

Diabetes Mellitus

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The following is an excerpt from the section on Diabetes Mellitus in the Clinical Handbook of Internal Medicine: The Treatment of Disease with Traditional Chinese Medicine, Vol. 3.



Diabetes mellitus (*tang niao bing* 糖尿病, literally 'sweet urine disease') is an increasingly common disorder in both affluent and developing societies. Diabetes mellitus (DM) is a syndrome of impaired insulin secretion and/or resistance of cells and tissues

to the influence of insulin. The end result is abnormally high blood sugar levels – hyperglycemia. Chronic diabetes is almost always complicated by other phenomena attributed to persistent hyperglycemia. It is these complications that account for the majority of the mortality and morbidity seen in chronic diabetics. The main causes of death related to diabetes are cardiovascular disease, stroke and kidney failure. Contributing to morbidity is blindness, gangrene, sensory deficit, peripheral neuropathy and chronic skin infections.

PATTERNS OF DIABETES MELLITUS

Lung and Stomach heat
Spleen qi deficiency
Phlegm damp
Damp heat
Liver qi constraint with heat
Qi and yin deficiency
Liver and Kidney yin deficiency
Kidney yin and yang deficiency
Blood stasis

There are two main types, type 1 (previously known as juvenile onset or insulin dependent DM) and type 2 (previously known as mature onset or non-insulin dependent DM). The old descriptions are redundant because of overlap in age group and treatment between the types. Children are increasingly being

diagnosed with type 2 DM, type 2 diabetics often end up needing insulin, and type 1 DM is occasionally seen in adults.

Type 1

Type 1 DM usually occurs during adolescence and is associated with autoimmune or infectious destruction of the insulin producing β -cells of the pancreas. A genetic susceptibility, in combination with viral or environmental exposure to triggers, starts a cascade of events resulting in destruction of β -cells. Destruction progresses subclinically over time until few β -cells remain, and insulin levels are too low to maintain blood glucose control. Since the pancreas no longer produces insulin, the insulin must be replaced and patients are medicated with insulin injections.

Comparison of type 1 and 2 diabetes

	Type 1	Type 2
Incidence	~10%	~90%
Age of onset	under 20	over 40
Onset	rapid	insidious
Weight at onset	thin	obese
Familial component	weak link	strong link
Insulin status	lacking	resistance to
Likely to develop complications	yes	yes

Type 2

Type 2 DM is characterized by resistance of target cells to the influence of insulin. Insulin levels in the blood are high, especially in the early stages, but insulin cell receptors are insensitive and glucose is not transported into cells. The glucose remains in the blood stream, resulting in hyperglycemia. Type 2 DM usually appears in middle age, develops gradually and may take years before diagnosis, at which time around 35% of patients have developed complications. There is a strong link to obesity, however patients can be obese without developing diabetes, and not all type 2 diabetics are obese. Some people have a genetic predisposition to insulin resistance, while others develop the condition

because of an unhealthy diet, lifestyle and high stress. A diet high in carbohydrate and sugar causes the pancreas to overproduce insulin. The cells of the body are overwhelmed by this excess insulin and protect themselves by reducing the number of insulin receptor sites on their surface. Consequently there are too few sites for insulin to carry out its normal function of allowing glucose to pass through the cell wall to be converted into energy.

Signs and symptoms

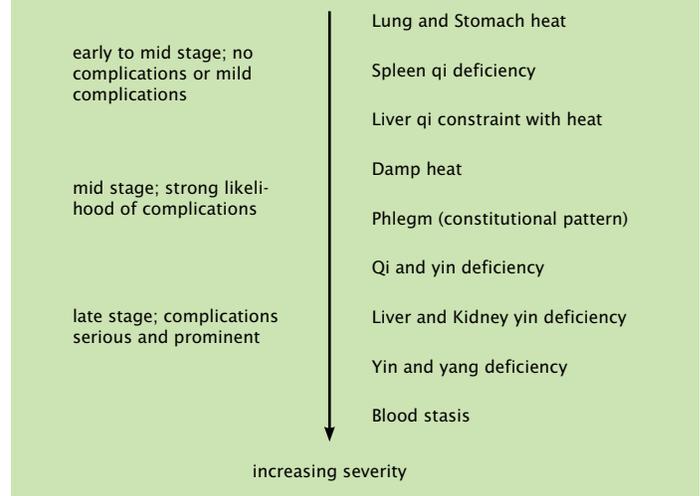
The classic symptoms of DM are:

