

Case Study of How China's Community Healthcare Service Responds to Type 2 Diabetes

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Abstract. Diabetes is one of the world's most common chronic diseases. From the data shown above, we can see that diabetes is a wide-spread serious illness. Hence, prevalence of diabetes imposes a substantial threat on public health well-being. Therefore, it is important for official organizations to come up with solutions to respond to diabetes. Among different type of diabetes, type 2 diabetes (T2D) is the most common one and usually influenced by postnatal factors. In China, community health service centers play a major role in responding to T2D. Thus, it is important to analyze how the community health service centers are currently responding to diabetes and create guides for future works based on the analyzed results. In this article, background information on present T2D prevalence and strategies used as response solution for diabetes in China are provided. The method, main goal, and significance of the case study are also included. The main focus of this study is evaluating how China's community health service centers are responding to T2D via SWOT analysis. Thorough evaluation on internal strengths, internal weakness, external opportunities, and external threats are conducted with the aid of health impact pyramid and levels of prevention. At the end of the article, 3 possible ways to improve how China's community health service responds to T2D based on SWOT analysis are stated. In addition, expectations towards future research on China's response to T2D are discussed.

Keywords: Diabetes, China, Intervention, Community Healthcare Service.

1. Introduction

The accurate prediction of power load is of great significance for the electric power production and the safe operation of the power grid and the national economy [1]. Short term load forecasting is an important part of energy management system. The prediction error directly affects the analysis results of subsequent safety check of power grid, which is of great significance for dynamic state estimation, load scheduling and cost reduction [2-4]. Traditional prediction methods are based on linear regression, such as time series method, analysis method and pattern recognition method has defects of respectively [5].

According to IDF (International Diabetes Federation), until 2021, approximately 537 million adults (20 to 79 years old) live with diabetes [1]. Statistics from WHO (World Health Organization) shows that diabetes and related complications caused an estimated 2 million deaths [2]. From the data shown above, we can see that diabetes is a wide-spread serious illness. China is the post-populous country in the world. Proportionally, it has a greater number of patients with diabetes than any other nation on Earth. According to statistics, there are around 116 million of diabetic population in China in 2019. This number is predicted to reach 147 million by 2045 [3].

The approximated prevalence of diabetic disease grew from about 10.9% in 2013 to about 12.4% in 2018. The approximated prevalence of pre-diabetes grew from 35.7% in 2013 to 38.1% in 2018. These data indicate that the growth rate is stable [4]. The increase in prevalence of diabetic disease is partly caused by increased obesity rate as obesity is a major risk factor leading to the diabetes [5].

When it comes to prevention of diabetes, classification proposed by Foes and Fine can be applied. There are 3 levels of prevention: primary, secondary, and tertiary. They define the 3 levels of preventions in the following way: Primary prevention is eliminating risk factors for a disease. Secondary prevention pays attention on early diagnosis and treatment of disease. Tertiary prevention aims to eliminate or moderate disability related to advanced disease [6]. In China, the primary prevention of T2D refers to carrying out health education among the general population, increasing

the awareness and participation of the population in the prevention and treatment of diabetes, and advocating a healthy lifestyle of reasonable diet, weight control, moderate exercise, salt restriction, smoking cessation, alcohol restriction, and psychological balance, and improving the awareness of diabetes prevention and treatment in the community as a whole. The secondary prevention and treatment of T2D refers to the implementation of diabetes screening in high-risk groups, timely detection of diabetes, timely health intervention, etc., attempting to prevent the occurrence of diabetic complications in diagnosed patients [7].

The community healthcare system plays an important role in T2D preventions. The system consists of community healthcare centers in different cities in China. Such healthcare centers are usually close to housing estates and thus make it convenient for residents to receive healthcare services. The main services community healthcare centers offer include educational promotion on healthcare, early diagnosis, and treatment for chronic diseases, making them ideal facilities to conduct primary and secondary preventions for T2D.

At present, there are around 1,000 research papers that are on relationship between China's community healthcare system and T2D on China's most influential Academic resource search platform (CNKI) and Wanfang medical database (search date: January 1, 2018 to December 14, 2022), which suggests that more researches in the field are needed. Also, most research papers available focus on community healthcare centers in specific regions in China.

The aim of this case study is to evaluate how China's community healthcare service system responds to T2D and suggest guides for future response plan.

2. Method

2.1. Literature research

When writing this case study, the author searched through extensive literature on T2D and community healthcare service system in China. The keywords used when searching for literature works are T2D, community health service centers, intervention, and patients. The literature works did research on multiple aspects that are related to the subject the author is writing about in this case study and thus provided valuable insights.

