



# An Innovative Strategy for Scientific Popularization of Tuberculosis Prevention and Treatment Among Adolescents: A Volunteer Advocacy Program

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**Abstract.** Scientific popularization of tuberculosis (TB) prevention and treatment among adolescents is of utmost significance in fighting the battle against TB in China. To obtain initial progress in adolescent TB control, it is pressing to implement corresponding scientific popularization work for the specific group of youngsters. Entering the new media era, it has become the general trend to employ more innovative and high-tech methods for TB scientific popularization. As a science popularization team of a medical college, the volunteer team of TB prevention and treatment has contributed a lot to the practice and exploration of TB control among the youth. Specifically, they focused on the current situation and existing issues in the TB health education content, creatively proposed the “1 + N” service concept as their novel science popularization mode, and established a knowledge-sharing platform according to the audience’s characteristics. All the efforts made by the advocacy team have achieved satisfactory results .

**Keywords:** Adolescents · Tuberculosis prevention treatment · Science popularization

## 1 Introduction

Tuberculosis (TB) is a chronic infectious disease caused by *Mycobacterium tuberculosis*, which affects the whole human body. The bacteria primarily spread through close-range droplets, and the induced disease is often characterized by long incubation periods, subtle early manifestation, easy dissemination, and so on. The illness is the second-largest infectious disease, only surpassed by COVID-19 (coronavirus disease caused by the SARS-CoV-2 virus), and ranks 13th among the top causes of death around the globe. [1] In the long struggle for TB control, TB infections among children and adolescents have become a crucial global health topic. “Global Tuberculosis Report 2022 Factsheet” and “WHO Operational Handbook on Tuberculosis: Module 5: Management of Tuberculosis in Children and Adolescents” from the World Health Organization (WHO) suggest that since 2020, undiagnosed and untreated TB cases have risen, and the mortality rate of TB

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continued to climb. For youngsters, at least 1.1 million develop TB annually, accounting for 11% of all TB cases globally. Among those adolescent cases, only 399,000 cases, which account only for 36.5% of the total, have been reported to National Tuberculosis Control Program; all the increasing figures reveal the risks and negative impacts of TB on the Juvenile population's well-being should not be underestimated. [2].

## **2 Importance of Conducting Scientific Popularization of TB Prevention and Treatment Among Adolescents**

### **2.1 Insufficient Awareness of Adolescents on Core Knowledge of TB**

Adolescents are in the transitional period from children to grown-ups. There is no clear delineation of adolescence clinically. Usually, the WHO standard for the age of youths is from 10–19 years old, which is generally followed. [3] Teenagers are recognized as the population most at risk of infection of pulmonary TB due to their features, such as concentrating in specific neighborhoods and engaging closely with each other. Hence, when there is an outbreak of TB among teenagers, it is highly possible to flare up large-scale epidemics. However, a lack of knowledge and skills in TB prevention and treatment has become one of the leading reasons for teenagers being the vulnerable group in terms of TB infection. [4–6] Research conducted during the 13th Five-Year Plan period of China suggested that the awareness rate of adolescents on the core knowledge of prevention and treatment of TB ranged from 66.0% to 81.4%, lower than the requirement of public awareness rate of 85%, showing the worrying condition of the ignorance of TB among teenagers. Even worse, inadequate awareness in the adolescent group could generate delays in TB detection and access to care to compromise their health. It is also significant to note that, in China, previous studies identified a high rate of postponed clinical visits among student TB patients. In recent years, the phenomenon has been on the rise; over 50% of students have delayed their clinical visits for TB. [7–9] To this end, prevention and treatment of TB among adolescents continue to be the national priority of TB control in China.

### **2.2 Superior Acceptance of Various Forms and Interesting Modes of Scientific Popularization Among Teenagers**

Adolescence is the critical phase of growth and development; important tasks, including shaping scientific ideas and healthy lifestyles, are also among milestone agendas during this period. In 2015, the critical mission of the “Internet + science popularization” construction project was appealed for implementation in China. In response, it is imperative to innovate the full range of modes of science popularization based on the emerging industries in the new media era to promote high-quality development of scientific popularization on TB prevention and treatment among adolescents. It is also essential to adjust the breadth, depth, and content of scientific popularization according to teenagers' demands to enhance the effect of science popularization activities. [10] Ye et al. found that 96.13% of adolescents in Guiyang were willing to participate in the scientific popularization of TB prevention and treatment. Those students also expressed

their hope for schools to carry out such activities. [11] Likewise, Wang et al. reported that teenagers in Hunan Province exhibited strong abilities to accept something new. [12] In their study, science popularization modes with sound visual effects, substantial interests, and fast and convenient dissemination are more straightforward for teenagers to accept.

