Prediction Model of Diabetes Complications Based on Genetic Engineering Improved Genetic Algorithm Optimized BP Neural Network

Abstract: Nowadays, with the rapid development of science and technology, people's living standards have been greatly improved, and many chronic diseases have also been brought, including diabetes. The occurrence of diabetes not only poses a serious threat to human body, but also poses a threat to human life with its development. BP (Back Propagation) neural network model can well solve the logic regression problem of single factor and multiple factors, and also better solve the collinearity problem of multiple factors. BP neural network optimized based on improved genetic algorithm can reflect the influence mode and degree of various factors, and can be predicted from the perspective of patients' diet, exercise, and doctors' application of insulin. In this paper, the patients in a hospital were taken as the research object, and the BP neural network method was used to analyze the causes of the disease. The prediction model was used to screen out the high-risk groups of diabetes patients and reduce their incidence rate. Secondly, according to the collected data, the relationship between diabetes related complications was analyzed in depth by using genetic engineering technology, thus providing a theoretical basis for the prevention and treatment of diabetes and its complications. The prediction accuracy of BP neural network optimized by genetic algorithm can reach 94.1%. In the high-risk group of diabetes, taking appropriate diet and behavioral measures can reduce the probability of diabetes. The prediction scheme of diabetes complications proposed in this paper is simple and its cost is low, which can greatly reduce the cost of prevention and treatment of diabetes and the probability of diabetes.

Keywords: Diabetes Complications, BP Neural Network, Genetic Engineering, Improved Genetic Algorithm

1. Introduction

The complication of diabetes is a complex genetic disease. Its genetic factors mainly include environment, society, lifestyle, etc. It is a chronic metabolic disorder syndrome, which is mainly due to the inhibition of metabolic reactions, leading to problems in the body's function. It would lead to complications of heart, cerebrovascular, renal function, eyes, lower limbs and other organs, with a high mortality rate. Complications of diabetes is a very hidden disease. Many patients have complications before diagnosis. With the rapid development of artificial intelligence technology, medical data has been widely used in the field of artificial intelligence, and many disease prediction models have also emerged. At present, there are many patients' clinical diagnosis and treatment data in the medical databases of major hospitals in China, and these data also promote the rapid development of disease diagnosis and prediction models. Diabetes is a chronic disease that endangers the national health, and its complications may endanger the life safety of patients. Therefore, in order to minimize the harm of diabetes complications, it is of great practical significance to establish a set of models that can early diagnose and predict the complications of diabetes using the massive data of diabetes patients in the hospital.

Diabetes is a common chronic disease that endangers people's healthy life. Peters Sanne AE reviewed the latest evidence on gender differences in the burden and complications of diabetes, and discussed the potential explanation for the gender differences. Diabetes is a strong risk factor for vascular disease. The relative risk of vascular diseases due to diabetes in women is much higher than

that in men [1]. The purpose of Pearce Ian's research was to explore the relationship between diabetes retinopathy and the common microvascular and macrovascular complications of diabetes, and how these factors may affect clinical practice [2]. Ljubic Branimir attempted to predict whether there would be 10 specific complications in patients with type 2 diabetes. Accurate prediction of complications may help to take more targeted measures to prevent or slow down the development of complications [3]. Targher Giovanni believed that nonalcoholic fatty liver disease and diabetes are common diseases. They often coexist and may have synergistic effects, which would increase the risk of liver and extrahepatic clinical results and also increase the risk of chronic vascular complications of diabetes [4]. Harding Jessica L believed that in recent decades, the prevalence of diabetes has increased significantly in almost all regions of the world. The increase in the number of diabetes patients or diabetes patients with a longer duration may change the disease situation of many people in the world, especially because of the high incidence rate of specific complications of diabetes (such as renal failure and peripheral artery disease) [5]. Their research data on diabetes is insufficient and would be further explored.

Complications caused by diabetes are "killers" that endanger people's health and even lead to death. Jha Jay C believed that chronic renal and vascular oxidative stress is related to the increase of inflammatory load and is a decisive process in the development of diabetes complications. Continuous hyperglycemia in diabetes would increase the production of reactive oxygen species, activate inflammatory mediators, and inhibit the antioxidant defense mechanism of oxidative stress that ultimately leads to vascular and renal damage in diabetes [6]. Karamzad Nahid believed that vitamin K has many beneficial effects on diabetes complications and pre diabetes. However, it is necessary to systematically integrate evidence to quantify these impacts in order to provide information for clinical practice and research [7]. Cole Joanne B believed that diabetes is one of the fastest growing diseases in the world, and clinical risk factors and blood glucose control cannot predict the development of vascular complications alone [8]. Menini Stefano believed that atherosclerosis is the main reason for the reduction of life quality and life expectancy of diabetes patients, while nephropathy and retinopathy are common manifestations of end-stage diabetes [9]. Hainarosie Razvan believed that diabetes would lead to a variety of health problems, but also would lead to complications in these patients. Regular inspection is needed to determine the patient's condition development [10]. Their research is only for the treatment of diabetes, and further research would be made on the complications of diabetes.