- Polydipsia:** increased thirst due to decrease in fluid volume and dehydration from excessive urination, and increased osmolarity of blood and extracellular fluids. Chinese medicine considers excessive thirst due to dryness from heat or yin deficiency, failure of Spleen qi and fluids to ascend to the mouth, blockage of the qi dynamic by damp heat or failure of Kidney yang qi to process fluids.
- Polyphagia:** increased hunger as glucose lost in the urine is unavailable for essential metabolic activity. In Chinese medical terms this can be due to heat affecting the Stomach, or a failure of qi transformation with relative lack of qi reaching the tissues.
- Polyuria:** increased urinary frequency and volume caused by osmotic diuresis from high levels of glucose in the urine; fluid loss leads to low blood pressure and dehydration. In Chinese medical terms this is due to failure of Kidney regulation over the lower yin (here the urethra), weakness of yang and poor fluid metabolism, or the bodies attempt to expel accumulating dampness.
- Hyperglycemia can also cause weight loss, nausea and vomiting, blurred vision, and predisposition to bacterial or fungal infections.
- Dehydration and inability of glucose to enter cells causes weakness and fatigue, and, when severe, cognitive disturbances. Symptoms come and go as plasma glucose levels fluctuate.

Patients with type 1 DM typically present with symptoms of hyperglycemia. Patients with type 2 DM may present with symptomatic hyperglycemia, but are often asymptomatic or have atypical symptoms, or present with diabetic complications such as tiredness, blurred vision, numbness and tingling in the hands and feet, thrush or chronic infections and wounds that are slow to heal. Diagnosis is based on clinical features, if present, and measurement of blood glucose levels, tested when fasting and two hours after a 75 gram oral load of glucose, the glucose tolerance test. The diabetic and prediabetic status of many patients is detected with routine blood screening.

In practice, many patients presenting to the Chinese medicine clinic are already diagnosed, medicated and at least partly managed. They present because the side effects of the medications are troublesome, they are not achieving good blood glucose control, or are experiencing complications. The symptoms of diabetes

Figure 1 Relative severity of DM patterns. Orderly progression through the patterns is not implied.



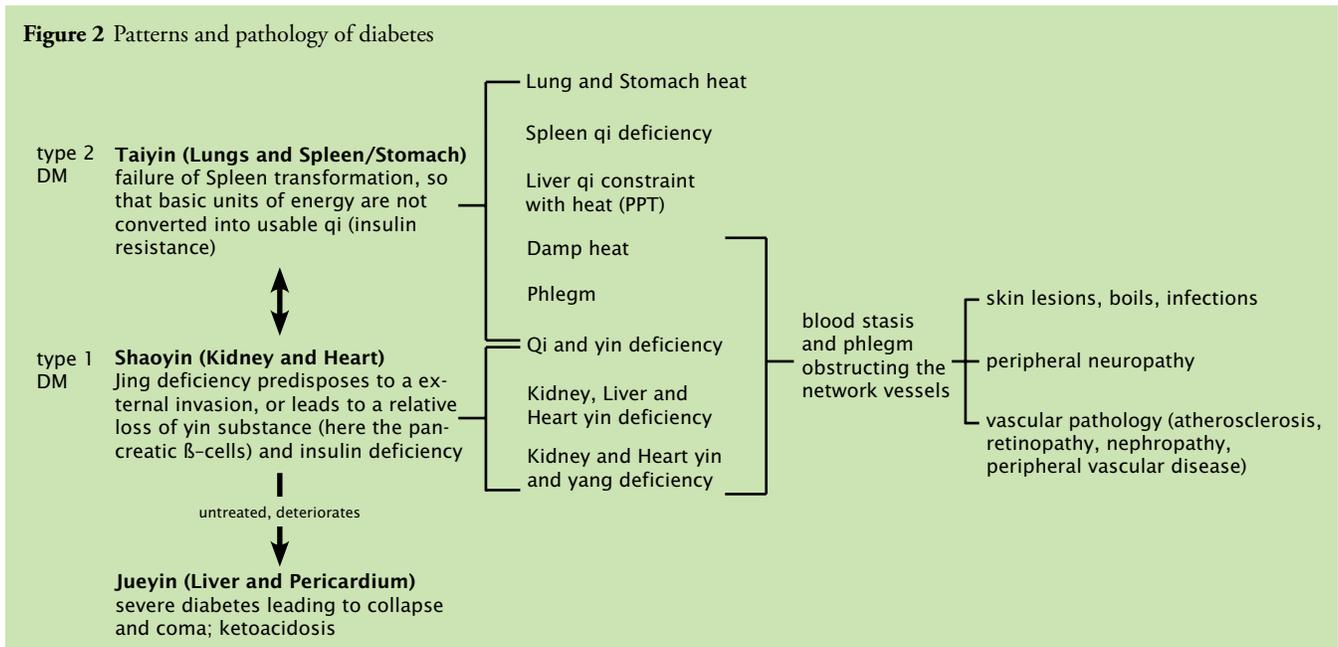
they experienced initially will generally be controlled, but may appear sporadically during periods of stress or dietary indiscretion, when tight glucose control is lost. Even in patients with good glucose control and few symptoms, the disease process continues, albeit at a slower pace, hence the gradual onset of complications and increasing medication requirements. About 30% of patients medicated with hypoglycemic agents end up needing insulin.

