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SCIENTIFIC

Prescription Drug Misuse and Associated Risk Behaviors among Public High School Students in Oklahoma: Data from the 2013 Oklahoma Youth Risk Behavior Survey

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Purpose: The purpose of this study was to assess the magnitude of prescription drug misuse among Oklahoma high school students, examine associated risk factors, and inform state-based prevention strategies.

Methods: Data from the 2013 Oklahoma Youth Risk Behavior Survey were used for this analysis and were representative of public school students in grades 9 through 12 in Oklahoma. Variables were examined using percentages and 95% confidence intervals. The chi-square test was used to test for differences in proportions. Logistic regression was used to produce adjusted odds ratios as measures of association between selected independent variables and prescription drug misuse.

Results: Nearly one in five students had ever used a prescription drug without a doctor's prescription. While there was no statistically significant difference of prescription drug misuse by gender or grade in the bivariate analysis, after covariate adjustment, females were 1.5 times more likely than males to have misused prescription drugs and twelfth graders were 1.7 times more likely than ninth graders to have misused prescription drugs.

Conclusion: Students who had ever taken prescription drugs without a doctor's prescription were significantly more likely than students who had never taken prescription drugs without a doctor's prescription to have engaged in current tobacco use, current binge drinking, current marijuana use, and lifetime drug use and have a higher prevalence of suicide risk.

BACKGROUND

Over the past two decades, the prescribing of controlled substances, especially opioid analgesics, has increased dramatically in the United States. In Oklahoma, from 2001 to 2012, per capita opioid sales nearly tripled.[1-2] Correlated with this increase in prescribing and availability was a significant increase in nonmedical use of prescription drugs, that is, the use of prescription drugs without a prescription or the misuse of prescribed drugs for the feeling or experience that results. Along with prescription drug misuse and abuse being a critical public health concern among the adult population, a significant increase in nonmedical prescription drug use has been observed among adolescents and young adults, making it an equally important area of study.

From 1994 to 2007, in the United States, the proportion of adolescent emergency room or doctor visits resulting in a controlled substance prescription nearly doubled (6% to 11%).[3] Overall, the rate of drug-related emergency department visits involving psychotherapeutic agents for youth aged 12 to 17 years remained fairly steady from 2004 to 2011; however, the rate involving opioid analgesics, benzodiazepines, or central nervous system stimulants increased substantially during the same time period (46%, 32%, and 245% increases respectively).[4]

Despite declines in other forms of substance abuse (e.g., alcohol, tobacco, illicit drugs) by high school students over the past decade, there has been an increase in prescription drug misuse and the percentage of students reporting lifetime nonmedical use of prescription drugs remains high. In 2013, 9% of youth aged 12 to 17 years had ever used prescription drugs nonmedically.[5] Two percent of youth aged 12 to 17 had used prescription drugs for nonmedical purposes in the past 30 days, a 21% decrease from 2011.[5] After marijuana, nonmedical use of prescription drugs is the second most common form of drug use in teens and young adults.[5] Substance abuse among young people is an indicator of future dependence, addiction, drug-related injury, overdose, and even death. Teens that use prescription drugs nonmedically are more likely to use tobacco, drink alcohol, and use illicit drugs.[6-7] Additionally, teens and young adults who report using prescription drugs nonmedically are more likely to engage in problematic or high-risk behaviors including gambling, impulsivity, increased sexual activity, and risky sexual behaviors such as multiple sexual partners and unprotected sex.[6,8]

Demographic correlates and associated risk and protective factors vary by the type of drug used. According to a systematic review of research on nonmedical use of prescription medications among United States (U.S.) adolescents, the most common class of prescription drugs involved was opioid analgesics. Other common drug classes of abuse included stimulants, sedatives, and tranquilizers. Study results varied somewhat, but overall, females appeared more likely to report nonmedical use of prescription medications, especially opioid analgesics.[9]

Nonmedical use of prescription drugs increases with age for preteens and teens.[7] This trend may be in part due to

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increased responsibility with age; students may be more responsible for self-administering medications, and school policies may allow for students to carry medications with them as opposed to being held and administered by school health staff. The odds of being prescribed a controlled substance may also increase with age. In a study of medical and nonmedical use of prescription opioids by U.S. high school seniors, almost one in four students had some exposure to prescription opioids (medical or nonmedical). Of those with medical use prior to nonmedical use, approximately 80% reported using their previously prescribed opioids nonmedically.[10]

