ALCOHOL USE BEHAVIORS AND OUTCOMES IN PROFESSIONAL STUDENT PHARMACISTS

by

SAMAH F. AL-SHATNAWI

(Under the Direction of Merrill Norton)

ABSTRACT

Problematic alcohol use is a prevalent behavioral health issue among college students. Evidence indicates that problematic alcohol use and other mental health problems are prominent in samples of healthcare students. However, less research has examined alcohol use behaviors and outcomes among student pharmacists in comparison to other healthcare students. Problematic alcohol use can cause personal disruption and loss of productivity at school and in the professional career of future pharmacists. As a result, the pharmaceutical healthcare process and patients' health may be jeopardized. Thus, the purpose of this work is to integrate previous research findings within a study that examines alcohol use behaviors and outcomes among a sample of student pharmacists in order to identify factors associated with their problematic alcohol use behaviors and outcomes.

Alcohol use behaviors and outcomes of student pharmacists were assessed prospectively using a cross-sectional study design. Student pharmacists enrolled at 6 pharmacy schools in the southeastern United States were solicited to participate in this study. Participants were asked to complete an online, anonymous, voluntary survey designed to assess substance use behaviors

and risk factors in student pharmacists. The survey was administered using Qualtrics software between 2013 and 2014. This survey included pre-validated measures that assess alcohol use behaviors and outcomes, alcohol use-related risk factors, perceived stress, depressive symptomatology, anxiety levels, personality traits associated with impulsive behaviors, and demographic factors.

The sample consisted of 1194 student pharmacists enrolled in their first, second, third, and fourth pharmacy program-years. A high prevalence of problematic alcohol use (18%) and a high rate of experienced alcohol-related outcomes (39%) within the past-year were observed. Significant associations between alcohol use behaviors and outcomes and different factors including: demographic characteristics (e.g. gender, age, year in school, relationship status, and academic performance); risk factors (e.g. age of first alcohol use, family history, other drug use, and existing mental conditions); psychological factors (e.g. anxiety level and depressive symptomatology); and personality traits (e.g. negative urgency and lack of premeditation) were also detected. Our results suggest that pharmacy schools should implement effective screening and early intervention programs in an effort to address this important student health issue.

INDEX WORDS: Problematic alcohol use, Alcohol-related outcomes, Risk factors, Student pharmacists, Pharmacy schools

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DEDICATION

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CHAPTER 1

INTRODUCTION

Substance use behaviors among college students have been a concern for many years. Excessive alcohol use on college campuses has become commonplace and time-honored tradition. According to the National Survey on Drug Use and Health (NSDUH), fully enrolled college students are more likely than their same age group counterparts (18-22) to report alcohol use.[1] Approximately 60% of fully enrolled college students reported current alcohol use (within the past 30 days), 40% reported binge alcohol drinking (5 or more drinks at the same time or within 2 hours on one or more days in the past month), and 13% reported heavy alcohol drinking (5 or more drinks on the same occasion on 5 or more days in the past month), while 50.6%, 33.4%, and 9.3% of their non-college age-mates reported these patterns of alcohol use, respectively.[2] There has been a consistent trend since 2002 indicating higher rates of alcohol use among college students compared to their non-college counterparts.[2] Noteworthy, despite serious consequences or impairments, college students rarely consider seeking help for problematic substance use behaviors.[3] Only 5% of 19% of college students who met the diagnostic criteria for Alcohol Use Disorders (AUD) reported that they sought help for problematic alcohol use.[4]

Despite the long-standing problematic alcohol use in college students, strict efforts to understand and yet ameliorate this problem are of recent development. Since 1976, in response to a comprehensive report by the National Institute on Alcohol Abuse and Alcoholism (NIAAA),[5] colleges and universities have initiated various efforts such as alcohol education and motivational interventions. However, in 2011, the Substance Abuse and Mental Health Services

Administration (SAMHSA) reported that heavy episodic drinking remains prevalent in U.S. colleges.[6] From 2002 to 2011, the rates of binge drinking among fully enrolled students declined slightly.[1] Nevertheless, no significant change was noticed thereafter.[1]

In college years, alcohol use has been linked to many deleterious short-term and long-term outcomes such as academic impairment, injuries to self and others and/or properties, social and economic outcomes, unsafe sex, violence, and fatalities.[7-11] In 2000, a study on a national representative sample of U.S. college students showed that students who reported frequent binge drinking were 8 times more likely to report injury, 17 times more likely to miss classes, 7 times more likely to have unplanned sex, and 8 times more likely to be involved in troubles with police than students who did not report binge drinking.[12] Between 1998 and 2005, a 9% increase in the proportion of college students who drive under the influence of alcohol, and a 3% increase in overall alcohol-related fatalities were reported.[7]

Alcohol Use Disorder (AUD) is a major sub-component of the overall Substance Use Disorders (SUD) that continues to pose a public health challenge in U.S. colleges.[13,14] Approximately 1 in 5 college students met the criteria for AUD within the past-year.[14] This rate was significantly higher than that related to non-college counterparts (18-25 year).[14] Based on the Diagnostic and Statistical Manual of Mental Disorders-IV (DSM-IV) criteria, college students were more likely to be diagnosed with alcohol abuse, and to report 2 criteria out of the 7 alcohol dependence criteria than non-college attendees.[14] Nevertheless, college students were similar to their non-college peers in the possibility of being clinically diagnosed with alcohol dependence.[14] Alcohol abuse is considered a transient problem among college students; yet, substantial numbers of students continue to have this problem beyond their college years.[14] Thus, this persistent pattern of college drinking and its associated outcomes highlight the urgent need

to implement preventive and treatment measures identified through research to reduce alcohol use and alcohol-related outcomes among this population.

Importantly, the risks for developing SUD are not equally distributed in populations. Several factors (e.g. biological, behavioral, psychological, social and environmental) contribute to subjective variations. Multiple factors have been identified as influential to the behavior of substance use in college students (18-25 years). These factors include: (*i*) genetic factors (e.g. family history of substance use),[15,16] (*ii)* demographic factors (e.g. age, gender, and ethnicity),[17-21] (*iii*) psychosocial factors,[21-26] and (*iv*) personality-related factors.[27-30]

Regardless of being medically educated, healthcare professionals and students bear a special risk for developing SUD.[31] In 2003, the National Institute on Drug Abuse (NIDA) stated that 8% to 12% of healthcare workers had chemical dependencies.[32] Approximately 10% to 15% of health care professionals are estimated to misuse alcohol or drugs at some time during their career.[31] Among healthcare professionals, pharmacists play a central role in medical care and are medication experts. Yet, they are highly vulnerable to SUD.[31] Approximately 40% of pharmacists have reported non-medical use of prescribed drugs.[33-36] In addition, a higher percentage of pharmacists report lifetime use of an opioid or anxiolytic (approximately 25% and 14%, respectively) as compared to nurses (15% and 8%, respectively).[37] Interestingly, significant associations between alcohol use, AUD, and problematic drug use in professional pharmacists recovering from SUD have been observed.[38] As a result, the healthcare process and patients' health might be threatened.

Noteworthy, substance use behaviors and/or disorders may develop at earlier ages prior to the profession (during college years or even before).[38,41] In one study, 88% of pharmacy professionals who reported non-prescribed drug use began during college years.[33] In addition,

previous research suggests that healthcare professional students are a significant subsample of the college student population that is at higher risk for problematic substance use behaviors.[40,41] Thus, research should focus on factors that might influence the behaviors of substance use in student pharmacists.

Problem Statement

While the behaviors of substance use among healthcare professionals and professional students (e.g. medical, dentistry, and nursing) were examined, no significant efforts have been seen in colleges and schools of pharmacy. Given the paucity of research related to substance use behaviors among pharmacy practitioners including student pharmacists, the need to advance this body of literature is evident. Substance use behaviors and disorders can cause personal disruption and loss of productivity at school and in the professional career of those with SUD. The absence of evidence-based methods for predicting or dealing effectively with the impact of substance use among professional student pharmacists further highlights the need for close review and assessment of these behaviors in this special population.

Since the late 1980s and early 1990s, the existence of problematic substance use behaviors, predominantly those alcohol-related in pharmacists and student pharmacists were reported. [34,41,42-44] A more recent study with data collected between 1995 and 1999 proposed that alcohol use may increase over time in this population.[45] Although older studies have highlighted the seriousness of problematic alcohol use behaviors in student pharmacists,[46-48] few studies have been conducted to investigate and examine the current pattern of alcohol use behaviors among this population.[49,50] It is important to note that older publications (published before 2000 or used data that was collected before 2000) formed the bulk of available literature.[34,42,43,47,48] Hence, the findings from the available literature would not be relevant to contemporary patterns of alcohol

use in student pharmacists. This finding alone indicates the need to conduct research regarding the current patterns of alcohol use behaviors and its associated risk factors and outcomes in pharmacy schools.

Most studies that examined the behavior of alcohol use in student pharmacists focused primarily on general demographic factors.[42,43,47,48,50] Few studies assessed the influence of other risk factors such as: onset of use, other drug use, mental health disorders, and family history.[37,49,51] None of the studies has mainly focused on other psychological and personality factors. In general, there is limited information about stress, depression, anxiety, and personality traits (related to impulsive behaviors) in this population. Therefore, there is a need for information regarding these factors and their influence on student pharmacists' behavior of alcohol use.

Study Rationale

Research reviewing and summarizing the extent of substance use in professional student pharmacists is needed. The paucity of knowledge about alcohol and other drug use among this population mandates the need for a comprehensive literature review. An extensive review of the literature will stimulate and guide future studies that aim for a better understanding of substance use behaviors in this special group of professional students.

The associations between potential risk factors (e.g. psychological factors) and alcohol use behaviors among student pharmacists are unknown. The identification of factors that influence alcohol use behavior in student pharmacists will aid in controlling substance use-related impairment in the pharmacy profession. Identifying significant risk factors will further support the development or modification of screening, preventive strategies and educational or consulting interventions that are tailored to pharmacy schools. Moreover, by identifying

subgroups of student pharmacists who might be at higher risk for problematic substance use, pharmacy schools and colleges can effectively target their preventive strategies to intervene early before substance use-related problems or disorders fully develop. Therefore, the progression rate of problematic substance use and SUD among this vulnerable population might be addressed.

Research Goal and Aims

The short-term goal of this research is to update the literature about alcohol use in student pharmacists. The ultimate goal of this research is to stimulate and encourage pharmacy schools to develop and/or improve preventive strategies (e.g. screening programs and educational interventions) with respect to problematic substance use and alcohol use in particular. The aims of this research are to:

i. Review the extent of substance use in student pharmacists and highlight potential factors associated with substance use behaviors in this population;
ii. Describe and assess alcohol use behaviors in a large sample of student pharmacists using a standardized tool: the Alcohol Use Disorder Identification Test (AUDIT);
iii. Assess the associations between demographic, psychological, personality traits (impulsive behavior domains), and other risk factors (identified in the literature review) and problematic alcohol use behaviors among student pharmacists;
iv. Determine the associations between several factors (demographic, psychological, personality traits, and other risk factors) on student pharmacists' experience of alcohol related outcomes; and
v. Describe the relationship between alcohol use and academic performance (e.g. Grade Point Average [GPA]) among student pharmacists.

Study Significance

This study is unique in that it applies the standardized tool (AUDIT) to assess and categorize alcohol use in a large sample of student pharmacists from multiple pharmacy schools. The findings will be relevant to the current pattern of alcohol use in pharmacy schools, and results will be compared to results from previously conducted studies among other groups of students (e.g. medical students and general college students). This study is novel as it examines the associations between psychological factors and personality traits and alcohol use behaviors in student pharmacists. Further, this study will provide current information on student pharmacists' psychological status (e.g. perceived stress, depressive symptomatology, and anxiety). These factors might have a direct influence on students' behavior of alcohol use and/or their academic achievement. Thus, students at higher risk of problematic alcohol use may be targeted by specific preventive and educational interventions.