2.2. SWOT analysis

The main research method used in this study is SWOT analysis. The author used SWOT to analyze internal strengths, internal weakness, external opportunities and external threats present in current Chinese community healthcare system. Each of the S, W, O, and T is analyzed through several various respects. The analysis focuses on primary and secondary prevention of T2D in Chinese community healthcare centers and offers precious reference value for future China's future public health strategies on T2D.

2.3. Significance

T2D is one of the most wide-spread chronic diseases across the globe. Its complications include cardiovascular disease, neuropathy, nephropathy, retinopathy, diabetes foot, etc. These complications all lead to serious physical damage and create substantial inconvenience for the patients' daily lives. The prevalence of T2D in China is growing in recent years which makes it a paramount public health issue. The community healthcare service system which is responsible for primary and secondary prevention of chronic disease is the key to moderate this issue. However, only little research has been done on Chinese community healthcare system's intervention on T2D. Thus, more studies should be done. This study provides evaluation on how China's community healthcare service centers respond to T2D. The evaluation results also offer guides for China's T2D intervention scheme in the future.

3. Results and discussion

3.1. Overview of How China's Community Healthcare Service Responds to T2D

Chinese community healthcare service centers are responsible for primary and secondary prevention of T2D. When implementing primary prevention, they use online and offline resources to promote education and raise general public's awareness about T2D. When implementing secondary prevention, they provide overall screening, track glycemic control, and medication. These strategies will be evaluated in the following.

3.2. SWOT analysis of how China's community healthcare service responds to T2D

3.2.1. Internal strengths

1) Extensive range of spread (primary intervention: education & promotion)

Offline leaflets, notices, announcements, etc. are inexpensive. In China, the prices of color printers are usually around \$100 USD to \$200 USD. The prices of paper materials are less than \$0.04 USD per sheet. Thus, it is very cheap to produce paper-based leaflets, notices, announcements, etc. In each community centers in Chinese cities, there are several noticeboards for important news and announcements. Residents usually gather around the boards and absorb information from it. The community healthcare centers have the access to the boards. In other words, they are allowed to put contents about hygiene and health on the boards and let residents read them. Hence, community healthcare centers can use the public bulletin boards to promote information about T2D and how to avoid become pre-diabetes effectively. Leaflets can also be used to promote diabetic education. The community healthcare centers can post leaflets into residents' mailboxes or directly send them to residents' doors. This method ensures that each resident in the community actually gets the information about diabetes and its prevention strategies. As a result of the spread of diabetic educational information becomes extensive. Since there is a positive correlation between T2D and obesity, the prevalence of diabetes will be decreased if healthy lifestyles are being promoted extensively [8].

Online social media platforms such as WeChat Official Accounts in China are influential in spreading information. As a social media, WeChat has developed rapidly and is popular, and its number shows a rising trend with the increase of WeChat users. [9] Official Accounts is a specific section designed for individuals or organizations to post information on Wechat. Whenever the Official Accounts that are followed by the users post new contents, the users will be immediately notified since there is a block on the WeChat homepage for Official Accounts' messages. In most Chinese cities, each social community has a WeChat Official Account. Information about activities and important news are posted by the Official Account on WeChat platform. Lots of people who live in a community would check the community's Official Account regularly so that they wouldn't miss any important notice. Thus, when promotions of diabetic knowledge are posted on such platform, the general public is going to see them and consider them as useful. In this way, diabetic knowledge can be spread and kept in lots of people's minds effectively.

2) Precise control (secondary intervention: diagnosis & early treatment)

Glycosylated hemoglobin (HbA1C) level is one of the examination indicators when physical examinations are conducted in community health service centers. Blood glucose level is also measured. According to research, the glycosylated hemoglobin level (8.10 ± 2.00) % of type 2 diabetic patients in the observation group is significantly higher than that of healthy people (5.48 ± 0.33) %. [10]. In 2022, the American Diabetes Association sets glycosylated hemoglobin (HbA1C) level of higher than 6.5% (48 mmol/mol) as an important index for diagnosis of prediabetes. [11] Two characteristics of medical screenings provided by community healthcare service centers indicate that most of the residents live in the community are willing to go and take the screening examination. One is that the screenings are provided for free. Another is that the community healthcare service centers are located within local communities which is close to the residential areas. Thus, it only takes little energy and time for the residents to go to the healthcare centers and take the examinations. With a great amount of people attending the medical screenings which usually include tests for glycosylated hemoglobin level, people

will know whether there is a chance for them to develop into T2D patients. The total number of residents with diabetes is also going to be precise.