### **2.3 Improvement of Comprehensive Quality, Health Literacy, and Fitness Level of Adolescents Systemically**

However, the incidence of adolescent TB shows a local upward trend on the condition that significant outcomes have been achieved in overall TB prevention and control in China. For instance, Tao et al. recorded that the incidence of sputum smear-negative pulmonary TB among children and adolescents in Shandong Province has notably grown. Meng stated that most pulmonary TB cases in Lingbao City, Henan Province were among teenagers. Those studies suggested that attention should be paid to adolescents when conducting prevention and control of pulmonary TB, which is a vital step in the general prevention and control work. Further, to implement the “Healthy China 2030” Planning Outline and the “State Council’s Opinions on Implementing the Healthy China Action Plan,” China has sequentially issued the “School Tuberculosis Prevention and Control Work Regulation (2017 Edition)” and the “Guidelines for the Prevention and Control of Tuberculosis in Chinese Schools.” Those documents clearly defined and required TB prevention and control work among adolescents and proposed requirements for renewing science popularization measures, enhancing the propaganda effect, broadening the reach, and exploring targeted strategies to improve the awareness rate of adolescents on the core knowledge of prevention and treatment of TB, which posed great significance to prevent and control TB epidemic.

## **3 Problems and Shortcomings in the Scientific Popularization of TB Prevention and Treatment Among Adolescents**

### **3.1 Deficiency of Team Building**

Scientific popularization teams for TB prevention and treatment are mainly universalistic groups for the whole society, but few scientific teams directed at teenagers exist. Teenagers usually favor guidance from highly-targeted science popularization teams to comprehensively improve their knowledge acquisition of TB prevention and control. There are three significant drawbacks of team building: 1) The personnel size is unsatisfactory. Most current teams comprise professional TB prevention and control practitioners, medical staff, and community volunteers, resulting in varying professional competence, diversified activities, limited audiences, and poor science popularization continuity; this situation leads to grossly inadequate development of the workforce. Moreover, the elevated levels of universal educational attainment call for science popularization of higher standards. 2) The traditional working methods ignored the distinctive demands of the adolescent population. Routinely, science popularization is carried out in terms of preaching, showing less efficacy in disseminating obscure medical expertise

compared to interactive and fun formats of activities. The antiquated forms impede adolescents from understanding and accepting TB prevention and treatment-related knowledge and raising awareness of the prevention and treatment of the disease. 3) Expertise in science popularization personnel has yet to be competitive. To build well-targeted and dedicated workforces integrated with the demands of teenagers, science quality enhancement projects should be implemented. Also, the training of expert team members should be strengthened.

### **3.2 Conservative Approaches and Less-Abundant Forms**

The young generation is growing up with the rapid development of the internet; with the vast internet wave, they are also titled the “digital natives.” It becomes their nature to learn and entertain via the internet. Concretely, online learning, information search, and recreation can all be completed online with cell phones, tablets, and other intelligent devices, which is the norm of the life of teenagers. Under this circumstance, the new media era’s arrival brings higher requirements for scientific popularization on the professionalism of personnel, modes, and carrier construction. The “National Action Plan for Scientific Literacy 2021–2035” released by the State Council highlighted that the popularization of science and scientific and technological innovation should be equally important, scientific literacy improvement actions of the youth and information construction of science popularization should be performed, promoting the spirit of science should be throughout the whole process of education. Also, based on conventional forms of science popularization, the creation of premium content and communication capacity should be enhanced. For this purpose, the science popularization activities for the prevention and treatment of TB are supposed to innovate forms and to improve the experience and interestingness of online interaction plus offline immersing.

### **3.3 Outdated Methods with Weak Pertinence and Creativity**

Adolescents usually favor participatory and engaging modes of science popularization due to their intense curiosity and strengths in thinking and creating. After integrating with the characteristics of the youth, the science popularization work can be conducted smoothly by narrowing the scope of targets and objects, improving precision, boosting the professionalism of science education and level of specialization, and raising the efficiency of the work and capacity for social service. Meanwhile, the innovative forms of science popularization can provide a sound environment and objective basis for cultivating innovation and creativity in the adolescent group. Additionally, the scientific popularization of TB prevention and treatment requires continuous innovation. The combination of professional knowledge of TB control with fun activities can collide for fresh, acceptable, and popular forms of science popularization, bursting its vigorous vitality and helping to serve teenagers better. General Secretary Xi Jinping stressed that scientific and technological innovation and science popularization are the two wings to empower China for innovative development. As one of the essential factors, science popularization works to plant the seeds of respecting science and promoting innovation in teenagers’ minds. This work is of fundamental importance in comprehensively promoting the scientific literacy of adolescents, boosting social innovation culture, shaping

positive and friendly innovation environments, as well as cultivating innovative personnel and science popularization talents in the next generation.

