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Study on the Effect of Behavioral Interventions Based on the Theory of "Knowledge, Attitude, Practice" on Tuberculosis Cognitive Level of Close Contacts

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Abstract: *Objective:* Based on the theory of "Knowledge, Attitude, Practice," health education was carried out for close contact with tuberculosis (TB) at a university in Beijing, and its impact on the students' awareness of TB was studied. This study could provide a reference for effective health education interventions among close contacts of TB in undergraduates. *Methods:* 102 undergraduates who had close contact with one confirmed case of pulmonary TB in April 2021 at a university were randomly divided into a control group and an intervention group. The intervention group was given the "Knowledge, Attitude, Practice" health education intervention by professionally trained doctors, and were asked to complete a self-designed TB-related questionnaire before and after the intervention. Both groups performed the Tuberculin Skin Test (TST) and chest X-ray (CR) examination. *Results:* The rate of the TST test was 18.6%, and CR examination showed 0 cases of pulmonary TB. The survey results showed that the TB awareness rate (96.1%, 49/51) in the intervention group was significantly higher than that of the control group (51.0%, 26/51), and the differences in awareness rate between the two groups were statistically significant ($P < 0.05$). Regarding the attitude/skills toward TB, the prevalence rate of tuberculosis-related attitude/behavior in the intervention group (94.1%, 47/51) was significantly higher than that of the control group (60.8%,31/51), and the differences between the two groups were statistically significant ($P < 0.05$). *Conclusion:* Both self-controlled and parallel-controlled studies showed that the health education intervention of "Knowledge, Attitude, Practice" improved the awareness of TB among close contacts of TB in undergraduates.

Keywords: Undergraduates; Close contact of tuberculosis; Behavioral intervention; Health education

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1. Introduction

Recently, the overall trend of tuberculosis (TB) incidences in China has been decreasing, but it is still a high-burden country for TB globally due to its large population base [1]. The number of TB cases reported annually

by China's Statutory Infectious Disease Reporting Information System (SIRIS) has ranked TB as the second highest among infectious diseases of categories A and B. The reported incidence rate of TB among students is about one-third of the whole population, and since 2011, TB has maintained its first place among infectious diseases of the student population in categories A and B. The age group of 15–24 years old accounts for about 85% of the total number of reported TB cases among students [2]. Colleges and universities are places with a high density of students, hence TB can be easily transmitted. Although undergraduates have some knowledge of TB through previous general education, they are still prone to anxiety and fear due to insufficient knowledge of TB, which increases their pressure and fear after coming in close contact with a TB patient [3]. The "Knowledge, Attitude, Practice" (KAP) theory has become a classic health education theory through the continuous process of acquiring relevant knowledge, establishing beliefs, and forming behaviors, that can effectively improve the health behaviors of students [4]. This study aims to improve the cognitive abilities of undergraduates who were in close contact with TB patients through the KAP intervention. This is to help them return to their normal lives and to provide a reference for the development of targeted health education interventions among undergraduates, especially among close contacts of TB.

2. Objects and methods

2.1. Research subjects

In April 2021, a college in Beijing discovered a suspected TB male patient in the outpatient clinic of the school hospital of the college. He was diagnosed with secondary TB, and his close contacts were screened. It was determined that there were 102 people in the same dormitory, class, laboratory, and club with the affected male, all of whom had cumulative contact with him for up to 40 hours in the month before the diagnosis. These students were randomly divided into 2 groups, 51 people in the observation group (37 men, 14 women), and 51 people in the control group (33 men, 18 women). The differences between the two groups of students in terms of gender, age, family residence, etc. were not statistically significant ($P > 0.05$).

2.2. Research methods

2.2.1. Questionnaire design

The questionnaire was developed based on the theory of KAP, concerning the public's, teachers', and students' core knowledge of TB, and other relevant information and literature [5]. This was combined with the actual situation of the students in the school and a total of 30 questions were listed. There were 20 questions in the knowledge section, including 5 core public TB knowledge, the significance of tuberculin skin testing (TST) test and chest radiograph, and the significance of preventive treatment and precautions, etc.; there were 7 questions in the attitude/behavior section, including attitudes toward TB outbreaks, discrimination, proactive reporting, and ventilation and disinfection skills. Before filling out the questionnaires, the investigators were uniformly trained and the questionnaires were distributed on the spot. With the purpose and significance of the survey being clarified, the surveys were conducted independently to protect the privacy of the respondents, and the questionnaires were recovered on the spot. Participants were required to sign a consent form. As part of routine infectious disease control, this study was exempted from ethical review.