The relationship between drug use, depression, and suicidality is well documented.[11-13] The relationship between nonmedical use of prescription drugs and depressive symptoms among college students has also been documented.[14-15] In a study that examined the relationship between nonmedical use of prescription drugs, depression, and suicidality, female students were not only more likely to experience depression, but were also more likely to have a prescription for a controlled drug and a history of a suicide attempt. Reporting of depressive symptoms or suicidality resulted in a significantly higher likelihood of stimulant, sedative, opioid analgesic, and antidepressant use.[11]

Increased substance abuse leads to increased morbidity and mortality due to overdose. Public health surveillance data collected on poisoning deaths in Oklahoma show that four out of five (79%) unintentional poisoning deaths involve at least one prescription drug. For deaths among youth and teens aged 12 to 19 years, the percentage is slightly higher (83%). From 2007 to 2012, 94 Oklahomans aged 12 to 19 years died of an unintentional prescription drug overdose. Ninety percent of these deaths were among teens aged 16 to 19 years. More than half (58%) of decedents had a history of substance use or abuse, 20% were definitely or likely drinking alcohol prior to their death, 28% had a history of mental health problems, and 10% had a history of an overdose.[16]

State-based substance abuse prevalence estimates vary by geographical location and may differ from national estimates. For this reason, prevention efforts and best practices should include analyses of not only national surveys but local and regional data as well.[9] The purpose of this study was to assess the magnitude of prescription drug misuse among Oklahoma high school students, examine associated risk factors, and inform state-based prevention strategies.

METHODS

Instrument

For the 2013 Youth Risk Behavior Survey (YRBS), 1,474 questionnaires were completed in 40 public high schools representing an overall response rate of 65%. The 2013 survey included 86 questions, covering six categories of health-risk behaviors, an assessment of obesity prevalence, and other health-related topics. Health-risk behaviors included behaviors that contribute to unintentional injuries and violence, tobacco use, alcohol and other drug use, sexual behaviors that contribute to unintended pregnancy and sexually transmitted diseases, unhealthy dietary behaviors, and physical inactivity.

The statewide, randomized YRBS is conducted biennially on odd-numbered years. The 2013 sample was selected using a two-stage sampling design. Schools were first selected for participation based on probability proportional to size (school enrollment in grades 9 through 12). Classes were then selected from each school using systematic equal probability sampling with a random start. The sample was weighted to be representative of Oklahoma public high school students in grades 9 through 12 based on the demographic distribution of the enrolled student population provided by the Oklahoma State Department of Education. A detailed explanation of YRBS methodology has been well documented elsewhere.[17]

Dependent Measure

The misuse of prescription drugs was measured by the question "During your life, how many times have you taken a prescription drug (such as OxyContin, Percocet, Vicodin, codeine, Adderall, Ritalin, or Xanax) without a doctor's prescription?" The response options were 0 times, 1 or 2 times, 3 to 9 times, 10 to 19 times, 20 to 39 times, and 40 or more times. For the classification of prescription drug misuse, responses of 0 times were coded as "no" and responses of 1 or more times were coded as "yes."

Independent Measures

Five independent measures were included in analyses – current tobacco use, current marijuana use, current binge drinking, lifetime drug use, and suicide risk. Current tobacco use was defined as smoking cigarettes on one or more of the 30 days before the survey. Current marijuana use was defined as using marijuana on one or more of the 30 days before the survey. Current binge drinking was defined as having five or more alcoholic drinks within a two-hour period during the 30 days before the survey. Seven questions were used to create the variable "lifetime drug use." Lifetime drug use was coded as "yes" if a student ever used any form of cocaine; sniffed glue or breathed the contents of aerosols or paints; injected illegal drugs; used heroin, methamphetamines, or ecstasy; or took steroids without a doctor's prescription. Five questions were used to create the variable "suicide risk." If a student reported any of the following during the previous 12 months (e.g., ever felt so sad or hopeless for two or more weeks in a row that he/she stopped doing some usual activities, seriously considered attempting suicide, made a plan about how he/she would attempt suicide, attempted suicide, or was treated for an injury from attempted suicide), then suicide risk was coded as "yes."

Internal consistency was examined for lifetime drug use and suicide risk using Cronbach's alpha. The coefficient alpha for both composite measures was greater than 0.7, indicating interrelatedness among the variables of each composite measure.

