

Comparative Analysis of Diabetes in China and The United States-Based on Risky Factor, Complications and Quality of Life

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Abstract. Of the two main types of diabetes, the most prevalent kind of diabetes is type 2 diabetes (T2D). In many of the world's countries with high diabetes rates and large populations, China and the United States are two nations that can be used as a point of reference when trying to find a solution to the diabetes problem. This paper analyzes the differences between China and the United States in terms of three aspects: risk factors, complications and the quality of life-related to this disease. Obesity is a risk factor that has a significant impact on diabetes in both the United States and in China, and smoking is also one of the risk factors which is more prominent in China. In terms of complications, the complications in the United States and China are almost the same, and the incidence is basically similar. The poor performance of pancreatic beta-cells and the disparity in treatment levels, however, are likely to blame for China's considerably greater prevalence of diabetic complications than the US. In China, the living quality of patients with any kind of diabetes depends more on the patient's economic status and education level, while in the United States, depends on cultural differences. Race is also an important factor affecting patients' quality of life.

Keywords: Type 2 Diabetes, China, the United States.

1. Introduction

Diabetes has been a prominent chronic disease for so many years. It is a disease of abnormal blood sugar caused by the pancreas not producing enough insulin or the body not using insulin effectively. The prevalence is about 9% of the world's adult population and is increasing yearly [1]. The fatality rate of diabetes itself is not high, about 2%, but the fatality rate caused by diabetes and its complications accounts for 12% of the total mortality rate, which is ranks as the world's seventh-leading cause of death [2]. China has become the nation with the greatest population of diabetes patients in the world in 2016 when the country's overall number of diabetic patients surpassed 100 million. Additionally, 84.1 million Americans are in pre-diabetes, and 30.3 million are with diabetes [3]. Diabetes prevalence has grown dramatically in low- and middle-income nations, as has the burden of disease, which greatly affected people's healthy lives and had a great impact on human health in all aspects of the world.

Although scholars have a deeper understanding of diabetes, its treatment and reduction of complications still need to be further improved. In order to have a deeper understanding of various causes and influencing factors of diabetes, this paper chooses China and the United States, two major countries with diabetes, as comparison objects to analyze risk factors, complications and life quality to aid in the treatment and progression of diabetes.

2. Risk factor

T2D is a chronic disease caused by multiple factors. In general, risk factors for developing T2D include age, gender, obesity, insufficient exercise, related family background, race, lifestyle, education and household income [4].

2.1. Risk factors of T2D in the Eastern China Region

According to an analysis of the prevalence of T2D in the Eastern China Region, influenced by the advantages of coastal cities and their higher socio-economic status, the morbidity is higher than in other regions in China. More importantly, for a long time, obesity has been generally considered an important and potentially controllable risk factor for the occurrence of diabetes. The most significant uncontrolled factor was family history, while gender and age raised the incidence of T2D by 12.3% and 24.6%, respectively [5].

The meta-analysis aims to search for information on the prevalence of T2D published in China between the years 1980 and 2014. The result shows that regarding gender and age, the prevalence of T2D is greater in men than in women from the age of 30 to 50 years. In those over 50 years, the prevalence of T2D is greater in women than in men, and the gap between them increases with age. Interestingly, the prevalence of T2D declines in those over 80; the prevalence in those aged 70-79 is 12.6% and 9.2% in those over 80. In terms of regional variations, metropolitan areas have a 30% greater prevalence than rural areas [5].

Lifestyle factors, such as physical activity and smoking, are also independent risk factors that increase the risk. According to a meta-analysis, the increased risk of diabetes and smoking are strongly correlated. Heavy smokers (smoking 20 cigarettes or more per day) have a 61% higher risk than non-smokers [6]. Han et al. showed that those with an optimum lifestyle, which is characterized by engaging in more physical activity, maintaining a balanced diet, having a BMI between 18.5 and 23.9 kg/m², and neither smoking nor drinking, have a 51% lower risk of diabetes than those with an unhealthy lifestyle [7].

