บทความวิจัย

ปัจจัยทำนายพฤติกรรมการป้องกันวัณโรคของนักเรียนชั้นมัธยมศึกษาตอนปลาย ในกรุงเทพมหานคร

Factors Predicting Tuberculosis Prevention Behaviors of Senior High School Students in Bangkok

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บทคัดย่อ

วัณโรคเป็นโรคติดต่อของระบบทางเดินหายใจที่เป็นปัญหาที่สำคัญทางสาธารณสุขทั่วโลก การวิจัยครั้งนี้เป็นการวิจัยพรรณนาเชิงพยากรณ์ มีวัตถุประสงค์เพื่อศึกษาอำนาจการทำนายพฤติกรรมการป้องกันวัณโรคของนักเรียนชั้นมัธยมศึกษาตอนปลาย ในกรุงเทพมหานคร จาก ปัจจัยการรับรู้ความเชื่อด้านสุขภาพ โดยใช้กรอบแนวคิดแบบแผนความเชื่อด้านสุขภาพของเบคเกอร์ กลุ่มตัวอย่างเป็นนักเรียนชั้นมัธยมศึกษาตอนปลาย ในสังกัดสำนักงานเขตพื้นที่การศึกษามัธยมศึกษากรุงเทพมหานคร และมีคุณสมบัติตามเกณฑ์ที่กำหนด จำนวน 243 คน คัดเลือกกลุ่มตัวอย่างโดยใช้วิธีการสุ่มแบบหลายขั้นตอน เครื่องมือที่ใช้ในการวิจัย คือแบบสอบถามที่ให้กลุ่มตัวอย่างตอบด้วยตนเอง ได้แก่ แบบสอบถามข้อมูลส่วนบุคคล แบบสอบถามด้านการรับรู้ความเชื่อด้านสุขภาพ ประกอบด้วย 1) แบบสอบถามการรับรู้โอกาสเสี่ยงของการเป็นวัณโรค 2) แบบสอบถามการรับรู้ความรุนแรงของวัณโรค 3) แบบสอบถามการรับรู้ประโยชน์ของการป้องกันวัณโรค 4) แบบสอบถามการรับรู้ต่ออุปสรรคของการป้องกันวัณโรค และ 5) แบบสอบถามพฤติกรรมการป้องกันวัณโรค มีค่าความเชื่อมั่นโดยสัมประสิทธิ์แอลฟาครอนบาค เท่ากับ 0.77, 0.86, 0.81, 0.83 และ 0.82 ตามลำดับ และผ่านการตรวจความตรงตามเนื้อหาทั้งฉบับมีค่าเท่ากับ 0.98 วิเคราะห์ข้อมูลโดยใช้สถิติเชิงพรรณาและใช้สถิติการถดถอยพหุคูณแบบเข้าพร้อมกัน

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ผลจากการศึกษาครั้งนี้พบว่า กลุ่มตัวอย่างอายุเฉลี่ย 16.74 ปี (S.D. = .93) กลุ่มตัวอย่างมีคะแนนเฉลี่ยพฤติกรรมการป้องกันวัณโรคโดยรวมเท่ากับ 66.92 คะแนน (S.D. = 11.47) อยู่ในระดับมาก ตัวแปรปัจจัยการรับรู้ความรุนแรงของวัณโรคและการรับรู้ประโยชน์ของการป้องกันวัณโรค สามารถร่วมกันทำนายพฤติกรรมการป้องกันวัณโรคของนักเรียนชั้นมัธยมศึกษาตอนปลายได้ ร้อยละ 8.6 (R^2 = .086, $p < .05$) ปัจจัยที่มีอำนาจการทำนายได้สูงที่สุด คือ การรับรู้ประโยชน์ของการป้องกันวัณโรค (β = .338, $p < .01$) รองลงมา คือ การรับรู้ความรุนแรงของวัณโรค (β = -.163, $p < .05$).