The original data set of diabetes patients is redundant and missing, and has different data sources. Therefore, this paper designs a data pre-processing process based on actual data, and gives a group of high-quality data, which can effectively tap the data potential of diabetes patients with complications, and achieve effective sharing of medical data. Genetic algorithm is used to analyze the classification performance of genetic factors. This model can provide an effective diagnostic mode for early detection and intervention of diabetes retinal patients, and can help doctors make correct judgments, which is worthy of clinical promotion. An early diagnosis system based on the diagnosis model of diabetes complications is established. The platform is convenient for diabetes patients to conduct visual data integration, query, statistical analysis and early diagnosis of diabetes complications. Early intervention for high-risk groups of diabetes complications can be used as an auxiliary diagnostic means to effectively reduce the occurrence of diabetes complications and improve their quality of life. In addition, the prediction accuracy of this scheme for hypertension can reach 88.9%.

2. Method of Diabetes Complication Prediction Model

2.1 Data Characteristics of Complications of Diabetes

In the classification of diabetes, type 2 diabetes is the main type. More than 80% of the patients live in developing countries, with low income level [11]. What's worse, due to the rapid development of society and economy, changes in human eating habits, and changes in lifestyle, the incidence of diabetes varies among ethnic groups. The incidence of diabetes and its chronic complications is increasing every year. Many patients would have irreversible blindness, chronic kidney disease, cardiovascular disease, foot ulcer and other diseases at the later stage of development [12].

At present, the number of people with diabetes is growing rapidly, especially the number of people with diabetes in low - and middle-income countries. Diabetes can not be completely cured. Once diagnosed, they would become ill for life. Among the biggest causes of renal failure, adults with diabetes are 2-3 times higher than normal people. In addition, retinal diseases caused by diabetes are also common, which is a major factor leading to blindness [13].

(1) Multiple dimensions

The data set of diabetes complications includes basic patient information, patient indicators, time related fields and other data, which can be summarized into three aspects: patient source information, time information, and patient indicator information [14].

(2) Irregular timing characteristics

All indicators of diabetes patients are random, and the examination of the same time dimension would also have many characteristics [15].

(3) Correlation between characteristic indicators and basic information of patients

Through the correlation analysis of the basic situation and characteristic index of diabetes patients with complications, it can be seen that there is a certain relationship between the two, which is one of the main factors in constructing diabetes complications.

(4) Complex correlation between characteristic indicators

The correlation analysis of various indicators of diabetes complications is carried out, and some indicators have certain correlation, which is a very important problem. The data related to the complications of diabetes have problems such as irregular time series, interrelation between different dimensions, interrelation between some characteristic indexes, etc. Therefore, attention must be paid to these problems when establishing the model to ensure the accuracy and effectiveness of the model.

The complications of diabetes are not easy to find at the initial stage. At present, the diagnosis of diabetes is mainly made by doctors, who judge the type of diabetes complications according to the patient's physical indicators, historical treatment, disease symptoms, personal treatment experience, etc. However, due to the different physical signs of different patients and clinicians, different complications would occur in the same situation. Therefore, it is easy for doctors to make wrong judgments, and once complications occur, it is difficult to cure. The harm of diabetes is unimaginable, so early prevention, early detection and timely treatment can effectively reduce the disease.

In recent years, data mining technology has been widely used in medical and health fields. At present, there are many clinical diagnosis and treatment data of patients in China's hospital database, including patient's visit, hospitalization, physical examination, medical advice, etc. These massive data contain a lot of undiscovered disease knowledge and rules. As long as it is associated with them, it can provide better treatment for some diseases.

