Original Article

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Effects of the Knowledge and Attitude Development Program to Promote Preventive Behaviors for Prescription Drug Misuse among High School Students in Central Thailand: A Quasi-Experimental Study

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Abstract:

Objective: Prescription drug misuse (PDM) among adolescents is an increasing public health issue, leading to significant physical, psychological, and social consequences. There is a pressing need for preventive strategies targeting young people to address this growing concern in Thailand.

Material and Methods: A quasi-experimental study using a repeated-measure design with 2 groups aimed to evaluate the effect of a knowledge and attitude development program on promoting preventive behaviors related to PDM. This study recruited 102 high school students, aged between 16 and 18, enrolled at a school in Central Thailand. The students were divided into 2 groups using multi-stage sampling: the intervention group (n=51) participated in a 4-week knowledge and attitude development program, while the control group (n=51) received a health education booklet. Assessments were conducted through structured questionnaires at 3 points: baseline, post-intervention, and 3-month follow-up. Data analysis was performed using descriptive statistics and a repeated measures analysis of variance.

Results: Significant differences were found in the mean scores of knowledge (F=142.166, p-value<0.001), attitudes (F=219.680, p-value<0.001), and preventive behaviors related to PDM (F=68.871, p-value<0.001) between the intervention and control groups at the 3-month follow-up. Furthermore, the mean scores of all outcomes in the intervention group

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significantly increased at post-intervention and 3-month follow-up (p-value<0.001). However, no significant improvement was observed in the control group across all time points (p-value>0.05).

Conclusion: The intervention group demonstrated significantly better knowledge, attitudes, and preventive behaviors on PDM than the control group. These findings indicate that the program might support efforts to promote preventive behaviors, and healthcare personnel can consider using it in the planning and management of PDM prevention.

Keywords: adolescent, health behavior, prescription drug misuse, quasi-experimental studies, students

Introduction

Prescription drug misuse (PDM)—defined as using prescribed medications in ways not intended by a physician, such as taking higher doses or using them recreationally—has become a pressing global health concern, particularly among adolescents[1,2]. This behavior poses serious risks, including addiction, mental health problems, academic decline, and social dysfunction[3-5]. Substances commonly misused include opioids, central nervous system depressants, and stimulants, which can cause both short-term effects (euphoria, sedation, impaired judgment) and long-term consequences (organ damage, dependence, overdose, and death)[6-8]. Adolescents are especially vulnerable due to developmental factors, peer pressure, academic stress, and misconceptions that prescription drugs are safer than illicit substances[9]. Misuse often involves medications prescribed to others, obtained through family, peers, or illegal sources, such as online platforms. In Thailand, the problem is increasingly reported among high school students in both urban and rural areas[10], with misuse acting as a gateway to future substance use and broader societal impacts, including healthcare burdens, reduced life opportunities, and legal issues[11]. Early intervention is critical to preventing long-term harm and future substance dependence.

School-based interventions are increasingly recognized as effective strategies for promoting health and preventing risky behaviors among adolescents, a group undergoing critical identity and value formation[12]. Programs that enhance knowledge and reshape attitudes toward drug use have demonstrated positive outcomes in reducing misuse. However, in Thailand, there is a lack of structured programs specifically addressing PDM among high school students[13,14]. To address this gap, the present study developed a knowledge and attitude development program grounded in the KAP model[15] (Knowledge, Attitude, Practice), which promotes behavior change by improving knowledge, shaping attitudes, and supporting preventive practices. The program was implemented using the 8R approach, which structured 8 sequential activities focused on enhancing understanding, resisting peer pressure, and developing practical prevention skills of PDM.

In Thailand, PDM is not clearly defined as illegal under current laws, and evidence on its prevention remains limited, particularly among adolescents in rural and semi-urban areas like Central Thailand[16]. While global research has addressed the prevalence and consequences of PDM, Thai studies have mainly focused on the legal aspects or social influences, such as peer and family dynamics[17]. There is a notable lack of research evaluating the effectiveness of school-based programs that aim to enhance students' knowledge and attitudes to prevent PDM. This gap limits the ability to design evidence-based interventions that can be integrated into the educational system, a key setting for early prevention[18,19]. This study aimed to describe changes in knowledge, attitudes, and preventive behaviors related to PDM between students who received a structured knowledge and attitude development program and those

who received a standard informational handbook. This study provides valuable insights for educators, policymakers, and healthcare professionals seeking effective methods to combat PDM among adolescents.

Material and Methods

Study design

This study employed a quasi-experimental research design with repeated measures involving 2 groups, including an intervention group and a control group. The intervention group participated in a 4-week program aimed at enhancing knowledge and attitudes regarding prescription drug misuse. This program included 8 sessions conducted twice a week, each lasting 60 minutes. In contrast, the control group received an informational handbook on PDM over the same duration as the intervention.

