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Comparison Between Peer-Led and Teacher-Led Education in Tuberculosis Prevention in Rural Middle Schools in Chongqing, China

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Abstract

The aim of this study was to investigate the efficacy of tuberculosis (TB) education through a comparison of peer-led and teacher-led methods of education about TB prevention among middle school students in rural Chongqing, China. A preintervention and postintervention questionnaire survey was conducted in 2 different middle school student groups to measure changes in knowledge, attitude, and practice (KAP) status of those students before and after each TB education program. Of 1265 students participating in the preintervention survey, 1176 completed the postintervention survey. KAP scores of both peer-led and teacher-led groups after intervention improved by as much as 2 times compared with before the intervention and those of the control group ($P < .01$). KAP scores of immediate evaluation were higher than those of long-term evaluation in the teacher-led education group ($P < .01$). The teacher-led group had a larger improvement than the peer-led group in practice scores ($P < .01$) in immediate effect evaluation.

Keywords

China, peer-led education, teacher-led education, middle schools, tuberculosis

Introduction

In response to numerous TB outbreaks frequently reported in middle schools across China over the past decade, the National TB Control and Prevention Program has identified students as one of the most important target population in 2001-2010.[1-3] Despite efforts to promote TB prevention, health education courses in the majority of China's middle schools, especially in rural areas, have been ignored because of a lack of professional health educators and high pressure caused by high school or college entrance exams, resulting in poor awareness on TB care and prevention

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among students.[4-6] Thus, it is urgent and necessary to find an effective and efficient approach to promote TB control in schools.

Available evidence indicates that children, especially adolescents, are more likely to share and accept information from their peers than their parents or other adults.[7] Peer education, therefore, has been reported to be an effective approach to promote health and behavioral changes.[8,9] In particular, peer-led education in school has been associated with successes in smoking prevention, substance abuse prevention, reproductive health promotion, and HIV/AIDS prevention.[10-14] However, very few peer-led programs have focused on TB prevention in middle and high schools. On a few occasions when the interventions were used, such as active TB prevention among international college/university students in the United States in 1992 and education for TB prevention in primary/elementary schools in China in 2008, the studies did not cover the adolescent population of middle and high schools, or there was a lack of comparison with other health education methods.[15,16]

Results from a national survey on knowledge, attitude, and practice (KAP) of TB prevention and control in 2006 by China Centers for Disease Control (CDC) suggested that a high percentage of teachers and students in middle schools, especially in rural areas, have poor knowledge of TB prevention and control because of inadequate health education in campuses. Only 38.8% of teachers and 34.1% of students reported having knowledge about TB symptoms, whereas less than 9% of students said that they knew how to prevent TB.[17] The low rate of awareness of TB might be associated with delay in seeking TB diagnosis and treatment and could negatively affect the National TB Control and Prevention Program.

In addition to environmental factors, the lack of TB-related knowledge and proper prevention behaviors has been a major factor affecting TB transmission. As a health education intervention, peer-led education may help improve students' TB-related KAP, which may contribute to TB prevention and control. Changes in knowledge and attitude usually indicate the short-term effectiveness of the intervention, whereas changes in practice reflect the effectiveness in the long term.

The present study aimed to assess the effectiveness of a peer-led TB education program by comparing KAP of TB prevention achieved by rural middle school students in a peer-led education group with those of students in a teacher-led group using the same school-based health education program in Chongqing, China. The study was also designed to measure the efficacy of both health education approaches by comparing 6-month follow-up data from both intervention groups with that of a control group that experienced no intervention. It is expected to produce scientific empirical evidence on the effects of peer-led health education programs on changes in KAP for Chinese teenagers from rural areas. The findings may provide health policy makers with research evidence on appropriate guidelines for health education programs aimed at improving effective TB control in China.

Methods

Study Site and Participants

This comparative study was conducted in Kai County, suburban of Chongqing Province, Southwest China, between September 2007 and December 2008. With two-thirds of its population in the agricultural sector, Chongqing is among the regions with the highest active TB prevalence rate. According to National TB Prevalence Survey in 2010, the province's TB prevalence was 549 cases/100 000 people compared with the national rate of 459/100 000.[18] In addition, a national survey in 2 Western provinces of China on public awareness of TB in 2006 also indicated that the TB awareness rate was 47.9% for teachers and 38.3% for middle school students.[17] Kai County was selected out of 11 poverty-stricken counties in Chongqing because it met our

selection criteria, including (1) being a poor county, (2) having high TB prevalence, (3) not having implemented any related health education interventions before, and (4) having good partnerships with local TB dispensaries.

