

*Full Length Research Paper*

# Retrospective analysis of medication for 508 cases of type II diabetes patients

Xiao-lan Zhou, Yuan-xi Gu and Jing-wen Gu\*

Worldwide Medical Center, Huashan Hospital, Fudan University, Shanghai, 200040, China.

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The aim of this study was to investigate the medication status of 508 patients with type II diabetes admitted to Huashan Hospital, and to guide their clinical medication. The data of the 508 patients with type II diabetes who were admitted to Huashan Hospital between July, 2010 and December, 2010 were collected and analyzed. In 508 patients, acarbose was the most frequently prescribed medication (n = 337, 66.34%), the highest frequency of acarbose was 66.34% (n = 337). Metformin which belongs to the biguanide group accounted for 20.28%. Pioglitazone which belongs to thiazolidinedione group had the lowest frequency of use, and was only 1.38% (n = 7), and patients were often treated with combination therapy (n = 194, 38.18 %). A total of 431 patients (85%) had chronic diabetes complications (state which ones: macro or micro vascular complications). Among the diabetic patients, age groups in 40 to 80 had the highest probability of illness and the incidence rate increases with age; therefore, this group should take regular medical examinations to prevent diabetes induced complications. In the choice of medication, prescription drugs like acarbose and other  $\alpha$ -glucosidase inhibitors, at the same time, combined medication with pancreatic kinionogenase are preferred. Enteric-coated tablets or other drugs to treat high blood pressure diabetes, heart disease, nervous system damage and other complications are also recommended.

**Key words:** Type II diabetes, combined medication, age related, complication, biguanide.

## INTRODUCTION

Diabetes is a chronic metabolic disorder induced by multiple pathogenic factors, if blood glucose is not well controlled, complications will occur, resulting in the lesions of failure of kidney, eye, feet and other parts which cannot be cured. Type II diabetes prevalence in recent years have significantly increased with the increased proportion of obese or overweight. Some studies had shown that metformin has a good effect on normal weight. Therefore, metformin was preferred on the basis of the lifestyle intervention, if you cannot meet the standard, then take further measures. Taking into account the weight loss, gastrointestinal reactions, and other factors among some patients, if they are not suitable for using metformin, the other drugs should be taken into consideration (Chinese Diabetes Society,

2010). At present, the number of diabetes patients is rapidly rising around the world, which has impacted people's health and quality of life; it has also been ranked as the non-communicable disease second only to cardiovascular diseases and malignant tumors (Hui and Zhi-you, 2008) in occurrence. Diabetes is clinically divided into two types; type I diabetes and type II diabetes which accounts for 95% in china (Heng-jie and Hong, 2008). In China, areas with higher living standard have higher incidence of diabetes. In clinical practice, patients with type II diabetes are usually treated with oral administration of hypoglycemic agents. Hypoglycemic agents with different modes of action have successively gone on the market, which have provided more choices for the treatment of diabetes (Krentz and Bailey, 2005). To investigate the clinical application status of such drugs, data of 508 cases of patients with type II diabetes in our hospital were collected and retrospectively analyzed. Diabetic patients complicated with vascular

\*Corresponding author. E-mail: [guyuanxi80@yeah.net](mailto:guyuanxi80@yeah.net).

diseases such as early diabetic nephropathy, hypertension and cerebral thrombosis should also use pancreatic kinionogenase enteric-coated tablets, which has effects such as dilation of blood vessels, promotion of microcirculation, activation of plasminogen, reduction of blood viscosity, inhibition of phospholipase A2, prevention of platelet aggregation, daily application of less than 100 mg aspirin would contribute to the prevention of cardiovascular and cerebrovascular diseases. Calcium antagonists and angiotensin-converting enzyme inhibitors are beneficial in diabetes mellitus complicated with hypertension, both types of drugs can reduce left ventricular hypertrophy and enable short-term reduction of proteinuria, but a conclusive result is still difficult to be obtained from long-term follow-up (Hao-lin and Nan-sen, 1999). Several studies have shown that angiotensin-converting enzyme inhibitors can not only lower blood pressure, but also reduce blood glucose and improve glucose tolerance (Baron et al., 1993).

## MATERIALS AND METHODS

Data on cases of patients with type II diabetes who were admitted to Huashan Hospital between July, 2010 and December, 2010 were collected and statistical analysis on age, gender, medication status, and diabetic complications were conducted.