Setting

This study was conducted in Central Thailand, with Nakhon Nayok Province purposively selected as the study site. Nakhon Nayok is a semi-urban province near the Bangkok metropolitan area, where rapid socio-economic development has brought emerging public health concerns, including PDM among adolescents. The province was chosen for its representative characteristics of many high schools in Central Thailand, its accessibility for program implementation, and the willingness of local educational institutions to collaborate on school-based health interventions. Additionally, previous reports from local health authorities and schools indicated a need for targeted preventive efforts addressing inappropriate PDM.

Sample size

The sample size was determined using the G*Power Program, with an effect size of 0.52[20], an alpha level of 0.05, a power of 0.95, and an allocation ratio (N2/N1) of 1. This analysis indicated that 48 participants were required for each group. To account for potential dropouts from the study, 5.0% was added to increase the sample size. Consequently, each group comprised 51 participants, resulting in a total sample size of 102.

Inclusion and exclusion criteria

Participants were high school students in grades 10 to 12, aged 16 to 18 years, enrolled at the School in Ongkharak District, Nakhon Nayok Province, during the first semester of the 2024 academic year. They had received parental permission and provided written consent to participate. Additionally, they were required to own a smartphone for communication and engagement with program materials. Students with a known history of drug misuse or diagnosed behavioral disorders were excluded to avoid potential confounding factors. Additionally, those unable to participate due to illness or who transferred to another school during the study period were excluded.

Sampling method

In this study, a multi-stage sampling method was used. Step 1: Nakhon Nayok Province in Central Thailand was intentionally chosen as the study location because of its accessibility, existing school collaboration networks, and increasing public health concerns related to PDM among adolescents. The province was divided into 4 districts, and Ongkharak district was intentionally selected based on student population data and school readiness to participate. Additionally, 3 high schools were included, and 2 schools were selected: The First school was intentionally chosen as the intervention group, and the Second School was chosen as the control group because of its existing cooperation and suitability for implementing the program. Step 2: Each group was formed by randomly assigning 51 students using simple random sampling with a lottery system based on the inclusion criteria and sequence of student ID numbers. From each selected school, 51 students who met the inclusion criteria and were available to participate in the study were selected. (Figure 1)

Intervention

The knowledge and attitude development program on PDM was created using the KAP model[15]. This model is commonly employed to guide the development of interventions aimed at behavior change by enhancing knowledge and attitudes to promote preventive behaviors on PDM. Educating students about the misuse of prescription drugs and increasing awareness can encourage preventive behaviors[20,21]. Community involvement was integrated to ensure sustainability and improve the program. Focus groups with students, teachers, and parents provided feedback on the intervention's design. Based on this, the researcher adapted the KAP model to draft the program, which was then reviewed by experts in pharmacology, education, and public health. After their recommendations, the principal investigator (PI) refined the program to ensure its comprehensiveness before implementation.

The intervention included educational sessions on PDM—its definition, health risks, and societal impacts—along with skill-building activities to develop refusal skills and informed decision-making in peer pressure situations. Each session was interactive, involving group discussions,