2.2.2. Observational indicators

Students in both groups underwent the TST and chest X-ray (CR) examination by a specialized hospital designated by the Disease Control Department before observation. Before the intervention and 1 week after the intervention, the two groups of students were required to fill out self-designed questionnaires, following

the principle of informed consent. The total knowledge or possession rate was calculated as the number of respondents who answered all the questions correctly/ 100% of all respondents, and the knowledge rate for each question was calculated as the number of respondents who answered a question correctly/100% of all respondents, with 80% or more correct answers to the questions being considered as possessing knowledge or familiarity of TB-related knowledge, attitudes, and behaviors [6]. Total satisfaction of the intervention group: all satisfied questions of the surveyed students/100% of all questions of the surveyed students.

2.2.3. Intervention methods

After school hours, the school doctor who was responsible for TB prevention and control management became the main lecturer, and the intervention group was provided with a 1-week health education program, which included watching relevant videos on TB prevention and control, lectures on the prevalence of TB in schools in Beijing, knowledge of TB, the purpose and significance of the TST test, the significance of prophylactic treatment and attention to medication use, and the skills of disinfecting TB and seeking medical treatment. Three thematic lectures were provided, where each lecture was followed by 10 min of doctor-student interaction. Students could ask questions and seek counseling through the WeChat group. At the end of the intervention, a satisfaction survey was conducted, and a supplementary course education was carried out for the control group following the ethical principles.

2.3. Statistical analysis

The results were entered using Excel software, double entry data self-checking was implemented, and SPSS 22.0 was used for statistical analysis; count data were expressed as the number of cases (n) and percentage (%), and the comparison between the groups was performed using the chi-square test (χ^2). Results were considered statistically significant at $P < 0.05$.

3. Results

3.1. TST test results

As shown in **Table 1**, 19 out of 102 close contacts were strongly positive for TST, with a positive rate of 18.6%, including 13 males and 6 females, with no statistically significant difference.

Table 1. Comparison of TST positivity rate between male and female close contacts with TB [n (%)]

Gender	Strongly-positive	Moderately positive/generally positive/negative	Positive rate	x^2	P
Male	13	57	18.57%	0.000	0.983
Female	6	26	23.08%		

3.2. CR examination results

CR examination of 19 close contacts with strong positive TST tests showed that TB was excluded in all cases.

3.3. Comparison of TB knowledge before and after intervention in both groups

As shown in **Table 2**, there was a significant increase in TB knowledge rate among the intervention group ($\chi^2 = 35.700$, $P < 0.05$) after the intervention. There was a significant difference in the knowledge rate between the two groups ($\chi^2 = 26.646$, $P < 0.05$). The effect of the intervention of the 20 TB knowledge-related topics and their comparison between the two groups are shown in **Table 3**.

Table 2. Comparison of TB knowledge before and after intervention in the control and intervention group [*n* (%)]

Group	Pre-intervention		Post-intervention	
	Number of people who know	Awareness rate	Number of people who know	Awareness rate
Control	22	43.1%	26	51.0%
Intervention	21	41.2%	49	96.1%*$^{\Delta}$

Note: Δ vs. control, $P < 0.05$; * vs. pre-intervention, $P < 0.05$

Table 3. Effect of intervention on knowledge related to tuberculosis in the control and intervention group [*n* (%)]

