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A preliminary exploration of the population distribution of tuberculosis in China

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Abstract. Tuberculosis (TB) is one of the ten leading causes of death worldwide and one of the major infectious diseases in China. This article collects and summarises relevant professional literature. To summarize the epidemiological characteristics of tuberculosis in China, the causes of its formation and the countermeasures against it. Over the past decade, the reported incidence of tuberculosis in China has been slowly declining but is still higher than the world average. The Chinese government currently have huge pressure to prevent and control tuberculosis. In future prevention efforts, emphasis should be placed on the elderly, adolescents, men and farmers. Relevant organizations should ensure that students are screened for tuberculosis at school and that the elderly are screened for it.

Keywords: Tuberculosis, Population Distribution, Risk factors, Control strategies

1. Introduction

Tuberculosis is a chronic infectious lung disease caused by Mycobacterium tuberculosis. It is also a major infectious disease in China. China remains one of the world's 30 high-burden countries for tuberculosis [1]. According to the World Health Organization's Global Tuberculosis Report 2021, the estimated number of tuberculosis cases in China in 2020 will be 842,000, accounting for 8.5 per cent of the global total. This is the second-highest number of tuberculosis cases in the world. In addition to clinical symptoms such as cough, sputum, sputum blood or hemoptysis. There are also generalised systemic symptoms such as low-grade fever, poor appetite, lethargy, fatigue, and irregular menstruation, which seriously affect the health and safety of patients. This disease seriously affects the health and safety of patients [2]. Tuberculosis is a highly consumable disease. Patient's burden of medical costs is high. And it also has a certain impact on patient's health and quality of life. At the same time, the disease has a long treatment cycle, which can affect regional economic and social development. Moreover, delayed treatment of tuberculosis may lead to serious complications such as pulmonary heart disease, lung cancer and pulmonary hypertension. These complications not only aggravate the condition but even endanger lives [3].

According to the latest version of the Law of the People's Republic of China on Prevention and Control of Infectious Diseases amended in 2013, infectious diseases are categorized into 44 types in 3 categories, namely Category A, B and C. The latest version of the Law is the latest version of the Law. Tuberculosis is a statutory Class B infectious disease. A total of 4,805,088 cases of incidence and 15,626

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deaths were reported in China in 2015-2020. The average annual incidence rate is 57.8747/100,000, ranking 2nd in the incidence of Class A and B infectious diseases. The mortality rate for tuberculosis is 0.1882 per 100,000 people. This figure is the second highest among all statutory infectious diseases, after AIDS and neo-coronary pneumonia [4].

2. Crowd Distribution

2.1. Age Distribution

By comparing the similarities and differences in the incidence of tuberculosis across China, the following conclusions were drawn. In terms of age distribution, the proportion of people over 65 is the highest and is increasing yearly. China's prevention and control policies should focus on people over 65 years of age. In recent years, as a result of the implementation of the Basic Public Health Tuberculosis Separate Program, tuberculosis symptom screening and chest X-ray examinations have been added to the physical examination programs for the elderly and diabetic population in primary health care facilities. This measure allows for earlier exposure to some cases of tuberculosis and also affects the reported incidence of the disease in people over 65 years of age.

Older persons have more chronic underlying diseases, such as cardiovascular diseases, tumours and other chronic diseases. Such diseases severely affect the immunity of older persons, making them more susceptible to infection by Mycobacterium tuberculosis [5]. Moreover, some diseases such as pulmonary fibrosis and chronic obstructive pulmonary disease (COPD) lead to changes in the microenvironment of the lungs in older people. This makes it easier for Mycobacterium tuberculosis to invade the lungs and also makes older people more susceptible to primary tuberculosis. Not only that, elderly TB cases have poor tolerance to therapeutic drugs. So, they are susceptible to side effects during drug administration and are prone to treatment interruption [6]. This leads to a high recurrence rate of tuberculosis in the elderly and a high rate of drug resistance. Besides, the elderly's knowledge rate of tuberculosis is the lowest among all age groups, accounting for only 47.2%. At the same time, the elderly are prone to neglecting their health problems. The Fifth Epidemiologic Survey of Tuberculosis in China found that nearly 40.0% of the elderly cases had no symptoms of tuberculosis. The proportion of symptomatic patients who did not consult a doctor was more than one-half, and 72.1% of them did not consult a doctor because they neglected their health. Those who did not consult the doctor because of financial difficulties accounted for 24.5%, higher than the national average of 18.2% [7]. Elderly people are not only physically conditioned to be weak and resistant to tuberculosis, but they also lack awareness of hygiene precautions. These factors greatly increase their probability of developing TB.