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CHAPTER 2

SUBSTANCE USE ATTITUDES, BEHAVIORS, EDUCATION AND PREVENTION IN COLLEGES OF PHARMACY IN THE UNITED STATES: A LITERATURE REVIEW[†]

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Abstract

This research describes and summarizes student pharmacists' substance use behavior in the United States. Current literature indicates that there are problems with alcohol and other drug use among student pharmacists. Although researchers have found variations in the type and rate of reported substance use, significant proportions of student pharmacists were identified as being at high risk for Substance Use Disorders (SUD). Findings from this review suggest that pharmacy schools should encourage and stimulate more research in order to implement effective screening and early intervention programs in an effort to address this important student health issue.

Key words: Substance use disorders, substance use behaviors, student pharmacists, colleges of pharmacy

Introduction

Healthcare professionals are at risk for developing Substance Use Disorders (SUD).[1] According to the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5), SUD is the updated term that embraces the two interrelated conditions of substance abuse and dependence.[2-4] The term "*addiction"* was completely eliminated from the updated SUD terminology in the DSM-5 because of its debatable definition and associated stigma.[3] The unidimensional disorder (SUD) is defined as a *"problematic pattern of behaviors related to the use of substance"* that can lead to significant impairment or distress.[2-5] Table 2.1 lists SUD criteria specified in DSM-5 manual. SUD clinical and functional impairments may include health problems, disabilities, and being unable to meet significant obligations at home, school, and/or

work.[4,5] The most common substances associated with SUD in the U.S. include alcohol, tobacco, cannabis, stimulants, hallucinogens, and opioids.[2,5]

In 2003, the National Institute on Drug Abuse (NIDA) stated that 8% to 12% of healthcare workers had chemical dependencies.[6] Approximately, 10% to 15% of healthcare professionals are estimated to misuse alcohol or drugs at some time during their career.[1] Among healthcare professionals, pharmacists play a central role in medical care and are medication experts. Yet, they are highly vulnerable to SUD.[1] Research shows that approximately 40% of pharmacists have reported non-medical use of prescribed drugs.[7-10] In addition, a higher percentage of pharmacists report lifetime use of an opioid or anxiolytic (approximately 25% and 14%, respectively) as compared to nurses (15% and 8%, respectively).[11] As a result, the healthcare process and patients' health might be threatened.

Substance use behaviors and/or disorders may develop during pre-professional years (i.e., college years or even before).[12,13] In one study, 88% of pharmacy practitioners who admitted lifetime use of non-prescribed drugs began to use drugs during college.[7] In general, substance use behaviors among college students have been a concern for many years. According to the National Survey on Drug Use and Health (NSDUH), college students are more likely than their same age group counterparts (18-22) to report alcohol use.[14] Higher rates of current (within the past 30 days), binge (5 or more drinks at the same time or within 2 hours on one or more days in the past month), and heavy (5 or more drinks on the same occasion on 5 or more days in the past month) alcohol use were reported by college students as compared to their non-college age-mates.[15] In addition to alcohol, research shows that college students commonly report use of other substances. For example, in a recent national survey (SAMHSA, 2014), 22.3% of college students reported past month illicit drug use.[15]

Previous research also suggests that healthcare professional students are a significant subsample of college student population that is at higher risk for problematic substance use behaviors.[16-18] However, less research has examined substance use among student pharmacists in comparison to other healthcare professional students.[8,9,18,19] Substance use and its disorders can cause personal disruption and loss of productivity at school and in the professional career. The primary purposes of this literature review are: (i) to highlight what is known about substance use behaviors among student pharmacists, and (ii) to identify factors that might influence problematic substance use behaviors among student pharmacists.

Methods

This review includes studies completed within U.S. colleges and universities identified through multiple databases (PubMed, Web of Knowledge, Google Scholar, and PsycINFO). Searches were conducted using the key words "substance use" OR "alcohol" OR "caffeine" OR "cannabis" OR "hallucinogen" OR "inhalants" OR "opioids" OR "sedatives" OR "hypnotics" OR "anxiolytics" OR "stimulants" OR "tobacco" AND "student pharmacists" OR "pharmacy schools" in the title and/or abstract. Limitations imposed within the search included English language and research conducted in human subjects. Further, cited references in all articles obtained by the aforementioned databases were reviewed. For the purpose of this review, any article on student pharmacists' substance use behaviors was included and the focus was on substance use rates or levels (quantity and frequency of substance consumption), motives for any substance use, and substance use related problems (negative outcomes).

Table 2.1. Diagnostic Criteria for Substance Use Disorders (SUD)[2]

Impairment of control over substance use criteria:[2]

1. Substance used in larger quantities or over an extended period than it is intended.[2]
2. Having tenacious desire or being unsuccessful in controlling, reducing, or quitting substance use.[2]
3. Spending a lot of time to obtain a substance, use a substance, and recover from its effects.[2]
4. Craving or having a strong desire to use a substance.[2]

Impairment of control over social activity criteria:[2]

5. Recurrent substance use resulting in failure to complete major role obligations at work, school, or home.[2]
6. Continued substance use regardless having continuous interpersonal and / or social problems.[2]
7. Withdraw from important social, occupational, recreational, and family activities because of substance use.[2]

Impairment of control over risky substance use criteria:[2]

8. Persistent substance use in situations where substance use is physically dangerous.[2]
9. Continued substance use regardless having the knowledge about physical or psychological problems that might be caused or deteriorated by the used substance.[2]

Substance use related pharmacological criteria:[2]

10. Tolerance [2]
    i. Increased need for higher doses of substance over time to reach the desired effects.[2]
    ii. Not reaching the desired effects with continuous use of the same substance dose.[2]
11. Withdrawal[2]
    i. Reporting characteristic substance withdrawal symptoms.[2]
    ii. Using same substance or a closely related substance to overcome withdrawal symptoms[2]

Severity level of SUD is based on the number of reported criteria within 12 month period:

A. MILD: Presence of 2-3 criteria.[2]
B. MODERATE: Presence of 4-5 criteria.[2]
C. SEVER: Presence of 6 or more criteria.[2]

Findings

The literature search identified 16 studies. Thirteen articles assessed student pharmacists' use of various substances,[8,11,15,16,18-26] two articles solely focused on alcohol use,[27,28] and one article examined only stimulants use.[29] Table 2.2 summarizes the studies found through this search. The following paragraphs summarize the findings of these studies by substance type.

Alcohol Use:

Previous researchers primarily focused on alcohol consumption and alcohol-related problems among student pharmacists. Alcohol was identified as the most used substance by student pharmacists.[16,22] Problematic alcohol use was reported in a significant number of reviewed studies.[11,16,18,27,28,30] In two recent studies, the Alcohol Use Disorders Identification Test (AUDIT) was used to evaluate alcohol use patterns among student pharmacists.[27,28] These studies showed similar results with approximately 25% of participants reporting hazardous or harmful drinking (AUDIT ≥8). Binge drinking (consumption of 5 or more drinks in one occasion) also was assessed in previous studies.[16,19,30] Results from two studies found that approximately 30% of student pharmacists had at least one binge drinking episode during the preceding 2 weeks.[16,30] In another study conducted by Kenna and Wood, 36% of student pharmacists reported binge drinking within the past 2 weeks.[11] A more recent study conducted by Bidwal et al. found similar results with 31% of respondents reporting binge alcohol use within the past-year.[20]

Tobacco Use

Less research has invistigated tobacco use among student pharmacists.[11,16,30] Some researchers included questions within their surveys to assess tobacco use as a covariate that might influence student pharmacists' use of other substances.[20,23-25,27] Kenna and Wood found that approximately 58% of student pharmacists reported a lifetime tobacco use.[11] Between 1990

and 2011, past-year tobacco use ranged between 8.1%-32%.[20,24] While the most recent study conducted by Bidwal et al in 2011 reported the lowest percentage of past-year tobacco use (8.1%),[20] the highest percentage (32%) was reported by Lord et al based on data collected in 2006.[24] For regular tobacco use, Lord et al reported that 10% of student pharmacists used tobacco a *few times a month or even more*.[24] Murawski and Juergens found similar results with approximately 10% of student pharmacists reporting daily tobacco use (data collected between 1995 and 1999).[23] However, other reports based on data collected in 2000 and 1990 showed 4.6% and 5.1% of daily tobacco use among student pharmacists, respectively.[11,25]

Caffeine use

The search identified only one study that investigated caffeine use among student pharmacists.[20] In a study of student pharmacists' use of stimulants, Bidwal et al found that 45.6% used caffeinated energy drinks and 10.4% used caffeine pills during the past year.[20]

Marijuana Use

Since 1990, marijuana was identified as the second most used substance after alcohol by student pharmacists.[8,11,22] Rates of current marijuana use in recent studies ranged from 6%-21%, and rates for lifetime use were between 14% and 33%.[11,20,24,30] As an example, Lord et al found that 21% of student pharmacists reported the use of marijuana in the preceding year.[24] Among these students, 5% reported using marijuana regularly on monthly basis.[24] However in studies conducted before 1993, researchers found higher rates of current (between 14% and 28%) and lifetime (between 39% and 52%) marijuana use among student pharmacists.[8,26,31,32] Notably, the literature suggests a reduction in the rates of past-year marijuana use among student pharmacists (from 21%[24] to 7.4%,[20] based on data collected in 2006 and 2011).

Non-medical use of prescription drugs

Non-medical use of prescription drugs was described as any use of prescription drugs without a legal prescription, or the use of prescribed medications in ways other than prescribed by healthcare providers such as taking higher doses or changing route of administration.[8,20,21,24] In late 1980's, a significant proportion of student pharmacists reported lifetime (66.7%) and past-year (41%) use of controlled substances without a legal prescription.[8] Specific classes of drugs misused during pharmacy school years are discussed below.

1. Prescription Stimulants

A small but significant proportion of student pharmacists reported misusing prescription stimulants.[8,16,24,25] The most commonly reported stimulants used by student pharmacists include dextro-amphetamine, amphetamine, and methylphenidate.[20,24,29] Five to 19% of respondents disclosed their current (within the past-year) non-medical use of prescription stimulants.[11,24,25] In 2004, Kenna and Wood stated that prescription stimulants were highly or frequently used by student pharmacists; 3.5% of their study respondents used them on monthly basis.[11] A recent study found that approximately 9% of student pharmacists used stimulants at some time during their college years, and 3.2% reported non-medical use within the past 5 months.[21] Other studies have found that between 7% and 9.7% of student pharmacists report a lifetime non-medical use of a prescription stimulants.[20,24,29] Lord et al[24] found a 7% lifetime stimulants use in 2009. However, in a more recent study, Volger et al[21] found a 11.6% lifetime stimulants use.

2. Prescription Opioids

Previous studies have found rates of prescription opioid misuse ranging between 8% and 15 % (lifetime),[10,28] and 1% to 6% (current use) among student pharmacists.[11,20,24,30] With respect to the two most recent reports (data collected in 2006 and 2011), past-year prescription opioid

misuse was reported by 5% and 2.3% of student pharmacists, respectively.[20,24] Rates of past-year prescription opioid misuse in student pharmacists increased from (1.7%)[30] in 1999 to (5%)[24] in 2006. However in 2011, past-year misuse of prescription opioids was reported by only 2.3% of student pharmacists.[20]

Other Illicit Drugs Use

Results from the literature search found mixed results regarding the use of other illicit drugs such as cocaine, ecstasy, heroin, and hallucinogens among student pharmacists. A majority of studies found that no more than 3% of student pharmacists reported lifetime or current use of cocaine, ecstasy, heroin, or hallucinogens.[16,20,22,24,30] However, Miller and Banahan found lifetime use rates of 11.6% for cocaine and 5.8% for ecstasy among student pharmacists in 1990.[22] Similarly, Rascati et al. found that 7% of students reported lifetime use of cocaine in 1993. [26] A more recent study reported a significantly higher percentage (13.8%) of lifetime hallucinogen use among student pharmacists.[11]

Potential factors influencing alcohol and other drug use behaviors

1. Age of first use

Evidence suggests many student pharmacists began substance use and/or experimentation during early years of age.[23,24,27,28,30] Some studies report under-age drinking at ages less than 10, 18, or 21 years.[23,27,30] In a study conducted in 1999, Baldwin et al reported that more than half of study participants used alcohol on a monthly basis before the age of 21 years.[30] Previous research also documented drug experimentation at very early ages (in junior high school, high school, or at any age before 21).[24,30] Approximately 28% of student pharmacists reported drug experimentation at an age less than 21.[30] In 2008, Lord et al found that approximately 5% and

4% of study respondents indicated their use of opioids and stimulants at ages less than 21 years, respectively.[24]

2. Gender

Despite the dominance of female enrollments in pharmacy schools, male gender was a significant predictor of substance use behaviors in most studies.[11,24,27,28] Oliver et al. and English et al. observed that male participants were statistically more likely to report hazardous or harmful alcohol use (score 8 or more on the AUDIT) compared to their female counterparts.[27,28] Similarly, being a male was identified as a significant predictor for reported past-year opioid use.[24]

3. Family history

Significant percentages of student pharmacists reported having family members with SUD.[23] Student pharmacists with family histories of alcohol and/or drug problems were more likely to have substance use-related behavioral problems (e.g. report high lifetime and/or past-year use) than their peers from families with no reported alcohol or drug use problems.[11,25] Noteworthy, all studies were based on student's perceptions of family-members behaviors, which may be confounded by the respondent's own use practices and perceived norms.

