Study on the awareness and its influencing factors of patients with pulmonary tuberculosis on preferential policies for tuberculosis prevention and treatment in Shandong, China

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Abstract
We investigated the awareness and its influencing factors of patients with pulmonary tuberculosis on preferential policies for tuberculosis prevention and treatment in Shandong, China. A total of 858 patients with pulmonary tuberculosis between January 1, 2018 and September 30, 2019 were surveyed with questionnaires. The basic information (age, sex, education level, family financial situation, disease and diagnosis and treatment, etc), policy awareness, and satisfaction survey status, etc of these 858 tuberculosis patients were collected and analyzed with SPSS software (Chicago, IL). The awareness of tuberculosis patients on preferential policies for tuberculosis prevention and treatment was acceptable with awareness rate of 75.17% (645/858), but their satisfaction with the current policies was not ideal. Debt status and total household assets were the influencing factors of awareness (P < .01). Patients with pulmonary tuberculosis expected to get more free items and lower-cost auxiliary drugs. Patients with pulmonary tuberculosis have different levels of awareness on preferential policies for tuberculosis prevention and treatment. Therefore, targeted promotion of preferential policies for tuberculosis prevention and treatment and different management methods for different patients are of great significance to the treatment of tuberculosis epidemics.

Abbreviation: GDP = gross domestic product, RMB = renminbi.

Keywords: awareness, preferential policy, prevention and treatment, tuberculosis, tuberculosis patients

1. Introduction
Tuberculosis is a chronic respiratory infectious disease that seriously endangers human health. It can cause work incapacity of patients and bring serious economic losses to society and families. China is one of the countries with the most severe tuberculosis burden, with the number of tuberculosis patients ranking 3rd in the world. In recent years, preferential policies for tuberculosis prevention and treatment have been continuously enhanced and improved in China. Local governments have actively implemented policies to reduce tuberculosis treatment costs and to effectively reduce the burden of tuberculosis patients. The awareness of patients on preferential policies for tuberculosis prevention and treatment will directly affect their compliance with standard management of tuberculosis.

Currently, the awareness rate of tuberculosis prevention and treatment have been extensively studied in China. Some studies also investigated the awareness of patients on the preferential policies for tuberculosis prevention and treatment. However, the specific effect evaluation of the preferential policies for tuberculosis prevention and the survey on the treatment satisfaction are rare, and there is a lack of systemativeness.

Herein, this study investigated the current status of patients’ awareness of preferential policies for tuberculosis prevention and treatment in Shandong, China. The factors that may affect patients’ awareness were evaluated. The ways of knowing the preferential policies and the degree of satisfaction were also evaluated. Our findings may help to understand the current implementation and existing problems of preferential policies for tuberculosis prevention and treatment, and may provide basis for policy making on the prevention and treatment measures of tuberculosis.
2. Materials and methods

2.1. Subjects

The subjects who were surveyed for tuberculosis in Shandong, China between January 1, 2018 and September 30, 2019 were enrolled. Inclusion criteria: Patients aged over 15 years old; Patients diagnosed with pulmonary tuberculosis according to “Diagnostic Standards for Tuberculosis (WS288-2017).” Written informed consent was obtained from all subjects. This study was approved by the Ethics Committee of Shandong Public Health Clinical Center.

2.2. Sampling method

A stratified cluster random sampling method was used in this study. First, according to the per capita Gross Domestic Product (GDP) level, all prefecture-level cities in Shandong, China were sorted into three categories: cities with good GDP level, medium GDP level, and poor GDP level. Then, a simple random sampling method was used to select a prefecture-level city from each category. Secondly, according to the per capita GDP level, all the counties of the sample cities were sorted, and 3 counties were randomly selected from each prefecture-level city using equidistant sampling method. Then, 6 towns were randomly selected from each sample county. Totally, subjects from 34 townships were surveyed.