The target population for this study was students attending rural middle schools. Middle schools in China were classified into 2 levels: junior stage (grades 6 or 7 to 9) and senior stage (grades 10 to 12). Three schools were selected by cluster sampling from the list of 6 middle schools in Kai County, including Tie Qiao, Wen Quan, and Feng Le middle schools. The selection criteria for those schools were (1) being in rural areas, (2) providing both junior and senior middle school education, and (3) having similar socioeconomic and geographic characteristics.

Calculation of the sample sizes of 70 students for each junior class and 83 students for each senior class was based on the estimated TB awareness rates of middle school students and the expected awareness rates to be improved to 80% after the intervention, assuming that a 2-sided significance level of .05 had to be used and a power of 90% was required. Our previous study estimated that the awareness rates of TB among middle school students used in the sample size calculation were 50% and 53% in junior and senior middle schools, respectively.[19] Because we applied cluster sampling for class selection and the design efficiency was 2, the sample sizes for junior and senior grades in each middle school were 140 and 166, respectively.

Intervention Design

Each of the 3 selected schools was randomly assigned to one of the following intervention groups: a peer-led group, a teacher-led group, and a control group. Students of peer-led and teacher-led groups received 1 month of peer-led or teacher-led health education, respectively, whereas those of the control group did not have any TB education. Three senior-grade classes and 3 others of junior grade were randomly selected from the 3 schools, respectively, to reach the required sample sizes. The study was approved by China's National Medical Ethics Committee of Operational Research on TB.

Social cognitive theory suggests that as a growing child's social world rapidly expands, peers would assume an increasingly important role in children's developing self-knowledge of their capabilities, and they can exert their influence on practice by actively shaping health behaviors or through more cognitively based social influence processes.[20] The development of peer-led and teacher-led TB education interventions were based around the observational learning concept of the Social Cognitive Theory by Albert Bandura, in which peers have the ability to participate in and promote health through cooperation and sharing information, and adolescents are more likely to accept information and change their health behaviors through observing and learning from their peers than adults.[21]

Students of peer-led and teacher-led programs were invited to participate in a 4-hour long TB education course and a wide range of group educational activities on TB prevention. The peer-led group received TB education from appointed peer leaders, whereas teacher-led groups learnt how to prevent TB through regular health education courses conducted by health education teachers. The peer education procedure included the selection and training of peer leaders, and a 1-month TB health education intervention.[22] A field supervisor was assigned to supervise and direct health educators' performance throughout the intervention period.

For the peer-led education intervention, we recruited 4 students (2 girls and 2 boys) from each participating class and trained them as peer educators. The selection criteria for peer educators were as follows: they (1) had to be volunteers and willing to help others and had to have (2) good interpersonal communication skills. In all, 24 peer educators received training on TB through a 1-day workshop provided by 5 specialists and researchers from Chongqing TB Center and Chongqing Medical University, including TB prevention and control knowledge, TB treatment policy, TB health strategies in schools, and peer education techniques. After the training, the peer

educators would conduct educational activities for their classmates, including face-to-face discussions on TB prevention, distribution of TB advocacy materials (eg, posters, placards, brochures, and notebooks), campus radio broadcasts, educational videos, campus newsletter publication, TB prevention paintings, TB knowledge quizzes, essay writing contest on TB, and "3.24 signature"—an activity supporting World TB Day on March 24, in which students were encouraged to show their willingness and determination to control TB by signing on a big red flag.

For the teacher-led program, 2 teachers were appointed by the school headmaster to participate in the intervention based on their willingness and good class teaching record. The selected teachers were invited to attend a half-day informal training with the research team on TB knowledge, treatment policy, and TB health strategies in schools. As part of the intervention, the health education teachers gave weekly lectures on TB prevention to the students and handed out TB advocacy materials on TB.

During the intervention month, peer leaders and health education teachers handed out hundreds of advocacy materials to students of 2 intervention schools involved in TB prevention. Peer educators conducted TB health education activities a total of 72 times during break time, class meetings, or group extracurricular activities. Health education teachers provided 4 hour-long lectures along with TB advocacy materials on campus.

