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Correlation between TCM syndrome type distribution and glycolipid metabolism in obese type 2 diabetes mellitu

Fan Song[1], Yuanyuan Ren[2,*]

[1]Shaanxi University of Traditional Chinese Medicine, Xianyang, 712046, China
[2]Xi'an Hospital of Traditional Chinese Medicine, Xi'an, 710021, China
[*]Corresponding author

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Abstract: This paper mainly discusses the distribution characteristics of TCM Syndrome Types in obese 2 diabetes patients and the correlation between TCM Syndrome Types and glucose metabolism and lipid metabolism. Through consulting, screening, analyzing and summarizing the relevant literature, the correlation between TCM Syndrome Types and glucose metabolism, lipid metabolism in obese patients with type 2 diabetes was summarized and studied. It can provide reference and new thinking direction for TCM clinical treatment of obesity 2 diabetes.

1. Introduction

Obesity and diabetes have become major public health problems in China [1]. Obesity and type 2 diabetes are both metabolic syndromes. The American Diabetes Association has reported that the probability of moderate obesity developing into diabetes is double that of ordinary people, and the probability of severe obesity developing into diabetes is five to ten times. The incidence of diabetes is directly related to obesity and other diseases, obesity is an important cause of diabetes, and obesity-type 2 diabetes is also closely related to glucose metabolism and lipid metabolism [2-3]. At present, the research of TCM on obesity type 2 diabetes is continuing to go deeper, and TCM is becoming mature in the treatment of obesity type 2 diabetes, achieving certain effects in reducing symptoms and improving biochemical indexes of glucose and lipid metabolism. At the same time, there are also some problems, such as various and inconsistent reference standards for TCM syndrome classification. The distribution of TCM syndrome types of obesity type 2 diabetes [4] and the studies on the relationship between TCM syndrome types and glucose and lipid metabolism are few. Therefore, this paper analyzes the literature related to TCM syndrome types of obesity type 2 diabetes, and discusses the distribution of TCM syndrome types of obesity type 2 diabetes and the correlation between TCM syndrome types and glucose and lipid metabolism. It provides a new idea for clinical treatment of obese type 2 diabetes mellitus.

2. Classification of TCM syndrome types

The classification and distribution of TCM syndrome types of obesity type 2 diabetes are as follows. Li Jianqing et al. [5] divided 110 cases of type 2 diabetes into superrecombinant and