Hypertriglyceridemia is an important factor leading to the disorder of blood glucose regulation in the body. When the concentration of triglyceride in the body exceeds the normal metabolic capacity of the liver, triglyceride would accumulate in adipocytes and produce a lipotoxic effect on islet cells, leading to apoptosis of islet cells and the reduction of the number of islet cells, and making glucose

metabolism abnormal. It is suggested that in the future, in the management of hospital-community integration, people should pay attention to individualized diet and exercise, avoid the intake of high-fat and high-carbon water, control the intake of salt and edible oil, and reduce the complications caused by dyslipidemia. For patients who have developed diabetes, regular monitoring and intervention through intelligent early diagnosis system and standardized treatment can reduce the admission rate of patients. In the development process of informatization in the medical industry, many medical units have adopted a large number of information management methods to achieve higher efficiency and higher service level. The system includes the physical examination indicators, medical records, physical signs and medical orders of patients, and is saved in various forms. With the development of the times and the rapid development of network information, a large number of real data of patients have been accumulated in the medical information system. It not only changes the traditional data of patients, but also contains many hidden information, which has high application value in medicine. Through data mining technology, people can find the factors related to diseases and help patients to carry out potential risk assessment, which would be the application prospect of medical data.

In the community, general doctors and medical staff provide the residents with the most basic medical and health care, and regional general hospitals provide general or special treatment. Emergency and critical patients are in the charge of cross-regional general hospitals. Nurses closely monitor patients, evaluate their health status, formulate treatment plans, and provide psychological counseling to patients. Senior nurses can also prescribe drugs to patients under the supervision of doctors, by themselves or under the supervision of doctors.

In the prevention and treatment of diabetes, the application of hierarchical diagnosis and treatment technology has made great progress in the management of diabetes in China. From a purely treatment oriented model, it has strengthened the cooperation between hospitals and all sectors of society, and has also increased the prevention and management of diabetes to provide residents with all-round quality services. With the gradual maturity of primary medical and health organizations, the establishment of hierarchical diagnosis and treatment system and the continuous improvement of corresponding supporting measures, China’s future hospital collaborative management model would be further developed, thus forming a set of effective prevention and treatment mechanism suitable for China’s national conditions.

There is a lack of awareness and health education on diabetes between community health service personnel and community residents. It is an effective method to carry out health education lectures on diabetes among residents, which can make patients pay more attention to the disease. In daily life, patients follow the guidance of doctors and use drugs, diet and exercise reasonably to prevent and treat diabetes.

At present, the main form of hospital community cooperation in China is hospital community referral, that is, to open a “green channel” for community residents through hospitals to provide convenience for residents eligible for referral. At the same time, the doctor would also decide whether the patient should return to the community for post-medical prevention and control and community follow-up according to the progress of the disease.

With the continuous acceleration of the worldwide informatization process, China’s medical industry has also entered the era of informatization. At present, the construction of medical informatization based on informatization has become a major decision to promote the reform of the health system and improve people’s living standards, and also an inevitable choice for the development of China’s medical cause. Establishing a reasonable medical information management platform can not

only effectively change the traditional medical model, but also improve the quality of medical services and enhance the core competitiveness of China's medical industry.

2.2 Prediction Algorithm Selection

The focus of this paper is how to use machine learning methods to intelligently predict the complications of diabetes patients, so as to achieve the purpose of diagnosis and treatment. At the same time, through the analysis of the diagnosis and treatment data of diabetes patients, the results of the article have higher prediction accuracy and effectiveness. At present, in the process of disease prediction, the most commonly used are regression model prediction, Bayesian network and neural network.

First, in multiple regression analysis, the selection of factors and expressions is a kind of guess, which would affect its diversity and uncertainty, but also ignore their correlation. Secondly, Bayesian inference algorithm requires a priori probability. If it has a large priori, it would cause a lot of errors. Especially when there are multiple characteristic indexes, the operation process would become more complex. BP neural network is a supervised learning algorithm. Its specific learning process is divided into forward and backward stages, that is, during forward propagation, the input information is transferred to the output layer through the input layer through the hidden layer. If the output layer does not get the output of the target, it would enter the reverse transmission, feed back the error between the output values from the original path, then modify the connection weights between the layers layer by layer, and constantly modify the network parameters until it is minimized. The optimization of BP neural network is shown in Figure 1.