Data Collection

Data were collected using a prequestionnaire and a postquestionnaire survey. Before the interventions started, a quantitative self-completed questionnaire survey was conducted to investigate students' TB awareness level at baseline. The questionnaire consisted of 60 questions totally, covering respondents' social and demographic information, basic knowledge about TB signs/symptoms and mode of transmission, and attitudes toward and practice of TB prevention and control. The practice was defined as major health behaviors related to TB prevention among students. The measurement of awareness rate for TB among the students was based on responses on TB KAP, whereas social and demographic information were counted as associated factors. The KAP scores were calculated as "1" for each correct answer and "0" for an incorrect one. Social and demographic information included whether the students were boarders or not, their mothers' education levels, and income of the students' families. Two self-completed questionnaire surveys were conducted 1 month and 6 months after the program to evaluate the effectiveness of the intervention.

Data Analysis

Data from the questionnaires were double entered using Epidata3.0. After validation, the data were converted into SPSS format and analyzed using SPSS version 13.0. Categorical data were displayed in the form of rates, and measurement data were presented as means plus or minus standard deviation for KAP scores of students before and after the intervention. ANOVA for repeated measurement was applied to compare the means of pre-KAP and post-KAP scores within each group. Covariance analysis was applied to compare the score differences among the 3 groups after intervention, whereas LSD was used to conduct multiple comparisons.

Results

Of 1265 students who took part in the present study, 692 were male and 573 were female; 49.3% were from junior grades, and 50.7% were from senior grades. Completed pretest and posttest data were obtained on 1164 students (92% of the original pretest sample). The average attrition rate

Table 1. Sample Size for Preintervention and Postintervention Surveys.

	Baseline Survey (n = 1265)	Evaluation Survey Immediately After the Intervention (n = 1178)	Evaluation Survey at 6 Months After the Intervention (n = 1164)
TQ school (peer-led group)			
Junior	225	216	216
Senior	251	228	225
WQ school (teacher-led group)			
Junior	194	194	192
Senior	220	185	201
FL school (control group)			
Junior	200	192	182
Senior	175	163	148

Abbreviations: TQ, Tie Qiao; WQ, Wen Quan; FL, Feng Le.

Table 2. Characteristics of Respondents in Each Group During Preintervention Survey (%).

Characteristics	Peer-Led Group	Teacher-Led Group	Control Group	Total
Gender				
Male	248 (52.1)	240 (58.0)	204 (54.4)	692 (54.7)
Female	228 (47.9)	174 (42.0)	171 (45.6)	573 (45.3)
Grade				
Junior	225 (47.3)	194 (46.9)	200 (53.3)	619 (49.3)
Senior	251 (52.7)	220 (53.1)	175 (46.7)	646 (50.7)
Total	476	414	375	1265

for the 3 groups was 7.0%. The sample size of preintervention and postintervention surveys broken down by school and grade level is presented in Table 1.

There were no significant differences in baseline survey results between the 3 groups in terms of social and demographic characteristics (Table 2). Data analysis also showed that mean KAP scores were not significantly different between the 3 groups before the intervention. The TB awareness rate of all respondents was 30.9%; the rate of correct responses to TB attitude-related questions was 55.3% and that to TB behavior-related questions was 39.1%. Students also indicated that the health education class was one of their most favorite channels to get TB knowledge together with consultations from doctors (64.5%) and radio or television programs (56.4%). Information that the students expected to gain included the most common signs/symptoms of TB (71.6%), health damages from TB (71.3%), and TB prevention (70.8%).

Intervention Satisfactory

Postintervention survey results showed that the peer-led program attracted the participation of the majority of students in this group. More than 60% of participants received advocacy materials for TB control, 60% joined in "3.24 signature" event, 58.0% were involved in designing TB information posters, and 49.9% wrote short essays about TB prevention.

The top 3 most popular peer educational activities as voted by participants were educational videos (76.4%), TB knowledge quizzes (75.3%), and the "3.24 signature" event (74.9%). The 3 activities were also listed as the top 3 most influential activities, including educational videos (54.8%), "3.24 signature" (53.5%), and TB knowledge quizzes (52.9%).