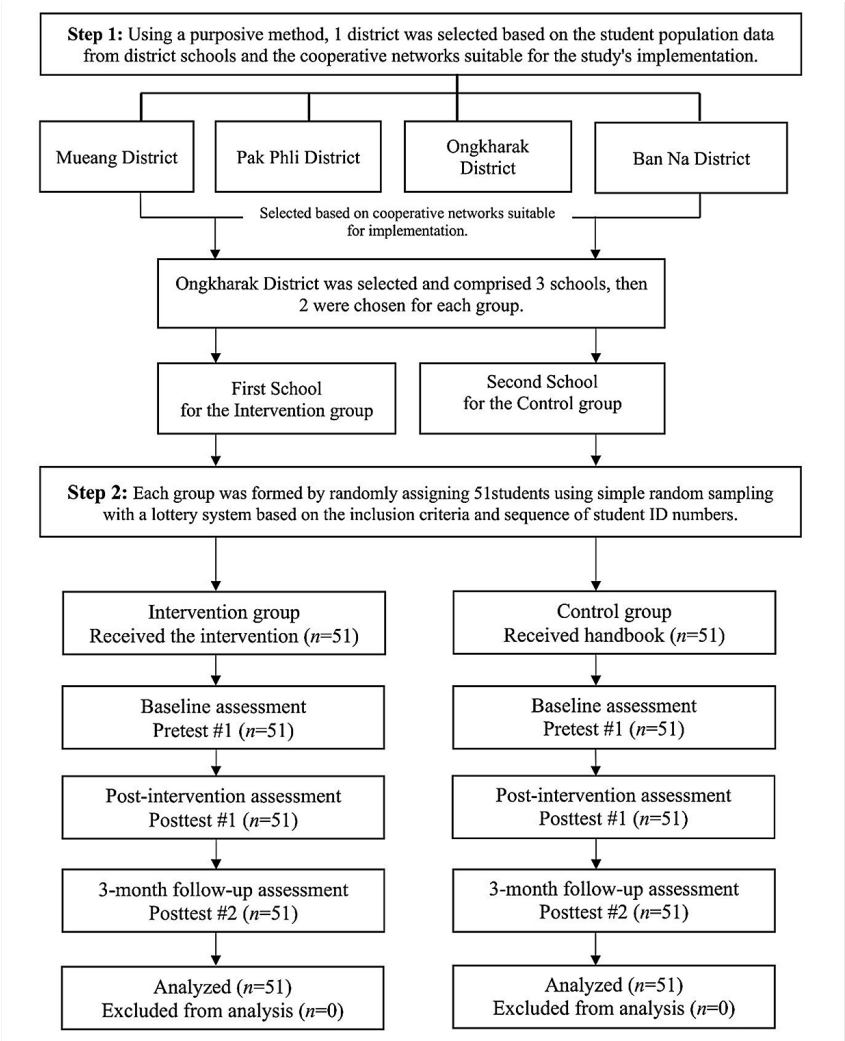

Figure 1 The diagram illustrating the sampling process and measurement timeline

role-playing activities, and informational presentations to engage students actively. Program materials were developed based on evidence-based guidelines and adapted to be culturally relevant for Thai adolescents. A key component was using social media as a communication and support tool, offering students reminders and resources to reinforce learning beyond the classroom.

The intervention group participated in a 4-week program consisting of 8 bi-weekly sessions, each lasting 60 minutes, and held after school to ensure regular attendance. The program was led by the PI and 7 assistant researchers, including public health professionals and a pharmacologist. This team-based approach guaranteed consistent, accurate, and relevant delivery of content related to adolescent health. The details of the 8R aimed to promote knowledge (K), attitudes (A), and practices (P) regarding PDM. A summary table, the intervention matrix linking 8R activities to KAP components, has been included in the methodology section to clarify each session's focus, with the KAP model shown as Table 1. The activities included: activity 1: Ramp up (Knowledge), activity 2: Root of knowledge (Knowledge), activity 3: Right of knowledge (Knowledge + Attitudes), activity 4: Role model (Attitudes + Practices), activity 5: Raise attention to PDM (Attitudes), activity 6: Relationship (Attitudes+Practices), activity 7: Reduce drug misuse behavior (Practices), and activity 8: Reflection and Recognition (Attitudes+Practices).

The study included a 3-month follow-up with thrice-weekly infographics via LINE for review and support. The platform enabled Q&A and counseling, while homeroom teachers monitored behaviors weekly. A follow-up assessment used the same questionnaire as the baseline and post-intervention. Additionally, the control group received an informational handbook on PDM covering definitions, causes, effects, prevention, treatment, resources, prescribing guidelines, and laws. They completed the same assessments as the intervention group at baseline, post-intervention, and 3-month follow-up.

Research instruments

The participants filled out a structured questionnaire. The tools utilized in this research were created following an extensive review of the literature and associated studies[15,22-24].

Part 1: The baseline data questionnaire. The PI developed this tool to assess baseline characteristics. The questionnaire included 8 items covering sex, age, living arrangements, financial support, peer influence on PDM, family relationships, social environment's influence on PDM, and school environment's influence on PDM.

Part 2: Knowledge assessment on PDM. This section consists of 20 questions to evaluate knowledge about PDM. The response options are "Correct" or "Incorrect." Each correct answer earns 1 point, while each incorrect answer earns zero points. The score interpretation is divided into 3 levels based on Bloom's criteria[25]: scores of 0-11 indicate low knowledge, 12-15 indicate moderate knowledge, and 16-20 indicate high knowledge of PDM.

Part 3: Attitude assessment toward PDM. This section consists of 15 questions measured on a 3-point Likert scale: Agree, Uncertain, and Disagree, with scores assigned as 3, 2, and 1, respectively. The score interpretation followed Best's criteria[26], where an average score of 1.00 to 1.66 indicated a low attitude level, 1.67 to 2.33 indicated a moderate attitude level, and 2.34 to 3.00 indicated a high attitude level toward PDM.

Part 4: Preventive behavior assessment toward PDM. This section consists of 15 questions measured on a 3-point Likert scale: Regularly Practiced, Occasionally Practiced, and Never Practiced, with scores assigned as 3, 2, and 1 for positive questions and 1, 2, and 3 for negative questions. The score interpretation follows Best's criteria[26], where an average score of 1.00 to 1.66 indicates a low level of preventive behavior, 1.67 to 2.33 indicates a moderate level, and 2.34 to 3.00 indicates a high level of preventive behavior toward PDM.