2.2. Risk factors of T2D in the State of New York

In New York State, T2D usually occurs in men aged 45 years and above. The older the age, the higher the prevalence. As with the prevalence of overweight and obesity, men are more likely than women to get T2D. However, as the number of overweight and obese young individuals has increased, the impact of T2D on adolescents is growing. Adults over 25 years old with the lowest family income are more than twice as likely to suffer from diabetes as adults with the highest family income [9].

Smoking increases the risk of diabetes and complications, including cardiovascular disease, lower limb amputation, nerve injury and kidney disease. It is appraised that 34% of adults with undiagnosed diabetes are currently smokers. Among diabetes adults who smoke in New York City, only 38% have tried effective smoking cessation aids. Therefore, healthcare providers play an essential role in reducing the impact of smoking, such as assessing smoking at each visit, advising patients to quit smoking, and recommending or prescribing drugs.

2.3. Comparison between China and the US

In 2020, the prevalence rate of diabetes in the United States was 10.6%, compared to 12.8% in China. The majority of diabetes within New York State also varies by race, compared to 6.8% for Whites and 10.5% for Asians [8, 9]. The prevalence of diabetes varies among racial and ethnic groups. It may be caused by genetic factors. In order to identify the gene loci related to T2D, a genome-wide association analysis (GWAS) was performed to find the susceptibility variations in the whole genome. Some GWAS in China show that some new genes have not been identified in the clinical analysis of Caucasians. The location, frequency and strength of association with diabetes of these gene variations are different from those of Caucasians. Most of diabetes susceptibility genes found in Chinese people are associated with dysfunctional β Cell related. However, only a small part is related to fasting

insulin, which may indicate the unique pathophysiological causes of diabetes in the Chinese population. Although the overweight and obesity rate of Asians is often lower than that of Western people (measured by BMI) [6].

Compared with genetic predisposition T2D patients are more affected by behavioural and environmental risk factors. The prevalence of adult smokers without T2D in China is about twice that in the United States. This may be because China is currently the most important tobacco producer and purchaser in the world, and its consumption accounts for one-third of all cigarette production.

Overweight and obesity are most common among adults in the lowest income groups in China and the United States, and the prevalence rate will decrease with the increase in income. Compared with adults in the highest income group, those with lower incomes are likewise more likely to report having diabetes risk factors, such as lack of exercise and not eating fruits and vegetables every day. Although the reason for the difference in the prevalence of diabetes is not completely clear, the economic disadvantage will make it more difficult for people to obtain healthy food and regular exercise, thus leading to the difference in the prevalence of obesity, which is the main risk factor for diabetes.

The age and gender structure of T2D are also different from that of the United States and China, which may be due to the aging of the Chinese population. The above analysis of the prevalence rate in China shows that elderly women and middle-aged men should closely monitor blood glucose levels. According to the different demographic and clinical characteristics of the disease, targeted health interventions are taken to improve patients' self-management ability, effectively control risk factors and improve health outcomes.

3. Complications of the diabetes

In 2015, approximately 12% of global health expenditures were for T2D and its complications [10]. According to CDC research, patients with T2D may have several complications: heart disease, stroke, blindness and other eye problems, diabetic Retinopathy, lens clouding; intraocular fluid increases in pressure, kidney disease, nerve damage, amputation, etc. [11]. With the development of the disease, the complications of diabetes pose a greater threat to the health of patients than diabetes itself. Therefore, focusing on the development of complications and finding the influencing factors and treatment methods can reduce the disease burden of diabetes to a certain extent. This section will focus on a will diabetic foot, cardiovascular disease, kidney disease, and diabetic retinopathy between China and the United States.

3.1. Complications of diabetes in China

Cardiovascular disease is the disease that has the greatest impact on the disease burden in China and even Asia. Patients with cardiovascular disease history such as hypertension and dyslipidemia are six times more likely to have T2D than those without cardiovascular disease history, or even higher risk [12]. For kidney disease, in a trial conducted in Shanghai in 2012 on 1847 people suffered from T2D, the prevalence rate of kidney disease was 41.31%, and proteinuria, non-proteinuria and kidney failure contributing 18.51%, 13.44% and 9.36% correspondingly [13].