When students were asked for their opinions on the peer education program, 67.6% said that they were very satisfied with their peer education, and only 9.5% reported being unsatisfied with the program. The majority of students showed their support for the interventions by saying that they were "beneficial" and "acceptable" and suggested that there should be similar activities in schools and their community.

TB Knowledge, Attitude, and Practice

Table 3 shows that the KAP scores of the participating students increased significantly immediately and 6 months after the intervention in both peer-led and teacher-led groups ($P < .05$), whereas there were no significant changes in the scores of the control group.

All KAP scores from immediate evaluation were higher than those at long-term evaluation in the teacher-led health education group ($P < .01$). For the peer-led group, knowledge and attitude scores from immediate evaluation of health effects were higher than those at long-term evaluation ($P < .01$). However, there was no significant difference between immediate and long-term evaluations in terms of practice.

To exclude the influence of preintervention scores and measure the KAP increment differences more effectively, covariance analysis was used for multiple comparisons between the 3 groups after the intervention (Table 4). The covariates in the covariance analysis were age, gender, educational level of parents, whether they lived on campus, and whether they were only children. KAP scores of both peer-led and teacher-led groups improved significantly ($P < .01$) compared with the control group. Comparison results indicated that the teacher-led group achieved a larger improvement than the peer-led group in scores for practice ($P < .01$) at immediate evaluation of health effects. Meanwhile, the peer-led group obtained a larger improvement than the teacher-led group in knowledge scores ($P < .01$) at long-term effect evaluation.

Discussion

The preintervention survey suggests that rural middle school students are in great need of education on TB prevention. None of the participating schools had specialized health education teachers/courses. A large number of students lacked information about TB symptoms, mode of transmission, and prevention methods, though they showed strong willingness to gain the knowledge.

Field reports also revealed that in a classroom of 60 to 70 students, each student has on average less than 1 m^2 (approximately 11 square feet). In dormitories, approximately 7 to 12 students share a small flat with poor ventilation, and local residents still had the habit of expectorating on the floors of hallways, playgrounds, and streets. Therefore, it is urgent to improve students' awareness and behavior through various health promotion approaches.

The study results indicated that both peer-led and teacher-led programs significantly improved students' TB-related KAP as compared with the control group (Figures 1-3). This signifies that both interventions are effective approaches to improve students' KAP in TB prevention. Although several comparative studies have suggested that peer-led programs are more effective than adult/teacher-led programs in improving health knowledge and behaviors, the results of this study do not confirm this.[23-26] It is worth noting that most of these peer-led programs focused on sensitive topics such as sexual health, alcohol abuse, or smoking.

Although teacher-led education had a more immediate effect on practice aspects, peer-led education had a better long-term effect on students' TB knowledge. With the passing of time, students' KAP in the teacher-led group decreased significantly, KAP in the peer-led group remained unchanged. Taking into account the positive effects of peer-led education, a concurrent lack of health education resources, and high study pressure, peer-led education is an effective

Table 3. Preintervention and Postintervention Score Comparison in Knowledge, Attitudes, and Practices Within Each Group $\bar{x} \pm SD$.[a]

	Knowledge			Attitude			Practice		
Group	Pretest	Posttest[b]	Posttest[c]	Pretest	Posttest[b]	Posttest[c]	Pretest	Posttest[b]	Posttest[c]
Peer-led group	5.82 ± 3.54	13.51 ± 3.34**	13.21 ± 3.30**	5.40 ± 2.17	7.00 ± 2.19**	6.78 ± 2.22*	3.03 ± 1.59	4.66 ± 2.03*	4.53 ± 2.02*
Teacher-led group	5.59 ± 3.49	13.81 ± 3.06**	12.14 ± 2.84**	5.53 ± 2.22	7.34 ± 1.95**	6.90 ± 2.06**	3.28 ± 1.55	5.17 ± 1.96**	4.86 ± 1.90**
Control group	5.85 ± 3.43	6.64 ± 3.35*	5.59 ± 3.97	5.59 ± 2.33	5.34 ± 2.24*	4.66 ± 2.67*	3.47 ± 1.51	3.38 ± 1.70	3.13 ± 1.75

[a]*$P < .05$; **$P < .01$.
[b]Posttest scores immediately after the intervention.
[c]Posttest scores 6 months after the intervention.