In addition, there is a small peak in the incidence of TB between the ages of 15 and 25. This age group consists mainly of high school and college students. Although the tuberculosis epidemic among students throughout China has been declining year by year, aggregated outbreaks of tuberculosis in schools occur from time to time each year. From January 2009 to June 2013, a total of 21 clustered outbreaks of tuberculosis in schools were reported throughout China. The average number of students affected in each outbreak was 25 [8]. In 2017, there were more than 40,000 cases of student tuberculosis in China. And the number of new cases of student tuberculosis accounted for 4.87% of all tuberculosis cases in the country. From 2014 to 2018 in Henan Province, the incidence rate of tuberculosis among students has shown a rising trend year by year [9].

Meanwhile, the proportion of student patients to all patients is increasing year by year. School tuberculosis outbreaks occur mainly in high schools, especially rural boarding schools and high school cram schools. These schools are huge and the number of students is large. So, the classrooms or dormitories are densely populated. The main problem for students is: that they are in the period of adolescent development. However, they are under great pressure to study, have irregular work and rest schedules, do not get enough sleep, and are poorly nourished. These lead to a decrease in the body resistance of the students. That is why students are prone to develop illnesses when infected with Mycobacterium tuberculosis. At the same time, adolescents have a lack of knowledge about TB prevention and treatment. Their symptoms after the onset of the disease are atypical and similar to those

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of the common cold. Therefore, they often treat it as a cold, which delays the diagnosis of the disease. In some cases, in order not to delay their studies, some students choose to buy their medication. This behavior leads to delayed diagnosis. Not only that, some students, after being diagnosed, deliberately conceal their illnesses from their class teachers or school nurses in order not to affect the Advanced Level Examination or the Secondary School Certificate Examination. They insist on attending classes with the disease, which leads to continuous transmission in the same class or dormitory.

The main problems in the schools are: Firstly, the schools do not implement the medical examination for new students. They are not able to detect tuberculosis patients at an early stage and promptly. Secondly, some schools do not have school nurses as required. Some schools do not implement a system for tracing the causes of sickness and absenteeism. They are unable to identify patients in a timely and proactive manner. Finally, school classrooms and dormitories are densely populated, with poor sanitation and poor ventilation. This creates a poor living environment for students.

The main problems of the tuberculosis control organizations are: firstly, they do not carry out active surveillance of the tuberculosis epidemic promptly. Secondly, after monitoring and discovering information on student patients, they did not carry out timely information verification and close contact tracing. In addition, after the outbreak, these organizations did not conduct on-site investigation and disposal and close contact screening promptly. Finally, there is no mechanism for communicating information on outbreaks between these institutions and schools.

2.2. Gender Distribution

Tuberculosis is more prevalent among men than women. This is consistent with the national and many provincial and municipal tuberculosis registries [10]. This may be due to the higher prevalence of smoking in men than in women. Smoking promotes bacterial adhesion to respiratory epithelial cells and increases alveolar permeability [11]. This has a suppressive effect on the immune system. Thus, smoking increases the risk of TB disease. It is also related to a variety of reasons, such as men's greater mobility, the pressure they bear in society, their social socializing, and their irregular lives. It is suggested that in the future, the government could conduct targeted TB prevention and treatment campaigns in places with relatively dense male populations and poor sanitation. Conducting campaigns at construction sites, labor markets, etc., to increase awareness and attention to tuberculosis among the male population and to reduce the incidence of tuberculosis [12].

2.3. Occupational Distribution

In the composition of the occupational group of people with tuberculosis, it can be found that farmers account for the largest share of the population. A study counted the population distribution of TB patients in Hebei Province from 2016-2020 [13]. The composition ratio of farmers was found to be 73.38%; followed by students, workers, and service industries.

Some scholars surveyed 621 migrant workers who fell ill in 2006-2008. It was found that the top three risk factors for exposure were: prolonged overtime labor, insufficient rest and sleep, and poor dietary nutrition. The remaining risk factors, in order of prevalence, are lack of hygiene, crowded and unventilated living, prolonged physical labor, and high residential mobility. Some data show that, in terms of working areas, the number of people who go out to work in coastal cities is higher than the number of people who work in inland cities and neighbouring counties [14]. This may be related to the relatively high prices on the coast, the poor nutritional status of migrant workers and the fast pace of life. In terms of the type of work performed and the number of years of work experience, the incidence of tuberculosis was predominant in the categories of security guards and waiters, where the intensity of labor was light, and in the categories of marketing and operators, where the intensity of labor was medium. They accounted for 37.32% and 46.9% respectively [15]. And the majority of people with long working years. This may be due to the relatively large number of persons engaged in such occupations. However, it cannot be ruled out that these people have poor living conditions, irregular work, irregular life, relatively long working hours, and so on. These need to be further studied. This may be related to

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factors associated with the low economic level of rural areas, relatively poor residential and living conditions, lack of transportation, poor accessibility to health services, and weak health literacy.