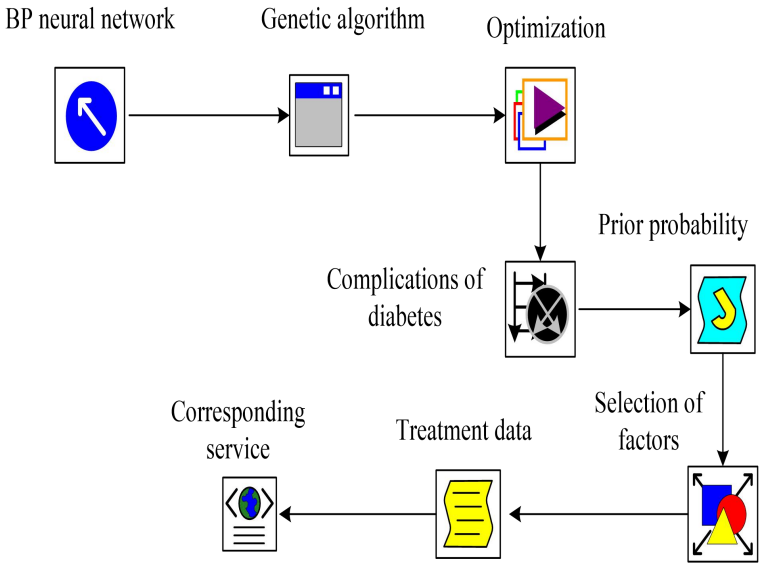

Figure 1. Optimization of BP neural network

The treatment of complications of diabetes varies, and corresponding measures should be taken according to the specific conditions of the complications. The activation functions of the neural network are linear, classified and curvilinear, and the formula of the sigmoid function is as follows:

$$f(x) = 1/(e + e^{x}) \quad (1)$$

The weight change of patients with diabetes $Z(Q)$ is:

$$Z(Q) = (1 - \beta e^{x})/(e + e^{x}) \quad (2)$$

The relationship between temperature T_y and time t in diabetes patients is:

$$T_y = x(t + 1) \quad (3)$$

Diabetes risk assessment is a disease risk prediction method based on health. Its purpose is to determine the risk of its occurrence, and intervene in it, so as to obtain better benefits. This model includes a variety of possible risk factors. Generally, logistic risk model is used to predict the probability of diabetes occurring in a certain period of time in the future, and to determine high-risk people through probability cut points. Scores are made according to different risk factors, and people with or without risk are judged according to the total score. The primary prevention of diabetes includes intervention in behavior and diet of identified high-risk groups to reduce the probability of future disease. In recent years, such models have been widely used. Many studies have shown that intervention would be a more effective health management method in high-risk populations. In the high-risk group of diabetes, the effect of adopting strategy prevention is better than that of simply adopting the strategy of the whole population, because this model can effectively find the risk factors of diabetes, and take appropriate diet, behavior and other measures to reduce the probability of diabetes. Therefore, this model has played an important role in the prevention of diabetes, and has received widespread attention worldwide.

(1) Sample set construction

In order to train the model and test the prediction effect of the model, the article finally needs to train the sample data set and test the sample data set. The source of the sample set is firstly the preprocessed data of patients with diabetes complications including four types of diabetes complications, and secondly, the normal data of patients with diabetes confirmed not to be ill after diabetes examination is obtained from the hospital information system. The sample set is processed according to the preprocessing method mentioned above, and strictly checked according to the normal range of each characteristic indicator, and finally 500 pieces of normal data without disease are obtained. The training sample set is used to train the established model, and the test sample set is used to test the accuracy of the trained diabetes complication prediction model.

(2) Genetic establishment

In order to obtain the initial weight and initial threshold of BP neural network, a set of genetic algorithm steps based on random initialization of population, determination of fitness function, selection operation, mutation operation, calculation of fitness function and so on are established. BP neural network uses the optimal weight and optimal threshold after optimization of genetic algorithm.

(3) Establishment of BP neural network

According to the improved BP neural network algorithm described above, the structure, training function and learning rate of BP neural network are determined, and then the selected training sample set is used to train it. Since the problem dealt with in this paper involves many features of sample data, taking all features as input would lead to a significant increase in the complexity of the neural network, which would affect the accuracy of the model.

Through the improvement of BP neural network, the structure, training function and learning rate of BP neural network are obtained, and the selected training samples are used for training. Because these problems are based on a large number of data features, if all data features are input, the complexity of the neural network would greatly increase.

(4) Conclusion output

The test samples of diabetes patients and the test sample sets of normal people are taken as input, and the trained model analyzes and processes them. The output probability values of diabetes complications can be used as the basis for auxiliary diagnosis. The prediction model of diabetes complications is shown in Figure 2.