Table 4. Multiple Comparisons After Intervention.[a]

	Knowledge		Attitude		Practice	
Multiple Comparison	MD[b]	MD[c]	MD[b]	MD[c]	MD[b]	MD[c]
A versus B	−0.30	1.10**	−0.27	−0.10	−0.55**	−0.30
A versus C	6.77**	7.58**	1.61**	2.09**	1.22**	1.39**
B versus C	7.07**	6.48**	1.88**	2.19**	1.77**	1.69**

Abbreviations: MD, mean difference after adjustment; A, peer-led education group; B, teacher-led education group; C, control group.
[a]***P* < .01.
[b]MD immediately after the intervention.
[c]MD 6 months after the intervention.

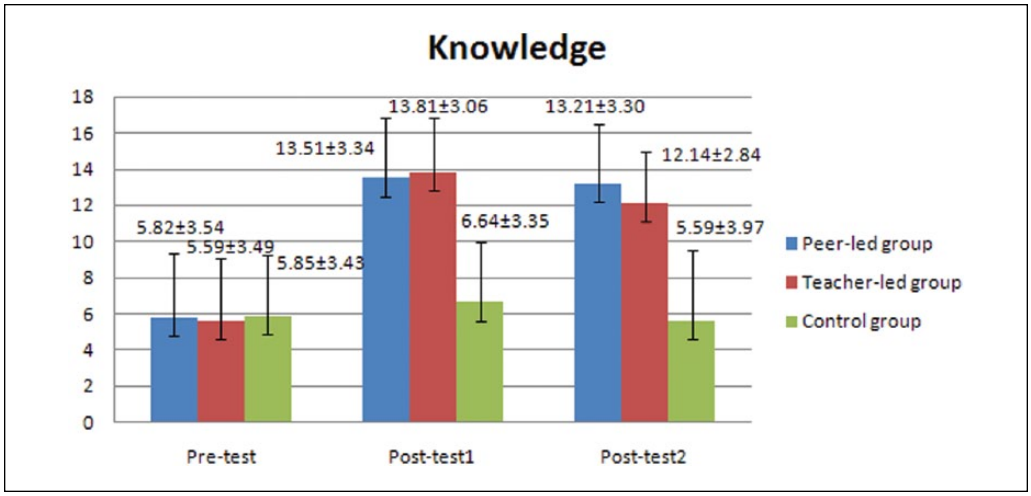

Figure 1. Preintervention and postintervention score comparison in knowledge within each group $(\overline{x \pm s})$.

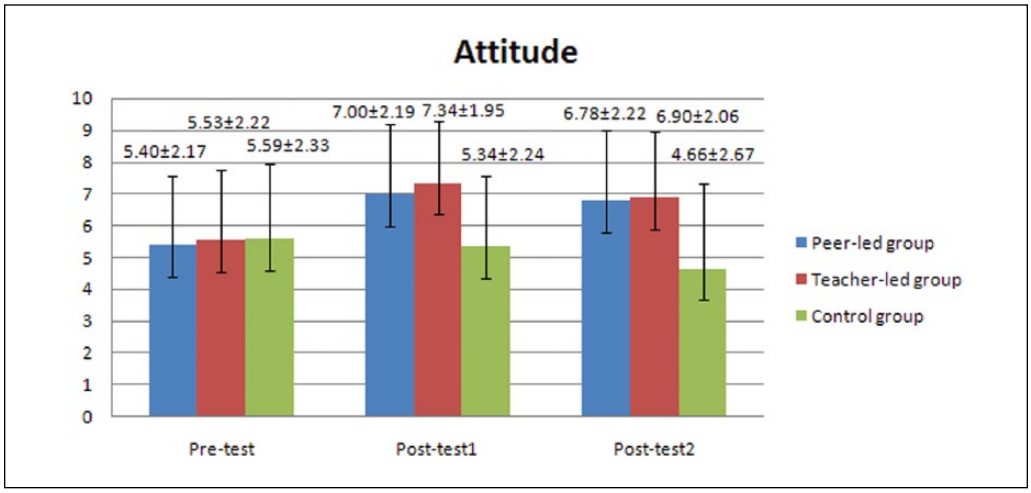

Figure 2. Preintervention and postintervention score comparison in attitudes within each group $(\overline{x \pm s})$.