Table 1 Details and implementation of the 8R intervention program based on the KAP model

Activity (KAP)	Objectives	Description
Ramp up (Knowledge)	To prepare participants for active and meaningful engagement in the program.	1. The researchers collected data on the participants' baseline measurement (Pre-test). 2. The participants played an ice-breaker game with a Human Bingo 3. The researchers simplified the explanation of the study's purpose, outlined the activities. 4. Participants were divided into groups to discuss and respond to prescription drug scenarios.
Root of knowledge (Knowledge)	To enhance the knowledge of prescription drugs, their proper use, and associated risks, and foster critical thinking.	1. Researchers presented videos and real-life scenarios on commonly misused medications, health effects, and social-legal consequences. 2. Participants engaged in "Debunk the Myth," researching and creatively presenting why common prescription drug myths were false
Right of knowledge (Knowledge+ Attitudes)	To empower participants with knowledge of their rights and responsibilities regarding PDM, and legal on PDM.	1. The researcher delivered an interactive lecture with visuals and case studies on prescription drug abuse and its effects. 2. Participants role-played PDM scenarios in small groups, received feedback, and discussed best practices. 3. Participants paired up to discuss ethical dilemmas related to prescription drugs and shared their proposed solutions.
Role model (Attitudes+ Practices)	To empower participants as role models in safe PDM and strengthen leadership and advocacy skills.	1. Researchers held interactive lectures with videos of health role models, showing how actions influence peers, and shared student-led campaign examples. 2. Participants practiced role-modelling through scenarios, received feedback to build skills, and wrote pledges to promote preventive behaviors. 3. Facilitators shared a motivational story about the impact of young leaders in health promotion.
Raise attention to PDM (Attitudes)	To raise participants' awareness of PDM and its consequences.	1. The researcher led a "Design and Deliver Your Message" activity where participants created awareness campaigns—posters, social media posts—and presented them to the class. 2. Participants noted one learning, one insight, and one action, which facilitators helped turn into goals.
Relationship (Attitudes + Practices)	To foster positive relationships that encourage collaboration and emphasize peer and adult support in PDM.	1. The researcher led discussions on relationships, peer support, and communication in overcoming challenges and building trust. 2. Participants worked in teams on drug misuse scenarios, presenting plans with facilitators providing feedback and key strategies. 3. A blind walk paired participants to guide each other verbally, then switched roles; facilitators debriefed on trust, communication, and support.
Reduce drug misuse behavior (Practices)	To equip participants with strategies for reducing PDM and promoting self-monitoring and accountability.	1. Participants list personal risky situations and discuss how to recognize and avoid triggers. 2. Replace Risky Habits" involved brainstorming positive alternatives and learning stress-management techniques like deep breathing and journaling. 3. Participants brainstormed alternatives to risky behaviors while learning stress-management. 4. Participants set SMART (Specific, Measurable, Achievable, Relevant, Time-bound) goals to reduce risky behaviors. 5. Participants jointly created a pledge to support reducing risky behaviors.
Reflection and Recognition (Attitudes +Practices).	To reinforce positive behaviors on PDM and motivate healthy decisions through recognition and rewards.	1. Researchers led the "My Journey" activity, where participants tracked progress, reflected, shared, and received encouragement. 2. Conducted "Expressing Gratitude," with participants sharing appreciations and facilitators reflecting on progress. 3. Facilitators distributed small rewards like school supplies and wellness kits to recognize participants' achievements. 4. The researchers collected data on the post-intervention measurement (Post-test).

PDM=prescription drug misuse, K=knowledge, A=attitudes, P=practices

Face validity was determined through structured expert feedback to ensure that the instrument accurately measured the intended constructs. A panel of 5 experts specializing in medicine, public health, pharmacy, community nursing, and health promotion reviewed the instrument. They assessed each item based on 2 key criteria: (1) clarity of language—ensuring the items were easily comprehensible for the target population, and (2) appropriateness for high school students—evaluating the suitability of wording and content. Based on their feedback, minor revisions were made, including rewording certain items for greater clarity, simplifying instructions, and refining phrasing to enhance both clarity and cultural relevance.

The tool's validity was assessed by 3 experts: a public health professional, a school teacher, and a nurse, using the Index of Item-Objective Congruence (IOC). The IOC values ranged from 0.90 to 1.00. The tool's reliability was tested through a pilot study involving 30 high school students from the same provinces as the study area, though they were not included in the present study. The data were analyzed for reliability, resulting in a Cronbach's Alpha Coefficient of 0.94 for the attitude assessment toward PDM, 0.92 for the preventive behavior assessment toward PDM, and the Kuder-Richardson-20 (KR-20) was 0.96 for the knowledge assessment on PDM.

Data collection

The PI collaborated with a high school to recruit participants for both the intervention and control groups. Approval was obtained from the school's director, and written informed consent was obtained from both students and their parents to confirm voluntary participation. Screening was conducted based on the inclusion criteria to identify eligible students. The intervention group engaged in a 4-week intervention program, conducted by the PI and 7 assistant researchers—including public health professionals and a pharmacist—who were trained using a standardized protocol. A session manual was used to ensure consistency in content delivery and facilitation. Participants received infographic materials via the official Line account 3 times per week during a 3-month follow-up period. Meanwhile, the control group received an informational handbook on PDM for self-study over the same period. Data were collected at 3 time points—baseline, post-intervention, and 3-month follow-up—through self-administered questionnaires completed by participants under the supervision of the research team. Data collection took place in a private classroom setting at the school between September and December 2024.