normal groups. Referring to the Guiding Principles for Clinical Research on New Chinese Medicines (Trial) (2002) and the Syndromes of TCM Clinical Diagnosis and Treatment Terms (1997), the two groups were divided into five syndrome types respectively, namely, deficiency of Qi and Yin, internal heat retention, dampness blocking, blood stasis blocking and deficiency of Yin and internal heat. Type 2 diabetes superrecombination was dominated by deficiency of qi and Yin and internal heat retention. Hu Shuang et al. [6] divided 158 overweight and obese type 2 diabetes patients into four syndrome types, namely Qi and Yin deficiency, Qi and Yin deficiency combined with blood stasis, dampness-heat distress of spleen combined with blood stasis, and Yin and Yang deficiency combined with blood stasis, according to diabetes related content in Guiding Principles for Clinical Research of New Chinese Medicines in 2002. Among the 4 syndrome types, the proportion of patients with Qi and Yin deficiency combined with blood stasis and dampness-heat obstruction of spleen combined with blood stasis are higher. Qi and Yin deficiency combined with blood stasis type is the most common TCM syndrome type in overweight and obesity type 2 diabetes. Wang Xue et al. [7] divided 205 patients with type 2 diabetes into normal group and overweight and obese group according to body mass index, and according to the content of thirst disease in TCM Internal Medicine (13th Five-Year Plan) and Guiding Principles for Clinical Research of New Chinese Medicines, the two groups were divided into these five syndrome types, namely dampness-heat trapped spleen, lung-stomach heat flourishing, deficiency of Qi and Yin, deficiency of Qi and Yin combined with stasis, deficiency of Yin and Yang. In the overweight and obese group, the type 2 diabetes mellitus was mainly characterized by deficiency of Qi and Yin combined with blood stasis (30%) and dampness-heat obstructing the spleen (27.27%). Deficiency of Qi and Yin combined with blood stasis was the most common, and deficiency of Yin and Yang was the least common. Liao Jianhong et al. [8] divided 166 middle-aged and young obese type 2 diabetes patients into three groups, namely Qi and Yin deficiency, phlegm-heat interjunction and Yin and Yang deficiency, according to the Guidelines for the Prevention and Treatment of Diabetes in Traditional Chinese Medicine. The syndrome of phlegm-heat interjunction was most common in obese type 2 diabetes. Feng Tong et al. [4] divided 143 patients with type 2 diabetes into obese and non-obese groups according to their body mass index, and according to the TCM Diagnosis and Treatment Standards of Diabetes complicated with Metabolic Syndrome (2011), the two groups were divided into two TCM syndrome types respectively, namely heat filling phlegm blocking blood stasis and Qi Yin deficiency blocking blood stasis. Heat filling phlegm blocking blood stasis is the main TCM syndrome type of obesity type 2 diabetes. Jiang Min et al. [9] divided 179 obese patients into two groups, obesity without diabetes and obesity with diabetes, according to whether they had type 2 diabetes, and referred to the staging and syndrome differentiation of diabetes in TCM Test Standard (1992) and Guidelines for Clinical Research of New Chinese Medicines (2002), the two groups were divided into (1) deficiency syndrome: Qi deficiency, blood deficiency, Yin deficiency and Yang deficiency. (2) Empirical evidence: blood stasis, Qi stagnation, liver-yang hyperactivity, phlegm dampness, heat stasis, heat stasis and damp-heat; Stagnation heat syndrome accounted for 37.5% in obese type 2 diabetes group, mainly liver and stomach stagnation heat. Yao Shuhong et al. [10] divided 200 patients with type 2 diabetes into obese and non-obese groups according to whether they were obese or not, and divided the two groups into five syndromes including deficiency of qi and Yin, deficiency of spleen and kidney Yang, stagnation of qi and blood stasis, suppression of phlegm and turbidification, and stagnation of liver and stomach heat by referring to the Diagnostic Criteria of Traditional Chinese Medicine and Guiding Principles for Clinical Research on New Chinese Medicines (2002). Liver and stomach stagnation heat accounted for 31.3% of obese type 2 diabetes patients. The main syndrome was liver and stomach stagnation heat, followed by phlegm turbidity suppression syndrome. Zhao Lihua et al. [11], referring to the TCM standards in "TCM Internal Medicine", "Guidelines for the Prevention and Treatment of