จากผลการศึกษาครั้งนี้มีข้อเสนอแนะว่า หน่วยงานต่างๆที่เกี่ยวข้อง ควรมีบทบาทสำคัญในการส่งเสริมสุขภาพเชิงรุกในโรงเรียน โดยอาจจัดทำโครงการคัดกรองวัณโรค หรือให้ความรู้เกี่ยวกับวัณโรค โดยคำนึงตามปัจจัยที่เกี่ยวข้อง เพื่อให้นักเรียนตระหนักถึงความสำคัญของการป้องกันวัณโรค

คำสำคัญ: วัณโรค พฤติกรรมการป้องกันวัณโรค นักเรียนชั้นมัธยมศึกษาตอนปลาย แบบแผนความเชื่อด้านสุขภาพ

Abstract

Tuberculosis is an infectious respiratory disease as a key public problem worldwide. This predictive descriptive research aimed to examine the predicting factors of tuberculosis preventive behaviors among senior high school students in Bangkok based on the factors of perceived health beliefs. The Health Belief Model of Becker was used as the conceptual framework in this study. Multi-stage random sampling was used to recruit the sample of 243 senior high school students of the Secondary Educational Service Area Office Bangkok who met the inclusion criteria. Research instruments were self-administered questionnaires including demographics, Health Belief Questionnaire which consisted of 1) Perceived susceptibility of tuberculosis infection, 2) Perceived severity of tuberculosis infection, 3) Perceived benefits of tuberculosis prevention, 4) Perceived barriers of tuberculosis prevention, and 5) Tuberculosis Preventive Behavior Questionnaire. The Cronbach's alpha reliabilities were 0.77, 0.86, 0.81, 0.83 and 0.82 respectively, and they had all been tested for content validity with a score of 0.98. Data were analyzed using descriptive statistics and enter multiple regression analysis.

The findings revealed that the mean age of the subjects was 16.74 years (S.D. = .93) The sample had a mean score of 66.92 (S.D. = 11.47) for the overall tuberculosis preventive behaviors at a high level. Perceived severity of tuberculosis and perceived benefits of tuberculosis prevention could co-predict overall tuberculosis prevention behaviors by 8.6 (R^2 = .086, $p < .05$). The factors with the highest influence are perceived benefits of tuberculosis prevention (β = .338, $p < .01$), followed by perceived seriousness of tuberculosis (β = -.163, $p < .05$).

Based on the study findings, the institutions should play a significant role in active health promotion in the schools by organizing the tuberculosis screening project or providing knowledge about tuberculosis based on the relevant factors to make students realize the importance of tuberculosis prevention.

Keywords: Tuberculosis, Tuberculosis prevention behaviors, Senior high school students, Health Belief Model

Introduction

Tuberculosis (TB) is an infectious respiratory disease, and is a key public problem worldwide. It is one of the top 10 causes of illnesses and death in several countries (World Health Organization : WHO, 2021; Department of Disease Control, Division of Tuberculosis, Ministry of Public Health, 2021). WHO estimated the incidence of TB worldwide up to 9.9 million patients (127 patients) per 100, 000 population in 2020. Thus, TB was announced as an international emergency that required urgent solutions. In 2021, Thailand was ranked in the top 30 countries with a high problem of TB (WHO, 2021; Bureau of Tuberculosis, Department of Disease Control, Ministry of Public Health, 2013). It was found that there were 35,951 new and recurrent tuberculosis patients, the reported rate of new and recurrent tuberculosis patients was 54 per 100,000 population. (Epidemiological and Emergency Operation Center, 2021). The most problematic area was Bangkok, Which is reported as the region with the highest new TB patients and those with TB recurrence in Thailand, 79.9 per the population of 100,000 due to the population density (Department of Disease Control, Division of Tuberculosis, Ministry of Public Health, 2021; Epidemiological and Emergency Operation Center, 2021). In 2021, the prevalence of TB was found in around 1.8 million adolescents worldwide (17% of all new TB patients), aged 10-24 years. If classifying adolescents aged 15-19 years, there were 535,000 TB patients (Laycock, Enane & Steenhoff, 2021).

TB in adolescents is usually disregarded in terms of setting prevention and caring strategies although this group is characterized by the drastic change in their physical development and increased peer interactions that cause a risk of TB spread and infection (Department of Mental Health, Ministry of Public Health, 2020). According to WHO (2020), senior high-school students include the middle and late adolescentes who are in their transition to reach full adulthood. Their physical development is almost complete, particularly, a maturity in body growth can be noticed. Thus, adolescents are less concerned with health promotion and disease prevention. It is also the age range of freedom of interactions, gathering in large groups, and an increased desire to always interact with friends. Therefore, there is a higher chance of unexpected TB infection in this age group. (Department of Mental Health, Ministry of Public Health, 2020; Ruangkanchanasetr, 2008).