Data analysis

Data analysis was performed using Statistical Package for the Social Sciences (SPSS) program version 29.0.1, with a significance level set at 0.05. Descriptive statistics, including minimum and maximum values, frequency, percentage, mean, and standard deviation (S.D.), were used to describe the data. The Kolmogorov-Smirnov test was applied to assess whether the continuous variables followed a normal distribution. The results showed that the dependent variables, including knowledge, attitudes, and preventive behaviors related to PDM, as well as baseline characteristics such as age and financial support, were normally distributed (p-value>0.05). From a smaller sample size, Q-Q plots were examined to validate these findings, confirming that the outcome variables maintained a normal distribution. The Chi-square test was utilized to compare categorical baseline characteristics between the intervention and control groups before the intervention. To ensure the test's appropriateness, the researcher confirmed that no more than 20.0% of the expected frequencies were below 5 for any variable. Fisher's exact test was used instead if this assumption was not met. Additionally, repeated-measures analysis of variance (ANOVA) was conducted to evaluate the effects of the intervention among high school students for assessing differences both within and between groups at baseline, post-intervention, and the 3-month follow-up.

Ethical considerations

This study followed ethical guidelines for research involving human participants. Ethical approval was granted by Valaya Alongkorn Rajabhat University under Royal Patronage, with IRB No: 0018/2024, certified on September 10, 2024. Written consent was obtained from all participants, and parental consent was secured for students under 18 years old. Participation was entirely voluntary, and students were informed of their right to withdraw at any time without facing academic consequences.

Results

Baseline Characteristics Variables

At the start of the study, 102 high school students were recruited and evenly assigned to either the intervention group (n=51) or the control group (n=51). After the experiment, all participants were assessed using the same evaluation tool both post-intervention and at the 3-month follow-up. Notably, there were no dropouts throughout the study. Table 2 shows no significant baseline differences between the intervention and control groups (p-value>0.05).

Table 2 Baseline characteristics of the intervention and control groups (n=102)

Variables	Total (n=102)	Intervention group (n=51)	Control group (n=51)	p-value
Sex				
Male	53 (52.0)	27 (52.9)	26 (51.0)	0.843[a]
Female	49 (48.0)	24 (47.1)	25 (49.0)	
Age (Years)				
16	61 (59.8)	31 (60.8)	30 (58.8)	0.715[a]
17	19 (18.6)	8 (15.7)	11 (21.6)	
18	22 (21.6)	12 (23.5)	10 (19.6)	
Living arrangements				
Parental house	74 (72.6)	36 (70.6)	38 (74.5)	0.256[b]
Relative's house	10 (9.8)	6 (11.8)	4 (7.8)	
Rented room/apartment	8 (7.8)	2 (3.9)	6 (11.8)	
Grandparents' house	10 (9.8)	7 (13.7)	3 (5.9)	
Financial support (Baht/day)				
<100	94 (84.3)	13 (25.5)	19 (37.3)	0.200[a]
100	8 (15.7)	38 (74.5)	32 (62.7)	
Peer influence on PDM				
Highly influential	11 (10.8)	7 (13.7)	4 (7.8)	0.775[a]
Moderately influential	28 (27.4)	13 (25.5)	15 (29.4)	
Slightly influential	17 (16.7)	9 (17.6)	8 (15.7)	
Not influential at all	46 (45.1)	22 (43.1)	24 (47.1)	
Family relationships				
Very close and intimate	54 (52.9)	24 (47.1)	30 (58.8)	0.253[a]
Occasionally close	38 (37.3)	23 (45.1)	15 (29.4)	
Not very close/distant	10 (9.8)	4 (7.8)	6 (11.8)	
School environment's influence				
Yes	39 (38.2)	17 (33.3)	22 (43.1)	0.697[a]
No	13 (12.8)	6 (11.8)	7 (13.7)	
Sometimes	25 (24.5)	14 (27.5)	11 (21.6)	
Not sure	25 (24.5)	14 (27.5)	11 (21.6)	
Social environment influences				
Significant impact	26 (25.5)	11 (21.6)	15 (29.4)	0.832[a]
Minor impact	22 (21.6)	12 (23.5)	10 (19.6)	
No impact	23 (22.5)	12 (23.5)	11 (21.6)	
Not sure	31 (30.4)	16 (31.4)	15 (29.4)	

Data are presented as n (%), [a]Chi-square test, [b]Fisher's exact test; *Significant difference p-value<0.05, PDM=prescription drug misuse

Among the 102 students, 52.0% were male, 59.8% were aged 16, with a mean age of 16.6 years (S.D.=0.8). Most lived with parents (74.2%) and had a daily allowance under 100 baht (84.3%, mean=94.6, S.D.=27.0). Nearly half (45.1%) reported no peer pressure to misuse drugs, and 52.9% had close family relationships. Environmentally, 38.2% cited school and 25.5% cited social settings as influencing PDM.

