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RESEARCH ARTICLE

Clearing the Air: A Pharmacy Student-Led Health Education Initiative to Combat Adolescent Tobacco Use

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Abstract

Objectives: Tobacco use among adolescents is a growing problem that yields many negative side effects including cancer, lung disease, heart disease, and even death. Lowering the use of tobacco among the adult population starts with the prevention of tobacco use initiation. Thus, the objective of this study is to investigate the efficacy of an interactive educational session conducted by pharmacy students to enhance tobacco knowledge among fourth-grade students.

Methods: The study involved educating 4th-grade students from two local elementary schools. Pharmacy students delivered educational sessions to five classes, focusing on the complications and negative health effects associated with tobacco use, as well as the importance of avoiding initiation. Each educational session consisted of a short slideshow followed by an interactive activity. The efficacy of the intervention was assessed through a pre-and post-assessment to measure knowledge gained.

Results: Out of a total of 112 fourth-grade students, 108 completed the pre- and post-assessment. The results confirmed that the intervention increased the participants' knowledge about tobacco use and its harmful effects, with a 13% score improvement from pre- to post-assessment. Student feedback indicated high satisfaction, with 68.5% reporting they learned more about tobacco from the educational session.

Conclusions: The results suggest that an interactive educational session presented by student pharmacists was able to improve knowledge regarding tobacco use and its harmful effects. Through this research, it is evident that pharmacy students are a vital resource for providing education to children regarding tobacco and its harmful effects.

Keywords

Tobacco, Education, Adolescents, Prevention, Public health, Community outreach

Introduction

Tobacco use is one of the leading causes of preventable diseases and death in the United States [1]. Tobacco use and secondhand smoke exposure can lead to cancers, lung disease, cardiovascular diseases such as coronary artery disease or stroke, rheumatoid arthritis, cataracts, reproductive health problems, pregnancy complications, asthma exacerbations, and gum decay [2,3].

The prevalence of tobacco use among the youth is on the rise. As of 2023, more than 6% of middle school students and 12.5% of high school students admit to the current use of a form of tobacco [4]. The contributing factors associated with tobacco use among the youth include social media use, mental health problems, a lack of coping mechanisms, peer pressure, household exposure, and low self-esteem [4]. Other contributing factors are flavor and youth-centered marketing strategies [4]. Tobacco is available in the form of cigarettes, chewing tobacco, e-cigarettes/vapes, cigars, and hookah, with diverse flavors in the latter three [5]. According to a CDC report, flavored varieties were a key factor influencing a group of youth to initiate the use of e-cigarettes [6].

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Addressing the tobacco use problem requires interventions such as education and awareness about the negative and harmful effects on health associated with using tobacco products. Healthcare professionals, such as pharmacists, can play an impactful role in creating this awareness. Starting these interventions at an early age will hopefully be more beneficial for the community because it is predicted that this will prevent the adolescent population from beginning to use tobacco products. Based on research, it is more effective to be proactive rather than reactive in relation to tobacco use prevention versus tobacco cessation [7]. A study by a science-based prevention system, Communities that Care (CTC), demonstrated a significant impact of prevention strategies on adolescents [8]. CTC followed over 4,000 individuals from 5th grade through one year post high school graduation (average age of 19 years) [8]. A total of 24 communities participated in this trial and were divided into 2 groups: intervention and control [8]. The intervention group received education and other prevention strategies for 5 years, starting in 5th grade. Annually, individuals from both the intervention and control group recorded their use of tobacco or drug products in the past year as well as any unlawful acts such as stealing, damaging property, or getting arrested that they had committed within the last year [8]. Results showed that 90.8% of participants finished the trial and completed all surveys [8]. The CTC found that implementing prevention strategies had an impact on stopping adolescents from using tobacco/drug products or committing crimes [8]. The final survey, conducted 1-year post-high school graduation, revealed that 38.8% in the CTC group and 31.9% in the control group abstained from cigarette use ($p < 0.05$), showing that intervention strategies beginning at a young age can prevent adolescents from starting tobacco use as they get older [8].

Continuing with the proactive approach of intervening with adolescents, the aim of this study was to determine the efficacy of a pharmacy student-led educational initiative to increase knowledge and awareness of tobacco-related issues in elementary school children. It was hypothesized that providing tobacco education and increasing awareness with an educational session, including a presentation and interactive activity, will equip the youth with an understanding of how tobacco use can impact their long-term health, aiming to prevent the initiation of tobacco product use in the future.