There are also three other complications, like diabetic foot, retinopathy and nerve damage. A cohort study at Shanghai First Hospital displayed that the prevalence of retinopathy in diabetic patients was 46.89% over 5 years, and the 5-year rate of retinopathy was as high as 32.23% under conditions where diabetes treatment was relatively effective [14]. As far as nerve damage is concerned, A China-wide study of diabetic nerve damage that covered 21 hospitals illustrated the prevalence of diabetic peripheral neuropathy was 52.97%. According to a retrospective cohort study covering 19 clinical centers, 27.3% of all amputees with diabetes were due to diabetes foot. Most patients have poor prognosis. Early diagnosis, detection and treatment are the best way to improve the quality of life in later life [15].

3.2. Complications of diabetes in the US

A retrospective survey in the US shows that the incidence of diabetic foot was 5.8% within 3 years in diabetic patients. In addition, 15% of them experienced lower limb amputation, severely impacting patient survivability [16].

With the development of medicine and surgery, the incidence of complications related to diabetes has decreased. But the burden of these complications is not optimistic. Cardiovascular diseases are no exception, accounting for 2/3 of the deaths of diabetes patients; Among them, ischemic heart attack, congestive heart failure (CHF) and stroke made up 40%, 15% and 10% respectively [17]. In terms of kidney disease, the survival prognosis is poor, which has a significantly negative implication on the quality of life and duration, because 7% of patients with T2D were already accompanied by kidney disease when diagnosed; 25% of T2D also have renal disease 10 years after the diagnosis [18].

As for other microvascular complications, in the national health and nutrition survey, the prevalence of retinopathy in diabetes patients is 28.5%, of which 4.4% have the risk of vision loss [18]. Steering damage: In an epidemiological study conducted by the University of Pittsburgh, diabetes neuropathy accounted for 34%, 18% for 18-29 years and 58% for 30 years [19].

3.3. Comparison between China and the US

Obviously, the prevalence of each complication is higher in China than in the United States. Compared with Western populations, Chinese patients with diabetes tend to be leaner and have poorer islet β -cell function, which may lead to microvascular complications and cancer sensitivity higher than macrovascular complications. On the one hand, it may be due to inappropriate treatment in China, and on the other hand, it may be due to untimely early intervention, however, in large cross regional and multi clinical trial centers, there is a lack of quantitative data on early intervention or weakening of screening complications. The reasons for the decrease in the rate of terminal kidney disorder compared to the incidence of other complications of diabetes remain unclear. The incidence of terminal kidney disease may be influenced by the increased percentage of non-Hispanic black Americans suffered from diabetes, as the morbidity of terminal kidney disease is twice as high in this population as in whites. [20].

In addition, obesity is indeed a vital risky consideration. In China, the number of IBM is lower than that of the United States or other western countries. However, only 5.6% of diabetes patients can receive the best treatment with the goal of optimal control of blood sugar, blood pressure and blood lipids [21]. The best management of diabetes requires good medical care, patient ability, health knowledge, self-control and self-discipline. Chinese patients with diabetes education have better self-care and blood sugar regulation, which is poorly managed in China.

4. Quality of Life

The health-related quality of life is extremely important for patients with diabetes, especially if they have complications. Their health-related quality of life can be assessed through the EQ-5D, which includes the action capability, care of the self, daily routines, ache/discomfort and stress. Therefore, the purpose of this section is to compare the quality of life of diabetes patients in eastern China and the eastern United States [22].

4.1. Life quality of T2D patients in Eastern China

East China is home to about one third of China's population, but its economic situation is so unbalanced that the study uses data from urban and rural participants at different economic levels. According to the data, it can be inferred that male's EQ-5D index is higher than female's EQ-5D index. Participants with higher economic level have higher EQ-5D index. Local education level also depends on the economy. Therefore, participants with higher education level also have higher EQ-5E index.