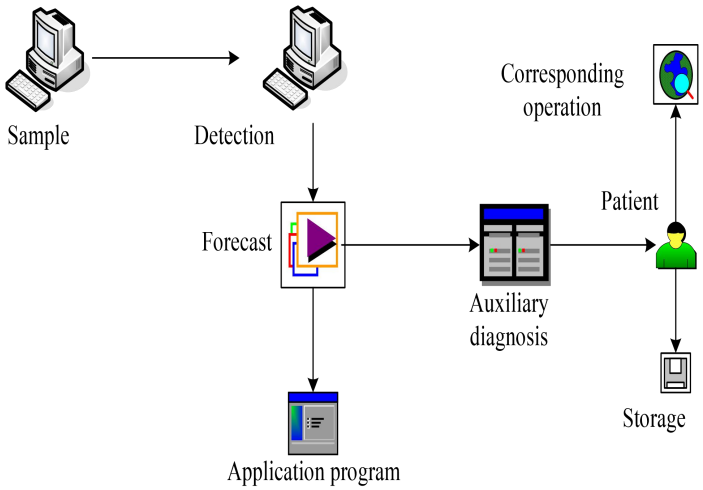

Figure 2. Prediction model of diabetes complications

Diabetes is a clinical syndrome that includes multiple factors such as heredity, society, lifestyle, environment, etc. It can lead to complications of multiple organs such as heart, cerebrovascular, kidney function, eyes, lower limbs, etc. The disability rate is extremely high. In addition, some complications have already occurred before diabetes is diagnosed. Therefore, the key to control diabetes lies in prevention and treatment, that is, before diabetes comes on, there are good living habits, diet and other measures to prevent or delay the development of diabetes, which is the most effective and economic prevention and treatment measures at present. Clinical pathway is a group of doctors who are responsible for supervision, treatment, rehabilitation and nursing. According to the specific work sequence and accurate time, the delay in rehabilitation and waste of resources would be reduced, so that patients can get the best medical care services. Efforts have been made to seek the regularity of treatment and standardized treatment procedures, and improve the efficacy and service quality. However, so far, such methods have not worked well. This paper attempts to use improved genetic algorithm, based on data, to explore the treatment rules and patterns of diabetes complications. The energy metabolism function of diabetes patients can be expressed as:

$$E_{\mathrm{n}}(v,h) = -bv - ch + h\sum hwj \quad (4)$$

Among the disease prediction objectives, if the population is taken as the target, the incidence rate, mortality and the occurrence point of infectious diseases can be predicted, and then the corresponding prevention policies can be formulated based on the prediction results. At present, such methods have been widely used in the prediction of chronic diseases such as cardiovascular disease, tumor, diabetes, etc. The onset and development of infectious diseases is a very complex process. How to correctly predict the development trend of individual diseases is the goal of human beings. It is of great significance to prevent the occurrence of diseases, formulate health policies and strategies and reasonably allocate medical resources. The probability expression of disease risk is:

$$H_B = -bv - ch - hw \quad (5)$$

For the complication prediction model of diabetes patients, it is mainly aimed at the possibility and sequence of various complications of diabetes patients many years later, including the impact of diet, behavioral intervention programs and diet intervention programs on the probability and mortality of complications. Diabetes and hyperlipidemia are all “diseases of wealth”, mainly because of good diet and less exercise. All kinds of bad living habits have brought many non infectious diseases to patients and their families. Diabetes also brings a lot of troubles to patients, making their lives more difficult. When patients with diabetes receive insulin treatment, they would generally have

hypoglycemia due to unreasonable treatment or hypoglycemic reaction caused by their own activities, which is very serious. In the diagnosis of diabetes, height p_L is the redundancy attribute:

$$p_L = \pi(b + \sum vw) \quad (6)$$

When all states of the hidden layer are determined, the probability of a single visible layer being activated is:

$$G_L = \mu(c + \sum wh) \quad (7)$$

Data mining technology has been developed in recent years, especially in the field of intelligent diagnosis in the medical field. Data analysis and information discovery is to mine hidden knowledge from a large amount of data, find rules from it, and transform them into understandable information. With the development of medical informatization and the continuous development of medical informatization, it has become an important means of data mining in the current medical field to analyze medical data by means of informatization and intelligence and transform the experience of medical workers into intelligent medical equipment. Therefore, according to the electronic medical records of diabetes patients, early treatment can be carried out, and the existing medical resources can be effectively used to promote hospital informatization.

Diabetes is a common disease, which is difficult to find in the early stage, has a long incubation period, and is difficult to recover. At present, because the etiology and mechanism of diabetes is not yet mature, it is very necessary to carry out early diagnosis. In recent years, with the continuous development of the medical field, the auxiliary diagnosis technology of diabetes is also getting more and more attention. The purpose of this paper is to establish an auxiliary diagnostic model for diabetes, that is, to analyze the risk factors of its occurrence and development, and to establish early auxiliary diagnostic techniques. At the same time, this paper also analyzed the current research on diabetes in China, and discussed a set of auxiliary diagnosis system suitable for diabetes in China.

