, a famous doctor who treats the spleen, pointed out that in addition to nourishing yin and clearing heat, the treatment of thirst quenching disease is a cure for strengthening the spleen and nvigorating qi The key to treatment, the spleen likes dryness and dampness, and the use of roducts that nourish yin and clear heat alone will hurt the temper and make the medium focus unlucky, so while strengthening the spleen and invigorating qi, it should also take into account the method of strengthening the kidney and activating the blood. Cheng Yichun et al. treated 100 patients with type 2 diabetes mellitus from the treatment of spleen, and the results showed that the fasting and 2h blood glucose and 24h urine glucose after meals were reduced. Shi Suyu et al. combined with the method of strengthening the spleen and nourishing yin and shengjin, homemade Yuquan pills, and the treatment results showed 30 cases of sugar Fasting blood glucose is reduced in patients with urine disease. Xiong Wensheng] and others treat type 2 diabetes from spleen expectorant and self-control spleen Phlegm-reducing lipid-lowering tablets effectively reduced triglycerides and cholesterol in the treatment of 140 elderly patients with hyperlipidemia. Ji Yunhaimade a homemade spleen and stasis pill, which has also achieved good results in the treatment of diabetes. Qian Yuliang's [6] self-imitating kidney and spleen and blood soup, the treatment results showed that the fasting, 2h postprandial blood glucose, TC and TG of 72 diabetic patients were reduced, and HDL-C was increased.

(b) Treatment from the kidney According to the physiological characteristics of kidney should be closed, it can be known that kidney essence cannot be excreted, so the treatment of glycolipid disease

from the kidney should nourish yin and benefit the kidney, and at the same time, it is combined with treatment methods such as qi and blood to increase the curative effect. Songhaikang According to the efficacy of strengthening the spleen and benefiting the kidney, and the treatment of sputum and removing stasis in the treatment of elderly hyperlipidemia, the results showed that TC and TG in the blood of 48 elderly patients with hyperlipidemia were effectively reduced, and HDL levels were increased. Zhong Songcai used the method of nourishing yin and tonifying the kidney, invigorating qi and strengthening the spleen, and self-simulated hypoglycemic soup, and the total effective rate for treating patients with type 2 diabetes was 91.4%. Wang Xu from the perspective of promoting kidney and activating blood and dissolving turbidity, self-mimicking kidney fat decoction for the treatment of patients with diabetes complicated with lipid metabolism disorders, the results show that this formula has good hypoglycemic effect, lipid regulation and blood viscosity reduction.

(c) From the liver treatment while thinning the liver and qi, while taking into account the spleen and neutralizing or activating blood circulation and removing stasis, harmonizing the liver and spleen, and smoothing the qi system, it can be more effective in the treatment of glycolipid metabolism diseases. Lu Yajuan^[7] self-leveling liver lipid-lowering pills, effective treatment of hyperlipidemia. Chen Rugui et al. from the perspective of liver thinning and blood circulation, the total effective rate of self-pseudodanling Xiaoyao decoction in the treatment of liver qi discomfort combined with stasis blocking hyperlipidemia reached 90.24% in 46 patients.

(d) From the treatment of qi yin, Qi Aiju made hypoglycemic safety to treat 40 patients with qi yin deficiency diabetes mellitus, and the results showed that this can effectively reduce blood sugar, glycated hemoglobin, and improve lipid metabolism. Xiao Changqing et al. on the basis of invigorating qi and nourishing yin, taking into account blood circulation and turbidity, homemade glycolipid pills, and the result was TC and TG in 30 patients with type 2 diabetes and hyperlipidemia both decreased, and HDL-C increased. Li Juncheng et al. made cellulite and hypoglycemic pills treated 80 cases of diabetes complicated by hyperlipidemia, and the results showed that the treatment effect was significant in blood lipids, blood rheology, FBG and insulin. Jiang Shulan et al. used the method of invigorating qi and nourishing yin, removing stasis and dispelling turbidity, and quasi-Qingning decoction treated 50 cases of type 2 diabetes mellitus complicated with hyperlipidemia, so that the clinical symptoms, fasting and postprandial blood glucose, and microcirculation of diabetic patients were curative. On this basis, Gong Zhenling^[8] conditioned Sanjiao, self-mimic pancreatic body health capsule for the treatment of diabetic hyperlipidemia, which reduced FBG, postprandial 2h blood glucose, GHb, tc, TG and plasma viscosity, hematocrit and fibrinogen in diabetic hyperlipidemia.