2.3. Questionnaire survey

The self-designed questionnaire was used. All investigators were trained before the survey to standardize the survey method and standards, and to ensure the survey quality. The survey contents included basic information (age, sex, education level, family financial situation, disease diagnosis and treatment, etc), awareness of preferential policies for tuberculosis prevention and treatment, ways of knowing the preferential policies and policy satisfaction. The socioeconomic status was reflected by the variables of education level (elementary school and below; junior high school; technical secondary school and high school; and, university and above), occupation (farmers and others), family income status (low-income: family annual income < 50,000 renminbi (RMB); middle income: family annual income 50,000–199,999 RMB; high income, family annual income ≥ 200,000 RMB), total household assets (low: disposable family assets < 30,000 RMB; middle: disposable family assets 50,000–199,999 RMB; high, disposable family assets ≥ 200,000 RMB), and household debt status (low: debt < 50,000 RMB; medium, debt 50,000–99,999 RMB; high: debt ≥ 100,000 RMB). The policy awareness was measured with a yes/no question. The questions actually asked to check awareness were “are you aware of the state policies that free anti-tuberculosis drugs are provided for tuberculosis patients?” and “are you aware of the state policies that fee reductions for chest X-ray examinations and sputum smear examinations are provided for tuberculosis patients?” The answer options were yes/no.

2.4. Statistical analysis

SPSS16.0 software (Chicago, IL) was used for statistical analysis of the data. The χ² test was used to compare the differences between groups, and the multivariate binary Logistic regression analysis was used to analyze the influencing factors. Significant difference was determined when P < .05.

3. Results

3.1. Basic clinical information of subjects

A total of 858 patients were surveyed in this study, including 614 males and 244 females. The subjects in the age group of 46 to 75 years accounted for 60% of the total subjects (516/858), which was the highest proportion. Subjects with education level of junior high school and below accounted for 82.75% of the total subjects (710/858). The major occupation of subjects was farmer, accounting for 76.22% (654/858). Additionally, 36.48% (313/858), and those in debt accounted for 39.63% (340/858).

3.2. Awareness and influencing factors of patients with pulmonary tuberculosis on preferential policies for tuberculosis prevention and treatment

The overall awareness rate of patients with pulmonary tuberculosis on preferential policies for tuberculosis prevention and treatment was 75.17% (645/858). Then, we further analyzed the effects of sex, age, education level, occupation, marital status, migrant working experience, medical insurance type, family economic status, and, diagnosis and treatment of tuberculosis patients on their awareness of preferential policies for tuberculosis prevention and treatment. As shown in Table 1, the awareness rate of subjects with different education level, income status, total household asset, whether in debt or not, and debt status were significantly different, suggesting that these were influencing factors of awareness rate (P < .05).

3.3. Multivariate binary logistic regression analysis of the influencing factors of awareness of patients with pulmonary tuberculosis on preferential policies for tuberculosis prevention and treatment

After adjusting for confounding factors, we performed multivariate binary Logistic regression analysis to further assess the influencing factors of awareness of patients with pulmonary tuberculosis on preferential policies for tuberculosis prevention and treatment. The results showed that the debt status and the total household assets of patients with pulmonary tuberculosis were the significant influencing factors of their awareness (P < .01) (Table 2).

3.4. Analysis on the satisfaction of patients with pulmonary tuberculosis with the current national preferential policies for tuberculosis control

According to this survey, there were 645 patients with pulmonary tuberculosis who were aware of the preferential policies for tuberculosis. Among them, 450 patients (69.76%) were satisfied with the preferential policies currently implemented; 119 patients (18.45%) were dissatisfied; and the remaining 76 patients (11.78%) showed indifference. In other words, most patients were satisfied with the current preferential policies. The main reasons for un-satisfaction are shown in Table 3. It can be seen that the main reasons were high examination cost (29.6%), high costs of auxiliary drugs (27.73%), and low reimbursement rate (27.47%). This suggests that patients with pulmonary tuberculosis mainly hope to reduce the cost of examination and auxiliary drugs and to improve reimbursement rate.