Methods

Study design

The study design involved educating 4th-grade students at two local elementary schools in Monroe, North Carolina. The schools that were included in this study were in economically challenged areas. A group of 3rd-year pharmacy students educated 5 classes of 4th-grade students about the complications and negative health effects associated with tobacco use and explained why it is best to avoid initiating use. At each of the 5 classroom educational sessions, 4 pharmacy students provided a brief presentation and interactive activity. The efficacy of the educational session was measured using a pre-and post-quiz to test the knowledge of the students prior to and after the presentation and interactive activity. All methods and materials were approved by the Institutional Research Review Board.

Presentation

A 5-minute slide presentation was given that displayed vital information about tobacco product use and its negative effects. The slide presentation provided comprehensive information about tobacco, including various products such as cigarettes, e-cigarettes, and chewing tobacco. The detrimental effects of both firsthand and secondhand smoke exposure were also highlighted. More specifically, an emphasis was placed on the risk of first-hand smoke exposure for developing health issues such as lung cancer and heart disease. Similarly, the risk of secondhand smoke exposure was included, which also increases the risk of developing lung cancer and heart disease. The presentation also included a depiction of the contrast in appearance of a healthy lung versus a smoker's lung. Students were asked questions during the presentation to ensure that they were actively listening and retaining the information being demonstrated. Some questions presented during the presentation included: 'Can you list some of the different types of tobacco products?', 'Can you name the type of tobacco product shown in this picture?', Where does tobacco come from? and 'Which of the following pictures shows an example of a healthy set of lungs?'.

Interactive activity

Following the presentation, students engaged in a game where images representing something healthy or unhealthy were matched to a healthy lung versus a smoker's lung. Students were organized into small groups of 5-6, allowing them to place the printed images onto an 18 × 24-inch foam board in the spot illustrating either a healthy lung or smoker's lung, whichever they deemed "correct." The images included a person exercising, healthy blood vessels, unhealthy blood vessels, discolored teeth, secondhand smoke, etc, serving to illustrate the distinctions between a lifestyle with healthy versus unhealthy lungs. The interactive activity took approximately five minutes for the students to complete. After the interactive activity, the correct placement of the images was reviewed by the pharmacy students to ensure that the students understood the distinctions. The interactive activity was incorporated into the educational session to assist the students in retaining the information provided during the presentation.

Pre- and post-quizzes

To gauge the effectiveness of the educational session, a paper quiz was administered before and after the intervention to assess the knowledge gained. The pre- and post-quiz both consisted of the same 8 multiple-choice questions, each having one correct answer. In addition to the quiz questions, the post-quiz included three subjective survey questions to obtain insight into the students' perceptions of the education session. These questions gauged if the students thought they learned something from the educational session, their enjoyment of the session, and their confidence in sharing the information acquired. Responses to the survey questions were collected on a 1-5 scale (1 = not likely, 5 = very likely).

Statistical analysis

Data was manually entered into an Excel spreadsheet. A paired t-test (two tails, $\alpha = 0.05$) was used to determine statistically significant differences between mean scores of the pre-and post-quizzes. Data are presented as mean ± standard deviation.

Results

A total of 112 fourth-grade students participated in the educational session and completed the pre- and post-assessments to evaluate their knowledge of tobacco. Only 104 assessments were included in the data analysis as the remaining assessments were incompletely answered. Student knowledge increased following the educational session which was indicated by the improvement in mean scores from the pre- to post-assessment (66.25 ± 19.94% vs. 79.38 ± 19.88%, respectively; $p < 0.0001$). There was an increase in the percentage of correct responses for 6 out of 8 questions on the post-assessment. The remaining two questions showed a small decline in the percentage of students who answered correctly. The students showed the most improvement on question 1, "What is tobacco?", with an increase of 44.3% of students answering correctly. Questions 2 and 5 exhibited the least improvement, with an actual slight decline in the percentage of students answering correctly on the post-quiz (-1.9% and -2.8%, respectively). See Table 1 for quiz questions and responses. Survey questions revealed that 68.5% of students "very likely" thought they learned something about tobacco and tobacco use from the educational session. Additionally, 71.3% of students were very confident to explain tobacco's harmful effects to someone, and 73.1% of students found the game very effective in understanding tobacco's impact on the

Table 1: Pre and post-assessment responses. Data represented as number of responses (%).