4. Access to prescription drugs

Concerning student pharmacists' access to controlled drugs, the vast majority of those who reported their non-medical use of prescription drugs, acquired these drugs illegally (with no valid prescriptions).[24] Easy access to prescription drugs was reported by student pharmacists.[8,11] Studies have shown mixed results regarding the sources of these drugs, with students indicating

varying worksite settings (community and/or outpatient pharmacies), school, and friends as the primary sources of drugs.[8,20,24]

5. Other potential factors

Several other factors such as coping with stress, performance enhancement, self-treatment and recreational purposes have been associated with student pharmacists' substance use. Student pharmacists have reported higher levels of stress as compared to the general adult population.[18,20,33,34] Alcohol use may be employed as a coping strategy to deal with stress among student pharmacists.[16,28,34,35] Regarding prescription stimulants, student pharmacists indicated that these drugs were primarily used to enhance performance (alertness and consentration) at school or work.[21,24,29] Self-treatment was the most commonly reported reason for using prescription opioids.[24] Specifically, student pharmacists reported using opioids to relieve stress or relax (29%), deal with chronic pain (23%), improve sleep (20%), and manage depression (11%).[24] Lastly, recreational use was amongst the most commonly reported reasons for illicit drug use (e.g. marijuana) in student pharmacists.[8,21,24]

Substance use related outcomes and student pharmacists' perceptions

Researchers have found negative outcomes associated with student pharmacists' substance use. These negative outcomes can be classified as educational (e.g. attending class under the influence,[16,22,25,27,30] missing classes,[25] receiving poor grades or evaluation[16,20,26]), risky-health behavioral (e.g. unintended sexual contact,[19,23,27] driving under influence or joining intoxicated driver,[16,20,30] experiencing blackouts[16,30]), and professional (e.g., taking care of patients while intoxicated,[16,25,30] missing work or going to work while intoxicated,[16,22,25,27,30] dealing with legal charges[16,25,30]). One study showed that student pharmacists had the highest rates of substance use related negative outcomes (e.g. missing class or work, attending class or

work while intoxicated, receiving lower grades or evaluation, dealing with legal and financial problems, facing marital and relationships problems, and taking care of patients while intoxicated) when compared to students from other healthcare professional programs (dentistry and Allied health).[25]

Previous studies also indicated that student pharmacists have concerns regarding the extent to which substance use is addressed in pharmacy schools.[18,25] Approximately 34% of student pharmacists believed that prescription drug misuse is a critical issue that needs to be seriously reviewed.[21] A substantial proportion of student pharmacists reported that their knowledge about substance use and SUD was insufficient.[23,26,30] In a study conducted in 1999, Baldwin et al. found that only 9% of student pharmacists considered the available school's resources (e.g. health counseling groups) as the first choice when seeking assistance for alcohol or drug use problems.[30] In addition, student pharmacists have indicated that there is a lack of policies regarding substance use, impairments, and recovery in pharmacy schools (e.g. treatment confidentiality and students' accountability).[23,30]

Methodological Considerations

The reviewed studies have methodological issues that warrant mentioning. First, all reviewed studies relied on self-reported data,[11,16,20,21,24,27,28,30] which may be subject to "reporting bias." There were no attempts to cross validate self-reported data with other measurements of substance use (e.g. biological tests or standardized screening tools). Student pharmacists' future careers are affected by documented substance use problems (e.g. licensing and practice regulations). Therefore, students may be more likely to underreport substance use behaviors. Second, previous research was not consistent in defining and measuring substance use behaviors among student pharmacists. For example, binge drinking was defined differently in *6* out of *9*

studies [11,15,16,19,20,23-26] Several of the reviewed studies evaluated substance use over different time-periods (e.g., during the past 2 weeks,[11,25] past 3 months,[19] over the past year[16,24]). Furthermore, many of the studies used substance use measures that were not rigorously developed/tested, or failed to provide information regarding the measures' psychometric properties (e.g., reliability, validity).[8,11,20,21,23-25] These measurement issues may limit the ability to: (i) obtain accurate assessments of problematic substance use among student pharmacists, (ii) evaluate the longitudinal change in student pharmacists' behavior of substance use, and (iii) compare and contrast results across study populations. Finally, the recency and current representativeness of information regarding student pharmacists' substance use is lacking. The majority of reviewed studies were conducted before 2010. Only 5 studies presented data collected within or after 2010 (5 years before conducting this review).[20,21,27-29] It is important to note that older publications (9 studies with data collected before 2000) formed the bulk of available literature.

Discussion

Problematic substance use behaviors within U.S. pharmacy schools present a significant issue to the pharmacy profession and U.S. healthcare system.[1] Current literature shows a relative dearth of research regarding the contemporary behaviors of substance use in student pharmacists. This is the first study to comprehensively review the available literature on substance use behaviors among student pharmacists in the U.S. Findings from this review highlight the existence of substance use behaviors in this population. Problematic alcohol use (hazardous and harmful use) was evident in a significant proportion of student pharmacists.[27,28] In addition, a smaller but still significant proportion of student pharmacists reported other drugs use (e.g. stimulants, opioids, marijuana, sedatives, hallucinogens, anxiolytics, heroin, and cocaine) within

the past-year.[20,21,24] This literature review provides pharmacy school stakeholders (e.g., school administrators, program coordinators, and program directors) with current and historical information regarding alcohol and drug use among student pharmacists. Given that student pharmacists are the professional pharmacists of tomorrow, emphasis should be placed on intervening on these problematic behaviors to prevent situations that may jeopardize future healthcare processes and outcomes.

Based on the DSM-5 criteria for SUD, results from previous research suggest that some student pharmacists may meet the diagnostic criteria for mild or even moderate SUD. Several studies reported data related to the *impairment of control over substance use criteria* (see Table 2.1). For example, high percentages of student pharmacists reported consuming large quantities of alcohol (e.g. binge drinking or hazardous consumption) in the most recent studies (published after 2010).[20,27,28] Furthermore, one study found that 3.2% of student pharmacists used prescription stimulants for non-medical purposes during the past 5 months.[21] In addition, student pharmacists also reported negative outcomes related to substance use (e.g. receiving poor grades or evaluation because of their substance use)[11] which correspond to the *impairment of control over social activity criteria*. Student pharmacists who indicated substance use also were more likely to report driving under influence or joining intoxicated driver (i.e., *impairment of control over risky substance use criteria*).[20] Collectively, these findings represent potential indicators for existing SUD in student pharmacists.

The evidence is mixed regarding the comparison between student pharmacists' substance use behaviors and other healthcare students' behaviors.[11,16,20,25,29] For example, one study showed that student pharmacists were more likely to use substances (binge alcohol drinking and prescription drug use) than dental and allied health students.[25] However, Kenna and Wood

(2004) found that student pharmacists had similar rates of alcohol use, and lower rates of other drug use as compared nursing students.[11] Baldwin et al showed that student pharmacists had lower alcohol consumption in comparison to medical, nursing, and allied health students; however, student pharmacists were more likely to use tobacco use when compared to medical, dental, and allied health students.[16] Baldwin et al also found that student pharmacists were more likely to use prescription stimulants (amphetamines) in comparison to other students.[16] However, Bossaer et al found no significant difference in rates of prescription stimulants use among pharmacy, medical and respiratory therapy students.[29] Overall, it is difficult to draw firm conclusions about whether pharmacy students engage in more or less problematic substance use behaviors compared to other health professional students given these findings. Furthermore, the methodological issues discussed earlier (e.g., inconsistent definitions and measurement of substance use) hinder comparisons across studies.

Current evidence regarding student pharmacists' problematic substance use calls for the implementation of preventive and treatment strategies in pharmacy schools. A plausible prevention strategy centers on strengthening students pharmacists' training about SUD and negative outcomes. The American Association of Colleges of Pharmacy (AACP) states that pharmacy schools and colleges are responsible for ensuring that student pharmacists are equipped with the skills and knowledge about substance use and SUD.[36] AACP recommends that all pharmacy schools provide professional SUD-related education at both entry-level and continuing-education programs.[36] Substance use can be addressed in coursework and/or co-curricular activities provided by pharmacy schools. Such educational and training programs may help student pharmacists identify signs and symptoms related to problematic substance use among themselves and their colleagues.[37]

Pharmacy schools also may assist student pharmacists who are at risk of developing or have SUD by implementing disease-state evaluation, referral programs and interventions that facilitate recovery.[36] Student services departments can play a role by assessing and evaluating students with a suspicious problematic substance use behavior. For example, the Student Assistance Program at Auburn University conducts evaluations of students with problematic substance use.[38] Based on evaluation results, students are referred for further evaluation and/or treatment. The Pharmacists Recovery Network website (www.usaprn.org) provides a SUD educational network and a list of available recovery assistance programs by state.[39] The role of this network is to provide individuals who seek recovery with confidential assistance and support. Educating students about such programs might increase their willingness to seek help and/or refer colleagues who need help.[39] In addtion, interventions aimed to prevent substance use problems among general college students also may be applicable to student pharmacists.[40-42] The Brief Alcohol Screening and Intervention for College Students (BASICS) is an example of a program that has been found to help general college students with alcohol use problems.[43-45] BASICS was developed to increase students' motivation to change their drinking habits and provide them with behavioral skill training on how to control alcohol drinking and how to manage daily stress.[44] Such programs could be modified to address factors associated with student pharmacists' substance use (e.g., stress, self-treatment) and implemented to help student pharmacists prevent and/or recover from SUDs.

Conclusion

Previous studies suggest that student pharmacists engage in problematic substance use and may be at risk of developing substance use disorders. These findings highlight the need for programs/interventions to address substance use in schools and colleges of pharmacy. Future

research should be conducted to gain a better understanding of substance use and SUD developmental processes among student pharmacists. For example, an annual national survey assessing attitudes, motivations, and substance use behaviors among student pharmacists may provide representative data for assessing the change in substance use over time, and help to identify mutable factors contributing to substance use.[46] Findings from such research may help pharmacy school administrators and stakeholders prevent substance use issues among students and aid students in need of substance use services.