Classical Chinese medicine and diabetes mellitus

The first mention of a disease resembling diabetes in China comes from the Simple Questions (Huang Di Nei Jing Su Wen; early Han dynasty, 1st century BCE) where the condition known as *xiao ke*¹ 消渴 was described. Xiao ke is a disease state characterized by persistent thirst and hunger, copious urination and weight loss. The Simple Questions (Chapters 40 and 47) makes the observation that xiao ke is due to consuming too much fatty, sweet or rich food, usually occurs amongst the wealthy, and that such patients are reluctant to change their habits, a situation similar to that seen in type 2 DM. The disease was differentiated into three subtypes, involving the upper, middle and lower burners. The upper burner type is attributed to heat scorching the Lungs, and is characterized by thirst; the middle burner type is due to heat in the Spleen and Stomach and is characterized by hunger; the lower burner type is due to failure of the Kidneys to control the lower orifices, and is characterized by profuse urination. Contemporary Chinese internal medicine texts place diabetes within the disease diagnosis of xiao ke.

In clinic, however, we observe that many patients diagnosed with diabetes mellitus or pre-diabetic conditions are overweight and do not display the characteristic symptoms of xiao ke. In addition, the complications of diabetes are not necessarily present in xiao ke, and diseases other than diabetes mellitus can lead to the symptoms of xiao ke, such as diabetes insipidus, hyperaldosteronism and hyperparathyroidism.

Figure 2 Patterns and pathology of diabetes



Pathology

The pathology of DM can be seen in terms of the six divisions. The majority of diabetic pathology occurs within the taiyin and shaoyin divisions. The taiyin pertains to the Spleen and Lungs, while the shaoyin pertains to the Kidneys and Heart. Hyperglycemia is common to both type 1 and 2 diabetes, and is due to failure of Spleen transformation. In type 1 DM, failure of Spleen transformation is due to the Spleen not being supported by the Kidney; in type 2 DM it is due to direct damage to the Spleen by diet or emotional factors.

Type 2 DM starts with taiyin dysfunction, which over time, starts to involve the shaoyin. In type 1 DM, the main pathology starts in the shaoyin, which fails to support taiyin. In practice, the majority of patients have impairment of both the taiyin and shaoyin divisions to one degree or another. The more chronic and severe the disease, the more shaoyin pathology, and the more the Heart and vessels are damaged. When uncontrolled, shaoyin pathology can lapse into the final and severe jueyin division, leading to coma and death (Fig.2).

Taiyin (Spleen and Lungs)

The Spleen is at the centre² of qi production and the stability of energy supply. The main function of the Spleen is transformation of the raw materials of food into a form of qi the body can use, and distribution of the results of transformation to the rest of the body. The Spleen extracts the pure essence of food (the 'sweetness' of earth) and sends it to the Lungs for final processing into usable forms of qi, which are then distributed to their target tissues and organs.

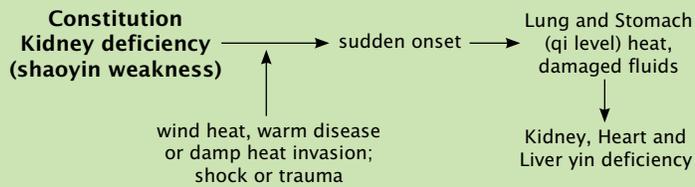
When transformation and distribution are disrupted, the conversion of food into qi is incomplete, and the sweet precursor to qi builds up in the blood. This can happen for two reasons:

- The Spleen can be overwhelmed, and its transforming and distribution function damaged, by excessive demands placed upon it. The Spleen can be taxed by overeating, or drained by overwork and qi expenditure that exceeds the Spleen's ability to replace it.
- The Spleen can be critically compromised by Kidney deficiency, which fails to provide the necessary support to the Spleen's demanding transformation and distribution function.