Project	Group	Pre-intervention	Post-intervention	x^2	*P*
TB is a serious chronic infectious disease	Control	38 (74.5%)	39 (76.5%)	0.053	0.818
	Intervention	36 (70.6%)	51 (100%) *	17.586	0.000
TB is transmitted through the respiratory tract	Control	42 (82.4%)	43 (84.3%)	0.071	0.790
	Intervention	43 (84.3%)	50 (98.0%) *	6.725	0.010
Coughing, sneezing, covering the nose and mouth, and not spitting can reduce the spread of TB	Control	35 (68.6%)	40 (78.4%)	1.259	0.262
	Intervention	38 (74.5%)	50 (98.0%) *	11.922	0.001
When is it advisable to participate in preventive treatment?	Control	14 (27.5%)	20 (39.2%)	1.588	0.208
	Intervention	13 (25.5%)	48 (94.1%) *	49.960	0.000
When should we not participate in preventive treatment?	Control	15 (29.4%)	21 (41.2%)	1.545	0.214
	Intervention	18 (35.3%)	46 (90.2%) *	32.882	0.000
For those who should have participated in preventive treatment but failed to do so, regular chest radiographs were taken for review	Control	11 (21.6%)	15 (29.4%)	0.826	0.363
	Intervention	12 (23.5%)	45 (88.2%) *	43.305	0.000
Common disinfection methods for TB outbreaks	Control	20 (39.2%)	23 (45.1%)	0.362	0.547
	Intervention	25 (49.0%)	50 (98.0%) *	31.481	0.000
What is drug-resistant TB?	Control	25 (49.0%)	25 (49.0%)	0.000	0.999
	Intervention	23 (45.1%)	47 (92.2%) *	26.299	0.000

Note: *$P < 0.05$ compared to the control group

3.4. Comparison of TB attitudes/behavioral holdings before and after intervention in the control and intervention group

As shown in **Table 4**, the differences in TB attitude/behavior holding rate between both groups after intervention were significantly different ($\chi^2 = 21.647$, $P < 0.05$). There increase in TB-related positive attitude and behavior holding rate in the intervention group was greater than that of the control group after the intervention ($\chi^2 = 31.481$, $P < 0.05$). The outcomes of both groups before and after intervention are shown in **Table 5**.

Table 4. Comparison of TB attitudes/behavioral holdings before and after intervention in the control and intervention group [*n* (%)]

Group	Pre-intervention		Post-intervention	
	Number of holders	Holding rate	Number of holders	Holding rate
Control	26	51.0%	31	60.8%
Intervention	25	49.0%	47	94.1%

Note: Δ vs. control, $P < 0.05$; * vs. pre-intervention, $P < 0.05$

Table 5. TB-related attitudes/behaviors pre- and post-intervention outcomes [*n* (%)]

Project	Group	Pre-intervention	Post-intervention	x^2	*P*
China remains a high TB burden country	Control	20 (39.2%)	20 (39.2%)	0.000	0.999
	Intervention	22 (43.1%)	48 (94.1%) *	30.782	0.000
Eliminating discrimination and caring for patients improves adherence and cure rates	Control	22 (43.1%)	23 (45.1%)	0.040	0.842
	Intervention	23 (45.1%)	49 (96.1%) *	31.922	0.000
Report suspicious symptoms or a diagnosis of TB to your school	Control	25 (49.0%)	28 (54.9%)	0.353	0.552
	Intervention	26 (51.0%)	51 (100%) *	33.117	0.000
Willingness to participate in preventive treatment, if eligible	Control	17 (33.3%)	17 (33.3%)	0.000	0.999
	Intervention	15 (29.4%)	46 (90.2%) *	39.193	0.000

Note: *$P < 0.05$ compared to the control group

4. Discussion

TB is a chronic wasting disease, which gravely jeopardizes human health and is also a statutory Class B infectious disease in China. TB mainly occurs through droplet interpersonal transmission especially in colleges and universities with big populations, where students have frequent close contact with each other [7]. Undergraduates have many opportunities to attend classes in large groups and participate in club activities. Despite the challenges posed by the COVID-19 pandemic and safety measures implemented by the school, compliance with mask-wearing regulations among students is low, which greatly increases their risk of contracting TB. Once a case is introduced, it is highly likely to cause an epidemic of TB. In the past two years, due to the prevention and control measures of the campus from the epidemic of new crown pneumonia, the awareness of undergraduates on infectious diseases has increased. However, the lack of knowledge of TB instilled fear and anxiety in undergraduates from coming in close contact with TB patients. This negatively affects the daily life of undergraduates and affects their schoolwork progression as come consider taking a break from school due to the outbreak of TB. Based on the theory of KAP, this study aims to improve the knowledge of undergraduates about TB through health education and promote good prevention habits, especially close contacts to correctly treat the disease and prevent an epidemic. This will help create a relaxed and safe environment for the students.