Due to the influence of traditional thinking in Chinese society, most women will spend more time doing housework and staying indoors, so they will spend less time going out, which makes them more likely to suffer from depression or anxiety. Among 893 men and women with T2D in Xuzhou City, eastern China's Jiangsu province, the prevalence rates of depression and anxiety were 56.1% and 43.6% respectively [23]. In patients with diabetes, EQ-5D index of male patients is 0.94, while that of female patients is 0.90. The index of married patients was 0.9, and that of single patients was 0.95. The value of EQ-5D is between -0.111 and 1, the index closes to 1 is healthy and 0 or less represents very poor health. Elderly often have low EQ-5D value, which may be related to the high prevalence of chronic diseases in the elderly. Areas with high economic and educational levels represent better medical facilities and human resources, and the treatment and care of diabetes patients in these areas are relatively good. Meanwhile, the low economic level also means that participants will engage in heavy physical work and have a high probability of injury. In the research data of East China, the value of EQ-5D of diabetes patients will increase with the increasing of income. Among them, EQ-5D index of diabetes patients whose income is more than 15000 dollars is 0.941, and EQ-5D index of diabetes patients whose income is 3000-6172 dollars is 0.833[24]. On the whole, although the life quality in East China is at the medium level, the health-related quality of life of diabetes patients in here is poor, which is related to the differences in economic and educational levels in East China.

4.2. Life quality of T2D patients in Eastern America

Compared with the diabetes research in China, there are more studies on diabetes in the United States than in China. The reason for all this may be that diabetes is the seventh leading cause of death in the United States, and people with T2D have a significantly lower quality of life than the others. Data in eastern Michigan shows that complications of diabetes can lead to lower HRQOL scores [23]. Current research in the eastern United States suggests that gender, age, race, family income, education level and body mass index may affect the health-related life index of diabetes patients through depression or anxiety, and T2D patients are twice as likely to suffer from anxiety or depression as patients with other chronic diseases and without diabetes [25].

In the experimental data of the United States in 2004 and 2009, 60.2% of the diabetes patients were women, 35.1% of diabetes patients had a lower education, and 51.9% of diabetes patients had family income less than \$40000[23]. Among the surveyed diabetes patients, the proportion of overweight is higher, and the proportion of those with lower education level and income level is higher. Overweight patients may be obese, possibly as a result of eating too many high-calorie foods. The increased incidence of obesity also increases the risk of diabetes [26].

4.3. Comparison between China and the US

The number of people with diabetes is on the rise in both China and the United States, compared with people without diabetes, people with T2D become progressively less healthy, which varies by region. Gender, age, household income, education, both weight and ethnicity affect health-related quality of life and can lead to a range of adverse psychological problems such as depression and anxiety.

Compared with the developed countries, China is still in the developing stage, so even though the economy of some regions in East China has reached to the level of developed countries, the gap between the rich and the poor is an important issue for China. Some diabetics will hide their disease and give up the treatment because of the high cost, so as to gain more time to finish their work and get more salary. The dual pressure of work and illness can also lead to some mental illness of patients, and long working hours can cause great physical consumption of patients. At the same time, they do not have enough time to plan their own healthy eating habits, and they lack the time to exercise, which will bring a great burden of diabetes in China. The United States is a multicultural country, but it also faces racial problems. Some ethnic diabetes patients may not be able to accept fair treatment and post disease treatment, which will bring a serious blow to their physical and mental health.

5. Conclusions

Diabetes is a worldwide problem. One out of seven adults in the United States have diabetes, and one out of ten adults in China has diabetes, which is still on the rise. This article compares the risk factors for T2D in China with the United States. Whether in China or the United States, diabetes can cause a series of complications, such as diabetes foot, cardiovascular disease, kidney disease, etc., which affect the life quality of patients. At the same time, due to disease reasons, patients may have anxiety, depression and other emotions, which further aggravate the impact on physical and mental health.

The differences between the two countries may be due to the differences in ethnic and demographic characteristics, or the shackles of traditional ideas. However, no matter which country it is, the management of diabetes cannot be ignored. Therefore, diabetes should receive more clinical attention, especially T2D

Timely intervention and prevention of diabetes, reduce the factors that induce diabetes from the source, and control the factors that affect diabetes consequently improving the life quality for diabetic individuals and lowering diabetes complications.

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