Once there is an excess of sweet in the blood several things happen. Excessive sweetness generates damp, which can condense into phlegm. Damp is sticky and obstructing, and can create heat and damp heat, which deplete yin. Damp obstructs the circulation of qi and blood leading to qi and blood stasis. The degree of blood stasis can be profound due to the combined effects of qi deficiency, yin deficiency, phlegm and damp. Qi deficiency also contributes to yin deficiency, as yin can only be acquired by efficient digestion of yin nourishing foods. As qi and yin are progressively depleted, the Kidney (shaoyin) is called upon to prop up Spleen function and a mixed taiyin shaoyin pathology emerges.

The progression from a taiyin condition seen in the early stages of type 2 DM, towards a mixture of taiyin and shaoyin pathology is consistent with what we observe in practice. Early type 2 DM and pre-diabetes is associated with Spleen qi deficiency, qi constraint, damp heat or phlegm patterns. The pathology is primarily in the middle burner. The longer the condition continues, the more the Kidney is weakened and yin depleted, until the most common chronic pattern, qi and yin deficiency, evolves. At this time, the cardiovascular complications become more significant, signalling greater shaoyin involvement. The increasing shaoyin weakness accounts for the observation that a significant proportion of type 2 diabetics end up eventually requiring insulin.

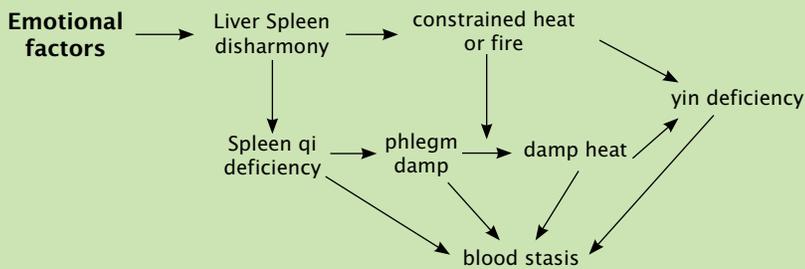
Figure 4 Etiology of type 1 DM



Constitutional factors

Diabetes tends to run in families. The inherited constitution can be one of Kidney weakness, Spleen deficiency, phlegm or Liver qi constraint. An inherited Kidney weakness leaves people vulnerable to invasion by external pathogens or rapid depletion of yin in response to a shock or trauma (type 1 DM, Fig. 4). In patients who develop type 2 DM, the Kidney deficiency is gradually exacerbated by ageing and excessive work, or the heat and Spleen deficiency created by an unhealthy diet. A phlegm type constitution can contribute to patients being overweight from an early age, while a Spleen deficient constitution is seen in thin, pale, tired children with little vim and indifference to food.

Figure 5 Emotional factors in the development of type 2 diabetes



Emotional factors

Diabetes can develop subsequent to a physical or emotional trauma or shock. Severe or sudden shock disrupts the Heart and Kidney (shaoyin) which creates a weakness that can be exploited by an invading pathogen, or leads to yin or yang deficiency. Sustained emotional conflict leads to Liver qi constraint, constrained heat and damage to qi and yin. Qi constraint weakens the Spleen, which in turn leads to the generation of damp, damp heat and phlegm (Fig. 5).

Exhaustion, overwork, pregnancy

Overworking, working excessively long hours or using more energy in activity than is gained through eating (often seen in athletes) weakens the Kidneys and Spleen, and depletes yin and yang. This process is exacerbated if sleep is insufficient or disrupted by shift work, for example. When associated with physical toil, the Kidneys tend to be weakened; when associated with mental work but a sedentary occupation, the Spleen is drained.

During pregnancy, jing resources are diverted away from the mother and towards the developing fetus. Any pre-existing weakness of shaoyin can be exacerbated during this time, leading to a failure to support taiyin and Spleen transformation, with transitory gestational diabetes the result.

Treatment

The main aim of treatment in diabetes is to regulate blood glucose levels while correcting the imbalances that enabled it to occur. Exercise, management of the diet, and weight loss are the first line of therapy for all type 2 DM patients, and in many cases these alone are sufficient to enable the patient to manage their condition. When intervention is required, acupuncture and herbal treatment can help keep their blood sugar under control, while gradually improving their constitutional health and general well-being. If treatment and management of life factors is started at an early stage of the disease, the pancreas has functional insulin producing tissue, and complications are not advanced, cure is possible.