Senior high-school students are another group with high risk of TB infection. After the covid-19 outbreak, senior high-school students have to return to school and have to study together with their classmates and class duration over 6 hours a day or 120 hours a month in classrooms for 6 months continuously. Most of ventilation in the classrooms is a closed system. If there is a TB student in a certain classroom, other classmates certainly have a risk of infection (Bureau of Tuberculosis, Department of Disease Control, Ministry of Public Health, 2013; Department of health, 2022). A study in South Africa township found that adolescents with tuberculosis it was not caused by coexistence with tuberculosis patients and 50 percent got tuberculosis from school. (Middelkoop, Bekker, Morrow, Lee, & Wood, 2014; Andrews, Morrow, Walensky & Wood, 2014). In Korea a study on the transmission of TB in a secondary school was conducted. In the school, 3 cases of active tuberculosis (TB) were found. After one year, the number of active TB cases increased to 40 in those schools (Kim et at., 2017). And in Thailand, the prevalence of pulmonary tuberculosis and latent tuberculosis among high school students is relatively low. The study found that none of the students had tuberculosis by screening by symptom screening and lung radiographs. And found

that 13 out of 270 students with latent TB, or 4.8%, were followed up after 1 year. None of them were infected with latent TB (Kornsitthikul et al., 2022).

According to literature review on TB prevention behaviors in senior high-school students or adolescents, there have been no studies on such issue in this particular group so far. Only the following at the level of junior high school or early adolescence. From the study, it was found that most of the junior high school students had 50.5% of TB prevention behaviors at a moderate level (Royviangkam, Therawiwat, & Imamee, 2021). It is also found other respiratory disease prevention behaviors. According to the studies on respiratory diseases, it was found that South Korean adolescents had high COVID-19 prevention behaviors by wearing surgical masks, but low social distancing behaviors (Park & Oh, 2021). Also, 54.8% of Chinese adolescents had SARS (severe acute respiratory syndrome) prevention behaviors as usual habits in 3 aspects, i.e., including good immunization, personal hygiene care, and environmental concern, 47.8% of them usually wore surgical masks (Wong & Tang, 2005).

To promote TB prevention in senior high-school students requires acknowledgement of the predictive factors of TB preventive actions. According to the concept of Becker (1974), it believes that perception is an indicator of health behaviors. An individual to show any bahaviors as actions to create good health conditions requires a variable to set a certain action, that is, the factor of perceived health, i.e., perceived susceptibility. According to the relevant studies, it was found that perceived susceptibility of TB of junior high school students in Bangkok Metropolitan Schools., positively related to TB and could predict TB prevention behaviors (Royviangkam, Therawiwat, & Imamee, 2021). In contrast, it was found that perceived susceptibility in household contacts living with TB patients in Surin Province, did not relate to TB and could not predict TB prevention behaviors (Japulee, 2010). As for perceived severity, the relevant studies found that perceived severity of TB of junior high school students in Bangkok Metropolitan Schools, positively related to TB and could predict TB prevention (Royviangkam et al., 2021). These did not conform to the study which found that perceived severity in people with TB contact in Bangkatum district Phitsanulok Province, did not relate to TB and could not predict TB prevention behaviors (Thomtong, 2021). As for perceived benefits of TB prevention, it was found that perceived benefits of TB prevention in household contacts living with TB patients in the Bangkok Metropolitan Region positively related to TB and could predict TB prevention behaviors (Montaisong, 2016). These contradicted the studies which found that perceived benefits of TB prevention in people with TB contact in Bangkatum district Phitsanulok Province did not relate to TB and could not predict TB prevention behaviors (Thomtong, 2021). And as for perceived barriers, the relevant studies found perceived barriers of disease prevention in household contacts living with TB patients in the Bangkok Metropolitan Region could predict TB prevention behaviors (Montaisong, 2016). This was different from the study which found that perceived barriers of disease prevention in household contacts living with TB patients in Si Sa Ket Province did not relate to TB and could not predict TB prevention behaviors (Muangklang, 2013). This could be concluded that the studies on the factors of perceived health beliefs relating to TB and predictability of TB prevention behaviors could not really make conclusions of those results.