## **4 Design of an Innovative Program for the Scientific Popularization of TB Prevention and Treatment Among Adolescents**

### **4.1 “1 + N” Service Concept and Optimization of the Team Building**

Our volunteer advocacy for TB prevention and treatment has operated science popularization activities for adolescents based on the “National Millions of Volunteers TB Knowledge Dissemination Action” project. In the process, the teams disseminated specialist knowledge on the medical field and initiated group ability-building proactively. To begin with, our volunteer advocacy for TB prevention and treatment is the principal science popularization team launched by the Chongqing Institute of Tuberculosis Prevention and Control. The team has established well-defined mechanisms for professional knowledge training, which were conducted by the specialists from the Chongqing Institute of Tuberculosis Prevention and Control, to improve the service level of science popularization and ensure the accuracy and normalization of the team’s expertise, thus meeting the needs of science popularization among the population of teenagers. The second is that our team originally summarized and put forward the “1 + N” service concept for the dissemination of knowledge by integrating the characteristics and needs of juvenile groups. To be specific, the “1 + N” service concept stands for one core knowledge dissemination team adding N teams of volunteers to boost the execution of dissemination service; one conventional target for knowledge dissemination plus N focuses on high-risk groups to achieve pertinence of dissemination service; one regular activity together with signature and classified events to promote service effectiveness. Those pioneer events held for adolescents have accomplished the goals set by the slogan of the program: “Experience events every month, explore highlights of every activity, encounter wonderful moments every time.” At the same time, the advocacy was not satisfied with the outcomes and continued to attempt to upgrade the service concept for version 2.0 of “1 + N” activity patterns, set further purposes for expanding publicity, dispelling misconceptions, and ongoing care, to offer adolescents better-targeted service of science popularization.

### **4.2 Connotation-Oriented and Diverse Forms**

Based on the status quo of participatory and exciting forms of science popularization preferred by teenagers, our volunteer advocacy designed various forms (17 types in total) of knowledge dissemination, including science-based songs, experimental medical observations, knowledge quizzes, science cartoons, public service announcements, science puzzles and so on, during the process of practicing “National Millions of Volunteers TB Knowledge Dissemination Action” project. To better combine audience needs, six feature activities were selected apart from regular ones, involving original crosstalks (Chinese-style comedy), science songs, knowledge contests, experimental medical observations, science cartoons, and science puzzles. As a popular art form, the

crosstalks were created and adapted according to daily life, local conditions, and the demands of teenagers. These tailor-made activities could maximumly achieve the purpose of disseminating scientific knowledge, approach, mindset, and spirit. Additionally, scientific songs were adopted to achieve the desired effect; for instance, a scientific song named “Alliance of TB Prevention and Treatment” was released online and played in the activities for the propaganda of TB prevention and treatment. The third activity is experimental medical observations to inform adolescent populations about TB causative factors. Microscopes and *Mycobacterium tuberculosis* smears were provided in the volunteer activities, and teenagers were invited to join in the medical experiments to observe *Mycobacterium tuberculosis* under microscopes. With the advantages of the medical profession of the volunteer team, the audience would grasp the related information of the pathogen under this intuitive experiment and pay increased attention to TB infection, control, and other related information.

Moreover, the advocacy introduced knowledge contests on the internet. Inspired by the popular idea of “Internet + science popularization,” the team proposed online knowledge contests called “Endorse for TB Prevention and Treatment.” In the competitions, those who got the highest scores in the fastest time became the “spokespersons” of TB prevention and treatment. Also, those winners would be invited to further science popularization events as volunteers to show their talents in spreading knowledge of TB. Besides, original cartoons were also employed. The volunteers designed and created a cartoon science handbook to make the knowledge of TB prevention and treatment interesting and easy to understand. It is more accessible for the youths to perceive obscure medical know-how in a light-hearted and humorous manner, which helps to accomplish the goal of TB knowledge taking root in teenagers. The final form of activity is the specialized science puzzles. The team carried out a public service advertising campaign to collect public service advertisements on TB prevention and control among Chongqing adolescents. Afterward, the excellent works were selected to customize the unique puzzles to be used in subsequent activities, making the “distant” knowledge of TB prevention and control more exciting and closer to life. TB knowledge was also spread to adolescents through a light-hearted and entertaining form. The team has actively explored the diversification of service forms to break all the barriers that challenge the development of novel knowledge dissemination and health education. By the above means, they attempted to get through the “last mile” of youth TB prevention and science popularization.