For patients dependent on insulin, cure is not possible, but diet and exercise are important, and the addition of Chinese medicine can assist in maintaining tight blood glucose control, and sometimes in reducing insulin requirements. Tight management of blood glucose and improvement of underlying pathology helps alleviate or prevent complications.

Dietary advice

Standard diets for diabetic patients are widely available and specialist dietitians are a valuable resource for patients. Intake of carbohydrate is limited to a certain number of measured portions per day and calories from fat are restricted. Other than these basic modifications, the diet that is suitable for the pattern of the individual concerned is recommended. For example, the diet to strengthen the Spleen and supplement qi recommends 40-60% carbohydrate, but for patients with Spleen qi deficient type diabetes, this proportion should be decreased to around 20-30%, with only complex, unprocessed carbohydrates allowed. Ideally, little or no processed or refined carbohydrate (white rice and white flour products, sugar and corn syrup, soft drinks, etc.) should be consumed.

Management of medicated patients

Treatment with oral hypoglycemic agents and insulin help maintain blood glucose levels and reduce the symptoms of diabetes. Patients may present with few clear features of diabetes, and little in the way of a clear symptom picture or pattern, although we find the tongue to be an accurate reflection of the true state of the body. Clinical experience reveals that most patients with chronic diabetes end up in between the taiyin and shaoyin ends of the spectrum, with qi and yin deficiency as their baseline pattern.

Even when patients are medicated and feel generally well, ongoing lifestyle management and Chinese medical treatment is recommended, as we know that even in patients with good blood glucose control, complications can still arise.

Insulin dependent

Type 1 diabetics must inject insulin on a regular basis. Once a patient with type 2 diabetes has progressed to needing insulin, it is likely they will be dependent on it for life. After a few months any remaining functional pancreatic tissue atrophies. However, some type 2 diabetics require insulin just once in a while (for example when fighting an infection) to maintain adequate control of the blood sugar. These patients have functional pancreatic tissue that can be stimulated to perform more efficiently, and they can stop the insulin when blood sugar has stabilized. Some patients requiring regular insulin may find their requirements decreasing over time. Experienced diabetics monitoring their blood sugar levels can make the necessary adjustments to their dosage without problem.

Insulin dependent diabetics can still benefit significantly from treatment with Chinese medicine in terms of management and prevention of the common macro and microvascular complications, and general measures of increased well-being and quality of life. Most benefit, however, will be gained from treatment with Chinese medicine before insulin dependence occurs.

Oral hypoglycemic agents

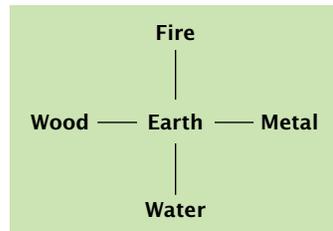
Patients using oral hypoglycemic agents may find their dosage requirements decreasing as their underlying condition improves with treatment and lifestyle change. The dosage can be reduced slowly in conjunction with regular blood sugar monitoring and some patients will be able to completely stop. Patients who have made significant lifestyle changes or who have started acupuncture or herbal treatment might experience hypoglycemia if they are taking more medication than required. Hypoglycemia is characterized by hunger, tiredness, light-headedness, and tunnel vision or fainting.

For a breakdown by etiology of the points and herbs used during treatment please see the Diabetes Mellitus section in Will Maclean's *Clinical Handbook of Internal Medicine, Vol. 3*.

Notes:

¹ Wasting and Thirsting [Bensky] or Dispersion Thirst [Wiseman]

² Positioned in the middle, and as the stabilizing earth element, the Spleen is our centre of gravity, and keeps us grounded in the face of change. The Spleen is very conservative and dislikes change. When internal



transformation is excessive and potentially destabilizing (as can occur when more food is consumed than can be efficiently processed), the Spleens response is to increase resistance to that change by reducing

the number of insulin receptors on cell walls, thus producing insulin resistance.

³ In the context of type 1 DM, the lack of yin substrate is reflected in the absence of insulin producing β -cells in the pancreas.

⁴ *gan ji* 痞积

BIO: Will Maclean has been in full time practice since 1987 and is the author, along with Jane Lyttleton, of the Clinical Handbook of Internal Medicine series (Volume 3 was just released in May 2010), and the Clinical Manual of Chinese Herbal Patent Medicines. He has taught seminars in Australia, New Zealand, the US, UK and South Africa. His main clinical interests are in disorders of the immune and gastrointestinal systems, and in the critical assessment of the classics based on the practical realities of modern clinical practice.