According to literature review, it revealed that senior high-school students had a risk of TB infection. Thus, TB prevention is hugely indispensable for them. Bangkok is still the area with the largest TB infection in Thailand. (Department of Disease Control, Division of

Tuberculosis, Ministry of Public Health, 2021). Literature review also found that TB prevention relates to several factors, including perceived susceptibility, perceived severity, perceived benefits of TB prevention, and perceived barriers of TB prevention. According to all factors as stated, the researcher found that each research with different results could not make conclusions about the related factors. Also, there have been no studies on the related factors that could directly predict TB prevention behaviors in senior high-school students. Therefore, the researcher was interested to study the predictive factors of TB prevention behaviors in senior high-school students in Bangkok. In this study tlhe concept of health belief model by Becker (1974) was applied as the conceptual framework. The results could be used as a guideline on TB prevention in senior high-school students in the future for their good health.

Research objectives

To study predictability of TB prevention behaviors in senior high-school students in Bangkok based on the factors of perceived health beliefs, including perceived susceptibility of TB infection, perceived severity of TB infection, perceived benefits of TB prevention, and perceived barriers of TB prevention.

Research hypotheses

The factors of perceived health beliefs, including perceived susceptibility of TB infection, perceived severity of TB infection, perceived benefits of TB prevention, and perceived barriers of TB prevention can predict TB prevention behaviors in senior high-school students in Bangkok.

Conceptual Framework

This study was based on a health belief model improved by Becker (1974). The literature review revealed the TB can be prevented if senior high-school students have high perceived susceptibility because a key cause of TB infection is interpersonal infection by inhaling contaminated air into the body, both from unaware TB patients and TB patients who do not prevent spread (Butho & Suggaravetsiri, 2011). Also, in classrooms with a larger number of student and class duration over 6 hours a day or 120 hours a month in classrooms for 6 months continuously, if there is a TB student in a certain classroom, other classmates certainly have a risk of infection As for their perceived severity in terms of TB spread to other body systems, social disgust, or life-threatening level (Bureau of Tuberculosis, Department of Disease Control, Ministry of Public Health, 2013). When senior high-school students perceive such threat to their health as stated, they will be ready to take actions for TB prevention. They can also evaluate actions as with huge benefits for themselves and low difficulties/barriers. As a result, this brings cues to actions for TB prevention behaviors. Thus, the researcher applied health belief model as the conceptual framework in this research. The relating factors consist of perceived susceptibility of TB infection, perceived severity of TB infection, perceived benefits of TB prevention, and perceived barriers of TB prevention because they could describe TB prevention behaviors in senior high-school students efficiently. The conceptual framework is displayed in Fig. 1

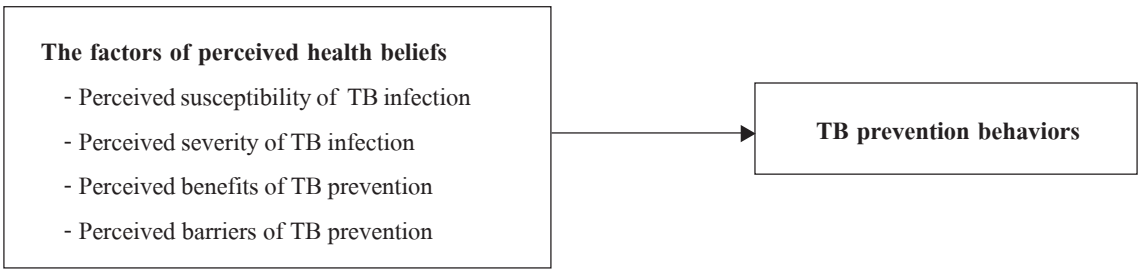

Figure 1: Conceptual framework

Methods

This is a predictive correlational research that aimed to study the predictive factors of TB prevention behaviors in senior high-school students in Bangkok based on the factors of perceived health beliefs, including perceived susceptibility of TB infection, perceived severity of TB infection, perceived benefits of TB prevention, and perceived barriers of TB prevention.