	All respondents Pre N = 104 (%)	All respondents Post N = 104 (%)	% Change in correct answer from Pre- to Post
1. What is tobacco?			
A Plant*	46 (44.2)	92 (88.5)	+ 44.3
A disease	6 (5.8)	1 (1)	
Cigarettes	34 (32.7)	9 (8.7)	
Vape	18 (17.3)	2 (1.9)	
2. What is the addictive/harmful substance found in tobacco products?			
Tar	3 (2.9)	6 (5.8)	- 1.9
Nicotine*	63 (60.6)	61 (58.7)	
Carbon Monoxide	26 (25.0)	21 (20.2)	
Rat poison	12 (11.5)	16 (15.4)	
3. What can happen if you use tobacco products?			
Cancer	11 (10.6)	9 (8.7)	
Lung disease	32 (30.8)	21 (20.2)	
Heart disease	14 (13.5)	10 (9.6)	
All of the above*	47 (45.2)	64 (61.5)	+ 16.3
4. What types of tobacco products are safe?			
Cigarettes	5 (4.8)	2 (1.9)	
Vape	4 (3.8)	4 (3.8)	
Cigars	5 (4.8)	1 (1)	
None*	90 (86.5)	97 (93.3)	+ 6.8

5. How can tobacco products affect your teeth?			
They can become stained and unhealthy*	90 (86.5)	87 (83.7)	- 2.8
They become shinier	2 (1.9)	8 (7.7)	
They start to glow in the dark	7 (6.7)	4 (3.8)	
They grow bigger	5 (4.8)	5 (4.8)	
6. What color are healthy lungs?			
Blue	5 (4.8)	6 (5.8)	
Pink*	94 (90.4)	97 (93.3)	+ 2.9
Green	1 (1.0)	0	
Orange	4 (3.8)	1 (1)	
7. What is secondhand smoke?			
Smoking a cigarette with both hands	10 (9.6)	9 (8.7)	
Breathing in smoke while someone else is smoking*	46 (44.2)	72 (69.2)	+ 25.0
Switching hands while smoking	8 (7.7)	10 (9.6)	
Sharing a cigarette with a friend	40 (38.5)	13 (12.5)	
8. Can you get sick from being around someone who does smoke?			
Yes*	75 (72.1)	90 (88.2)	+ 16.1
No	29 (27.9)	12 (11.8)	

*Denotes correct response

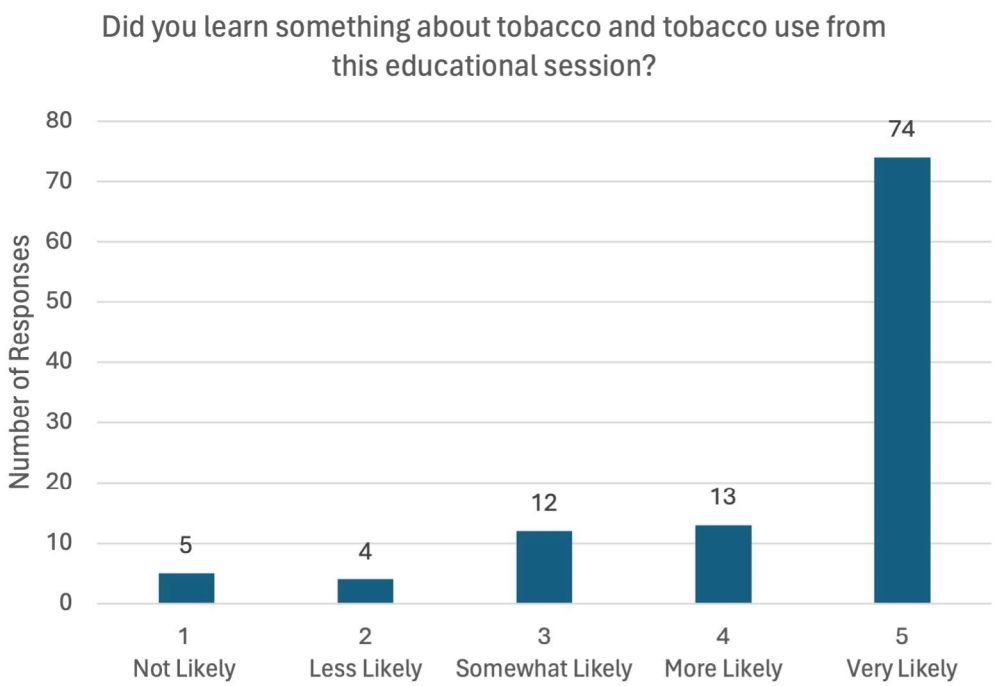

Figure 1: Responses to survey question 1. Numbers above bars indicate precise number of responses.

body. See Figure 1, Figure 2 and Figure 3 for survey questions and responses.