With the progress of computer technology, artificial intelligence technologies such as machine learning and deep learning have made new breakthroughs. In addition, medical institutions have accumulated a large amount of medical information data, which makes “artificial intelligence and medical care” become a hot research topic at present. At present, many diseases can be analyzed and predicted through physical sign indicators, and disease risk can be assessed in advance, so as to achieve the goal of precise prevention, and then reduce the incidence rate of diseases from the source. In the field of medical imaging, the accuracy of intelligent diagnosis of some diseases has reached or even exceeded that of experts in the field. According to the research on diabetes, diabetes has the highest incidence of complications at the early stage of illness. Therefore, it is of great significance for patients and society to predict diabetes and its complications by technical means. After that, the paper would make a comparison with the multi-layer perceptron model and the radial basis function neural network model.

3. Prediction Results of Diabetes and Its Complications

The harm of diabetes is not only limited to health, but also causes huge economic burden to the country, families and individuals. In recent years, the economic burden of diabetes patients worldwide has become increasingly heavier. Therefore, how to effectively prevent and reduce its complications has become a major issue for countries and individuals. With the progress of medical theory, practice and technology, the prevention and treatment object of diabetes has changed from simple control of blood sugar to prevention and reduction of complications to a multi-level and multidisciplinary comprehensive prevention and treatment model. In the recommendations of the Ministry of Health and the Ministry of Finance on promoting the equalization of basic public health services, the management

of chronic diseases is particularly mentioned. Diabetes is the main risk factor of cardiovascular disease in china, and its early diagnosis and intervention has been listed as the national long-term scientific development plan. It is necessary to improve the residents' health awareness. Starting with hazard factors, people should carry out health education, strengthen primary prevention, and reduce the incidence rate of diabetes from the source. On this basis, in combination with the hierarchical diagnosis and treatment system, people would vigorously promote the signing of family doctors, taking the establishment of a comprehensive prevention and treatment zone for chronic diseases as the starting point. In order to effectively prevent and control diabetes, people must start from safeguarding the health interests of the whole society and strengthen the management of diabetes.

The training results after neural network modeling are shown in Figure 3 (multi-layer perceptron model training is shown in Figure 3 (a), and RBF neural network model training is shown in Figure 3 (b)). The correct rate of ketosis is 80.4%, and the correct rate of nephrosis is 85.7%. Using 50 input RBF neural network model for training, the correct rate of ketosis is 40.2%, and the correct rate of nephrosis is 39.8%.

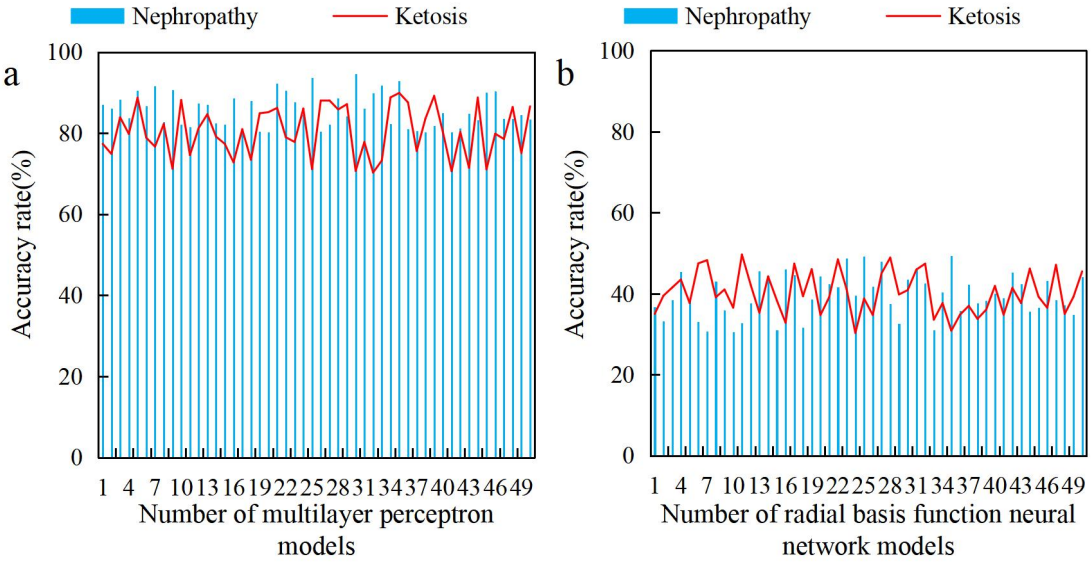

Figure 3. Training results after neural network modeling

The complications of diabetes include kidney disease, retinopathy, hypertension, foot disease, neuropathy, etc. The incidence of retinopathy (28.4%), nephrosis (14.7%) and neuropathy (10.7%) was higher than other complications. The statistics of the incidence of complications of diabetes are shown in Figure 4 (the incidence of retinopathy, nephropathy and neuropathy is shown in Figure 4 (a), and the incidence of hypertension and foot disease is shown in Figure 4 (b)).