The population in this study included grade 10-12 high-school students in Bangkok under the Secondary Educational Service Area Office Bangkok 1 (SESAO), totally 119 schools, divided into 2 areas.Area 1 that included 67 schools with 52,995 senior high-school students and Area 2 that included 52 schools with 58,490 senior high-school students. There were 2 areas with a combined total of 111,485 senior high-school students (The Secondary Educational Service Area Office 1, 2022; The Secondary Educational Service Area Office 2, 2022). The samples in this study included grade 10-12 high-school students in academic year 2022. A total of 278 students participated in this study with 133 students coming from Nawaminthrachinuthit Satriwitthaya School Phutthamonthon under the SESAO1 and 145 students from Latplakhaophitthayakhom School under the SESAO2. Inclusion criterias for participants were 1) Grade 10-12 senior high-school students in Bangkok under the SESAO; 2) with complete consciousness and can communicate efficiently; 3) have a smartphone or c ommunication device that can connect to the internet; 4) no communication berries, i.e., they must neither be deaf nor dumb; and 5) with consent to answer the questionnaires by senior high-school students and their parents signing the consent form. The exclusion criteria for the sample group are intended to cease providing research information.

G*power version 3.1.9.7 (Faul, Erdfelder, Buchner, & lang, 2012) was used for calculation in setting sample size in this research, with the significance level of .05, power analysis = .80, and number of predictors = 4. Small effect size of $f2$ = .05 was obtained by calculating average correlation coefficient from 2 relating research papers (Montaisong, 2016; Kiksanthia,2014). 232 obtained the sample in this study. To prevent loss of the samples and incomplete questionnaires, the sample size need to be added 20% (Lemeshow, Hosmer Jr., Kla, & Lwanga, 1990); Therefore, 278 samples were obtained. 35 high school students withdrew. Thus, a total of 243 out of 278 participants were left

Instrument

The instrument for data collection included 3 sets of questionnaires.

Set 1: Personal data. The questionnaire was developed by the researcher with a total of seven questions as a checklist and open-ended questions.

The demographic questionnaire included gender, age, educational level, attending tuition schools, GPA, residence, and household TB patients.

Set 2: Perceived health beliefs. The perceived health beliefs questionnaire consisted of 47 items and divided into 4 parts as follows:

Part 1: Perceived susceptibility of TB infection - The researcher modified from the perceived susceptibility questionnaire of Montaisong(2016) and Muangklang (2013). There were a total of 13 item, seven of them were positive statements, including items 3-6, 11-12, and 13: while six of them were negative statements including item 1-2, 7-9, and 10. A 3-point Likert rating scale (3 = Yes to 1 = No) was used and it was divided into three levels as follows: Yes = the respondent agreed with that question most, Not sure = the respondent partly agreed with that question and No = the respondent totally did not agree with that question. The total score was in the range 13-39. The interpretation is as follows: 13-21 points are low perceived susceptibility of TB infection, 22-30 points are moderate perceived susceptibility of TB infection, and 31-39 points are high perceived susceptibility of TB infection. (Srisatidnarakul, 2010)

Part 2: Perceived severity of TB infection - The researcher modified from the perceived severity questionnaire of Montaisong (2016) and Muangklang (2013). There were totally 12 items. Eight of them were positive statements, including items 1, 5-6, 8-11, and 12, and four items were negative statements including item 2-4, and 7. It was a 3-point likert rating scale (3 = Yes to 1 = No) divided into three levels as follows: Yes = the respondent agreed with that question most, Not sure = the respondent partly agreed with that question and No = the respondent totally did not agree with that question. The total score was in the range 12-36. The interpretation is as follows::12-19 points are low perceived severity of TB infection, 20-27 points are moderate perceived severity of TB infection, and 28-36 points are high perceived severity of TB infection. (Srisatidnarakul, 2010)

Part 3: Perceived benefits of TB prevention - The researcher modified from the perceived benefits questionnaire of Montaisong (2016) and Muangklang (2013). There were a total of 12 items, 11 were positive statements, including items 1-3, 5- 11, and 12, and one item was negative statements including item 4. It was a three-point likert rating scale (3 = Yes to 1 = No) divided into three levels as follows: Yes = the respondent agreed with that question most, Not sure = the respondent partly agreed with that question and No = the respondent totally did not agree with that question. The total score was in the range 12-36. The interpretation is as follows: 12-19 points are low perceived benefits of TB prevention, 20-27 points are moderate perceived benefits of TB prevention, and 28-36 points are high perceived benefits of TB prevention. (Srisatidnarakul, 2010)

Part 4: Perceived barriers of TB prevention - The researcher modified from the questionnaire about perceived barriers questionnaire of Montaisong (2016) and Muangklang (2013). There were a total of 10 items and all were positive statements. It was a 3-point likert rating scale (3 = Yes to 1 = No) divided into three levels as follows: Yes = the respondent agreed with that question most, Not sure = the respondent partly agreed with that question and No = the respondent totally did not agree with that question. The total score was in the range 10-30. The interpretation is as follows: 10-16 points are low perceived barriers of TB prevention, 17-23 points are moderate perceived barriers of TB infection, and 24-30 points are high perceived barriers of TB infection. (Srisatidnarakul, 2010).