Effects of the intervention program between and within groups on knowledge

Table 3 presents the repeated-measures ANOVA results, showing a significant difference in knowledge of PDM between groups (F(1,100)=142.166, p-value<0.001). Mauchly's test was not significant (p-value>0.05); the Sphericity assumption was met. Within-subject analysis revealed significant changes in mean knowledge across 3 time points (p-value<0.001), indicating a strong time-by-intervention interaction. Post hoc pairwise comparisons with Bonferroni correction showed no significant difference in knowledge scores between the intervention (9.98±3.03) and control groups (9.94±2.77) at baseline (p-value>0.05). However, significant differences emerged at post-intervention (intervention: 13.49±2.40, control: 10.23±1.35, p-value=0.011) and at the 3-month follow-up (intervention: 19.04±0.82, control: 12.17±2.80, p-value<0.001) (Table 4). Knowledge scores in the intervention group increased significantly more than in the control group (Figure 2). The effect size for knowledge improvement was large (η^2=0.587).

Table 3 Repeated measures ANOVA of outcome variables between and within groups (n=102)

Outcome variables	ss	df	MS	F-test	p-value
Knowledge of PDM					
Between subject					
Intervention	876.876	1	876.876	142.166	<0.001*
Error (between-group-error)	616.797	100	6.168		
Within subject					
Time	1,684.105	2	842.052	163.147	<0.001*
Intervention x time	594.301	2	297.150	57.573	<0.001*
Error (within- group-error)	1,032.261	200	5.161		
Attitude toward PDM					
Between subject					
Intervention	2,961.778	1	2,961.778	219.680	<0.001*
Error (between-group-error)	1,348.222	100	13.482		
Within subject					
Time	2,382.608	2	1,191.304	107.653	<0.001*
Intervention x time	1,176.163	2	588.082	53.142	<0.001*
Error (within- group-error)	2,213.229	200	11.066		
Preventive behaviors for PDM					
Between subject					
Intervention	1,427.846	1	1,427.85	67.871	<0.001*
Error (between-group-error)	2,103.778	100	21.04		
Within subject					
Time	1,293.065	2	646.533	20.161	<0.001*
Intervention x time	825.477	2	426.239	13.291	<0.001*
Error ((within-group error))	6,413.791	200	32.069		

*Statistically significant at p-value<0.05, PDM=prescription drug misuse, ANOVA=analysis of variance, ss=sum of squares, df=degrees of freedom, MS=mean of square,

Table 4 Post-hoc pairwise comparison with Bonferroni correction of outcome variables (n=102)

Time	Group		Mean difference	SE	p-value
Knowledge of PDM					
Baseline	Intervention	Control	0.039	0.575	0.946
Post-intervention	Intervention	Control	3.255	0.386	<0.001*
3-month follow-up	Intervention	Control	6.863	0.408	<0.001*
Attitude toward PDM					
Baseline	Intervention	Control	0.843	0.750	0.264
Post-intervention	Intervention	Control	7.745	0.726	<0.001*
3-month follow-up	Intervention	Control	10.078	0.555	<0.001*
Preventive behaviors for PDM					
Baseline	Intervention	Control	0.255	0.927	0.784
Post-intervention	Intervention	Control	4.275	1.435	0.004*
3-month follow-up	Intervention	Control	8.431	0.648	<0.001*

*Statistically significant at p-value<0.05, PDM=prescription drug misuse, SE=standard error

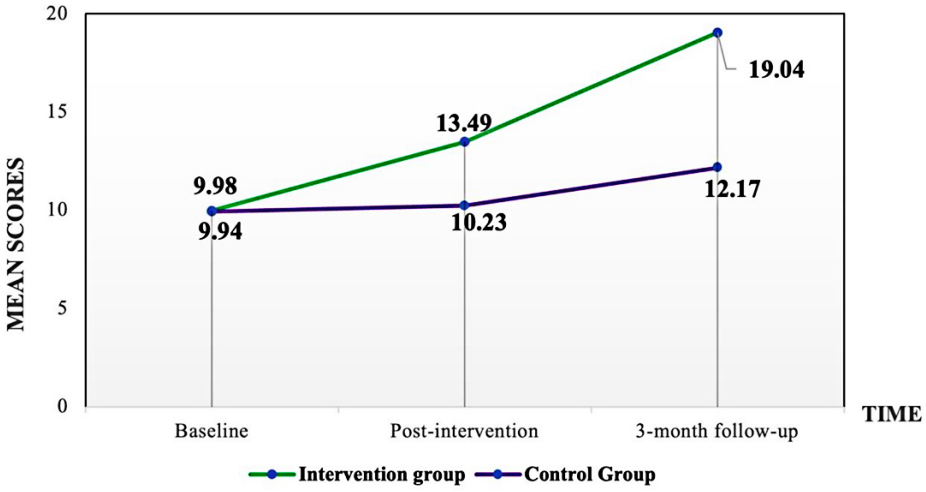

Figure 2 Mean scores of the knowledge of prescription drug misuse at 3 times

to retain information and apply it in real-life situations[27].