3.5. Health promotion of preferential policies for tuberculosis prevention and treatment

Among the 858 patients with pulmonary tuberculosis surveyed in this study, only 331 (38.58%) were aware of the preferential
policies for tuberculosis prevention and treatment before diagnosis of tuberculosis. The patients who were not aware of the preferential policies accounted for 61.42%. Table 4 shows how these 331 patients became aware of the preferential policies.

It can be seen that radio and television, publicity by relatives and friends, free consultation lectures, and education by doctors were the main ways for the population to understand the preferential policies for tuberculosis prevention and treatment.

Table 1
Influencing factors of awareness of tuberculosis patients on preferential policies for tuberculosis prevention and treatment.

| Factors                        | Awareness | Non-awareness | Awareness rate | \( \chi^2 \) | \( P \) |
|--------------------------------|-----------|---------------|----------------|-------------|--------|
| Sex                           |           |               |                |             |        |
| Male (n = 614)                | 467       | 147           | 76.06          | 0.904       | .342   |
| Female (n = 244)              | 178       | 66            | 72.95          |             |        |
| Age (yr)                      |           |               |                |             |        |
| <30 (n = 123)                 | 97        | 26            | 78.86          | 8.969       | .002   |
| 31-45 (n = 146)               | 113       | 33            | 77.40          |             |        |
| 46-60 (n = 235)               | 181       | 54            | 77.02          |             |        |
| 61-75 (n = 281)               | 209       | 72            | 74.38          |             |        |
| 76+ (n = 73)                  | 45        | 28            | 61.64          |             |        |
| Education level               |           |               |                |             |        |
| Elementary school and below (n = 359) | 251  | 108           | 69.92          | 14.797      | .002   |
| Junior high school (n = 351)  | 267       | 84            | 76.07          |             |        |
| Technical secondary school and high school (n = 128) | 109 | 19             | 85.16          |             |        |
| University and above (n = 20) | 18        | 2             | 90.00          |             |        |
| Occupation                    |           |               |                |             |        |
| Farmer (n = 654)              | 487       | 167           | 74.46          | 0.743       | .389   |
| Other (n = 204)               | 158       | 46            | 77.45          |             |        |
| Marital status                |           |               |                |             |        |
| Married (n = 649)             | 490       | 159           | 75.50          | 0.152       | .697   |
| Other (n = 200)               | 155       | 54            | 74.16          |             |        |
| Migrant working experience    |           |               |                |             |        |
| Yes (n = 760)                 | 574       | 186           | 75.53          | 0.440       | .507   |
| No (n = 98)                   | 71        | 27            | 72.45          |             |        |
| Types of medical insurance    |           |               |                |             |        |
| Urban residents medical insurance (n = 650) | 486  | 164           | 74.77          | 0.420       | .811   |
| Urban employee medical insurance (n = 92) | 69   | 23             | 75.00          |             |        |
| Self-financed and other (n = 116) | 90  | 26             | 77.59          |             |        |
| Income level                  |           |               |                |             |        |
| Low income (family annual income < 50,000 RMB) (n = 288) | 203 | 85             | 70.49          | 6.911       | .002   |
| Medium income (family annual income 50,000-199,999 RMB) (n = 376) | 285 | 91             | 75.80          |             |        |
| High income (family annual income ≥ 200,000 RMB) (n = 194) | 157 | 37             | 80.93          |             |        |
| Total household assets        |           |               |                |             |        |
| Low (disposable family assets < 50,000 RMB) (n = 313) | 210 | 103            | 67.00          | 17.968      | <.001  |
| Medium (disposable family assets 50,000-199,999 RMB) (n = 286) | 224 | 62             | 78.32          |             |        |
| High (disposable family assets ≥ 200,000 RMB) (n = 259) | 211 | 48             | 81.47          |             |        |
| Whether in debt or not        |           |               |                |             |        |
| Yes (n = 340)                 | 233       | 107           | 68.53          | 13.326      | <.001  |
| No (n = 518)                  | 412       | 106           | 79.54          |             |        |
| Household debt status         |           |               |                |             |        |
| No debt (n = 518)             | 412       | 106           | 79.54          | 13.511      | .004   |
| Low (debt < 50,000 RMB) (n = 124) | 84  | 40             | 67.74          |             |        |
| Medium (debt 50,000–99,999 RMB) (n = 126) | 88  | 38             | 69.84          |             |        |
| High (debt ≥ 100,000 RMB) (n = 90) | 61  | 29             | 67.78          |             |        |
| Pathogen                      |           |               |                | 0.076       | .678   |
| Positive pathogen(n = 337)    | 258       | 79            | 75.76          |             |        |
| Negative pathogen(n = 461)    | 341       | 120           | 73.97          |             |        |
| Unknown (n = 60)              | 46        | 14            | 76.67          |             |        |
| Drug resistance               |           |               |                | 1.280       | .258   |
| No (n = 832)                  | 623       | 209           | 74.88          |             |        |
| Yes (n = 26)                  | 22        | 4             | 84.62          |             |        |
| Treatment management          |           |               |                | 0.312       | .576   |
| Under full supervision (n = 692) | 523  | 169           | 75.58          |             |        |
| Other (n = 166)               | 122       | 44            | 73.49          |             |        |