Analyses

SAS 9.4 was used to perform analyses.[18] *SAS PROC SURVEYFREQ* was used to generate descriptive statistics and to perform bivariate analyses. *SAS PROC SURVEYLOGISTIC* was used to perform multivariable analyses. Variables were

examined using percentages and 95% confidence intervals (CI). The chi-square test was used to test for differences in proportions. Logistic regression was used to produce adjusted odds ratios (AORs) as measures of association between selected independent variables and prescription drug misuse. Variables were considered statistically significant at $p<0.05$. Gender, race/ethnicity, grade, and all independent measures (i.e., current tobacco use, current binge drinking, current marijuana use, lifetime drug use, and suicide risk) were controlled for when modeling on prescription drug misuse. Although tobacco use, current binge drinking, current marijuana use, and lifetime drug use were similar risk behaviors, all variables were kept in the final model due to each variable's known association with prescription drug misuse and was more informative than modeling each risk behavior independently of the other risk behaviors.

RESULTS

Nearly one in five students (18.0%) had ever used a prescription drug without a doctor's prescription **(Table 1)**. There were no statistically significant differences for prescription drug misuse across gender, race/ethnicity, or grade level in the descriptive analysis.

In the bivariate analysis, students who reported current tobacco use, current binge drinking, current marijuana use, lifetime drug use, or a suicide risk factor were more likely to have ever misused prescription drugs than students who had not engaged in those risk behaviors **(Table 2)**.

Multivariable logistic regression analysis was used to assess the odds of prescription drug misuse while adjusting for covariates of gender, grade, race/ethnicity, and the five risk behaviors. The associations of current binge drinking, current marijuana use, lifetime drug use, and suicide risk remained statistically significant with prescription drug misuse in the multivariable model **(Table 3)**. Two risk behaviors, lifetime drug use and current marijuana use, had AORs of threefold or above (5.8 and 3.0, respectively), followed by current binge drinking (AOR=2.6) and suicide risk (AOR=1.7). Current tobacco use was not statistically significant after adjusting for the other risk behaviors, gender, race/ethnicity, and grade level.

While there was no statistically significant difference of prescription drug misuse by gender or grade in the bivariate analysis, after covariate adjustment, females were 1.5 times more likely than males to have misused prescription drugs (95% CI, 1.1-2.2, $p= 0.02$) and twelfth graders were 1.7 times more likely than ninth graders to have misused prescription drugs (95% CI, 1.0-3.0, $p= 0.04$).

Limitations

The YRBS is a cross-sectional study; therefore, the measured associations reflect one point in time and do not imply a causal relationship. These data were representative of public school students in grades 9 through 12 in Oklahoma. Adolescents who attended private institutions, were home-schooled, or did not attend any school were not represented in this study. There is potential underreporting of risk behaviors by students participating in the YRBS. Despite efforts to conduct the YRBS in such a manner as to preserve confidentiality, some students may not report events if they feel their answers will in some way identify them. Furthermore, students read and interpret the questions and form their answers without any external assistance; therefore, students may have different interpretations of the YRBS questions and response options. Lastly, notwithstanding the suicide questions, the YRBS lacks the ability to document the presence of mental health issues and their contribution to prescription drug misuse.

DISCUSSION

Prescription drug misuse among adolescents is a public health concern with research demonstrating alarming rates of nonmedical prescription use among this population.[19] The present study examined the prevalence of prescription misuse among adolescents completing the Oklahoma YRBS, identified substance use and mental health factors associated with increased odds of prescription misuse, and offers possible targets for prevention or intervention.

Results from the bivariate analysis found that 19% of female high school students and 18% of male high school students reported lifetime prescription drug misuse. These results demonstrate a higher overall prevalence of lifetime prescription misuse and higher prevalence among females, compared to other epidemiological studies.[20-21] For example, findings from the Monitoring the Future study determined that approximately 16% of male twelfth graders and 14% of female twelfth graders had taken a prescription drug without medical supervision at some point during their lifetime[20] and findings from King et al. found similar rates in a survey of seventh through twelfth graders (14%).[21] Differences in lifetime use by gender with females having a higher prevalence of prescription misuse has been found in other studies.[22]

While there was no difference in prescription drug misuse by gender in the bivariate analysis, results from the multivariate analysis showed that females were 1.5 times more likely than males to have misused prescription drugs. Additional conferred risk for females may be related to higher rates of internalizing problems (depression, anxiety) and trauma, which are often comorbid with substance abuse. Relatedly, females are more likely than males to be prescribed narcotics or anti-anxiety medications that are vulnerable to abuse.[23] Higher rates of prescriptions among females could also be related to higher rates of chronic pain conditions compared to males or a greater propensity for women to seek treatment and report symptoms and functional disability associated with pain.[24] Regardless of the reasons for this gender disparity, females have increased access to prescription opioids, which may increase their risk of misuse. More research, however, is needed to further explain this gender disparity.