Additionally, providing students with comprehensive knowledge about the dangers and consequences of PDM is crucial. Many high school students may not fully understand the risks associated with the misuse of these medications, especially when they are used recreationally or without a prescription[28,29]. The finding aligns with Lucas et al., who reported significantly increased knowledge of PDM post-training[24]. Similarly, Evans et al. found improved knowledge among students after participating in the TINAD program[30], and Onuorah et al. observed a significant rise in psychoactive substance knowledge in the intervention group compared to controls[31].

This program can improve attitudes toward

Effects of intervention program between and within groups on attitude

There was a statistically significant difference in attitudes toward PDM between groups (F(1,100)=219.680, p-value<0.001). Mauchly's test was not significant (p-value>0.05); the Sphericity assumption was met. Within-subject analysis showed significant changes in mean attitude across 3 time points (p-value<0.001), indicating a strong time-by-intervention interaction (Table 3). Post hoc comparisons with Bonferroni correction revealed no significant difference at baseline between the intervention (26.53±3.84) and control groups (25.68±3.73) (p-value>0.05). However, significant differences were found at post-intervention (intervention: 35.25±2.37, control: 27.50±4.69, p-value<0.001) and 3-month follow-up (intervention: 37.55±2.19, control: 27.47±3.30, p-value<0.001) (Table 4). Attitude scores improved significantly more in the intervention group (Figure 3), with a large effect size (η^2=0.687).

Effects of the intervention program between and within groups on preventive behavior

There was a statistically significant difference in preventive behaviors for PDM between groups (F(1,100)=67.871, p-value<0.001). Mauchly's test was not significant (p-value>0.05); the Sphericity assumption was met. Within-subject analysis showed significant changes in preventive behaviors across 3 time points (p-value<0.001), indicating a strong time-by-intervention interaction (Table 3). Post hoc comparisons with Bonferroni correction showed no significant difference at baseline between the intervention (30.76±4.74) and control groups (30.51±4.62) (p-value>0.05). However, significant differences emerged at post-intervention (intervention: 35.07±4.74, control: 30.08±8.99, p-value=0.004) and the 3-month follow-up (intervention: 39.88±1.53, control: 31.45±4.37, p-value<0.001) (Table 4). Preventive behaviors improved significantly more in the intervention group (Figure 4), with a large effect size (η^2=0.404).

Discussion

The study shows the program effectively enhanced students' knowledge of PDM, with the intervention group gaining significantly more knowledge than the control group. The finding can be explained by the program's use of interactive teaching methods, such as group discussions, case studies, and role-playing activities. These methods likely facilitated active learning, making it easier for students