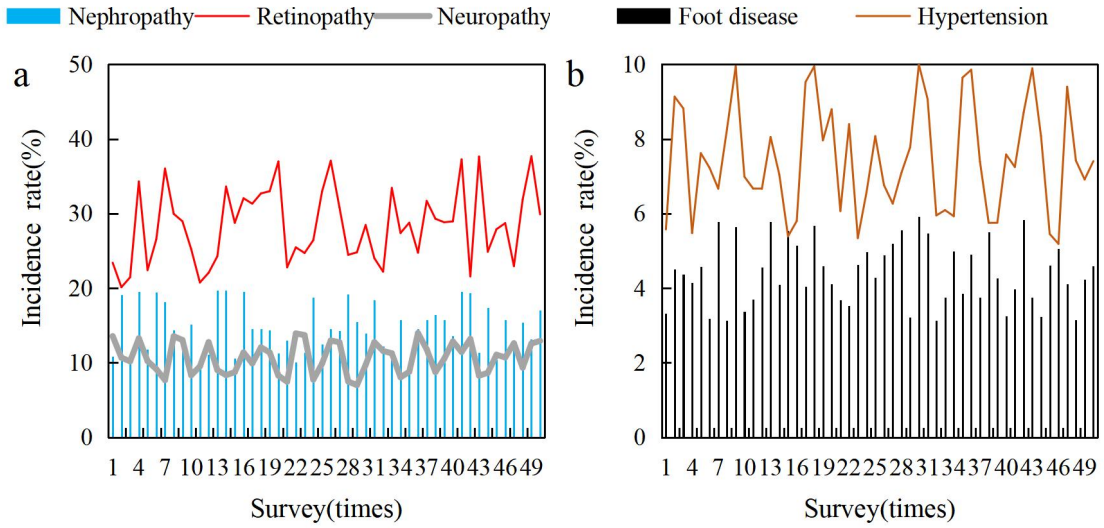

Figure 4. Statistics of complication rate of diabetes

The prediction accuracy of this scheme for foot disease, hypertension and retinopathy is shown in Figure 5 (the prediction accuracy of foot disease is shown in Figure 5 (a), and the prediction accuracy of hypertension and retinopathy is shown in Figure 5 (b)). The prediction accuracy of retinopathy was as high as 94.9%. The prediction accuracy of hypertension was 88.9%, and that of foot disease was 91.7%.

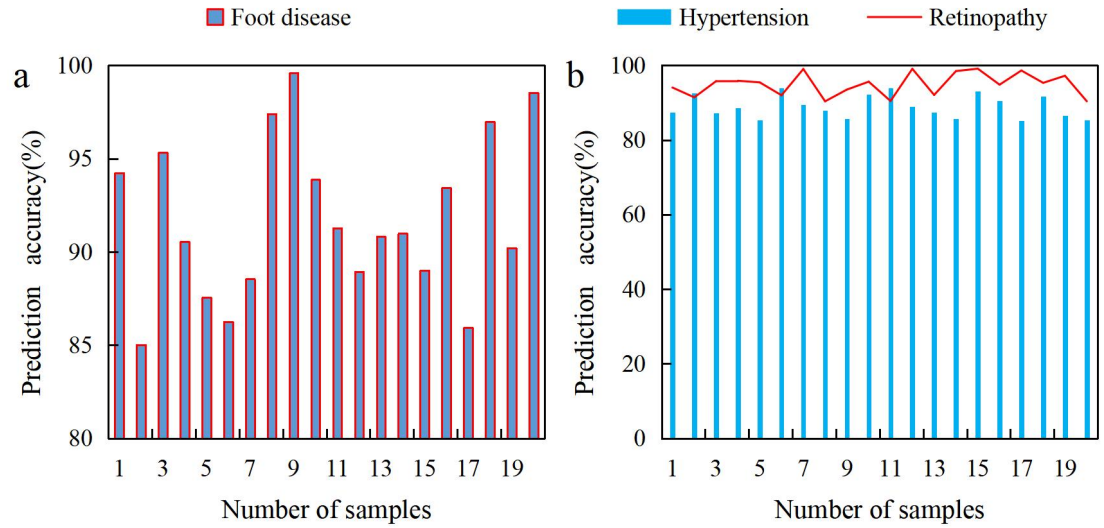

Figure 5. Prediction accuracy of the article scheme for foot disease, hypertension and retinopathy