The present study examined the co-occurrence of prescription drug misuse with other current and lifetime health-risk behaviors via multivariate analysis. Prescription drug misuse was associated with current binge drinking, current marijuana use, lifetime drug use, and suicide risk. Results were generally consistent with previous literature that has

Table 1. Prevalence of Prescription Drug Misuse by Demographic Characteristics: Oklahoma YRBS 2013

	Prescription Drug Misuse				
	Yes		No		
	Unweighted n	Weighted %	Unweighted n	Weighted %	p value
Gender					
Female	124	18.5	607	81.5	
Male	127	17.5	612	82.5	0.61
Race					
NH Black	-	-	88	84.0	
Hispanic	32	19.7	131	80.3	
NH Native American	30	19.7	115	80.3	
NH Multiple Races	38	18.8	166	81.2	
NH White	134	17.7	680	82.3	0.53
Grade					
9th	57	14.3	402	85.7	
10th	82	18.1	373	81.9	
11th	58	17.2	266	82.8	
12th	53	22.8	179	77.2	0.09
Total	**251**	**18.0**	**1220**	**82.0**	

Demographic subtotals may not equal the survey sample total (n=1,474) due to missing values

Unweighted n= number of survey respondents

Weighted %= representative of all public school 9-12 graders

NH= Non-Hispanic

(-) Data for Asian/Pacific Islanders and small cell sizes are not shown due to statistical imprecision

documented the relationship or co-occurrence of prescription drug misuse with other health risk behaviors.[25-27] For example, Sung et al. found that the highest correlate of opioid misuse was the use of other substances including alcohol and tobacco, illicit drugs, and misuse of other prescription drugs.[27] Similar findings were obtained by Schepis et al. who found that adolescent preferences for risk taking and past-year use of cigarettes, alcohol, marijuana, cocaine and/or inhalants was associated with prescription misuse.[26]

In contrast to previous work examining similar correlates of prescription drug misuse, results from the multivariate analysis demonstrated that current tobacco use was not associated with an increased risk of prescription drug misuse, suggesting that engagement in other serious health-risk behaviors confers more risk for prescription drug misuse, particularly current marijuana use and lifetime drug use. This finding may be related to attitudes about the perceived harmfulness of various health behaviors. For example, findings from Johnson et al. showed that approximately 43% of eighth graders and 48% of tenth graders perceived great risk in smoking one to five cigarettes per day, but a higher percentage of youth viewed use of various drugs as conferring great risk.[28] Thus, youth may be more likely to engage in tobacco use because it is perceived as less dangerous or risky than other drug use. As such, they may engage in tobacco use but refrain from engaging in perceived higher risk health behaviors such as misusing prescription drugs.

Also of note, suicide risk was associated with increased risk for prescription drug misuse. Although the role of mental health problems and substance abuse has long been established in the literature, the role of adolescent mental health issues in prescription drug misuse has not been as widely examined. Findings from the present study are consistent with existing literature suggesting that symptoms of depression or indicators of suicide risk are significant predictors of nonmedical prescription drug use.[29]

Table 2. Bivariate Analysis of Prescription Drug Misuse and Selected Risk Behaviors: Oklahoma YRBS 2013

		Prescription Drug Misuse		
Risk Factor		Yes	No	
Current Tobacco Use	Yes	43.1	56.8	*p*<.001
	No	11.6	88.3	
Current Binge Drinking	Yes	43.1	56.8	*p*<.001
	No	10.7	89.2	
Current Marijuana Use	Yes	49.8	50.1	*p*<.001
	No	11.5	88.4	
Lifetime Drug Abuse	Yes	58.9	41.0	*p*<.001
	No	10.9	89.1	
Suicide Risk	Yes	29.1	70.8	*p*<.001
	No	12.7	87.2	