Treatment of T2D usually involves three parts: monitoring, medication, and modification of lifestyles. Monitoring includes daily tracking of blood glucose level and regular check of levels of factors that indicate further development of disease. Community healthcare service centers are capable of receiving the monitored data of the diabetic patients and profile the data. Therefore, when the disease shows tendency of exacerbation, immediate actions can be implemented to prevent further development of diabetes. Medication for T2D includes use of insulin, biguanides, and other oral medicines that improve insulin sensitivity. The community healthcare service centers can use the patients' profiled data to give prescriptions of medicines. The amounts of medicines prescribed will vary rapidly with respect to the patients' physical condition. The community healthcare centers are able to prescribe the right amount at the right time timely. This is because the community healthcare centers' near distance to the residential areas makes it convenient for residents to travel between home and the centers. Lifestyle management is also an essential part of treatment for T2D since obesity and lack of exercise contributes to occurrence of T2D. Modification of lifestyle proves to be an effective method of preventing further development of T2D. In senior untrained overweight people, a combination of moderate activity, consumption of *Calanus finmarchicus* oil, or a good diet, may improve fat loss and boost glucose metabolism [12]. Once again, due to the convenience of going there, community healthcare service centers have the ability to track patients' daily routine and suggest lifestyle rearrangements for them.

3.2.2. Internal weaknesses

1) Ineffective education and promotion (primary intervention: education & promotion)

It is hard to evaluate how much of the diabetic knowledge promoted has been actually absorbed by the general public who have seen the promotions. At present, the most common and economically worthy way of collecting people's thoughts on certain topics is by asking participants to fill out forms or questionnaires. This method, however, might be ineffective. For one thing, most people will not be willing to fill out the questionnaires. In order to make the evaluation of how the general public absorbing diabetic knowledge promoted thorough and complete, the questionnaires would be with hundreds of questions, requiring participants to answer each one with detailed sentences. Thus, the process of filling the questionnaires would be time-consuming and unpleasant. To save time and avoid having a torturing experience, most people who have seen the diabetic knowledge promotion will choose to ignore the existence of the questionnaire. As a result, only very little amount of data could be collected and a thorough analysis cannot be made. For another, the answers participants give in the questionnaire might not be able to reflect their actual mental activities. The expressions used in the questions on the questionnaire might lead the participants to answer in a specific way that is against their original natural thoughts. Also, the words participants write might not be able to express their thoughts accurately. Hence, the answers given by the participants might be interpreted by the ones analyzing the questionnaire responses mistakenly. Moreover, the staffs of the community health service centers may not possess the ability to analyze the questionnaires correctly even if the participants' thoughts are accurately expressed in their answers.

The knowledge content that can be disseminated by promotion is limited. In order to let the information, spread as far as possible, the words spread would be limited. Since lengthy articles filled with professional terminologies are certainly not welcomed by the general public who are lack of diabetic knowledge, the authors of the promoted contents tend to write short passages using straightaway language. Nevertheless, a lot of concepts related to diabetic diseases require detailed explanation using exact terminologies. Such concepts, hence, are not presented to the general public. This makes it difficult to provide the overall audience with an in-depth understanding of diabetic disease. Also, the staffs of the community health service centers may lack professional diabetic knowledge and writing skills so that they are not able to write articles that could provide effective education for the general public in the first place.

2) The cost is high (secondary intervention: diagnosis & early treatment)

The price of devices used for diagnosis of diabetes and early treatment themselves is high. The fee of maintenance for the equipment is also high. Nevertheless, the community health service centers are usually having limited budgets [13]. Such condition makes it extremely hard for community health service centers to provide continuous service of diabetes diagnosis for the local residents. The price of providing individual treatments for early diagnosed diabetic patients is even higher. In a district in Kunming, which is a city of medium economical level, 56.5% of patients pay more than 10,000 RMB a year for diabetes [14]. Thus, it is hard for community health service centers to keep track of early diabetic patients and provide continuous treatments for them.

The cost needed to manage the entire process of diagnosis and treatment is extensive. In order to provide diabetic diagnosis and treatment service for the entire community, a large number of staffs is needed. Nevertheless, no additional workforce had been sent to community health service centers to enhance the work. Since 2006, most community health service centers have included patients with T2D into community management, and the number of patients under management has doubled several times, and some even more than ten times, but the number of staff has not increased significantly. [15] The reason behind such phenomenon is that extensive amount of additional cost would be spent if more labor force is hired. Costs are also required to manage the community health service center staffs and residents waiting for diagnosis and treatment.