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Table 2.2. Key studies that assess substance use patterns among student pharmacists

Study, year (Ref no)	Assessed substances	Location, year of data collection	Students sample: n, RR Student pharmacists: n, RR [Design/Measures]	Results (student pharmacists)	Provided Comparison
Normark et al, 1985 (18)	Alcohol Other drugs (not specified)	North Carolina, 1983	Student pharmacists: 391, 82% Study sample didn't include other students or professionals Cross-sectional study of substance use impairment risk with self-reported alcohol and other drugs use (in class paper & pencil)/ 15 item survey, collected from previous measurements, no information about reliability &/or validity.	Students believe drug abuse is a problem in pharmacy school: >37% Students believe alcohol abuse is a problem in pharmacy school: Third year students: >80% Fourth year students: 40% Fifth year students: 58% Students with potential or actual substance use problems: 17.6%	As compared to students in 3rd year, 4th and 5th year students believed that alcohol and drug abuse problems were less severe in pharmacy school.
Mcauliffe et al, 1987 (8)	Marijuana Cocaine Opiates Sedatives Stimulants Tranquilizers Hallucinogens	New England state, 1984	Student pharmacists: 278, 67% Study sample included professional pharmacists Cross-sectional study of self-reported use (mail survey)/ 40 item survey, no information about reliability &/or validity.	Past-year use of any controlled substance without a prescription: 41% Lifetime use of any controlled substance without a prescription: 66.7% Past-year recreational drugs use: 36% Lifetime recreational drugs use: 57%	As compared to professional pharmacists in this study, student pharmacists reported a significantly higher rate of recreational drugs use.
Miller & Banahan III, 1990 (22)	Alcohol Marijuana Amphetamines Barbiturates Tranquilizers Cocaine Heroin Ecstasy	8 pharmacy schools in the Southeastern U.S., 1986	Student pharmacists: 1440, RR=? Study sample didn't include other students or professionals Cross-sectional study of self-reported use (in class paper & pencil) / 91 item survey, modified from Monitoring the Future project survey.	Past-year consumption of alcoholic drinks: 76.5% Past-year marijuana use: 13.8% Past-year amphetamines use: 6.8% Past-year tranquilizers use: 4% Past-year barbiturates use: 0.9% Past-year cocaine use: 3.1% Past-year ecstasy use: 3.1% Past-year heroin use: 0.2% Lifetime consumption of alcoholic drinks: 82.3%	As compared to general college students,[47] student pharmacists in this study were significantly less likely to report past-year use of alcohol, marijuana, amphetamines, barbiturates, and cocaine.

				Lifetime marijuana use: 39.3% Lifetime amphetamines use: 17.8% Lifetime cocaine use: 11.6% Lifetime ecstasy use: 5.8% Lifetime heroin use: 1.3%	
Rascati et al, 1993 (26)	Alcohol Cocaine Marijuana Amphetamines	3 pharmacy colleges in Texas, year was not provided	Student pharmacists: 603, 90% Study sample didn't include other students or professionals Cross-sectional study of self-reported use (in class paper & pencil) / pre-tested survey from Monitoring the Future project.	Lifetime consumption of ≥ 2 alcoholic drinks on at least 1 occasion: 86% Past-year consumption of ≥ 2 alcoholic drinks on at least 1 occasion: 72% Past-year marijuana use: 6.0% Past-year cocaine use: 1.0% Past-year amphetamines use: 3.0% Lifetime marijuana use: 26.0% Lifetime cocaine use: 7.0% Lifetime amphetamines use: 9.0%	As compared to older studies,[8,31,32] student pharmacists in this study reported lower rates of amphetamine, cocaine, and marijuana use.
Kriegler & Baldwin, 1994 (25)	Alcohol Tobacco Stimulants Marijuana Opiates Cocaine Sedatives Hallucinogens Amphetamines	Midwestern Health Science University (Nebraska), 1990	Students sample: 1707, 57.6% Student pharmacists: 161, 81.7% Cross-sectional study of self-reported use (in class paper & pencil)/ 75 item (pilot tested) survey, no information about reliability &/or validity).	Past-year alcohol use: 90.5% Consumption of ≥ 5 drinks in the past 2 weeks: 40.8% Regular consumption of alcohol on weekly basis: 32.2% Past-year tobacco use: 22.2% Daily tobacco use (within past-year): 5.1% Past-year stimulants use: 19.0% Past-year marijuana use: 11.3% Past-year cocaine use: 1.3% Past-year amphetamine use: 5.7% Past-year sedatives use: 7.7%	As compared to campus average drinking rates, student pharmacists reported higher rate of binge drinking (40.8%). Similarly, student pharmacists reported higher past-year use rates of amphetamines, sedatives, and stimulants compared to average campus use rates. Consequently, in comparison to other student groups in this campus, student pharmacists reported more negative

					consequences related to alcohol and drug use.
Noormohamed et al, 1998 (19)	Alcohol Marijuana Cocaine Amphetamines	3 pharmacy schools (UI, MCP, & TSU), year was not provided	Student pharmacists: 848, 50% Study sample didn't include other students or professionals Cross-sectional study of self-reported use (in class paper & pencil) / survey with no further information.	Alcohol use within the past 3 months: 73.3% Consumption of ≥ 5 drinks on the same occasion within the past 3 months: 51.9% Lifetime marijuana use: 12.4% Lifetime cocaine use: 5.4% Lifetime amphetamines use: 3.9%	This study found higher rate (68%) of consuming ≥ 5 drinks/occasion in the past 3 months among UI students as compared to students from TSU (44%) & MCP (42%). Lifetime marijuana use was the highest among UI students (22%) as compared to TSU (12.9%) & MCP (3.7%). However, lifetime cocaine use was the lowest among UI students (2%) as compared to students in TSU (3.6%) & MCP (9.3%). Relative to national college students, this study showed similar or even higher rates of alcohol and other drug use in student pharmacists.
Murawski & Juergens, 2001 (23)	Alcohol Tobacco Marijuana Cocaine Hallucinogens Amphetamines	University of Mississippi, 1995-1999	Student pharmacists: 1995: 168, RR=? 1996: 172, RR=? 1997: 246, RR=? 1998: 171, RR=? 1999: 238, RR=? Study sample didn't include other students or professionals Longitudinal study of self-reported use (paper and pencil)/ 21 item survey, with no	Drinking alcohol started at age less than 21years: 48.9% Current alcohol use (active alcohol consumers): 66.7%-75.0% Past-year binge drinking (≥ 5 drinks at one occasion): 33.3% Lifetime marijuana use: very little reported use (% not specified) Past-year tobacco use (daily): 10.3% Tobacco use started at age less	As compared to older studies conducted in the late 1980s,[25,26,31] this study showed lower rates of current alcohol use among student pharmacists. Furthermore, this study indicated that student pharmacists consumed less alcohol and reported

			information about pilot test &/or reliability & validity.	than 21years: 14.5%	less use of other substances as compared to the general college population.
Kenna & Wood, 2004 (11)	Alcohol Tobacco Stimulants Marijuana Opiates Sedatives Cocaine Hallucinogens Anxiolytics Barbiturates	Northeastern state, 2000	Students sample: 135, 35.3% Student pharmacists: 87, 45.5% Cross-sectional study of self-reported use (in class paper & pencil)/ general questions about lifetime and monthly use of alcohol and other substances, with no information about reliability or validity.	Lifetime alcohol use: 92.0% Consumption of ≥ 5 drinks during the past 2 weeks: 35.7% Lifetime and daily tobacco use, respectively: 57.5% &4.6% Lifetime and monthly marijuana use, respectively: 49.4% &14.0% Lifetime and monthly cocaine use, respectively: 3.4% & 1.2% Lifetime and monthly opiates use, respectively: 14.9% & 0.0% Lifetime and monthly stimulants use, respectively: 8.0% & 3.5% Lifetime and monthly anxiolytics use, respectively: 5.7% & 0.0% Lifetime and monthly sedatives use, respectively: 1.0% & 0.0% Lifetime and monthly hallucinogens use, respectively: 13.8% & 0.0%	Regarding alcohol consumption, student pharmacists reported lower rate of consuming ≥ 5 drinks during the past 2 weeks as compared to general college students in 2000.[48] For tobacco use, student pharmacists were less likely to use tobacco (lifetime or daily) than nursing students and other college students. As compared to nursing students in, student pharmacists reported lower rates of lifetime use of non-medical prescription drugs. Student pharmacists were less likely to report (lifetime or monthly) marijuana use than nursing students. Student pharmacists reported higher rate of lifetime opiate use than general college students,[48] however, nursing students reported a significantly greater rate (39.2% vs. 14.9%). Similarly, student pharmacists were less likely to report

					anxiolytics, sedatives, and muscle relaxants than nursing students.
Baldwin et al, 2006 (16)	Alcohol Tobacco Marijuana Cocaine Sedatives Opioids Hallucinogens Amphetamines	Nebraska, 1999	Students sample: 2646, 56.4% Student pharmacists: 427, 66.1% Cross-sectional study of self-reported use (in class paper & pencil + school mail)/ Survey instrument from previous study.[27]	Past-year alcohol use: 81.2% Past-year consumption of ≥5 drinks per occasion: 17.1% Past-year tobacco use: 25.8% Past-year drug use: 8.9% Past-year marijuana use: 5.9% Past-year amphetamine use: 1.2% Past-year sedatives use: 3.0% Drive under the influence: 40% Attend class and/or work under the influence: 8.2%	As compared to students in other programs (medical, dental, nursing, and allied health) in this study, student pharmacists reported the least consumption of marijuana (5.9%), opioids (0.7%), and hallucinogens (0.2%) within the Past-year, but they consumed the most of stimulants (Amphetamines).
Lord et al, 2009 (24)	Alcohol Tobacco Stimulants Marijuana Opioids Hallucinogens Sedatives Cocaine	Private urban college of pharmacy in the North-eastern U.S., 2006	Student pharmacists: 950, 62% Study sample didn't include other students or professionals Cross-sectional study of self-reported use (online)/ 95 item survey with no information about reliability & validity.	Lifetime opioids use: 8.0% Lifetime stimulants use: 7.0% Past-year opioids use: 5.0% Past-year stimulants use: 5.0% Past-year alcohol use: 77.0% Past-week drinking of more than one drink per day: 14.0% Past-year tobacco use: 32% Past-year tobacco use (monthly): 10% Past-year marijuana use: 21.0% Past-year sedatives use: 5.0% Past-year hallucinogens use: 3.0% Past-year cocaine use: 2.0%	As compared to national survey results on general college students,[49,50] student pharmacists showed similar rates of non-medical prescription medications use. These findings contradict the results from a previous study conducted by Kenna & Wood in 2004.[11]
Baldwin et al, 2011 (15)	Alcohol Tobacco Marijuana Cocaine Sedatives Opioids	1 public southwestern & 2 (public & private) Midwestern	Student pharmacists: 566, 86.5% Study sample didn't include other students or professionals Cross-sectional study of self-reported use (in class paper &	Past-year alcohol use: 82.2% Past-year tobacco use: 25.4% Past-year marijuana use: 6.9% Past-year cocaine use: 0.7% Past-year opioids use: 1.7% Past-year sedatives use: 3.9	Past-year alcohol use was the lowest among the Midwest private school students (73.2%) and the highest among Midwest public students (93.2%).