Diabetes in TCM" and "National Standards of the People's Republic of China", divided 144 obese patients with type 2 diabetes into six syndromic types, namely syndrome of heat stagnation of liver and stomach, gastrointestinal heat accumulation, qi stagnation and phlegm obstruction, spleen deficiency and phlegm dampness, qi and Yin deficiency and blood stasis and Yin deficiency and blood stasis. Heat stagnation of liver and stomach is the most common type of obesity type 2 diabetes. Tong Xiaolin et al. [12] made reference to the 5th edition of Diagnostics of Traditional Chinese Medicine, Differential Diagnosis of Symptoms of Traditional Chinese Medicine, Reference Standards for Syndrome Differentiation and Diagnosis of Diabetes Mellitus (1994), Part of Syndrome Type of Clinical Diagnosis and Treatment Terms of Traditional Chinese Medicine (2003), and Clinical Guiding Principles of New Chinese Medicine for the Treatment of Diabetes Mellitus (2002), which were published by Shanghai Science and Technology. The 2518 obese type 2 diabetes patients were divided into stomach stagnation heat, gastrointestinal heat, qi stagnation phlegm obstruction, spleen deficiency phlegm dampness and other syndrome types. The TCM syndrome types of obesity type 2 diabetes were mainly liver and stomach stagnation heat (middle and inner heat). Li Chunxiu et al. [13] divided 200 obese patients with type 2 diabetes into 6 syndrome types including liver and stomach stagnation heat, gastrointestinal dampness heat, spleen deficiency phlegm dampness, qi and Yin deficiency, phlegm stasis block and Yin and Yang deficiency by referring to Clinical Evidence-based Guide of Traditional Chinese Medicine for Diabetes (2016 edition) edited by Tong Xiao Lin and published by Science Press. The most common TCM syndromes of obesity type 2 diabetes mellitus are liver and stomach stagnation heat, and most patients with liver and stomach stagnation heat syndrome are phlegm-dampness. According to Wang Zexu et al. [14] in Guiding Principles for Clinical Research on New Chinese Medicine and Internal Medicine of Traditional Chinese Medicine, 143 middle-aged and young obese patients with type 2 diabetes were divided into four TCM syndrome types: spleen deficiency and dampness-filling syndrome (49 cases, 34%), stomach heat-dampness-blocking syndrome (39 cases, 27%), phlegm-stasis interformation syndrome (32 cases, 23%) and spleen-kidney Yang deficiency syndrome (23 cases, 16%). Obesity type 2 diabetes mellitus is mainly caused by spleen deficiency and dampness. Lu Siqi et al. [15] selected 188 obese patients with type 2 diabetes and divided them into five syndrome types, namely phlegm (dampness) heat interjunction syndrome, Yin and Yang deficiency syndrome, qi and Yin deficiency syndrome, spleen deficiency and dampness and blood stasis syndrome, among which spleen deficiency and qi deficiency and blood stasis syndrome accounted for a relatively high proportion.

To sum up, the syndromes of obesity type 2 diabetes are mainly concentrated in heat stagnation of liver and stomach and spleen deficiency and dampness. "Neijing" in "hate spleen" "Xiaoke" "Xiaozhong" "diaphragm elimination" "wind leakage" "wind elimination" "food also" belong to the range of diabetes, hate spleen ask ·Strange disease Treatise: "Sick mouth sweet, what is the name of the disease? How did you get it? Qibo said: The five Qi overflow also, named spleen hate, husband five taste entrance, hid in the stomach, spleen to do its Qi, body fluid in the spleen, so that the population Gan also; This fat beauty is also born. He must eat sweet and rich food. Fat makes people hot inside and sweet makes them full. Therefore, his qi overflows and turns to thirst quenching, which he cures with orchid and eliminates stale qi." [16] It shows that hate spleen is made up of deficiency heat, hate diet fat and beautiful people susceptible to the disease, excessive diet fat Gan, sedentary without consumption, accumulate in coke, affect the transport function of the spleen and stomach, lead to food accumulation heat, moist heat accumulated in coke, and cause full internal heat, disease in the stomach and intestines, coke internal heat is the core pathogenesis of diabetes disease, body transport loss division and eventually hair as thirst disease [17]. "Medical school must read": "but the spleen soil weak..... Gather into sputum". "Plain Question ·Xuanming Five Qi" recorded: sitting for a long time hurt the meat, lying for a long time hurt the qi, pointed out