Discussion

Educating the youth can help them make informed decisions about tobacco use. This study has shown that a pharmacy student-led educational session can increase the knowledge regarding tobacco and tobacco use in 4th grade adolescents. A total of 112 fourth-grade students participated in the educational session. However, eight students incompletely answered the assessments, potentially influenced by typical interruptions in a fourth-grade classroom, resulting in a response rate of ~93%.

Overall knowledge improved approximately 13% from pre- to post-assessment. The majority of questions had an improvement in correct responses after participating in the educational session. Only two

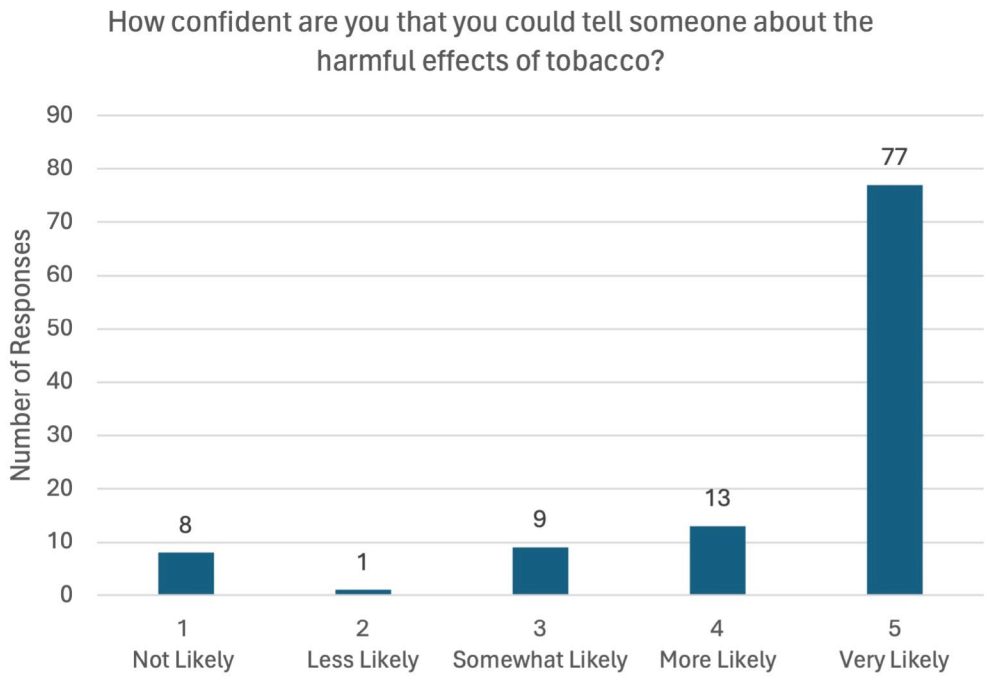

Figure 2: Responses to survey question 2. Numbers above bars indicate precise number of responses.