3. Control Strategies

3.1. Strengthening Education on Disease Prevention

Publicize through videos, lectures, pamphlets and bulletin boards. Explain the causes, hazards, treatment and prevention of tuberculosis to susceptible people. Let them fully understand the importance of tuberculosis prevention and treatment. And make them actively master the corresponding control and preventive measures [16]. At the same time, it is important to strengthen the education, management and supervision of environmental hygiene and personal hygiene of patients with confirmed TB. Promote them to develop good behavioral habits. Keep patients as far away from others as possible when they talk or cough, especially in crowded places, and do not spit to avoid infecting others [17]. The level of awareness about TB among the rural population should be raised. This will lead to regular screening and examination to prevent tuberculosis. At the same time, training of health personnel in rural areas can be strengthened to increase the screening rate for tuberculosis. Emphasis should also be placed on the rural environment and public health management to improve the rural population's health behaviors [18].

3.2. Reducing the Economic Burden

The Government continues to expand the coverage of medical insurance and gradually increase the reimbursement rate. This will reduce the financial burden on cases. According to a national survey, 95.6 per cent of elderly tuberculosis cases are covered by various types of medical insurance. From the time of consultation to the time of diagnosis, 84.2 per cent of new cases and 75.0 per cent of known cases paid out-of-pocket [19]. From this, it can be seen that medicare coverage is broader today. However, the percentage of out-of-pocket payments for medical expenses from the time of consultation to the time of diagnosis is high. Some scholars have argued that tuberculosis should be managed by single-case flat-rate payments to reduce the financial burden on cases [20]. In addition, governments at all levels need to increase their investment in primary healthcare services to improve their accessibility and utilization. This will increase the detection rate of tuberculosis cases in the elderly.

3.3. Controlling Infectious Agents

Patients with tuberculosis are the main source of infection of tuberculosis. Because they are in a state of prolonged bacterial excretion, they pose a certain potential threat to the surrounding population in indirect or direct contact with them. Therefore, to effectively prevent TB, susceptible people and patients with suspected TB, should have regular and intensive X-ray chest examinations. Patients should be diagnosed and treated early. To control the condition and the source of infection, and try to avoid the occurrence of infection.

In summary, although the reported incidence of tuberculosis in China is slowly declining, it is still higher than the world average. In future government prevention and control efforts should focus on key populations such as the elderly, adolescents, men, and farmers. Therefore, these populations should be targeted for prevention and treatment. Screening and TB prevention education should be strengthened for these people. And raise awareness and emphasize the importance of TB among these populations.

However, some limitations have been identified in the research. Most of the literature in this paper is selected from the Chinese literature. So, the summary overview of the topic is not comprehensive enough. And there are also some limitations in the quoted articles. For example, there is a lack of in-depth analysis of the occupational characteristics of TB patients, mobile populations, and the impact of the 2020 epidemic due to novel coronavirus infections. It is recommended to further optimize and improve the research design, etc. in future studies. This will allow for better collection and analysis of data on occupations, mobile populations, etc. and distribution characteristics. This will enable a more accurate and comprehensive understanding and reflection of the overall epidemic and distribution characteristics of registered tuberculosis cases.

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4. Conclusion

China has the second-highest burden of tuberculosis in the world. The incidence and mortality rates of tuberculosis are among the top five legally recognized infectious diseases. In addition, the number of drug-resistant strains is increasing. Therefore, the situation of tuberculosis prevention and treatment in China is very serious. Tuberculosis is a respiratory infection that is highly contagious and has a long course. There is currently no vaccine for adults. The BCG vaccine also has more limited protection. Therefore, early detection and diagnosis of patients as well as standardized treatment and management are the main points of TB prevention and control. In addition, latent tuberculosis infection and preventive interventions have become a hot topic of concern in the field of tuberculosis.In general, China's efforts to prevent and control infectious diseases have a clearer focus. Targeted prevention and control are being carried out for key diseases with high morbidity and mortality rates. This is significant in reducing morbidity and mortality from single diseases, as well as the overall morbidity and mortality from infectious diseases in the country. In addition, in terms of transmission routes, enteric and respiratory-type diseases remain the main causes. The outbreak of intestinal infectious diseases is particularly serious. Both intestinal and respiratory transmission are closely related to public hygiene practices. This is mainly caused by poor hygiene practices such as diet, drinking water and the respiratory tract. The correction of bad hygiene habits and the development of good hygiene habits are mainly achieved through health education and the popularization of science. Therefore, sustained and in-depth health promotion must be continuously promoted as a key element in the prevention and control of infectious diseases. The Government should formulate appropriate prevention and control policies for areas with high morbidity rates, implement all basic work and explore new means of prevention and control. The goal of ending the epidemic of infectious diseases should be realized at an early date.

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