### Patients

In this study we enrolled 83 patients (43 women and 40 men) with type II diabetes (Nephropathy), 84 patients (52 women and 32 men) with peripheral neuropathy, 88 patients (54 women and 34 men) with retinopathy, 81 patients (46 women and 35 men) with coronary heart disease, 81 patients (39 women and 42 men) with cerebral vascular disease, and 20 healthy control subjects (47 women and 44 men). In Table 1, the clinical characteristics of all patients were reported. The microvascular and macrovascular complications only were analysed. The complications were evaluated by four biochemical indices and the whole group was classified by age and gender.

We had obtained ethics approval from the ethics committee at our institution and obtained written informed consent from all involved participants.

### Biological indication test

Blood samples of all patients were collected from a peripheral vein and then kept on ice. The serum was collected by centrifugation (3,000 rpm for 10 min at 4°C), aliquoted, and stored at -80°C until analyzed. HbA1c, total cholesterol, aspartate aminotransferase (AST) and alanine aminotransferase (ALT) were examined, respectively. Each experiment was performed in duplicate using same procedure.

## RESULTS

Biochemical characteristics of 431 patients who have complications are shown in Table 1. The patients' age

ranging from 60 to 80 and men were found to be more likely to get more complications among the type II diabetes patients. All of the patients had higher HbA1c level than normal (<7%). The total cholesterol level also exceeded the normal level. As for AST and ALT level, cerebral vascular disease and peripheral vascular disease had high level of AST, and three complications among peripheral neuropathy, retinopathy and cerebral vascular disease had high ALT level. In short, all the parameters examined by us were higher than the control range.

### Complications of diabetes

In 508 cases of patients with type II diabetes, 431 cases had complications such as nephropathy, peripheral neuropathy, retinopathy, coronary heart disease, cerebral vascular disease, peripheral vascular disease, etc., which were accounting for 84.84%; only 77 cases were free of complications. This area needs to be expanded as we believe it is an important rationale for the study.

### Medication status of 508 cases of patients with type II diabetes

A total of eight different hypoglycemic agents were used, drug varieties and frequency of use are shown in Table 2. It can be seen from Table 2 that the highest frequency of use was of acarbose at 66.34% (n = 337), metformin which belonged to the biguanide, accounted for 20.28%. Pioglitazone which belonged to thiazolidinedione group had the lowest frequency of use, and was only 1.38% (n = 7); among 508 cases of patients with type II diabetes, 212 cases were administered with only one kind of hypoglycemic agent, 194 cases were administered with two kinds of hypoglycemic agents, and 34 cases with three kinds of hypoglycemic agents.

### Concomitant use of hypoglycemic agents with other drugs

Among 508 participants, in addition to the combined use of hypoglycemic agents, other types of drugs were concomitantly used (n = 426 cases, 83.86 %). Concomitantly used drug varieties, frequency of occurrence, and frequency of use are shown in Table 3.

It can be seen from Table 3 that combined medication with pancreatic kinionogenase enteric-coated tablet or other drugs to treat high blood pressure diabetes, heart disease, nervous system damage and other complications was recommended, other combined drugs like aspirin enteric-coated, atorvastatin calcium and irbesartan tablets also had the superiority to other drugs in treating diabetes disease.

**Table 1.** Biochemical characteristics of 431 patients who have complications.

Parameter	Microvascular complications			Macrovascular complications			Control range
	Nephropathy	Peripheral neuropathy	Retinopathy	Coronary Heart disease	Cerebral vascular disease	Peripheral vascular disease	
Age	62.3	61.5	65.2	80.1	68.3	69.5	60.00
Gender	35M/46F	41M/28F	43M/30F	35M/31F	30M/36F	36M/40F	40M/31F
HbA1c	8.1%	7.9%	7.6%	8.3%	8.5%	8.2%	6.5~7%
Total cholesterol	180±1.2	192±2.5	200±3.6	176±2.4	152±3.8	134±4.4	130~200
AST	56±3	61±4	73±5	68±2	110.2	105	5~40
ALT	42±3	112	109	48	113	76	7~56

**Table 2.** Type and use proportion of oral hypoglycemic agents

Drug category	Drug name	Number of cases	Frequency of use (%)
α-glucosidase inhibitors	Acarbose (Glucobay)	337	66.34
Biguanides	Metformin (Junlida)	103	20.28
Sulfonylureas	Glimepiride (Amaryl)	45	8.86
	Gliquidone	17	3.35
	Glipizide (Mieteni)	11	2.17
Thiazolidinediones	Pioglitazone (Aiting)	7	1.38