RMB = renminbi.

Table 2
Multivariate binary Logistic regression analysis of the influencing factors of awareness of tuberculosis patients on preferential policies for tuberculosis prevention and treatment.

| Variable                        | OR    | 95% CIs         | \( P \) |
|---------------------------------|-------|-----------------|--------|
| Debt status                     | 0.731 | 0.616, 0.868    | 0.001  |
| Total household assets          | 1.619 | 1.257, 2.084    | 0.000  |
| Income                          | 0.976 | 0.722, 1.318    | 0.873  |
| Pathogen                        | 0.945 | 0.341, 2.619    | 0.913  |
| Drug resistance                 | 1.710 | 0.632, 4.628    | 0.291  |
| Treatment management            | 0.824 | 0.525, 1.334    | 0.400  |
| Sex                             | 0.833 | 0.565, 1.299    | 0.358  |
| Age                             | 0.861 | 0.716, 1.035    | 0.112  |
| Education level                 | 0.902 | 0.596, 1.364    | 0.624  |
| Occupation                      | 1.124 | 0.676, 1.870    | 0.653  |
| Marital status                  | 0.955 | 0.626, 1.566    | 0.830  |
| Migrant working experience      | 1.111 | 0.624, 1.976    | 0.721  |
| Types of medical insurance      | 0.931 | 0.557, 1.554    | 0.764  |

OR = odds ratio; 95% CI = 95% confidence intervals.
4. Discussion

In this survey, the number of male pulmonary tuberculosis was significantly higher than that of female pulmonary tuberculosis. The age group of 46 to 75 years old had the highest proportion of pulmonary tuberculosis. The main occupation of the enrolled subjects was farmer, and most of them had the education level of junior high school and below. These results, which are consistent with other previous findings in China,

Additionally, the awareness rate of patients with pulmonary tuberculosis about the preferential policies for tuberculosis prevention and treatment was 75.17%, which was higher than that in other areas in China. In 2017, a study by Shu et al[6] showed that the awareness rate of tuberculosis policies in Shandong was 55.61% in 2016 in Guizhou, China. In 2017, a study by Shu et al[6] reported that the policy awareness rate of tuberculosis patients in Jiangxi, China was 59.9%. The policy awareness rate of Uyghur tuberculosis patients was 47.55%.[7] However, the policy awareness rate of inpatients was relatively low, only 23.24%, and the awareness rate of patients in some specialized hospitals was only 8.46%. In recent years, Shandong Province has actively implemented the preferential policies for tuberculosis patients, which has increased the overall policy awareness rate of patients. However, the preferential policies have not been implemented in provincial and municipal specialized hospitals. Therefore, the awareness of patients in these hospitals may be unsatisfactory.

This study showed that the educational level, income, debt, and total household assets of patients with pulmonary tuberculosis were closely related to their awareness of preferential policies for tuberculosis prevention and treatment. However, Logistic regression analysis showed that the effects of educational level and income on the patients’ awareness were not significant. Previous studies have shown that age, sex, education level, occupation, household registration type, etc. have all been confirmed to be the main factors affecting the awareness rate of patients on tuberculosis prevention and related policies.