With the rapid development of network technology, health management has been widely used between families and individuals. Generally, this device can monitor the target's vital indicators in real time, collect information, and transmit, display, and analyze using mobile devices such as mobile phones. At the same time, telemedicine is also gradually developing towards individualization, providing accurate monitoring, diagnosis, prevention and treatment measures for individual users. Artificial neural network is a physical model that simulates and reflects the neural network of the brain from the aspects of structure, principle, function, etc. It is composed of many neurons in a specific way. There are rich and complete connections between them, forming an extremely complex dynamic network. Neural networks can approximate any type of function, and can describe the rules of sample

data regardless of their expression.

The prediction comparison of different algorithms for diabetes complications under different proportion of missing values is shown in Figure 6 (Bayesian network and BP neural network are shown in Figure 6 (a), and the optimized BP neural network is shown in Figure 6 (b)). The prediction accuracy of the optimized BP neural network was as high as 94.1%.

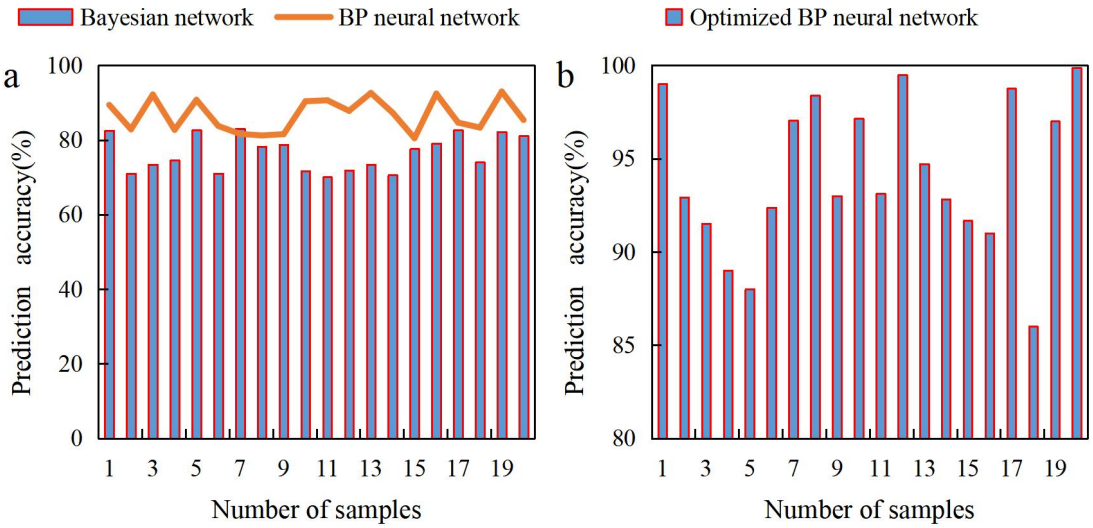

Figure 6. Comparison of different algorithms for prediction of diabetes complications under different percentage of missing values

4. Conclusions

Diabetes is a common chronic metabolic disorder disease with a high incidence rate. According to the latest data, the number of diabetes patients in China ranks first in the world and is still growing, while the proportion of diagnosis and treatment is very low nationwide. The early manifestation of diabetes is generally not obvious, which would aggravate the condition and lead to complications of diabetes. Complications cause great harm to the patient's body, and would also greatly increase the medical expenses. Therefore, early detection and prevention should be carried out, which plays a very important role in improving the patient's quality of life and health level. Diabetes is very difficult to cure in the world. The prevalence of diabetes is on the rise in the world due to factors such as prolonged sitting. The development of diabetes is a comprehensive function of many aspects. The existing prediction model based on clinical patients needs to be further tested and revised by other hospitals. Moreover, even if it can be passed, more unknown risks would be found with the deepening of research, which would lead to the decline of clinical efficacy. Therefore, people must continue to add new prediction indicators. Patients are included in various medical centers to optimize the model and dynamically update and evaluate the clinical prediction model. The clinical risk prediction model is only a prediction method, and its application needs to be combined with the rich experience of clinicians to make scientific clinical decisions.

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