Set 3: TB prevention behaviors in senior high-school students. The researcher modified from the TB prevention behaviors in household TB patients questionnaire of Montaisong (2016) and Muangklang (2013). There were

a total of 17 items. A 5-point Likert rating scale (5 = Regularly to 1 = Never) was used and divided into five levels as follows: Regularly = everyday, Often = 5-6 days/week, Sometimes = 3-4 days/week, Rarely = 1-2 days/week, and Never = never. The total score was in the range 17-85. The interpretation is as follows: 17-39 points are low TB prevention behaviors in senior high-school students, 40-62 points are moderate TB prevention behaviors in senior high-school students, and 63-85 points are high TB prevention behaviors in senior high-school students. (Srisatidnarakul, 2010)

Content validity & Reliability

Content validity was tested by three experts, including pediatrician specializing in respiratory system, pediatric nursing instructor and community health nursing instructor. The total mean of content validity index (CVI) was. 98. When considering each aspect, the CVI were as follows: perceived susceptibility of TB infection = 1, perceived severity of TB infection = 1, perceived benefits of TB prevention = .92, perceived barriers of TB prevention = .9, and TB prevention behaviors in senior high-school students = 1. After revision following the experts comments, all questionnaires were tested for reliability by 30 senior high-school students, whose characteristics were similar to the target samples. Cronbach's alpha coefficient of all questions were .77, .86, .81, .83 and .82 respectively.

Ethical considerations

The study obtained ethical form the Human Research Ethics Committee, Faculty of Medicine Ramathibodi Hospital, Mahidol University with an approval number (COA. MURA2022/194) Date of approval March 19, 2022. The researcher explained the research objective, data collection method, rejection of participation, and withdrawal from the research anytime they would like to with no need to give any reasons. Their rejection or withdrawal would not affect their study at all. If the samples consented to participate in this research, they and their parents had to sign the consent form. All data obtained was kept confidential, and was presented as the overview only. All documents would be terminated after the research implementation was completed.

Data collection

The researcher explained the research objective and data collection method to a class teacher of grade 10-12 both schools. The researcher introduced herself to the participants in home room period. The research objective was also explained, along with data collection methods, the right of participants to reject research participation, and confidentiality of their personal data, that is, the results of this research would be presented as the overview only. The students and their parents were requested for their consent to sign their names for research participation. The student would bring the consent request form back to their parents for signing, and return the form to the class teachers the next day. The researcher and the class teacher provide the questionnaires based on the number list obtained by sampling. Then we also explained how to answer the questionnaires, and gave an opportunity for the participants to ask any questions until they were all clearly understood. Next, the participants were instructed to answer the questionnaires. It took about 20 minutes. They could choose to answer the questionnaire either paper form or online they were comfortable taking the paper form. The questionnaire would be distributed by class teacher during in the home room period. If more comfortable answering questionnaires online. The class teacher would send a Google form link via line application or scan a QR code to enter the questionnaire. After answering the questionnaires, the class teacher collected all data and

researcher recheck completeness of all data in each set of the questionnaires for further statistical analysis.

Data analysis

The data were analysed using SPSS software versions 25. Determine the level of significance $p < .05$. The personal data and perceived health beliefs were analyze using descriptive statistics. Pearson's product moment correlation coefficient was used to analyze of relationship between the factors of perceived health beliefs and TB prevention behaviors. Enter multiple regression analysis was used to examine the predictors of beliefs and TB prevention behaviors. All variables met the assumption of normality, linearity, homoscedasticity, no multicollinearity (Tolerance = .590-.868, VIF = 1.152-1.695), and no autocorrelation (Durbin-Watson = 1.895). (Burns & Grove, 2005; Munro, 2001)

Results

Part 1 Attributes of the sample group. Most of them were female (60.1%). The average age was 16.74 years old (range = 15-19 years, S.D. = .93). The majority of the sample group were in grade 11, followed by grade 10 and 12 (34.6, 33.3, and 32.1%, respectively). The mean percentage of achievement was 3.51-4.00 (45.6%). The majority lived in their parent's or guardian's house, followed by rental house/condominium/apartment (58.5 and 37.0%, respectively). Most of them never lived with TB patients (95.9%).