	Hallucinogens Amphetamines	pharmacy schools, 1999	pencil) / 62 item survey that was taken from a survey (after slight modifications) used in a previous study.[27]	Past-year amphetamines use: 1.9% Past-year hallucinogens use: 0.9% Monthly alcohol use before age of 21years: 52.3% Any drug experimentation before age of 21: 27.4% Drinking ≥ 5 drinks on the same occasion within the past 2 weeks: 29.0%	Tobacco use was 1.4% higher among Midwest public students as compared to their results in 1990.[25] Tobacco use in student pharmacists was higher than medical, dentistry, and allied health students. However tobacco use in student pharmacists was 11% lower than nursing students.[16] The use of other substances was similar across all schools. Sedatives use was very low in Midwest public students (0.6%) as compared to other students in Midwest private (4.7%) & Southwest public (5.9%).
English et al, 2011 (27)	Alcohol	9 pharmacy schools (1 public in Northeast, 1 private in Northeast, 1 private in South, 2 private in Midwest, 1 public in Midwest, 1 public in West, &2 public in South),	Student pharmacists: 1161, RR=? Study sample didn't include other students or professionals Cross-sectional study of self-reported use (online & in class paper & pencil) / 32-item questionnaire including AUDIT.	Past-year alcohol use: 86.4% Past-year report of hazardous alcohol use (AUDIT≥ 8): 25.2% Past-year report of high degree of alcohol related problems (16 ≥AUDIT ≥19): 3.0% Past-year report of symptoms that suggest alcohol dependence: 25%	As compared to national results on college students in 2009,[49] this study reported higher rates of alcohol consumption among student pharmacists. As well, student pharmacists in this study reported higher AUDIT scores as compared to a national sample of medical students (15.4% with AUDIT ≥ 8) in 2009 study.[51]

		2009-2011			
Bossaer et al, 2013 (29)	Stimulants	East Tennessee State University, 2011	Students sample: 372, 59.9% Student pharmacists: 225, 70.5% Cross-sectional study of self-reported use (online survey) / 23-item questionnaire created by healthcare professionals (medicine & pharmacy) with no information about pilot test and/or reliability & validity.	Lifetime stimulants use: 9.7% Main reasons for using stimulants: improve academic performance, enhance alertness and energy, get high (recreational use), and drug experimentation. Negative consequences associated with stimulants use: criticism from others, more doctor visit, and inability to take OTC medications.	Rate of non-medical prescription stimulants use among student pharmacists was similar to the rates reported by healthcare professional students (medical and respiratory therapy students).
Volger et al, 2013 (21)	Stimulants Tobacco Marijuana Cocaine Prescription medications: (sedatives & pain medications)	North Carolina, 2012	Student pharmacists: 407, 39% Study sample didn't include other students or professionals Cross-sectional study of self-reported use (online)/ 22 item survey with no information about pilot test and/or reliability & validity.	Lifetime stimulants use: 11.6% Non-medical use of prescription stimulants in pharmacy school: 8.8% Non-medical use of prescription stimulants during the past 5 months: 3.2% Under-age alcohol use: 59.9% Under-age tobacco use: 13.27% Lifetime marijuana use: 27.0% Lifetime use of prescription medications (sedatives & pain medications): 7.6%	As compared to other studies among general college students,[50,52,53] student pharmacists in this study showed higher prevalence of lifetime non-medical use of prescription stimulants. Similarly, as compared to Lord et al.[24] study, this study showed a 4% increase in the prevalence of lifetime non-medical use of prescription stimulants.
Bidwal et al, 2014 (20)	Alcohol Tobacco Caffeine Stimulants Opioids Anxiolytics Marijuana Cocaine Hallucinogens Heroin	5 Pharmacy schools, 2 medical schools, & 5 physician assistant schools in California, 2011	Students sample: 589, RR=? Student pharmacists: 309, RR=? Cross-sectional study of self-reported use (online)/ 50 item survey with no information about pilot test and/or reliability & validity.	Past-year stimulants use: 6.1% Past-year opioids use: 2.3% Past-year anxiolytics use: 2.9% Past-year alcohol use: 64.1 Past-year tobacco use: 8.1% Past-year caffeine pills use: 10.4% Past-year caffeinated energy drinks use: 45.6% Past-year binge alcohol use (≥ 5 drinks at one occasion): 31.1%	As compared to previous studies,[11,24] this study showed lower rates of stimulants, marijuana, hallucinogens, and opiates use among student pharmacists. As compared to medical and physician assistant students in this study,

				Past-year heavy alcohol use (≥ 5 drinks on the same occasion on ≥ 5 days within 30 days): 9.1% Past-year marijuana use: 7.4% Past-year cocaine use: 0.3% Past-year hallucinogens use: 0.6% Past-year heroin use: 0.3%	student pharmacists were less likely to report binge &/or heavy alcohol use as well as non-medical use of stimulants and marijuana. In general, this study found that rates of substance use among professional students are less than general college students. However, higher rates of non-medical prescription stimulants use were reported in this study as compared to national college students.
Oliver et al, 2014 (28)	Alcohol	Auburn University, year was not provided	Student pharmacists: 349, 82.5% Study sample didn't include other students or professionals Cross-sectional study of self-reported use (in class paper & pencil) / AUDIT & DMQ-R.	Past-year report of hazardous or harmful alcohol use (AUDIT≥ 8): 23.2% Past-year report of large and frequent (hazardous) alcohol consumption: 67.2% Past-year report of symptoms that suggest alcohol dependence: 29.5% Past-year report of alcohol related harms: 46.7%	As compared to a previous study conducted by English et al,[27] this study showed similar percentage of hazardous or harmful alcohol use patterns among student pharmacists.

Ref no: Reference number;?: Not provided
Abbreviations: RR: Response rate; AUDIT: Alcohol Use Disorders Identification Test; DMQ-R: Drinking Motives Questionnaire Revised; UI: University of Iowa; MCP: Massachusetts College of Pharmacy; TSU: Texas Southern University; OTC: over-the-counter

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CHAPTER 3

CONCEPTUAL FRAMEWORK AND STUDY HYPOTHESES

Given the complexity of substance use behaviors, several conceptual and theoretical models have been used to explain factors that are associated with the behavior of problematic substance use.[1] Despite significant research on the topic, the absence of a unified theory or a framework that represents an integrated conceptual model is still challenging.[2] A consolidative model of substance use behaviors should embrace biological, genetic, psychological, social, personal, and environmental factors.[2] However, proposing and testing such comprehensive models is challenging. The examination of complex substance use models requires the integration of a host of variables and longitudinal follow-up of representative samples of individuals from different populations.[3] Considering these obstacles, many hypotheses have been developed to explain and understand the correlations between subsets of these factors and substance use behaviors.

In the self-medication hypothesis of substance use, Khantzian emphasized, "addicts are attempting to medicate themselves for a range of psychiatric problems and painful emotional states."[4] Preceding Khantzian was Conger's tension reduction hypothesis stating that "alcohol serves to reduce tension or anxiety, possibly because of the depressing or tranquilizing effects of alcohol on the nervous system. Drinking is thus reinforced by the tension reduction effects obtained."[5] The convergence between self-medication and tension-reduction hypotheses suggests that alcohol use behaviors can be considered as reactive behaviors that are associated with certain conditions and/or psychological experiences. According to Khantzian, these conditions

are psychological symptoms or painful affects that might make an individual more vulnerable to problematic alcohol use behaviors and/or AUD.[4] Thus, subjective states of distress, not necessarily psychiatric disorders, were recognized as important factors that govern and regulate self-medication.[6] The main aspects of the self-medication hypothesis rely mainly on substance effects in relieving psychological problems and distress.[7] Three factors might interact and influence the behavior of substance use. These factors are: (*i*) the substance's main action and effects; (*ii*) personality organization and characteristics of subjects; and (*iii*) the inner states of psychological distress.[7] The behavioral hypothesis of self-medication has been utilized in studies examining alcohol use behaviors among college students.[8-10]

In this study, past research findings will be integrated within the conceptual framework of the self-medication hypothesis of substance use within a large sample of student pharmacists. Based on the available literature,[11] alcohol was identified as the most used substance by student pharmacists. This research will mainly focus on the extent of alcohol use, problematic alcohol use behaviors, and the experience of alcohol-related outcomes among student pharmacists. This study will primarily examine the associations between alcohol use behaviors and the experience of alcohol-related outcomes and different factors such as: (i) demographic factors, (ii) alcohol use-related risk factors (age of first alcohol use, family history, other drug use, mental and psychiatric disorders), (iii) personality traits associated with impulsive behaviors, (iv) inner psychological states such as depression, anxiety, and perceived stress among student pharmacists. Figure 3.1 depicts the conceptual model of potential factors influencing alcohol use behaviors and the experience of alcohol-related outcomes in student pharmacists.

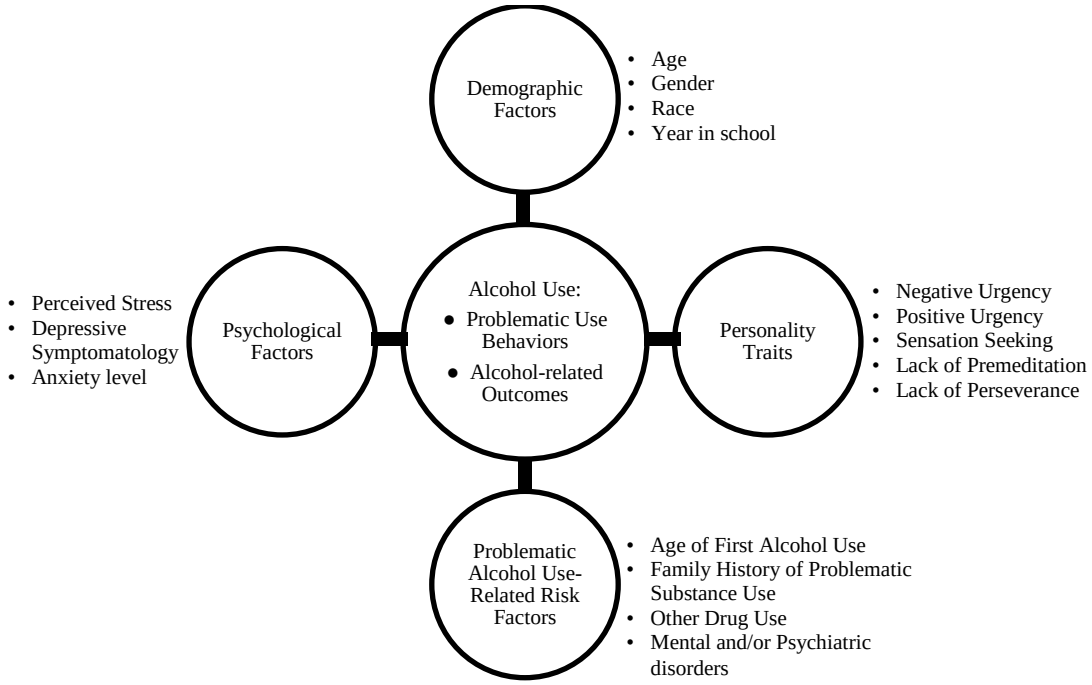

Figure 3.1. Conceptual model of potential factors associated with problematic alcohol use behaviors and the experience of alcohol-related harms in student pharmacists.

Research Questions and Study Hypotheses

This research investigates the relationships between demographic factors, problematic alcohol use-related risk factors, inner psychological states and personality/impulsivity factors and alcohol use behaviors and outcomes within a large sample of student pharmacists. The study focused on the following research questions and hypotheses:

Question 1. Is there any significant relationship between student pharmacists' demographic characteristics (e.g. age, gender, race, and relationship status) and alcohol use behaviors and the experience of alcohol-related harms?

- Ho1.1: There is no relationship between students' demographic characteristics and alcohol use behaviors.
- Ha1.1: There are significant relationships between students' demographic characteristics and alcohol use behaviors.

- Ho1.2: There is no relationship between students' demographic characteristics and the experience of alcohol-related outcomes.
- Ha1.2: There are significant relationships between students' demographic characteristics and the experience of alcohol-related outcomes.

Question 2. Do significant differences exist in student pharmacists' alcohol use behaviors when stratified by year in the program (P1, P2, P3, and P4)?

- Ho2: Significant differences do not exist between students' alcohol use behaviors when stratified by their program years.
- Ha2: Significant differences exist between students' alcohol use behaviors when stratified by their program years.

Question 3. Is there any significant relationship between student pharmacists' problematic alcohol use-related risk factors (e.g. age of first alcohol use, family history of substance use disorders, other drug use, and concurrent mental and/or psychiatric condition) and alcohol use behaviors and the experience of alcohol-related outcomes?

- Ho3.1: There is no relationship between students' alcohol use-related risk factors and alcohol use behaviors.
- Ha3.1: There are significant relationships between students' alcohol use-related risk factors and alcohol use behaviors.

- Ho3.2: There is no relationship between students' alcohol use-related risk factors and the experience of alcohol-related outcomes.
- Ha3.2: There are significant relationships between students' alcohol use-related risk factors and the experience of alcohol-related outcomes.

Question 4. Is there any significant relationship between students' reported inner psychological states (e.g. anxiety level, depressive symptomatology, and perceived stress) and alcohol use behaviors and the experience of alcohol-related outcomes?

- Ho4.1: There is no relationship between students' reported inner psychological states and alcohol use behaviors.
- Ha4.1: There are significant relationships between students' reported inner psychological states and alcohol use behaviors.

- Ho4.2: There is no relationship between students' reported inner psychological states and the experience of alcohol-related outcomes.
- Ha4.2: There are significant relationships between students' reported inner psychological states and the experience of alcohol-related outcomes.

Question 5. Is there any significant relationship between student pharmacists' personality traits associated with impulsivity domains (e.g. negative urgency, positive urgency, sensation seeking, lack of premeditation, and lack of perseverance) and alcohol use behaviors and the experience of alcohol-related outcomes?