(e) Treatment of phlegm and stasis Sputum is an important pathological basis for the emergence of diabetes and many comorbidities, so expectorant and turbidity reduction is an important principle in the treatment of diabetes. Wang Huameng treated 46 patients with hyperlipidemia according to the sputum decoction plus reduction, and the total effective rate was as high as 95.6%. Modern pharmacological studies have shown that the method of activating blood circulation and removing stasis can effectively expand blood vessels, change blood rheology, effectively improve microcirculation disorders, and effectively prevent and treat blood vessel complications such as glycolipid metabolism diseases. Zhu Chen Yu self-proposed hypoglycemic blood remedy, opening a precedent for the treatment of diabetes and blood circulation and stasis. Shi Xizhi^[9] et al. believe that hyperlipidemia forms arteriosclerosis, which blocks pancreatic blood vessels, resulting in insulin secretion disorders, resulting in abnormal blood sugar, so they advocate the treatment of diabetic hyperlipidemia patients with stasis and lipid reduction, effectively reducing blood viscosity and controlling blood sugar. Zhang Ying et al. self-simulated blood blood hypoglycemic formula, effectively improved the TC and TG levels of 58 patients with glycolipid metabolism disease. Liang Lijing added blood exhaustion powder on the basis of TCM differentiation to treat patients with glycolipid metabolism diseases, and the effect was very good.

3.2. Current status of single flavor Chinese medicine in the treatment of GLMD

Single flavor Chinese medicine has excellent efficacy in treating diseases of glycolipid metabolism, mainly mulberry leaves, summer hay, purslane, ginkgo biloba and so on. (See Figure 5)

(a) Mulberry leaves are sweet, bitter and cold, and belong to the lungs and liver meridians, and have the effect of evacuating wind and heat and clearing the liver. Liu Yinghua^[10] et al. reported that mulberry leaf extract can reduce postprandial blood sugar by inhibiting α -glucosidase activity and glucose absorption. Li Xiangrong et al. reported that mulberry leaf water extract could reduce blood glucose and LPO content in diabetic rats with tetraoxamine, and increase SOD levels.

(b) *Summer subtilis* has a bitter taste, bitterness and cold, and belongs to the liver and gallbladder meridians, and has the effect of clearing the liver and brightening the eyes, dissipating knots and reducing swelling. Liu Baolin et al. reported that subtilitol extract can promote insulin secretion and increase the utilization of blood sugar by tissues, thereby improving glucose tolerance and fighting the effect of epinephrine on blood sugar. At the same time, *P. subtilis* extract can effectively reduce urine protein, creatinine content, etc., and has a certain effect on preventing diabetic nephropathy.

(c) Purslane acid, cold, return to the liver, large intestine meridian, has the effect of clearing heat and detoxification, cooling blood and stopping bleeding and stopping diarrhea. Xiao Fengying et al. have shown that purslane can effectively improve the disorder of glucose and lipid metabolism by reducing serum TNF- α and IL-6 concentration and increasing the expression level of serum LPL mRNA activity. He Shengwen^[11] et al. have shown that purslane can reduce the number of intimal foam cells, reduce lipid deposition, inhibit the formation of AS plaques, and reduce serum TC, TG, Increased apparent viscosity of MDA, whole blood hyporesction, and plasma mesosection, and increased HDL-C. Wang Xiaobo et al. reported that fresh and dry purslane can reduce hyperlipidemia and inhibit the formation of LPO.

(d) *Ginkgo biloba* is sweet and bitter, returning to the heart and lungs, and has the effect of activating blood circulation and removing stasis, and calming asthma in the lungs. Nian Hong^[12] et al. studies have shown that *Ginkgo biloba* extract can reduce postprandial blood sugar, reduce the content of TC, TG, LDL-C in blood, reduce MDA content in blood, improve SOD activity in blood, reduce islet damage, and have hypoglycemic and lipid-lowering effects.



Figure 5: Single Flavor Chinese Medicine

3.3. Research on the treatment of GLMD with active ingredients in traditional Chinese medicine

At present, many active ingredients in traditional Chinese medicine have been confirmed to regulate fat and reduce glucose, and according to their active ingredients, they can be divided into polysaccharides, alkaloids, peptides, saponins, flavonoids, volatile oils, etc.