The results from the present study may help inform prevention efforts to combat the problem of prescription drug misuse among adolescents with other substance use and mental health problems. Given the significance of the problem and the identification of risk factors that may place some adolescents at increased risk of prescription misuse, early detection and restricting access are critical. Early identification of adolescents at risk for prescription misuse can be accomplished via the utilization and integration of mental health screening and assessment instruments in schools.[30] Screening in primary care, which is recommended by the American Medical Association's *Guidelines for Adolescent Preventive Services*, is one mechanism for early identification of risk factors and prevention of prescription misuse among adolescents. Brief screening tools have been specially designed for this purpose and have been utilized with some degree of success in screening for substance use among adolescents. Expanding these brief screening tools to include items related to mood, suicide risk, and behavior indicative of prescription misuse may be helpful.

Restricting or limiting adolescent access to prescription drugs is also an important target for prevention, particularly among females who have been shown to have increased access to prescription opioids. According to the 2013 National Survey on Drug Use and Health, 53% of past year nonmedical users of pain relievers aged 12 and older obtained their pain relievers for free from a friend or a relative.[31] Secure storage of current medications and proper disposal of unneeded, unused, and expired medications is critical for limiting access.[32] Additionally, increased monitoring of prescription use by those receiving pain relievers is needed to prevent diversion and possible misuse.

With the exception of addiction specialists, most health care providers who prescribe medication receive minimal training on recognizing substance abuse.[32] Research has demonstrated the stigma surrounding substance abuse is higher when compared to other health conditions. Negative attitudes toward substance abuse are barriers to health care access; providers may feel patients are not serious about their health, take advantage of the health care system, or are non-compliant with care.[33] Although some strides have been made in this area with increased awareness, physicians are still not adequately recognizing and addressing substance abuse among patients.[34]

While this study highlights factors that may be associated with increased risk among adolescents, other risk factors have been established and should be carefully considered in the design and implementation of any prevention program. Other risk factors include peer and parental influences such as peer models and approvals of behavior, peers' use of prescription drugs for recreational purposes, and parental monitoring.[35-37] Media influences and physicians' prescribing practices may also play a role.[3,38-39]

CONCLUSIONS

Nonmedical prescription drug use is a significant problem among Oklahoma adolescents. The current study identified risk factors that were associated with increased odds of prescription drug misuse by high school students. In terms of demographic differences, females and older students were more likely to misuse prescription drugs compared to males. High school students who engaged in various health-risk behaviors and reported mental health concerns had elevated odds of misuse.

Early identification of those adolescents at risk for

Table 3. Multivariable Analysis of Prescription Drug Misuse and Selected Risk Behaviors: Oklahoma YRBS 2013

	Adjusted Odds Ratios[1]	95% Confidence Intervals	p value
Risk Factors			
Current Tobacco Use	1.55	(0.88-2.73)	0.12
Current Binge Drinking	2.60	(1.25-5.41)	0.01
Current Marijuana Use	3.01	(1.66-5.42)	<.001
Lifetime Drug Abuse	5.85	(3.34-10.26)	<.001
Suicide Risk	1.74	(1.17-2.60)	0.006
Gender			
Male	ref		
Female	1.52	(1.06-2.18)	0.02
Race/Ethnicity			
NH White	ref		
NH Black	0.83	(0.29-2.33)	0.72
NH Hispanic	0.88	(0.52-1.50)	0.66
NH Native American	0.83	(0.49-1.39)	0.49
NH Multiple Races	0.96	(0.52-1.75)	0.90
Grade			
9th grade	ref		
10th grade	1.58	(0.96-2.61)	0.07
11th grade	1.29	(0.77-2.17)	0.33
12th grade	1.73	(1.02-2.95)	0.04

1 Multivariable logistic regression adjusting for gender, grade, race/ethnicity, and selected risk factors.

Data are not shown for Asian/Pacific Islanders due to statistical imprecision

NH= Non-Hispanic

prescription misuse is important as drug use at a young age increases the risk of later dependency, addiction, and other health risk behaviors. Prevention efforts should emphasize early screening through various mechanisms (school, primary care). Existing adolescent-focused prevention/health promotion programming should incorporate information on prescription drugs and proper storage and disposal.

Future research should further examine and clarify the gender disparity in nonmedical prescription drug use and identify other risk and protective factors that may help explain adolescent engagement in this health-risk behavior.

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