that sitting for a long time will also hurt the spleen, resulting in deficiency of temper, easy to suffer from thirst disease. It is recorded in Su Wen that the spleen and stomach are acquired, and qi and blood are the source of metabolism. If the diet is excessive, the spleen and stomach will be damaged, the transport function of the spleen and stomach will be out of balance, and the essence of water and grain cannot be normally transported, leading to diseases [18]. The "dampness evil" in the body of phlegm and dampness and heat will lead to different manifestations for a long time, which is originally "dampness and fullness". The dampness is characterized by "heavy turbidiousness and sticky", which is difficult to remove, while the spleen prefers dryness and hates dampness [19]. The transport function of the spleen is mainly reflected in the transport of water grain and liquid water [20]. The spleen has the function of transporting, dispersing and absorbing water liquid, and the water liquid is metabolized out of the body through the zhuan organs. The rise and fall function of the spleen and stomach is abnormal, the functions of the spleen and the stomach are impaired, phlegm and dampness accumulate in the body, the middle coke and dampness block, Yang qi repress, phlegm and dampness will accumulate under the skin and further lead to obesity. If the stagnation is prolonged, the heat in the body is more serious, the dampness and dampness can also be inhibited, and then a series of problems such as dampness and dampness will occur, and even the phlegm and dampness will be caused by purifying liquid. The syndrome of spleen deficiency and dampness is common in the early stage of obesity type 2 diabetes, and deficiency syndrome can appear with the progression of the disease. The accumulation and stagnation of pathological products for a long time will turn into heat, heat will damage Yin fluid, and transform into a syndrome of deficiency and damage of Qi, blood and Yin and Yang. Therefore, in the TCM treatment of diabetes, besides inheriting the traditional "three elimination" theory, attention should also be paid to the treatment of phlegm, dampness, ointment and fat and other pathological products. In clinical application, attention should be paid to seeking the root of the syndrome differentiation as a whole, while taking into account other symptoms of the disease. In treatment, medication should be adjusted at any time according to the random changes of symptoms, and the influence of the patient's TCM syndrome type on treatment should be fully considered, so as to improve clinical efficacy.

3. Glycolipid metabolism

The main detection indexes of glucose and lipid metabolism include fasting insulin (FINS), insulin resistance index (HOMA-IR), fasting blood glucose (FPG), 2h postprandish blood glucose (2hPG), glycated hemoglobin (HbA1c), C-peptide, etc. [21-22] Lipid metabolism: Total cholesterol (TC), triglyceride (TG), serum low density lipoprotein cholesterol (LDL-C), high density lipoprotein cholesterol (HDL-C) [23-24].

3.1 Sugar metabolism

Fasting blood glucose (FPG): Jiang Min et al. [9] conducted Spearman rank correlation analysis on all syndrome types and blood glucose in obese type 2 diabetes group, and Yin deficiency syndrome and Jie-heat syndrome were positively correlated with FPG. Zhao Lihua et al. [11] summarized that the fasting blood glucose level of obese patients with type 2 diabetes from high to low was as follows: spleen deficiency phlegm-dampness syndrome, qi stagnation phlegm-blocking syndrome, qi and Yin deficiency combined with blood stasis syndrome, Yin deficiency combined with blood stasis syndrome, liver and stomach heat stagnation syndrome, stomach heat accumulation syndrome. The fasting blood glucose level of spleen deficiency phlegm-dampness syndrome was significantly higher than any other syndrome type. Liao Jianhong et al. [8] proved that the fasting blood glucose in the yin-yang deficiency group was significantly higher than that in

the control group (healthy population). The study of Wang Xue et al. [7] showed that the syndrome of dampness-heat trapping the spleen was positively correlated with FBG, compared with the syndrome of lung and stomach heat sheng, Qi and Yin deficiency, and Yin and Yang deficiency. Wang Zexu et al. [14] proved that compared with any other syndrome type of spleen deficiency phlegm-dampness, the fasting blood glucose of spleen deficiency and dampness Sheng group was the highest.

2h postmeal blood glucose (2hPG): In the experiment of Wang Zexu et al. [14], the blood glucose level of overweight/obese patients at 2 hours postmeal was in the order from high to low: spleen deficiency and dampness, stomach heat and dampness obstruction, phlegm-stasis interformation, spleen and kidney Yang deficiency. The syndrome of spleen deficiency and phlegm-dampness is common for high blood sugar 2 hours after meal.

HbA1c (HbA1c): Liao Jianhong et al. [8] proved that the HBA1c level of phlegm-heat interjunction syndrome and deficiency of Qi and Yin were significantly higher than that of deficiency of Yin and Yang, and the classification of TCM was not comprehensive, such as the common syndrome of spleen deficiency and dampness and sheng was not included. Hu Shuang et al. [6] compared that there was no significant difference in HBA1c water between different syndrome groups.