The experiments showed that astragalus polysaccharides, yam polysaccharides, mulberry leaf polysaccharides, yellow essence polysaccharides, ginseng polysaccharides, oxknee polysaccharides, zhimu polysaccharides, *Ganoderma lucidum* polysaccharides, goji berry polysaccharides, tanpi polysaccharides, coix kernel polysaccharides, Maimendon polysaccharides, rehmannia polysaccharides, rhubarb polysaccharides, golden cherry seed polysaccharides, pumpkin polysaccharides and other hypoglycemic effects are significant, among which rehmannia oligosaccharides can not only regulate glycolipid metabolism disorders, but also regulate physiological hyperglycemic states. Astragalus polysaccharides can also improve glucose and lipid metabolism disorders; Yam polysaccharides can effectively improve islet cell function while lowering glucose.

Moreover, the saponins in astragalus, ginseng, *Panax notoginseng*, lychee nucleus, eleuthero, *Codonopsis*, *gynostemma*, bellflower, dogwood, and *scutellaria baicalensis* can effectively reduce glucose, among which *Panax notoginseng* saponins can not only improve macrovascular lesions, but

also effectively regulate hyperlipidemia; While eleuthero saponins regulate blood lipid metabolism, they can effectively improve islet cell function; Total gynostemma glycosides have the effect of lowering lipids and protecting the liver and preventing the formation of arteriosclerosis.

Silymarin, quercetin, puerarin, ginkgo biloba flavonoids, hawthorn flavonoids, vine tea total flavonoids, mulberry leaf total flavonoids, buckwheat total flavonoids, skullcap stem and leaf total flavonoids, acetylsaloxanthonoids and other flavonoids can effectively adjust the disorders of glucose and lipid metabolism. Among them, silymarin can also effectively improve blood rheology, so as to effectively prevent and treat diabetic neuropathy; Puerarin can also effectively resist platelet aggregation and enhance the biological effect of insulin; Baicalin can inhibit the activity of aldose reductase in diabetic patients, improve the indicators of neuropathy, and help the treatment of diabetic neuropathy.

In addition, volatile oils such as paeonol can also reduce the course of forced spondylitis by inhibiting hyperlipidemic endothelial cells. Ginseng polypeptides, bitter melon peptides and other polypeptides can inhibit hyperglycemia and effectively reduce blood sugar.

3.4. Proprietary Chinese medicine for the treatment of disorders of glucose and lipid metabolism

At present, many proprietary Chinese medicines are popular clinically due to their advantages of convenience, rapid efficacy and fewer adverse reactions. Among them, the main ones with good hypoglycemic efficacy are Yuquan pills, thirst quenching pills, sugar maikang granules, Jinqi hypoglycemic granules, hypoglycemic clips, thirsty lening capsules, sugar elimination capsules, thirst quenching tablets, Yangyin hypoglycemic tablets, ginseng hypoglycemic granules, thirst quenching capsules, Jinlida oral liquid, Shengjin thirst quenching capsules, etc.; Lipid-lowering proprietary Chinese medicines mainly include blood lipid kang capsules, lipobitu capsules, gynostemma total glycoside tablets, Hedan tablets, Tongmai lipid lowering tablets, hawthorn essence lipid lowering tablets, Tai Lipoan capsules, lipid lowering and detoxification capsules, etc.

4. Prospect

The cause of diabetes mellitus combined with hyperlipidemia is closely related to overeating fat and thick taste, phlegm wetness and blood stasis are its important treatment factors, this disease belongs to the virtual and real inclusion, the virtual standard, the treatment needs to be treated as a whole, comprehensive diagnosis and treatment. At present, most of the clinical treatment is only aimed at controlling blood sugar, on this basis, the control of risk factors such as blood lipids and blood pressure should be paid attention to, which is conducive to promoting the prevention and treatment of glycolipid metabolism diseases. Moreover, Western medicine is mainly based on hypoglycemic and lipid-regulating drugs, which inevitably have side effects such as drug withdrawal and rebound, liver and kidney damage, etc., and Chinese medicine has unique advantages in this disease, so it can be combined with the pathogenesis of Chinese medicine for integrated treatment of traditional Chinese and Western medicine. Although traditional Chinese medicine has advantages in this joint research, the current experimental research on this disease is still insufficient, and most of the studies still stay at the level of using single drug drugs and case observations to speculate the mechanism of action of the whole formula, and lack multi-pathway and multi-target research. In future research, we can combine traditional Chinese medicine to increase the number of target insulin receptors and increase insulin sensitivity, so as to further prevent and treat glycolipid metabolism diseases.

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