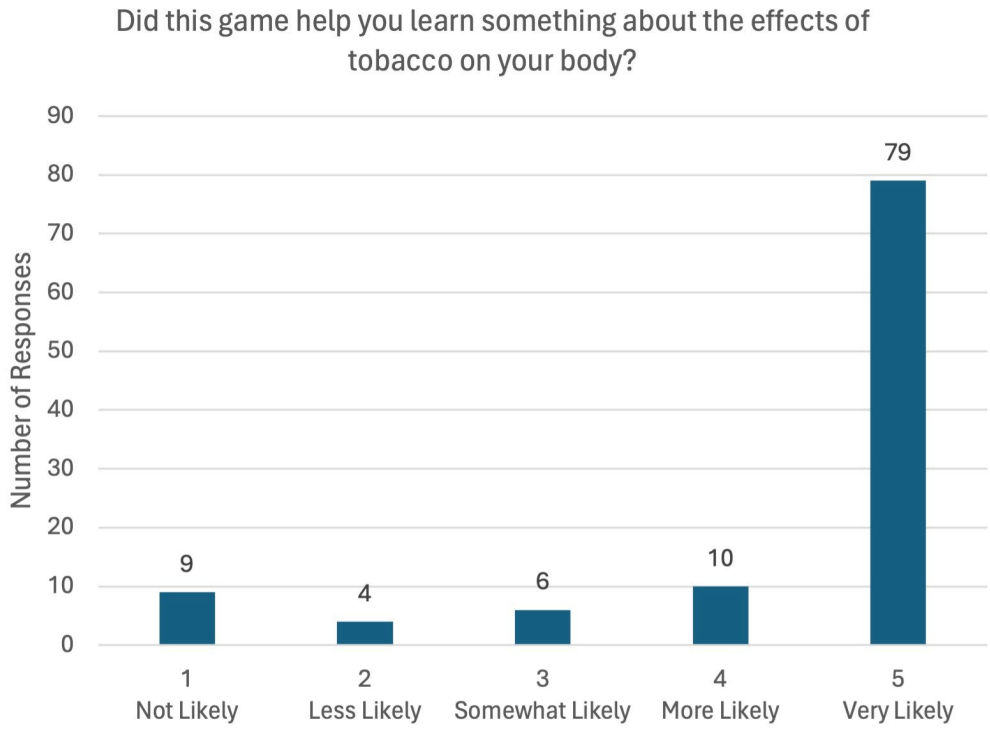

Figure 3: Responses to survey question 3. Numbers above bars indicate precise number of responses.

questions unexpectedly did not show an improvement; these were questions regarding the addictive substance found in tobacco products and the detrimental effect on teeth. Poor performance on the former question was likely due to poor writing of the question. Two descriptors were used in the stem of the question ("addictive" and "harmful") with more than one potential correct answer choices depending on how the stem was interpreted. Nicotine is the addictive substance in tobacco products, however, carbon monoxide and tar are harmful substances found in tobacco smoke. Regarding the latter quiz question that showed no improvement, students already had significant knowledge about the effects of tobacco use on teeth before the educational session, with 86.5% of students answering correctly on the pre-quiz. After the educational session, a few more students were persuaded that teeth become shinier due to use of tobacco products. The reason for this unexpected shift in responses is uncertain.

Similarly to the study published by the nonprofit organization "Communities that Care (CTC)", this educational session was given to children in elementary school with a focus on preventing tobacco use as the children enter adolescence and adulthood [8]. Unlike the CTC trial, this study only assessed the amount of knowledge gained and did not track the number of students who began using tobacco products via follow-up surveys. The goal of this intervention was to prevent tobacco use by providing decision-impacting education.

After an extensive literature review, no studies were found that have conducted research involving a student-led educational session intervention focused only on tobacco in this age demographic. However, a study was conducted that evaluated overall health education, which included tobacco education, exercise, medication safety, hygiene, nutrition, and summer safety with students within the same demographics as our study. Additionally, the intervention was led by student pharmacists, and it included pre and post-quizzes to assess knowledge. The student pharmacists provided a short educational session and hands-on activity for each topic. Overall, this study was very similar to ours, and the results showed an improvement in knowledge overall, including the two tobacco-based questions in their assessments from pre- to post [9]. Similar to our research, the results from this intervention show that education provided by pharmacy students could be a useful resource to increase awareness of tobacco use complications and, therefore, possibly prevent initiation of use among the youth population.

There were some weaknesses in our study. First, both schools were dual language schools where English was their second language. Due to this language barrier, it was required to repeat questions several times for the students leading to possible distractions and short attention. Translated assessments were provided upon request, but it could be possible not all students received one who needed it. Secondly, as previously mentioned, not all of the participants who completed the pre-assessment completed the post-assessment. This led to 8 assessments not being used in the results. It could be possible that those who did not fully complete the post-assessment were the students who struggled with the language barrier or were the least engaged. Thirdly, the short session allotted for the educational session required that the pre-assessment, post-assessment, slide presentation, interactive game, and game review all be done within 30 mins. The students had several questions and wanted to discuss more during the presentation. This could have led to less time being available to complete the post-assessment which could have led to random answer choices or incompleteness of the assessment. Fourthly, with no long-term follow-up, it is not known if the gain in knowledge due to the educational session will translate to the prevention of tobacco use in the future. Lastly, the study design did not include a comparator group; therefore, it is unable to determine if the educational session's impact would have been different if delivered by licensed pharmacists or other healthcare providers, to students with different demographics, or with a different educational approach.

Conclusion

Tobacco use is a leading cause of death and disease in the United States. The prevalence of tobacco use in adolescents is on the rise. In an attempt to prevent future use of tobacco products, an interactive educational session was offered to 4th-grade students by pharmacy students. Results suggest that the educational session delivered by pharmacy students was effective in increasing children's knowledge regarding tobacco and tobacco use. Based on these results, it can be concluded that the utilization of pharmacy students may be a useful resource for providing education to children regarding tobacco and tobacco product use.

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