Fasting insulin (FINS) and insulin resistance index (HOMA-IR): Wang Zexu et al. [14] demonstrated that FINS and HOMA-IR levels were the highest in overweight and obese patients with stomach heat and dampness syndrome, and the lowest in spleen-kidney Yang deficiency syndrome. The overweight and obese people with gastric heat-dampness syndrome are more likely to cause increased insulin secretion and insulin resistance than other TCM syndromes. The core pathogenesis of insulin resistance is heat, in which stomach fire plays an important role in the pathogenesis. Heat evil in the body damages Yin, strengthens heat and eats qi, and then qi stagnates and blood stasis, obstructs veins, and turbidities are endogenous. Subtle transport is affected, sugar metabolism and lipid metabolism are disturbed, and insulin sensitivity decreases and insulin resistance occurs. Wang Xue et al. [7] showed that there was no significant difference between different syndrome types in FINS and HOMA-IR levels. Hu Shuang et al. [6] had the lowest Fins level and HOMA-IR value in both qi and Yin deficiency groups. Fins level and HOMA-IR value of Yin and Yang deficiency combined with blood stasis were the highest.

Obese type 2 diabetes patients often have abnormal blood sugar and blood fat. Due to the accumulation of "fat turbidity" in the body, the normal operation of qi and blood is affected, and the gasification function of the spleen and stomach is also abnormal. The increased blood sugar cannot be fully utilized by the body, that is, a "sugar turbidity" environment is formed. The disorder of glucose and lipid metabolism in obese type 2 diabetes mellitus may occur at different stages of the disease [9]. Generally speaking, the blood glucose of spleen deficiency phlegm-dampness syndrome is higher than that of other TCM syndroms. Blood glucose comes from diet, blood glucose belongs to sweet soil and is the main source of the spleen, blood glucose is the qi stored in the spleen, and "spleen essence stored" means blood glucose transformation is contained in the spleen. Under the normal function of the spleen, cells are more sensitive to insulin and reduce insulin resistance, thus promoting the synthesis of liver glycogen. Control blood sugar by lowering it; If "the spleen does not store essence", the spleen will become dysfunctional, the glucose of glycogen decomposition will increase, and the effect of gluconeogenesis will be enhanced, thus the blood sugar will rise [11].

3.2 Lipid Metabolism

Total cholesterol (TC) and triglyceride (TG): Feng Tong et al. [2] showed that TG and TC in the

obese group were significantly higher than those in the group of Qi and Yin deficiency with blood stasis and non-obese group. Jiang Min et al. [9] analyzed the correlation between various TCM syndrome types and blood lipid in the obese type 2 diabetes group, and found that TG was positively correlated with the syndrome of Jie-heat, and negatively correlated with the syndrome of Qi -stagnation. Liao Jianhong et al. [8] proved that the ratio of total cholesterol and triglyceride in phlegm-heat interjunction and deficiency of Qi and Yin in the group was significantly higher than that in the control group (healthy population). The increase of total cholesterol and triglyceride level may be related to heat and sputum.

Low-density lipoprotein cholesterol (LDL-C): Feng Tong et al. [2]'s experiment showed that there was no significant difference in LDL cholesterol among all groups. Liao Jianhong et al. [8] proved through statistical methods that the LDL cholesterol in the phlegm-heat interjunction and both qi and Yin deficiency group was significantly higher than that in the control group (healthy population).

High-density lipoprotein cholesterol (HDL-C): Jiang Min [9] conducted Spearman rank correlation analysis of syndrome types and blood lipids in obese type 2 diabetes group, and concluded that Yin deficiency syndrome was negatively correlated with HDL cholesterol levels.

Serum lipid level and visceral fat thickness: Liu Yujing et al. [25] proved through research that the serum lipid level of patients with phlegm dampness and Yin deficiency was significantly higher than that of patients with traditional Chinese medicine constitution. The thickness of visceral fat was the highest in patients with phlegm and dampness, followed by patients with dampness and heat, and the lowest in patients with peace and calm. Serum lipid levels and visceral fat thickness were significantly abnormal in obese type 2 diabetes patients with phlegm-dampness, damp-heat and Yin deficiency, and the changes of serum lipid levels and visceral fat thickness were the most obvious in patients with phlegm-dampness.