The difference in the results of this study may be related to the particularity of the survey subjects. Most of the survey subjects in this study were farmers, and the proportion of elderly population was large. Their education level was generally low, with 82.75% of subjects having junior high school education level or below. According to the logistic regression analysis, the economic status of tuberculosis patients (debt status and total household assets) was an important factor affecting the awareness rate of tuberculosis policies. Tuberculosis patients with poor economic conditions not only have a low standard of living, and lack of welfare and medical insurance, but also have a low degree of integration with mainstream society, and have fewer approaches to understand relevant knowledge and policies, thus leading to delays in treatment or interruption of treatments.[10,11] Therefore, in the prevention and treatment of tuberculosis, special attention should be paid to health education and guidance for patients with poor economic conditions and low educational level, therefore improving their compliance with treatment.

The subjective evaluation of tuberculosis patients in this survey showed that 69.76% of the subjects were satisfied with the current policy, which is lower than the satisfaction rate on policy guarantee and cost burden by Zhao et al[12]. In their study, patients’ satisfaction with medical insurance policies, cost burdens, and tuberculosis free policies were also lower than other evaluation indicators. The main reasons for patients’ dissatisfaction were the high cost of examination, high cost of auxiliary drugs, and low reimbursement rate. At present, the preferential policy for tuberculosis prevention and treatment implemented in Shandong Province only provides free first-line anti-tuberculosis drugs in the basic-level tuberculosis prevention institutions, and reduces or exempts the cost of chest X-ray and sputum smear examinations. However, with the improvement of medical conditions, designated medical institutions often use Digital Radiography, Computed Tomography and other examination methods in the diagnosis of tuberculosis, and conduct related auxiliary examinations to ensure the safety of medication before and during the treatment of tuberculosis, resulting in an increase in patient medical expenses.[12]

In the current medical insurance policy of most areas, tuberculosis is only included in the general outpatient reimbursement system, but is not included in the reimbursement system for special diseases such as chronic diseases. Thus, the reimbursement rate is low. Meanwhile, the transportation expenses and necessary nutrition expenses incurred by patients during the diagnosis and treatment process also bring a great burden to patients with poor economic conditions. Studies have shown that the economic burden of tuberculosis patients in China is still heavy and has rapid growth rate, which cannot be completely addressed by the existing preferential policies.[13,14] The government should increase free programs or increase the proportion of medical insurance reimbursement rates based on economic conditions and residents’ income levels; actively coordinate civil affairs departments to implement more medical assistance and provide transportation and nutrition subsidies for tuberculosis patients with financial difficulties, thereby preventing interruption of treatments due to financial reasons and increasing the cure rate.
5. Conclusion
This study shows that the awareness rate of tuberculosis patients in Shandong Province about preferential policies for tuberculosis prevention and treatment is higher than that of other regions in China. The patient’s family assets and debt situation are closely related to the degree of awareness of preferential policies. The patient’s understanding of the policy before tuberculosis diagnosis mainly comes from radio and television, publicity by relatives and friends, free consultation lectures, and education by doctors. Patient satisfaction with the current preferential policies is not ideal, mainly due to high examination costs, expensive auxiliary medicines and low reimbursement rates. Improving the level of awareness of tuberculosis patients on preferential policies for tuberculosis prevention and treatment is a long-term, systematic, and arduous task, but this work can effectively promote the patients to seek medical treatment, improve the control of tuberculosis infection, and has huge social and economic benefits. It is recommended to carry out a variety of tuberculosis health publicity and education in rural areas. It is also recommended to increase the ability of grassroots tuberculosis professionals to provide health education and policy publicity, so that they can better provide supervision and management and policy publicity services for tuberculosis patients. This can greatly improve the treatment compliance of tuberculosis patients and reduce treatment interruptions, therefore reducing the spread of tuberculosis.

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