- Ho5.1: There is no relationship between students' personality traits and alcohol use behaviors.
- Ha5.1: There are significant relationships between students' personality traits and alcohol use behaviors.

- Ho5.2: There is no relationship between students' personality traits and the experience of alcohol-related outcomes.
- Ha5.2: There are significant relationships between students' personality traits and the experience of alcohol-related outcomes.

Question 6. Is there a significant relationship between student pharmacists' alcohol use behaviors and academic performance (defined as self-reported school GPA)?

- Ho6: There is no relationship between students' alcohol use behaviors and academic performance in pharmacy school.
- Ha6: There is a relationship between students' alcohol use behaviors and academic performance in pharmacy school.

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CHAPTER 4

RESEARCH METHODOLOGY

Because of the study's noninvasive nature and anonymous data collection, the University of Georgia's Institutional Review Board (IRB) approved the current study with expedited status for one year in 2013. Data collection for this research was completed over one academic year (2013-2014), thus a continuing review application was submitted to maintain an active study protocol during this period. The renewed approval letter for this research is included in Appendix A. All collaborating researchers/faculty members at each pharmacy school submitted their certificates of Collaborative Institutional Training Initiative (CITI) prior to data collection. Student script, online consent "first part of the entire survey," and debriefing forms were required by the IRB. These forms are included in Appendices B, C, and D, respectively. Researchers at each school had to read a standardized script explaining the survey, needs for participation, and directions to access the online survey to all enrolled students before survey distribution. The online consent form was included within the survey link as the first part of the survey. After participation, students were provided with a debriefing form (with needed contact information to give feedback or ask questions about the study).

Study Design

A cross-sectional study with prospective data collection was undertaken to describe and assess alcohol use behaviors and its related harms in a large sample of professional student pharmacists from multiple schools of pharmacy in the U.S.

Sampling and Data Collection Procedure

Participants were recruited via e-mail within one academic year (2013-2014). Program coordinators or faculty members were invited to collaborate in this research during national meetings, such as College of Psychiatric and Neurologic Pharmacists (CPNP) meetings. In these national meetings, a brief introduction about the study was provided. If researchers showed interest in participation, a collaboration plan was offered. After recruitment, 6 pharmacy schools (2 public, 2 private for profit, and 2 private not for profit) with 4 year pharmacy programs agreed to officially participate in this research. Collaborators provided lists of enrolled students' institutional Email addresses. All students from the collaborating schools had the chance to participate in this study.

Student pharmacists enrolled in the P1 to P4 professional years at 6 pharmacy schools in the southeastern United States were approached by e-mail via Qualtrics®. Qualtrics® software is a web-based survey platform capable of generating customized reports for large datasets, or exporting unidentified data in compatible formats to commonly used statistical software packages. The distributed e-mail contained a special link to the survey, which enabled each student to complete the survey only once. Participants were asked to complete an anonymous, voluntary survey instrument "*the Student Pharmacists Chemical Health Scale (SPCHS)*" designed to assess substance-use behaviors, psychological, personality, and demographic factors in professional student pharmacists.[1] In order to ensure respondent anonymity, a username and

password unique to the survey administration time block was given to each group of students. Additionally, the Qualtrics® survey recorded each response with a randomly generated 15-digit code to exclude the possibility of linking sensitive data to individual respondents. Furthermore, participants were advised that their responses would only be used in aggregate with other collected responses from multiple schools. Researchers assured that participation was voluntary and students could refuse to participate or even withdraw at any time without any consequences. Students were not compelled to provide answers to every survey question, but they were encouraged to be as truthful and complete as possible. At the end of the survey students had the option to exclude their responses from this study. Participants were not compensated (monetary or other incentives) and did not receive any course credit for their participation.

A cover letter and link to the online survey were emailed to 2027 students at 6 pharmacy schools. The timing of survey administration (within exam free period) at each school was chosen to preempt potential response inconsistencies due to examination-related issues. Students were allowed 30 minutes to complete the survey in their schools. The survey link was active for two weeks. Students who did not provide consent of agreement to participate or include their responses in the study (n= 24) were excluded. Further, participants who opened the survey without answering any question were excluded (n=45). Finally, students who missed the AUDIT scale (n=5) were also eliminated from the final study sample. A total of 1194 students were included in this study.

Survey Design

Each subject was asked to complete the SPCHS that included self-reported measures.[1] The questionnaire included a total of 193 items in multiple sections. For each section, specific instructions were provided to guide the students in answering appropriately. Skip logic was utilized within the survey design to simplify responses and also to reduce time needed to complete the survey. On average, students took 20 minutes to answer the entire survey. For this research, only sections on demographic and other risk factors (e.g. family history and age of first alcohol use), alcohol use, impulsivity domains, and psychological factors (perceived stress, depressive symptomatology, and anxiety) were obtained and analyzed.

Measures Related to this Study

Section A:

Demographic questions related to:

- Age in years, gender (male or female), ethnic background (American Indian or Alaskan native, Asian or Pacific Islander, African American, Hispanic, White, and "other" ethnicity), and relationship status (single, never married; single, divorced; single, widowed; currently married; married, separated; non-marital committed relationship) .
- Student professional year of study: P1, P2, P3, and P4.
- Approximate GPA. GPA is indicated as the most frequent factor used in pharmacy schools to evaluate progression in academic programs.[2] In general, pharmacy schools require students to maintain a minimum GPA to stay in pharmacy programs. Traditionally, a 3.0 GPA indicates good academic performance in professional programs. [2]

Section B:

Questions related to risk factors that might influence alcohol use in student pharmacists: [3]

- Age of first alcohol use in years. Students were asked to report their first age of alcohol use, if applicable. The onset of alcohol use at ages less than 21 is considered as underage drinking. Previous research showed that the age of first alcohol use might directly influence alcohol use behaviors in student pharmacists.[4,5]
- Lifetime use of other drugs. Participants were asked to report their first age of other drug use, if applicable. A significant association between alcohol use and any use of other drugs has been reported.[5,6] Student pharmacists who reported other drug use were more likely to report problematic alcohol use than students who reported no drug use.[7,8]
- Family history of problematic substance use. Participants were asked to indicate any known substance use problems among their family members. Participants reported whether any family member (grandparents, parents, siblings, spouse, or kids) had problems with substance use. Responses were coded as 0 if no family member had problems and/or if participants chose "*do not know*", or 1 if at least one family member had problems with substance use. Studies conducted in student pharmacists indicated a significant association between family history of any problematic substance use and problematic alcohol use behaviors.[4,6,9]
- Diagnosis with mental illness. Students were asked to indicate any diagnosis of mental health problems. The association between mental disorders and alcohol use behaviors were not examined in student pharmacists. Nevertheless, literature on medical students showed a significant association.[10]

Section C:

Alcohol use related measures:

Participants were asked to complete the Alcohol Use Disorders Identification Test (AUDIT). The AUDIT is a 10-item standardized screening tool that was developed by the World Health Organization for assessing alcohol consumption within the past 12 months.[11] This scale demonstrated favorable psychometric properties,[12-14] as it maintains an average Cronbach's alpha of 0.81 and excellent test-retest reliability over a one-month interval ranging between (0.84-0.95).[14,15] The first part of this tool (3 questions) assesses the frequency and quantity of alcohol use, the second part (3 questions) assesses the symptoms of alcohol dependence, and the last four questions assess problems related to alcohol use.[11] Each item in this scale has a score between 0 and 4, with a composite score ranging between 0 and 40. Higher scores indicate higher levels of problematic alcohol use.[16] Individuals with scores $\geq$ 8 are considered to be at high risk for problematic alcohol use, which indicates hazardous or harmful alcohol use behaviors.[16] The self-reported AUDIT scale has been applied to assess general college student's alcohol consumption, and it has been used in several studies within professional students.[16-18] This scale has been shown as a valid tool when used for assessing students' alcohol use behaviors and its related outcomes.[19,20] Good sensitivity (82%) and specificity (78%) values were reported when a cutoff of 8 or more was used for identifying problematic alcohol use among college students.[19,21]

In addition to the engagement in problematic alcohol use behaviors, individuals might experience several alcohol-related outcomes. These harmful consequences might affect alcohol users and/or others without having any current Alcohol Use Disorders (AUD).[12,16] The experience of alcohol-related outcomes was assessed using harmful alcohol use items (items 7-10) within the AUDIT. Specifically, these items assess harmful experiences such as guilty

feelings after alcohol use, experience of blackouts, alcohol-related injuries to self or others, and others' concerns about alcohol use.[12] The AUDIT scale was shown to have a very good ability in examining and predicting alcohol-related harms based on these specific items.[22] Scores on each item (items AUDIT7- AUDIT10) were added to represent the experience of alcohol-related harms as an outcome.

Section D:

Personality traits associated with impulsive behavioral domains related measures.

The students were asked to complete the UPPS-P impulsive behavioral scale. While a four factors impulsivity model (UPPS) has been described,[23] a fifth domain was recently added (UPPS-P).[24,25] These scales were primarily developed and tested in samples of college students. The original scale (UPPS) was tested in patients with different impulsive related disorders, such as AUD.[26]

The five-factor impulsivity tool (UPPS-P) encompases domains including negative urgency, positive urgency, sensation seeking, lack of perseverance, and lack of premeditation.[24,27] Negative urgency refers to impulsive behaviors as a response to negative emotions, such as binge drinking in response to a failing grade in post-secondary educational settings.[27] Positive urgency, the most recently described impulsivity-related domain, refers to engaging in impulsive behaviors as a result of intense, positive emotions.[24,25] Sensation seeking describes behavior disposed toward exciting or novel experiences, such as skydiving or high-speed automobile racing.[27] Lack of perseverance denotes failure to complete a task due to boredom or fatigue, and lack of premeditation describes engaging in activities without regard to consequences.[27]

The UPPS-P scale contains 59 self-reported items: 12 items measure negative urgency, 14 items for positive urgency, 12 items for sensation seeking, 10 items for lack of perseverance domain, and 11 items for lack of premeditation. The reliability and validity of the UPPS-P have been well documented within samples of college students.[24,28] Each subscale has an internal consistency coefficient greater than 0.80. In this study, impulsivity subscales were reliable as they showed good coefficient alphas (measure of internal consistency) of: 0.82, 0.85, 0.86, 0.82, and 0.80 for subscales of negative urgency, positive urgency, sensation seeking, lack of premeditation, and lack of perseverance, respectively.

Section E:

Psychological factors related measures:

- *Depressive symptomatology*. The students were asked to complete the Beck Depression Inventory-II (BDI-II). BDI-II is a self-reported assessment tool designed to assess the presence and severity of depression symptoms.[29,30] The original tool (BDI) was developed by Beck et al in 1961, and since then, it has been revised and modified several times. This instrument relies mainly on somatic depressive symptoms, which represent a phenomenon of pre-existing condition rather than the disease of depression itself.[31,32] BDI-II (the current version) was developed in 1996.[29] This tool has been extensively used in research to assess depressive symptomatology because of its brevity and ease in scoring.[30,33] In particular, it has been utilized in research assessing depressive symptoms in medical students.[10] BDI-II contains 21 self-reported items and takes approximately 5-10 minutes to complete. Each item has a score of (0-3); therefore, its total score can range between (0-63). The BDI-II tool is highly reliable with a coefficient alpha of 0.93 among college students, and 0.92 among outpatient psychiatric patients.[34] Furthermore, its

validity is well established. BDI-II has been demonstrated to strongly correlate (r=0.93) with the former version of the BDI,[35] and the Hamilton Rating Scale of depression (r=0.61-0.86).[32,36] In this study, the BDI-II scale was reliable as it showed an excellent coefficient alpha (measure of internal consistency) of 0.93. As recommended in the manual for BDI-II,[34] scores were categorized as:

- A score of 0-13 indicates minimal depression
- A score of 14-19 indicates mild depression
- A score of 20-28 indicates moderate depression
- A score ≥ 29 indicates severe depression

- *Anxiety level*. The students were asked to complete the Zung Self-Rating Anxiety Scale (Z-SAS). The Z-SAS has been used in research for assessing an individual's level of anxiousness.[37] This instrument consists of 20 self-reported items. Each item has a score of (1-4), with a total raw score ranging from (20-80). Dividing by 80 and then multiplying by 100 transform the total raw score. The transformed scores then can range between 25 (low anxiety) and 100 (very high anxiety).[38] The Z-SAS is a reliable instrument with a coefficient alpha of 0.85.[38] Further, it is a valid instrument, as studies showed its significant correlation with the Hamilton Anxiety Rating Sale.[38,39] In this research, the Z-SAS scale was reliable as it showed a good coefficient alpha (measure of internal consistency) of 0.87.