Part 2 Health beliefs. The sample group's mean score of perceived susceptibility of TB infection was at a moderate level; the average score was 28.41 points (S.D. = 3.24), perceived severity of TB infection was at a high level; the average score was 28.02 points (S.D. = 4.09), perceived benefits of TB prevention was at a high level; the average score was 29.16 points (S.D. = 4.51), and perceived barrier of TB prevention was at a moderate level; the average score was 23.38 points (S.D. = 5.68)

Part 3 TB prevention behaviors in senior high-school students. The average score of TB prevention behaviors in senior high-school students was at a high level; the average score was 66.92 points (S.D. = 11.47)

Part 4 Analysis results of the predictability of perceived health beliefs to TB prevention behaviors in senior high-school students

The analysis results of the predictability of TB prevention behaviors in senior high-school students using multiple regression analysis, it revealed that the predicting factors, including perceived severity of TB infection and perceived benefits of TB prevention could together explain for 8.6% ($R^2 = .086$, $p < .05$). The highest predictor affecting the TB prevention behavior in senior high-school students were perceived benefits of TB prevention ($\beta = .338$, $p < .01$), followed by perceived severity of TB infection ($\beta = -.163$, $p < .05$ (Table 1)

Table 1 Multiple regression coefficients of perceived health beliefs and TB prevention behaviors in senior high-school students (n = 243)

Predictor	b	SE	β	t	p-value
Perceived susceptibility	-.075	.247	-.021	-.306	.750
Perceived severity	-.457	.226	-.163*	-2.018	.045
Perceived benefits	.860	.184	.338**	4.666	.000
Perceived barriers	-.123	.134	-.061	-.916	.361

Constant = 59.652, R = .293, R^2 = .086, R^2adj = .070, SEest = 11.059, F = 5.587, p < .05

* p-value < .05, ** p-value < .001

Discussion

The results revealed that the predicting factors, including perceived severity of TB infection and perceived benefits of TB prevention could together explain TB prevention behavior in senior high-school students for 8.6% (R2 = .086, p < .05). According to the research, it found that the most factor that could predict TB prevention behavior in senior high-school students was perceived benefits of TB prevention, followed by perceived severity. This can supported the theory in accordance with Becker's conceptual framework of health beliefs. (Becker, 1974) The senior high school students perceive the severity of how those diseases can affect physical health, mental health, economy, society, life-threatening and high perceived benefits affect decision making on about TB prevention of senior high school students.

Perceived benefits of TB prevention

The results revealed that perceived benefits of TB prevention were associated with TB prevention behavior in senior high-school students (r = .235), and could predict their TB prevention behavior (β = .338). To clarify, perceived benefits of TB prevention in senior high-school students is good for themselves in terms of physical and mental dimensions and could also help prevent TB infection as well as illness. This conformed to the conceptual framework of health beliefs (Becker, 1974), and could be clarified in terms of perceived benefits of TB prevention. If individuals believe that disease prevention by any efficient and appropriate methods could generate physical, mental, and social advantages, and to intimates; they will decide to perform prevention behavior against diseases and illnesses despite well perceived susceptibility and perceived severity. This study is also consistent with the study in teenagers aged between 12-18 years in Isfahan, Iran. It found that perceived benefits was significantly positively associated with COVID-19 prevention behavior (r = 0.29, p < 0.001) and could predict prevention behavior (β = -.05) (Fathian, Kohadeseh, Tavakoli & Jaleh 2021). Also, in the study of Muangklang (2013), Montaisong (2016) and Tueyot(2013), they were found that perceived benefits of TB prevention were positively associated with TB prevention behavior and could predict TB prevention behavior.