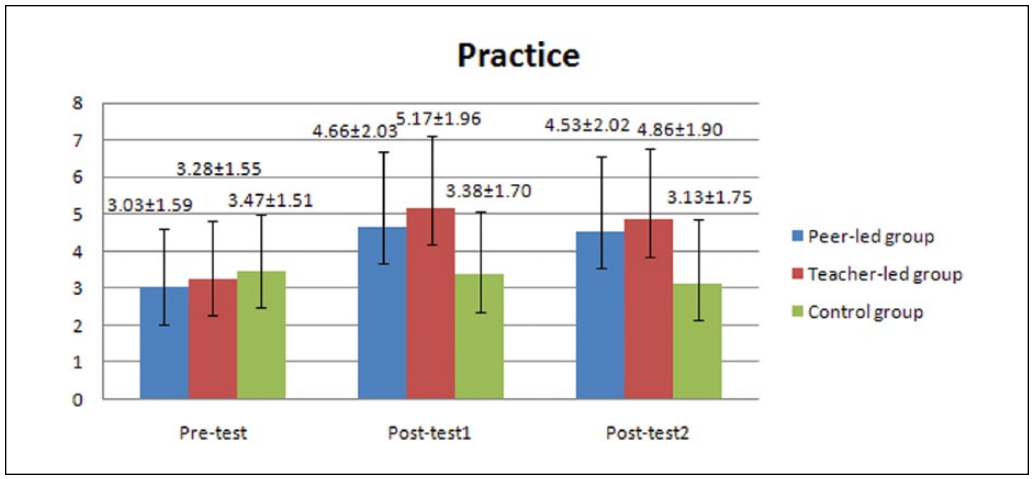

Figure 3. Preintervention and postintervention score comparison in practices within each group $(\overline{x \pm s})$.

health education approach to reduce the spread of TB in campuses, especially in rural middle schools in China.[17,27]

There were several advantages to conducting the peer-led TB education intervention in this study. First, there was low TB awareness among the target population in the selected schools. Second, both teachers and students expressed interest in learning about peer-led TB education. Most students were willing to act as peer leaders and participate in educational activities, whereas school leaders were willing to provide places and facilities to conduct those activities, such as computer labs and campus broadcast stations. Third, peer-led education was easy to carry out and received a good response among the students. Participating students preferred educational activities with high interaction, such as educational videos, the "3.24 signature" event, and TB quizzes. Most peer-led activities were held after school or during class meetings, so they did not interfere with routine classes. Fourth, TB advocacy materials developed by China CDC were eye-catching and easy to understand, so they were very well received among students.

A potential limitation of our study is attrition resulting from school transfer, dropouts, or rearrangement of classes, though the attrition rate was relatively low when compared with that of other peer education programs on campus.[28,29] Differences were found in postintervention practice scores among the 3 groups. We were also unable to conduct a cost-effectiveness analysis of peer-led and teacher-led education because of the small number of peer educators and health education teachers participating in each education program. A larger-scale study with a rigorous study design is needed to explore the cost-effectiveness of different education programs and to evaluate the impacts of the intervention in controlling TB incidence in the longer term.

Conclusions

This study demonstrated an innovative approach to compare peer-led and teacher-led education in TB prevention in rural middle schools in China and explored the differences between the 2 health education models. The peer-led program can help address the problem of lack of health teachers in rural middle schools. If students receive health knowledge from peers or teachers, they disseminate it to their families and communities through the chain of "teacher-student-families-communities," and thereby enlarge the scope and impact of health education. One study pointed out that students would disseminate health information to 9.38 times more people within

20 days after they got it and then enlarge to another 3.62 times more people through their family or community members.[30] In the process, peer education can promote the transition from awareness to attitude or practice change, so as to promote the formation of a healthy lifestyle.

Both peer-led and teacher-led programs could generate significant improvements in students' KAPs as regards TB prevention and control. To avoid a school TB outbreak, various forms of school-based health education should be undertaken, especially in rural middle schools. It is strongly suggested that an informed judgment should be made taking into account the local situation of the school, such as availability of a health education teacher and other resources, together with student characteristics and preferences. Schools in rural areas often lack qualified health education teachers and teaching materials, and therefore, developing a network of peer educators could be a helpful solution to promote TB health education on campus. Both peer-led and teacher-led education programs should be used together to achieve optimal and long-term effectiveness in TB control.

Declaration of Conflicting Interests

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