## DISCUSSION

The initial management of type II diabetes involves modifications to diet and exercise therapy; however, if blood glucose levels are not within normal limits then pharmacotherapy is required. If pharmacotherapy is not used when blood glucose levels are consistently high then, the risk for complications will be very high. Acarbose is the most frequently used hypoglycemic agent, its mechanism of action is to inhibit the activity of intestinal-type cells, α-glucosidase, and to delay the hydrolysis of carbohydrates, production of glucose, as well as the absorption of glucose. As a first-line drug for type II diabetes, it is especially suitable for those

with normal (or not too high) fasting blood glucose and significantly increased postprandial blood glucose to use alone or in combination with other hypoglycemic agents; adverse reactions are common gastrointestinal reactions. In individual cases, allergic skin reactions such as erythema, rash and urticarial eruption may also occur.

Metformin can improve insulin sensitivity, in addition to hypoglycemic effect, it also has many other effects: it can reduce very low density lipoprotein level, increase high density lipoprotein level, increase arterial blood flow, inhibit platelet aggregation, reduce vascular permeability, inhibit advanced glycation end products, etc (Ofenstein et al., 1999; Ruggierol et al., 1999; Lannello et al., 2004; Heng-zhong et al., 2007). A study has

shown that oral administration of metformin can reduce the level of circulating free fatty acids. Some patients showed gastrointestinal discomfort after oral administration of this drug, such as nausea, vomiting, diarrhea, abdominal pain, constipation, abdominal distension and indigestion; type II diabetic patients who were complicated with ketoacidosis, liver and kidney dysfunction, heart failure, acute myocardial infarction, etc., should not use this drug.

For patients with normal renal function, plasma drug  $t_{1/2}$ =2-5 h, 90% of absorbed drug was eliminated within 12 h (Bailey and Turner, 1996). The application of sulfonylurea hypoglycemic agents, especially in the elderly, is not recommended, as long-term application could

**Table 3.** Concomitantly used drug types and number of cases

Drug name	Number of cases	Frequency of use (%)
Pancreatic Kininogenase Enteric-coated Tablets	416	81.89
Aspirin Enteric-coated Tablets	163	32.09
Atorvastatin Calcium Tablets	150	29.53
Irbesartan Tablets	101	19.88
Nifedipine Controlled-Release Tablets	71	13.98
Fenofibrate Capsules	52	10.24
Isosorbide Mononitrate Sustained-Release Tablets	46	9.06
Bisoprolol Fumarate Tablets	48	9.45
Enalapril Maleate Tablets	53	10.43
Nifedipine Tablets	69	13.58
Valsartan Capsules	35	6.89
Metoprolol Tartrate Tablets	21	4.13

lead to high risk of hypoglycemia; for diabetic patients complicated with renal diseases, the appropriate oral hypoglycemic agent is gliquidone, as only 5% of the drug is excreted via the kidney. It is a well known fact that pancreatic kininogenase enteric-coated tablet combined with epalrestat can have efficiency on diabetic peripheral neuropathy (DPN) patients (Xiao-yuan, 2011; Berkow, 1992; Gulixian et al., 2010; Hui et al., 2008; Ming et al., 2011; Xin-lian and You-yu, 2003). In the combined use of two kinds of drugs, the combination of  $\alpha$ -glucosidase inhibitor and insulin was the most prevalent. In the combined use of three kinds of drugs, the combination of  $\alpha$ -glucosidase inhibitor, metformin and insulin was the most common. Among the diabetic patients, age groups in 40 to 80 had the higher probability of illness and the incidence rate tend to increase with age; therefore, this group should take regular medical examinations to prevent diabetes regularly. In the choice of medication, prescription drugs like acarbose and other  $\alpha$ -glucosidase inhibitors, at the same time, combined medication with pancreatic kininogenase enteric-coated tablet or other drugs to treat high blood pressure diabetes, heart disease, nervous system damage and other complications is recommended. During the nursing period, blood pressure was controlled below 125/75 mmHg (1 mmHg = 0.133 kPa), and have close observation of changes in blood pressure and prevent the occurrence of orthostatic hypotension. Lower protein in urine would occur by eating the low protein food, thereby reducing the ability of insulin resistance, thus improving glycometabolism, fat metabolism, and protein metabolism, and at the same time, improving injuries, pressure ulcers, and infection prevention. Arteriovenous fistula should be taken care for dialysis patients (Ji-qiong et al., 2011).

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