Perceived severity of TB infection

The results showed that perceived severity of TB infection was not associated with TB prevention behavior in senior high-school students (r = -.021). But when it was brought to the predictive equation with other variables, it could predict TB prevention behavior

in senior high-school students (β = -.163). To clarify, senior high-school students assessed the possibility of TB severity that could affect them in several aspects, including high dangers to health of themselves, social space limitation and absent from school. (Royviangkam et al., 2022) Even so, they still slightly perceived the significance and necessity of TB prevention behavior d ue to teenage also they not interested in the severity of TB infection that are occur.This conformed to the conceptual framework of health beliefs (Becker, 1974), It could be clarified that an individual would be ready to perform appropriate health behavior if they believed that illnesses caused physical severity, such as pain, disability, or life-threatening dangers; mental severity, such as stress and anxiety due to social space limitation or social disgust; and possible economic severity, such as treatment expenses, travel for treatment, and time loss such as absence from study for treatment. This might be a possibility of high perceived severity in senior high-school students. The finding of this study correspond with the study of Montaisong(2016), who found that perceived severity of TB infection could predict TB prevention behavior in household contacts in the Bangkok Metropolitan Region (β = .131). Furthermore, according to the study on migrant workers in China, it found that perceived severity of TB prevention could predict TB prevention behavior (β = .41) (Li, Yang, Zhang, Fisher, Tain & Sun, 2015).

Perceived susceptibility of TB infection

The results revealed that perceived susceptibility of TB infection was not associated with TB prevention behavior in senior high-school students and could not predict TB prevention behavior in senior high-school students ($p > .05$) This could be clarified that senior high-school students found that perceived susceptibility of TB infection in moderate level due to they were teenage also belief or awareness about susceptibility of TB infection insufficient. Therefore, no interested about susceptibility of TB infection. For this reason, senior high-school students rarely avoided and searched for TB prevention guidelines. Becker (1974) clarified perceived susceptibility was a feeling or opinion of individuals toward the possibility of health problems. Individuals have different beliefs. Thus, they have different prevention and avoidance methods to perform and take care of themselves. Those with perceived susceptibility would be aware of prevention, and they would find prevention guidelines. In contrast, those with a low level of perceived susceptibility, they would certainly not pay attention to prevention. Perceived susceptibility of the sample in this research was still not much (Moderate level) because some of the sample did not perceive TB infection and spread. In addition, for this reason, this might cause low TB susceptibility and failure to predict TB prevention behavior and also conformed to the study of Kiksanthia(2014), who found that perceived TB susceptibility was not associated with and could not predict TB prevention behavior in household contacts.

Perceived barriers of TB prevention

The results revealed that perceived barriers of TB prevention was not associated with TB prevention behavior in senior high-school students and could not predict TB prevention behavior in senior high-school students ($p > .05$). This could be clarified that senior high-school students still perceived barriers of TB prevention, possibly resulting in their poor TB prevention behavior. According to Becker (1974), he clarified that individuals' behavior resulted from thoughts, expectations, negative factors, or possible barriers whether more or less. In case of low perceived barriers of TB prevention, there would be high decision-making on such behavior. Those barriers might be expectations or what happened in real life, such as expenses, inconvenience, or time-wasting. These might cause individuals not to start finding guidelines on behavior for disease prevention. The sample

had perceived barriers of TB prevention at a moderate level, May be it's because teenagers are still the age that they haven't taken full responsibility for themselves. Both in health care, which still depends on parents. Therefore, it does not take into account the obstacles that will occur as a result, such as expenses, access to health check-up services, etc., including from basic information, most children have never lived with patient TB (95.9%). The results consistent with the studies of Kiksanthia (2014), and Tueyot (2013), who found that perceived barriers of TB prevention was not associated with and could not predict TB prevention behavior.

Recommendations

1. Nurses, public health officers, school health teachers, and other relevant authorities should play a significant role in active health promotion in the schools in the region by organizing the TB screening project or providing knowledge about TB based on perceived severity and perceived benefits to construct the awareness of TB prevention in students.

2. Teaching about tuberculosis should be added to the secondary education curriculum or training to disseminate knowledge related to tuberculosis, especially perceived severity of TB infection and perceived benefits of TB prevention to secondary school students because it is an age group that is likely to be exposed to TB.

3. To conduct a study in other department, such as private schools

4. Other factors of Health belief Model that might relate to TB prevention behaviors in senior high-school students should be examined, such as perceived information, and perceived functional competency

5. Quasi-experiment research as a program, activity, or video promoting senior high-school students to be aware of the accurate and appropriate TB prevention strategies, including create intervention research based on research result.

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Conflict of interest

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