In traditional Chinese medicine, hyperlipidemia is classified as "phlegm turbidness" and "obesity", and there is no specific disease name. Phlegm, dampness, stasis and turbidness are the pathogenic factors and pathological products. The causes of obesity and hyperlipidemia have the same aspects, both are caused by long-term diet incontinence, exercise negligence, the spleen health function is lost, water grain fine cannot get normal transport, and turned into turbidities; Wet with heavy turbid, sticky characteristics, Qi and blood operation is blocked, the formation of sputum; Phlegm can turn heat into blood stasis for a long time, which eventually leads to vascular obstruction and blocked operation of veins. This state is similar to the pathological state of abnormal lipid metabolism in modern medicine. Phlegm and blood stasis coagulate in blood vessels, and the overexpression of pathological products also enhances the adhesion and aggregation of platelets, which secondary promotes coagulation and intensification and leads to hypercoagulability [18], leading to hemodynamic changes. Blood flow is blocked, and over time the vascular cavity forms a narrowing and blockage, leading to the rapid emergence of complications of diabetes. In the patients with dyslipidemia, spleen deficiency and dampness-sheng account for the largest proportion compared with other TCM syndromes, indicating that the dyslipidemia in obesity type 2 diabetes mellitus is more obvious. Studies have found that patients with phlegm-dampness are more prone to dyslipidemia, and their blood lipid levels are significantly higher than other TCM constitution, and pathological products of phlegm and blood stasis can aggravate lipid metabolism disorders [14].

Most obese type 2 diabetes patients have obvious disorders of glucose metabolism and lipid metabolism. For obese diabetes patients, weight must be paid attention to while controlling blood sugar to avoid abdominal obesity. Diabetes is a systemic metabolic disorder caused by a variety of reasons, which can be manifested as abnormal metabolism of sugar, protein and fat [10]. We have many traditional Chinese medicines that can regulate glucose and lipid metabolism. For example,

Astragalus has the effect of replenishing qi, improving fat metabolism and promoting glycogen synthesis; The pharmacological action of Coptis shows that its active components can reduce blood sugar by inhibiting the accumulation of fat, and at the same time by promoting insulin secretion, absorption, utilization and regulating lipid metabolism. The combined application of astragalus membranaceus and Coptis chinensis can effectively regulate the disorder of glucose and lipid metabolism, protect the structure and cellular function of pancreas and islets, stimulate insulin secretion, and achieve the purpose of lowering glucose and lipid. Yuzhu can effectively reduce blood sugar, blood lipid indexes, improve the serum fasting insulin level, can effectively promote insulin secretion. In TCM clinic, the direction of phlegm, dampness, heat and blood stasis can be adjusted and treated according to syndrome differentiation, so as to achieve the purpose of reducing weight, lowering sugar and regulating lipid.

4. Deficiencies and prospects

There are few researches on TCM syndrome types and glycolipid metabolism of obesity-type 2 diabetes mellitus, and there are few references available. Currently, there are relatively many master and doctoral disserations, and the classification standards of TCM syndrome types of obesity-type 2 diabetes mellitus in various clinical observations are inconsistent and different. Small sample size, regional differences, different patient history time, and different age distribution will all lead to data bias, leading to insignificant differences between TCM syndrome types. Some studies lack comparison of syndrome types between groups, which cannot accurately explain the problem. Some clinical observations also cover overweight patients, which will affect the results. The abnormal lipid metabolism of obese type 2 diabetes mellitus is related to the TCM syndrome type. Refer to the above summarized TCM syndrome type phase glucose and lipid metabolism indicators to guide clinical lipid regulation and blood sugar control, give full play to the characteristics of TCM treatment of this disease, and continue to explore.

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