### **4.3 Resource-Sharing Mechanisms and Developments in Step with the Future**

The year 2023 is the initial year of the thorough implementation of the guiding principles from the 20<sup>th</sup> National Congress of the Communist Party of China. It is also a decisive year for comprehensively building a modern socialist country. Those significant situations give meaning to this year as a remarkable beginning for tremendous vigor and a critical step for concrete actions. Against this background, our advocacy of TB prevention and treatment will cooperate with the Chongqing Institute of Tuberculosis Prevention and Control, medical institutions, and schools, establishing a platform for sharing educational resources and a mechanism for sharing volunteerism in the aspect of scientific popularization of TB prevention and treatment among adolescents. In the practical application, partners in the project determined that the Chongqing Institute of

Tuberculosis Prevention and Control would play the role of guiding, and other teams should cooperate with each other to promote mutual cooperation and communication among all volunteers and staff. The scientific popularization teams are regarded as the major communicators of scientific knowledge and spirit, and the construction of those teams desires concentration to shape excellent teams with great skills and keen information capture ability, which allows them to stand at the front line of science services, and stay up-to-date of developments.

To equip scientific popularization teams of TB prevention and treatment among adolescents with sociality, participation, and promptness, building resource-sharing coordination mechanisms is imperative, allowing leverage the strength of program members and realizing resource sharing, optimal efficiency, and keeping knowledge of the prevention and treatment of TB advance with time. The teams for the prevention and treatment of TB are also looking forward to more volunteers working together with us to share our passion for TB science popularization, strive for the early realization of the ambitions of ending TB, and make more outstanding contributions to creating an international community of health for all.

## 5 Conclusion

In summary, in the scientific popularization of TB prevention and treatment among adolescents, the active innovation of scientific popularization forms and strategies can enhance the value of scientific popularization and social impact. With regard to the group identity of adolescents, teams for TB control are required to improve the precision of scientific popularization, boost the effective integration of expert knowledge and new media forms of activities and increase the interest and sense of engagement. In that case, the novel programs can generate outcomes of scientific popularization, strengthen the level of TB-related knowledge acquisition among the teenage population, and raise their awareness of TB prevention and treatment. Eventually, the ultimate goal of all the scientific popularization activities and programs and health education is to systematical upgrade adolescents' comprehensive quality, health literacy, and fitness level.

## References

1. LU CR, FANG HX, LU PX, et al. The global tuberculosis report 2021: key data analysis for China and the global world [J/CD]. *Electronic Journal of Emerging Infectious Diseases*, 2021, 6(4) 368-372.
2. SONG M, LU PX, FANG ZW, et al. The global tuberculosis report 2022: key data analysis for China and the global world [J]. *Electronic Journal of Emerging Infectious Diseases*, 2023, 8(01)
3. World Health Organization. Orientation program on adolescent health for health care providers [R]. Geneva: WHO, 2006: 1-30.
4. TAO NN, LI YF, LIU YX, et al. Epidemiological characteristics of pulmonary tuberculosis among children in Shandong, China, 2005-2017[J]. *BMC Infect Dis*, 2019, 19(1): 408.
5. MENG Q. Analysis of epidemiological characteristics of pulmonary tuberculosis patients in Lingbao City from 2011 to 2013 [J]. *Henan Journal of Preventive Medicine*, 2015, 26(3): 250-251, 255

6. DAI B, JIANG H, CHEN ZQ, et al. Analysis of epidemiological characteristics of pulmonary tuberculosis among students in Zhenjiang City from 2010 to 2015[J]. *Jiangsu Journal of Preventive Medicine*, 2016, 27(3): 315–316.
7. TAN C. Epidemiological characteristics and prevention of tuberculosis among students in Dazhou City[J]. *Sichuan Journal of Physiological Science*, 2019, 41(1): 25-2.
8. PAN GZ, DU YH, ZHANG JX, et al. Analysis of the epidemic trends of tuberculosis among students in Guangzhou City from 2011 to 2015 [J]. *Guangdong Medical Journal*, 2018, 39(21): 3245-3250.
9. ZHANG ZB, WANG GY, WANG XJ, et al. Delay in treatment and influencing factors of student tuberculosis patients in Wuhan from 2011 to 2018[J]. *Chinese Journal of School Health*, 2020, 41(9): 1368-1371.
10. China Internet Network Information Center. Annual Report on the Internet Use of Chinese Minors (2020) [EB/OL]. (2021–7–21) [2022–7–28].
11. Ye Z, YANG J, GUO P, et al. Investigation and analysis of knowledge, attitude, and practices of tuberculosis prevention and control among college students in Guiyang City[J]. *Chinese Journal of Antituberculosis*, 2023, 45(3): 265–270.
12. WANG D, GAO M, WEI BH, et al. Evaluation of the effectiveness of a tuberculosis health promotion program among high school students in a county of Hunan Province[J]. *Practical Preventive Medicine*, 2023, 30(01): 9–12.

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