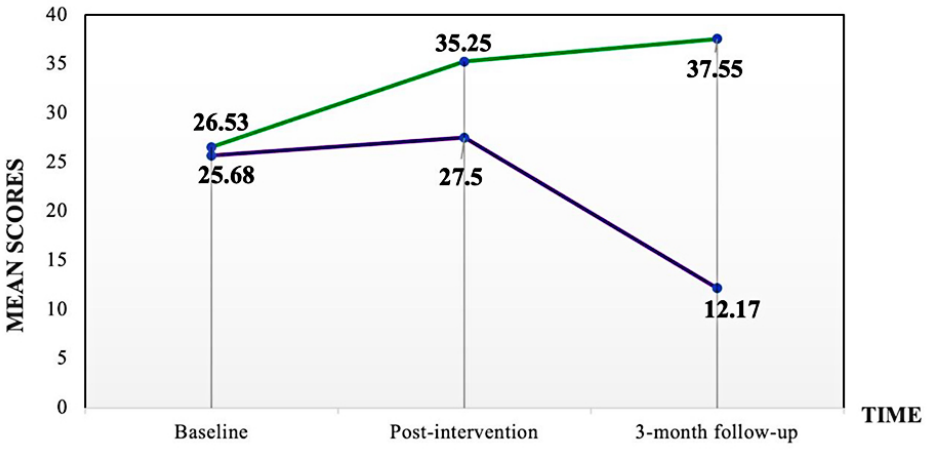

Figure 3 Mean scores of attitude toward prescription drug misuse at 3 times

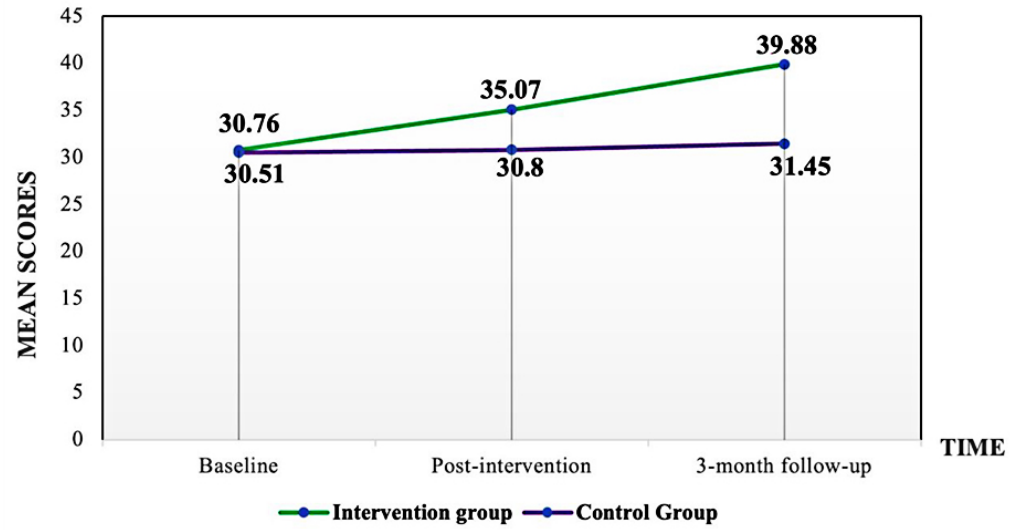

Figure 4 Mean scores of the preventive behaviors for prescription drug misuse at 3 times

PDM, a growing concern among adolescents prone to experimentation. The program's focus on attitude shifts targets the key drivers of PDM, challenging adolescents' misconceptions that misuse is less harmful or socially acceptable[32]. Engaging activities promote responsible attitudes, which often precede behavior change[33]. Additionally, the program equips students with practical skills—such as refusal techniques and stress management—to resist peer pressure and avoid misuse[34]. Peer involvement fosters a supportive environment that leverages peer influence to promote healthy choices and enhance program effectiveness. This finding aligns with Evans et al., who reported improved attitudes after the TINAD program[30], and Onuorah et al., who found significant attitude improvements in the intervention group versus the control group [31].

The intervention effectively promotes preventive behaviors on PDM among high school students. By increasing awareness of the physical, psychological, and social risks, the program helps correct misconceptions that PDM is safer than illicit ones[35]. Shaping students' attitudes—viewing misuse as harmful and unacceptable—strongly influences behavior change[23]. Through interactive methods like discussions and peer-led activities, the program fosters informed decision-making and encourages healthier choices[36]. This finding supports the KAP model, where knowledge shapes understanding, influencing attitudes and leading to healthier practices[15]. As students view PDM more negatively, they are more likely to avoid it and adopt positive coping strategies[37]. The program also addresses emotional triggers—like stress or anxiety—by offering healthier alternatives to self-medication. Additionally, fostering a peer-supported culture in schools can reinforce behavior change and reduce misuse. The findings align with previous research. Lucas et al. reported a significant increase in alternative behaviors to prescription drug use after a brief health-focused intervention[24]. Similarly, Evans et al. found that students in the TINAD© program demonstrated increased self-efficacy[30]. Fadaei et al. also showed that education based on the Health Belief Model significantly improved preventive behaviors in the intervention group compared to the control group[38].

This study had several strengths. First, the intervention was systematically structured based on the KAP model, ensuring theoretical consistency and targeted behavioral change. Second, the implementation process was rigorous, with clearly defined procedures, trained facilitators, and standardized content delivery. This study had several limitations. First, the quasi-experimental design lacked random assignment, limiting the ability to attribute behavior changes solely to the intervention. Second, the study was conducted in Central Thailand, which may limit generalizability, especially to urban school populations. Lastly, the use of self-reported data may introduce response biases. Recommendations for future studies: First, future studies should use extended follow-ups and complementary methods to assess long-term program effectiveness and improve data validity, reduce bias, and deepen insights into sustaining PDM prevention in adolescents. Second, future studies should increase the sample size and use random sampling to enhance reliability and generalizability. Lastly, this study relied on self-reported questionnaires, which may introduce recall or social desirability bias. Future research should consider incorporating complementary methods such as direct behavioral observations, in-depth qualitative interviews, and follow-up assessments beyond 3 months.

Conclusion

The intervention group demonstrated significantly better knowledge, attitudes, and preventive behaviors on PDM than the control group. The large effect sizes highlight the program's strong practical value in promoting responsible PDM prevention. Practice recommendations are as follows: First, integrate the program into school and primary healthcare curricula to reinforce preventive behaviors. Second, train teachers and peer leaders to enhance engagement and support the long-term implementation. Third, use interactive tools—such as apps, gamification, or social media—to increase accessibility and interest. Lastly, schools and policymakers should enforce clear regulations on PDM to prevent misuse.

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Conflict of interest

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