The results of this study showed that none of the 102 cases of close contacts had TB, although the positive rate of TST was 18.6%. Through the KAP intervention, we explained to the students that if they were infected, they should maintain a good mindset albeit being at risk of TB, and reduce the possibility of developing TB by exercising, enhancing their nutritional intake, sleeping well, paying attention to environmental hygiene, and adopting healthy living habits. They were also advised to follow the doctor's prescription for anti-TB prophylaxis drugs, and the significance of the drug was explained in depth. After the intervention, the positive attitude/behavior holding rate of close contacts with strong positive TST rates towards TB preventive treatment was significantly higher than before the intervention, where 15 strong positive close contacts signed up for preventive treatment and completed it.

This study showed that the pre-intervention TB knowledge rate among undergraduates was less than 45%. It can be seen that the role of general education on TB carried out using freshmen health education in colleges and universities was relatively limited for new close contacts of TB. Furthermore, education has been implemented online due to the requirements of epidemic prevention and control, thus failing to achieve the educational purpose as the rate of TB prevention and treatment core knowledge is only slightly higher than that of the 2015 Beijing Public Health Survey [8]. The planned, organized, and evaluated TB KAP health education interventions for students and the faculty, especially the thematic education courses and counseling

programs, have a positive significance and role in preventing the risk of TB transmission on campus. It can cultivate undergraduates to be the first person responsible for their health, improve teachers' and students' in-depth knowledge of TB, awareness of prevention and control, rectify bad habits, maintain healthy behaviors, seek medical treatment promptly, early diagnosis and early treatment of illness, and truthfulness in reporting the disease. In addition, the Ministry of Education Healthy Schools ought to strongly promote the KAP health education intervention so that it can be widely implemented.

This study has some limitations. The sample size was small and the representative limitations may affect the extrapolation of the results. In addition, the intervention time was also relatively short, and the study subjects mastered the relevant knowledge after intensive indoctrination, but the long-term effect of attitude and behavior change lacked observation.

5. Conclusion

The implementation of KAP health education interventions among undergraduate students improved the awareness of TB among close contacts.

Disclosure statement

The authors declare no conflict of interest.

References

[1] Lei R, Zhang T, Wu C, et al., 2022, Investigation of an Aggregated Tuberculosis Outbreak in a University in Chongqing. China Tropical Medicine, 23(3): 289–292.

[2] General Office of National Health Commission, 2020, Circular of the General Office of the National Health Commission of the People's Republic of China and the General Office of the Ministry of Education on the Triggering of Guidelines for Tuberculosis Prevention and Control in Chinese Schools. Bulletin of the Ministry of Education of the People's Republic of China, 2020(11): 22 + 49–146.

[3] Zhou Y, 2020, Psychological Intervention Study of Close Contacts of Tuberculosis Patients in a University. China Medical Guide, 18(9): 146–147.

[4] Jin F, Wang F, Li F, 2020, Effect of "Knowing, Believing and Doing" Health Education in the Care of Elderly Patients with Diabetes Mellitus. Heilongjiang Medicine, 44(2): 257–258.

[5] Chen H, 2012, Research on health education intervention for tuberculosis in Zhabei District schools, dissertation, Fudan University.

[6] Zhang B, Liu Z, Hu Y, et al., 2019, A Survey on the Knowledge, Attitude and Skills of Freshmen About AIDS in a College and a Study of Different Health Education Models. China Health Education, 35(1): 62–65.

[7] Jia F, Li C, 2017, Research on Psychological Intervention for Close Contacts of Tuberculosis in a University in Qingdao. China School Nurse, 31(3): 161–162.

[8] Gao Z, Li Y, Xu Y, et al., 2020, Comparative Analysis of The Results of a Survey on the Public's Core Knowledge of Tuberculosis Prevention and Treatment in Beijing in 2006 and 2015. Health Medicine Research and Practice, 17(6): 5–11.