    - A score of 25-44 represents normal level of anxiety
    - A score of 45-59 represents minimal to moderate anxiety levels
    - A score of 60-74 represents marked or sever anxiety levels
    - A score above 75 represents extreme anxiety levels

- *Perceived stress*. Participants were asked to complete the perceived stress scale (PSS-10). In general, the perceived stress scales (PSS: 4, 10, and 14) are the most widely utilized instruments for measuring the perception of psychological stress among college students.[40] Existing studies concerning stress in healthcare professional students have extensively used the PSS.[41-43] The reliability and validity of the PSS have been established.[40] Among the three available versions of PSS (PSS-14, PSS-10, and PSS-4), PSS-10 possesses superior psychometric properties.[40] The PSS-10 is a self-administered scale with 10 items. Each item has a score ranging from (0-4). The total summated score, therefore, can range between (0-40), with a higher score indicating a higher psychological stress level. PSS-10 is a reliable and valid tool with coefficient alpha >0.80 and it has been shown to be widely valid, as it correlates with different measures of stress.[44,45] In this study, the PSS-10 scale was reliable as it showed a good coefficient alpha of 0.84.

Statistical Analysis

Responses were downloaded from the Qualtrics software into Microsoft Excel, where data was checked and imported into SAS for statistical analyses (version 9.4, Cary, North Carolina).

Variables Coding and Descriptive Statistics

The total AUDIT score (main outcome variable) was calculated by summing the scores of each item in the 10-item AUDIT scale. The AUDIT score variable was operationalized and dichotomized according to standard usage as social drinking (AUDIT $\leq$ 7) and hazardous or harmful drinking (AUDIT $\geq$ 8).[12] Experience of alcohol-related outcomes (secondary outcome variable) was obtained and assessed based on questions 7-10 on the AUDIT scale.[12] These items

represent the experience of alcohol-related outcomes (harmful experiences) if any item score is ≥ 1. Binge drinking was also obtained and assessed based on item 3 from the AUDIT scale.[12] This item asks about the frequency of drinking 5 or more drinks on one occasion, with choices of (never, less than monthly, monthly, weekly, and daily, or almost daily). Students who reported 5 or more drinks per occasion on a monthly, weekly, or daily basis within the past-year were considered binge drinkers. In addition, alcohol dependence symptoms were assessed based on questions 4-6 on the AUDIT scale.[12] These items represent alcohol dependence symptoms if any of these item's score is >0.

With respect to psychological factors, perceived stress, depressive symptomatology, and level of anxiety were assessed and examined as independent variables that might affect alcohol use behaviors and the experience of alcohol-related outcomes in student pharmacists. The PSS-10 score was obtained by reversing the scores (e.g. 0=4, 1=3, 2=2, 3=1, and 4=0) on the four positive items (items 4,5,7,and 8) and then summing the scores across the 10 items.[44] The BDI-II score was calculated by summing the scores of each item in the 21-item BDI-II scale.[32] The anxiety index score was obtained by summing the raw scores of each item in the 20-item Z-SAS and then converting the raw total scores to anxiety index scores by dividing total raw scores by 80 and then multiplying by 100.[39]

Personality traits associated with impulsive behaviors were also included as independent variables that might influence alcohol use behaviors in student pharmacists. Negative urgency, positive urgency, lack of premeditation, lack of perseverance, and sensation seeking domains were assessed and obtained based on the 59-item UPPS-P impulsive behavioral scale.[24] The negative urgency score was obtained (based on 12 items in the UPPS-P) by reversing items: 2, 7, 12, 17, 22, 29, 34, 39, 44, 50, and 58 and then calculating the mean score of reversed items in

addition to the score on item 53.[24] The positive urgency score was obtained by reversing items: 5, 10, 15, 20, 25, 30, 35, 40, 45, 49, 52, 54, 57, and 59 and then calculating the mean of these reversed items.[24] The lack of premeditation score was obtained by calculating the mean of items: 1, 6, 11, 16, 21, 28, 33, 38, 43, 48, and 55.[24] The lack of perseverance score was obtained by reversing items: 9 and 47 and then calculating the mean of these reversed items in addition to scores on items: 4, 14, 19, 24, 27, 32, 37, and 42.[24] Finally, the sensation seeking score was obtained by reversing items: 3, 8, 13, 18, 23, 26, 31, 36, 41, 46, 51, and 56 and then calculating the mean of these reversed items.[24]

Descriptive statistics were used to describe alcohol use behaviors among student pharmacists. Categories of alcohol use behaviors were based on total AUDIT scores (hazardous or harmful (AUDIT ≥ 8) vs. non-hazardous or non-harmful (AUDIT < 8)), age of first alcohol use (lifetime alcohol users vs. non-alcohol users (students who reported that this question was not applicable to them as they never used alcohol)), and the first item in AUDIT scale (current alcohol users, who reported any alcohol use within the past-year vs. students who reported no alcohol use in the past 12 months). The prevalence of lifetime alcohol users was obtained by dividing the number of students, who reported an age of first alcohol use by the total number of respondents. Further, prevalence of hazardous or harmful alcohol use was determined by dividing the number of students who reported an AUDIT score ≥ 8 by the number of students who reported lifetime alcohol use. Means, medians, standard deviations, interquartile ranges (IQR), ranges, and frequencies were calculated as appropriate for each variable.

Extent of missing data

Missing data presents a potential challenge to data analysis in survey research.[46] Since students were allowed to skip questions in this study, the extent of missing data was examined. Among the 1194 participants, none missed any item from the AUDIT scale. With respect to other factors including demographic variables of gender (n_{miss}= 2), ethnicity (n_{miss}= 5), relationship status (n_{miss}= 1), and GPA (n_{miss}= 6), the extent of missing data was not significant. In addition, among other risk factors few participants had missing data for example, mental or psychiatric illness (n_{miss}= 2), family history of substance use (n_{miss}= 2), and other lifetime drug use (n_{miss}= 6). There were also students who failed to complete some items in the PSS-10 scale (n_{miss}= 83), BDI-II scale (n_{miss}= 67), and Z-SAS scale (n_{miss}= 81). However, many of these respondents missed several items from different scales (in addition to demographic and other risk factors) and were previously excluded from analyses. The extent of overall missing data (<10% of study sample) was minimal. Therefore, missing data bias was not an issue of concern.[46] As a result; missing data was assumed to be missing completely at random. Thus both techniques of listwise deletion and pairwise deletion yield unbiased estimates;[46] Pairwise deletion was applied.

Tests of Difference

Given that several continuous variables (e.g. AUDIT score, PSS10 score, BDI-II score, and anxiety score) are included in this study, assumptions of normality were examined. All continuous variables in this study violated normality assumptions based on the Shapiro-Wilk test for normality (P-value < 0.001). Thus, non-parametric tests of difference were used.[47] To compare differences in AUDIT scores, stress scores, anxiety scores, and depression scores between groups of students with 2 categories (e.g. males vs. females and public vs. private

programs) the Wilcoxon-Mann-Whitney test was used.[48] Differences in AUDIT scores, stress scores, anxiety scores, and depression scores between students in 3 or more categories (e.g. different program years) were examined using the Kruskal-Wallis test, and, where differences existed, a follow-up multiple comparison procedure (post hoc tests) was run using an online macro compatible with the statistics software.[49]

Tests of correlations

Bivariate associations between hazardous or harmful alcohol use or the experience of alcohol-related outcomes and several characteristics (categorical variables) were examined using Pearson Chi-squared analyses. Correlation between continuous variables (AUDIT score, age of first alcohol use, age, and self-reported GPA) was assessed using the Spearman Correlation Coefficient.

Bivariate models of problematic alcohol use behaviors

The influence of each psychological factor (perceived stress, anxiety, and depression) on alcohol use behaviors (problematic (AUDIT≥8) vs. non problematic (AUDIT≤7)) was initially tested through bivariate logistic regression analyses using the following model:

- $\text{logit}\,[p(Y=1)] = \ln[p(Y=1)/(Y=0)] = \beta_0 + \beta_1 x_1 + \varepsilon$

  Where p: estimated probability of problematic alcohol use behavior (Y=1), β_0: model intercept, β_1: effect coefficient for x_1: anxiety, depression, or perceived stress score, and ε is the error term.

Multiple Logistic Regression Analyses

Logistic regression is the most appropriate statistical analysis technique for analyzing relationships when the study outcome is dichotomized.[50] Thus, to measure the effects of different factors on alcohol use behaviors (Problematic (AUDIT≥8) vs. non-problematic (AUDIT≤7)) logistic regression analyses were used. The influence of factors (e.g. demographic, risk factors, personality traits, and psychological factors) among students who reported lifetime alcohol use was identified by using multivariate models. These models were developed using a stepwise selection method. To test the goodness of fitted models and for models comparison, the model significance, coefficient significance, max-rescaled R-square (pseudo R-square), and the Hosmer and Lemeshow goodness-of-fit test were determined. Factors that produced unreliable estimates (with large standard errors and/or failed to achieve maximum likelihood estimates) were eliminated from the models. The significance of models was assessed using the likelihood ratio and Wald Chi-square tests, and individual coefficients were checked using Wald Chi-square tests and 95% Wald confidence limits.

The following models were used in multiple logistic analyses:

- $\text{logit}\,[p(Y=1)] = \ln[p(Y=1)/(Y=0)] = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \ldots + \beta_k x_k + \varepsilon$

  Where p: probability of hazardous or harmful alcohol use (Y=1) relative to non-hazardous or non-harmful alcohol use (Y=0) and ε is the error term.

- $\text{logit}\,[p(H=1)] = \ln[p(H=1)/(H=0)] = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \ldots + \beta_k x_k + \varepsilon$

  Where p: probability of experienced alcohol-related outcomes (H=1) relative to no experience of alcohol-related harms (H=0) and ε is the error term.

To test for moderation, where moderator variables might reveal that the relationship between two variables (e.g. psychological factor and alcohol use behaviors) is dependent on another variable (moderator), interaction terms between predictor variables (e.g. anxiety) and moderators (e.g. personality traits) were included as predictors of the outcome variables. The moderation effect of gender and personality traits associated with impulsive behaviors in the relation between alcohol use behaviors and psychological factors was examined using the following models:

- $\text{logit}[p(Y=1)] = \ln[p(Y=1)/(Y=0)] = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_3 x_2 + \beta_5 x_3 x_1 + \ldots + \beta_k x_k + \varepsilon$

  Where p: probability of hazardous or harmful alcohol use (Y=1) relative to non-hazardous or non-harmful alcohol use (Y=0) and ε is the error term.

- $\text{logit}[p(H=1)] = \ln[p(H=1)/(H=0)] = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_3 x_2 + \beta_5 x_3 x_1 + \ldots + \beta_k x_k + \varepsilon$

  Where p: probability of experienced alcohol-related harms (H=1) relative to no experience of alcohol-related harms (H=0) and ε is the error term.

Preliminary Results

Sample Characteristics

This section provides a detailed evaluation of the sample characteristics relative to the profiles of the 6 pharmacy schools, from which the study sample was derived and the national profile of U.S. pharmacy schools in 2014.[51] In the overall sample, females (67%) were slightly overrepresented (p=0.02) compared to males (33%) in accordance with the national student pharmacists gender profile of 61.5% female.[51] However, as compared to the profiles of schools involved in this study, a similar gender profile was found (p >0.05). Ethnically White students were significantly overrepresented (74%) compared with 2014 national pharmacy schools profiles of White ethnicity (55%).[51] The remaining ethnic groups were otherwise similar to student pharmacists' national profiles (p >0.05). As compared to the 6 pharmacy schools' profile of ethnicity, White students were also somewhat overrepresented (74% vs. 68%), but the other ethnic groups were similar (p >0.05).