The time required to complete an overall diagnosis process for the entire community is long. The population within a community in China is immense. The community where I live in (Lianyang Community, Pudong District, Shanghai) has about 35,000 permanent residents. If the community health service centers are providing diagnosis service for every local resident in the communities, the time required to finish the diagnosis process would be extremely lengthy.

3.2.3. External opportunities

1) Government assisted promotion (primary intervention: education & promotion)

The National T2D Prevention Guidelines point out the importance of publicity and education. The publishing of such guidelines is approved by governmental agencies. Thus, the points made in the guidelines must fit with the thoughts of the government officials. In other words, the government officials agree with the perspective that it is important to enhance education and promotion of diabetic disease. Hence, the government may help promote information about T2D via official platforms which have great influence on the general public.

In recent years, the country has paid more and more attention to the publicity of chronic diseases. The current goal for China is to become a powerful socialist modernized country at the year of 2035. The government and people have been chasing this goal since 2020, when a moderately prosperous society in all respects was built in China. One thing that needs to be accomplished in order to become a powerful socialist modernized country is to ensure that the health condition of people is sound. As the government of a country with a large population with chronic diseases such as T2D, the Chinese government would certainly be willing to promote knowledge about such diseases.

2) Apply for government subsidies (secondary intervention: diagnosis & early treatment)

As mentioned before, in order to reach the goal of making China a powerful socialist modernized country at the year of 2035, the government would support activities that help to reduce the prevalence of clinic diseases in China. Thus, community health service centers may have the chance to apply for government subsidies and use them on diagnosis and early treatment for T2D. In this way, the problem of extensive costs for equipments, management, and extra work force can be easily solved. Also, the costs for individual treatments may be partially covered by the government. Hence, the secondary intervention of T2D can be continuously implemented in community health service centers all around China.

3.2.4. External threats

1) Commercial advertisements seize publicity resources (primary intervention: education & promotion)

Firms issue a large number of leaflets and notices to promote products, blocking diabetes education and publicity information. The primary goal for firms is to sell as many products as possible. In order to acknowledge the general public about their products, firms would make leaflets and notices. Some local firms may even pay money to the community's WeChat Official Account to post articles about their products. Under such circumstance, most of the leaflets, notices, and WeChat articles people see are advertisements for products of different companies. Thus, whenever people see leaflets, notices, or WeChat articles, they will assume they are commercial advertisements and ignore them. Gradually, even if the leaflets, notices, or WeChat articles are actually about T2D information, people will ignore them as well.

2) Diagnosis and treatment for other diseases may occupy the same resources (secondary intervention: diagnosis & early treatment)

The devices used to diagnose T2D may be used in diagnosis of other diseases which are newly introduced into the community healthcare service system. For instance, the equipment sphygmomanometer is used both in diagnosis of T2D and newly introduced cardiovascular disease. Thus, the situation in which diagnosis of newly introduced cardiovascular disease competes with the diagnosis of T2D for limited resources of sphygmomanometers is very likely to occur. Also, the staffs implementing diagnosis of T2D and other diseases are the same people. Thus, the situation in which they are busy diagnosing other new diseases other than diagnosing T2D is likely to happen. Hence, the efficiency of T2D diagnosis will be lowered.

4. Conclusions

The internal strengths and weakness that the Chinese community health service system currently have when coping with T2D are discussed in the article. The external opportunities and threats are also mentioned. Overall, the strengths are: the educations and promotions made have a wide spreading range and the ability to implement an accurate control in the secondary intervention stage. The internal weaknesses include: ineffective of education and promotion and a high cost needed in diagnosis and early treatment phase. The external opportunities are: the government may be willing to help in education and promotion of diabetic knowledge and provide subsidies for diagnosis and early treatment of T2D. The external threats are: the popularization of commercial advertisements may make the publicity resources for T2D less available and the fact that diseases newly introduced to the community health service system may occupy the same resources as T2D.

Upon the research done in this case study, 3 possible ways to improve how China's community health service responds to diabetes will be proposed in the following. First, the government needs to pay more attention to the intervention of T2D. To be specific, the government may help to publicize T2D via official accounts on social media platforms and provide subsidies for the community health service centers within China. Second, the official guidelines written for intervention of T2D may give more detailed directions on how to manage works related T2D in Chinese community health service centers. The direction may include how to distribute resources in diagnosis and treatment of T2D and how to improve the professional ability of staffs working in the community health service centers. Third, the commercial advertising activities should be limited by the government through legislation so that important information posted by community health service centers will not be ignored by the general public.

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