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CHAPTER 5

EXAMINATION OF FACTORS ASSOCIATED WITH ALCOHOL USE BEHAVIORS AND OUTCOMES IN STUDENT PHARMACISTS[†]

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Abstract

This study examined alcohol use behaviors in a cross-section of student pharmacists. Results indicated a high prevalence (18%) of past-year problematic alcohol use. Among participants who reported alcohol use, 43% experienced alcohol-related negative outcomes. Third year students were more likely to report problematic alcohol use. Age, gender, relationship status, onset of alcohol use, nonmedical drug use, and family history of problematic substance use were significantly associated with student pharmacists' behavior of problematic alcohol use.

Keywords: alcohol use, hazardous or harmful, student pharmacists

Introduction

Alcohol consumption by college students is an issue of concern in almost all U.S. colleges and universities.[1] According to the National Survey on Drug Use and Health (NSDUH) in 2014, college students were more likely than their same age group counterparts (18-22) to report alcohol use.[2] Higher rates of current (within the past 30 days), binge (5 or more drinks at the same time or within 2 hours on one or more days in the past month), and heavy (5 or more drinks on the same occasion on 5 or more days in the past month) alcohol use were reported by college students as compared to their non-college age-mates.[2] In addition, since 2002, there has been a consistent trend of higher rates of alcohol use among fully enrolled college students in comparison to non-college students.[2]

College drinking is associated with several untoward outcomes, such as death, unintentional injuries to self or others, driving under the influence, physical assault, alcohol-related sexual assault and date rape.[3,4] In addition, emergency department visits and healthcare

utilization are very common among college students who engage in heavy or hazardous alcohol use.[4,5] Alcohol-related consequences among college students also include academic-related outcomes, such as missing classes and receiving lower grades and evaluations.[4,6]

Previous research suggests that healthcare students are a significant subsample of the college student population that is at a higher risk for problematic alcohol use behaviors.[7,8] Among healthcare students, limited evidence suggests that student pharmacists may struggle with problematic alcohol use. English, Rey, and Schlesselman found that more than 25% of their study sample reported harmful or hazardous alcohol use.[9] A more recent study found 23% of student pharmacists at a single institution indicated harmful or hazardous alcohol use.[10] The presence of problematic alcohol use behaviors in student pharmacists may increase their vulnerability to develop Substance Use Disorders (SUD) during their professional career given their easy access to controlled substances and prescription drugs.[11-14] Alcohol and other substance use related impairments or disorders among professional pharmacists may jeopardize the quality of pharmaceutical healthcare and threaten patients' health.[15]

Several factors associated with alcohol use behaviors among student pharmacists have been highlighted.[16] These factors mainly include background or demographic factors (e.g. age, gender, race, relationship status, and year in pharmacy school), in addition to other risk factors such as: age of first alcohol use, family history of SUD, other drug use, and concurrent mental or psychiatric problems. The examination of alcohol use behaviors and associated factors would be important for the development of prevention strategies and treatment interventions such as curricular education, effective screening, and behavioral counseling for student pharmacists and other healthcare students who are at high risk for problematic alcohol use.

Although previous studies have examined alcohol use behaviors in student pharmacists, these studies were limited in several ways. First, available studies provide limited information about student pharmacists' current alcohol use behaviors. Prior research has primarily reported old data, which was collected before 2000.[12,17-19] Second, even though more recent studies have been conducted, results were either inconclusive or based on small sample sizes and represent students from a single institution. For example in English et al. evaluated alcohol use behaviors in a large sample of student pharmacists (from different 9 schools), however, the authors did not examine a full model that controlled for different factors, which could explain or predict problematic alcohol use in student pharmacists.[9] Only bivariate association or correlational analyses were conducted. Oliver et al. examined alcohol use behaviors in student pharmacists, but the study sample included students from a single school of pharmacy, which limited the generalizability of findings to the broader population of student pharmacists.[10] Furthermore, important risk factors highlighted in previous research such as (i) age of first alcohol use,[20,21] (ii) family history of substance use problems,[20,22] (iii) other drugs use,[21,23] and (iv) psychiatric or mental disorders were excluded in this study.[20,23]

The purposes of this study were to: (i) describe and assess current alcohol use behaviors among student pharmacists in different program years (P1, P2, P3, and P4), and (ii) identify significant demographic and other risk factors that can potentially influence the behavior of problematic alcohol use and the experience of alcohol-related harms in a large sample of student pharmacists from multiple schools in the United States.

Methods

Participants and procedure

Professional student pharmacists attending 6 pharmacy schools (2 public, 2 private for profit, and 2 private not for profit) in the southeastern United States were solicited to participate in this study. Participants were asked to complete an anonymous, voluntary survey (The Student Pharmacists Chemical Health Scale "SPCHS") designed to assess substance use behaviors and risk factors in professional student pharmacists.[24] The survey was implemented through a web-based survey using Qualtrics software over one academic year period (2013-2014). To ensure respondent anonymity, a username and password unique to the survey administration time block was given to each group of students. Additionally, the Qualtrics survey recorded each response with a randomly generated 15-digit code to exclude the possibility of linking sensitive data to individual respondents. Participants were advised that their responses would only be used in aggregate with other responses collected from multiple schools. Potential respondents were assured that participation was voluntary and that they could refuse to participate or even withdraw at any time without any consequences. Participants were not compelled to provide answers to every survey question, but were encouraged to be as truthful and complete as possible. At the end of the survey, participants had the option to exclude their responses from the study. A cover letter and link to the online survey (including the consent form) were emailed to 2027 students who attended the six pharmacy schools. Students were allowed 30 minutes to complete the survey in their schools and were provided a debriefing form (with needed contact information to give their feedback or if they had any questions and/or concerns about the study) after submitting their responses. The survey link was active for two weeks. The Institutional Review Board (IRB) at the University of Georgia (UGA) approved this study.

Our study sample consisted of 1194 (59% response rate) student pharmacists, who agreed to participate and include their data in this research study. Participants who did not provide consent of agreement to participate or include their responses in the study (n= 24) were excluded. Students who opened the survey without answering any question (n=45) were also excluded. Finally, participants who missed the AUDIT scale (n=5) were eliminated from the final sample. The mean age of participants was 24.8 years with a range of (18-53). The majority of participants were female (67.3%). Most participants identified themselves as White (74.6%), followed by Asian or Pacific Islander (13.5%), Black (5.8%), Hispanic (2.1%), and others (4.0%). Regarding academic status, 440 (36.9%) of the participants were in first-year, 322 (27.0%) were in second-year, 329 (27.5%) were in third-year, and 103 (8.6%) were in fourth-year. Compared to the 2014 profile of student pharmacists enrolled at all U.S. colleges of pharmacy, females were slightly overrepresented 67.3% vs. 61.5% (p=0.02).[25] Ethnically White students were significantly overrepresented (74%) compared with national profiles of White ethnicity (55%).[25] The remaining ethnic groups were otherwise similar to student pharmacists national profiles (p >0.05).

Measures

Alcohol use behaviors. The Alcohol Use Disorders Identification Test (AUDIT) scale was used to evaluate behaviors of alcohol consumption and alcohol-related outcomes. The AUDIT is a 10-item, self-reported screening tool developed by the World Health Organization (WHO) for assessing alcohol consumption within the past 12 months.[26] The first 3 questions assess the frequency and quantity of alcohol use, the next 3 questions assess the symptoms of alcohol-dependence, and the last 4 questions assess alcohol-related harms.[26] Each item in this scale has a score between (0-4), with a scale composite score ranging between (0-40). Higher scores indicate

higher levels of problematic alcohol use.[27] AUDIT scores ≥8 indicate problematic (hazardous or harmful) alcohol use behaviors.[27] The AUDIT has been used to assess alcohol consumption among general and professional college students and found to be valid for identifying students at high risk for problematic alcohol use behaviors.[10,27-30] The criteria score of AUDIT ≥8 was found to have good sensitivity (82%) and specificity (78%) for identifying problematic alcohol use among college students.[29,31] In this study the AUDIT showed a good reliability coefficient alpha (>0.81). The total AUDIT score (outcome variable) was calculated by summing the scores of each item in the 10-item AUDIT scale. Participants with scores more than or equal to one on the AUDIT first item were considered as current alcohol users (who reported any alcohol use within the past-year). The AUDIT score variable was further operationalized and dichotomized according to standard usage as social drinking (AUDIT ≤ 7) and hazardous or harmful drinking (AUDIT ≥ 8).[26]

Alcohol-related outcomes. Alcohol-related outcomes were assessed based on the last 4 items within the AUDIT scale (items 7-10). These items specifically assess alcohol-related harmful experiences such as feeling guilty after alcohol use, blackouts, alcohol-related injuries to self and others, and others' concerns about alcohol use behaviors.[26] A total score of one or more on these items represents the experience of any of the specified alcohol-related harms within the past-year. Furthermore, the AUDIT item 3 "*How often do you have five or more drinks on one occasion?*" was used to identify students who binge drink. Frequencies of binge drinking choices are: (never, less than monthly, monthly, weekly, and daily).

Alcohol use risk factors. Risk factors associated with students' alcohol consumption were identified by reviewing the available literature.[16] Survey items assessed family (grandparents, parents, siblings, spouse or girl/boyfriend, and children) history of problematic substance use and

psychological disorders. Participants were asked to report their age of first substance use (alcohol and other drugs), and if students have never used alcohol and/or other drugs they were asked to type "*Not Applicable (NA).*" Participants with any reported age of first alcohol use were defined as lifetime alcohol users vs. participants who never used alcohol. Participants were also asked to indicate the presence of any diagnosed psychiatric or mental problems.

Demographic factors. Participants were asked to provide their exact age, GPA and year in pharmacy school (e.g. first, second, third, and fourth). The self-reported year in pharmacy school was crosschecked with provided lists from each school as they were embedded in Qualtrics panels used for data collection. Participants also were asked to choose the best choice that reflects their gender (male vs. female), ethnic group (White, African American, Asian or Pacific Islander, Hispanic, and other), and relationship status (single never married, single separated: "*single divorced"* or "*single widowed"*, married, and committed in a non-marital residential relationship).

Data Analysis

Responses were downloaded from the Qualtrics software into Microsoft Excel, where data was checked and imported into SAS (version 9.4, Cary, North Carolina). Spearman correlation coefficients were generated to test for significant associations between continuous variables (e.g. age of first alcohol use) and AUDIT scores. Frequency tables and Chi-square analyses were conducted to evaluate relationships between alcohol use behaviors (AUDIT<8 and AUDIT ≥8) and other categorical variables (e.g. gender, ethnicity, year in program). Since the normality assumption for ANOVA test was not met (Shapiro-Wilk statistic test with a P-value <0.0001),[32] non-parametric test statistics (Kruskal-Wallis tests) were used to examine the differences in AUDIT scores between students in different class years. Multiple comparison post

hoc tests for the Kruskal-Wallis were performed to provide evidence of significant location differences between groups.[32] Multivariate logistic regression analyses were conducted to assess the associations between different factors (demographic and risk factors) and the probability of student pharmacists' engaging in problematic alcohol-use (yes/no) and experiencing alcohol-related harms (yes/no).

Results

Table 5.1 summarizes the characteristics of study participants. The majority of participants (n= 1081, 90.5%) reported consuming alcohol at least once during their lifetime, while only 113 (9.5%) reported that they have never used alcohol (Figure 5.1). Among students who reported lifetime alcohol use, the mean age of first alcohol use (±SD) was 17 years (±2.7) ranging between 5 and 27 years. Most participants who reported lifetime alcohol use ($P<0.0001$) were young, single, white, female students at low risk of problematic alcohol use (AUDIT<8).

Among alcohol users (who reported lifetime alcohol use), 20% (214/1081) reported high total AUDIT scores (≥8), which indicate a problematic (hazardous or harmful) alcohol use (Figure 5.1). Within the past-year, 464 (43%) and 203 (19%) of lifetime alcohol user students reported alcohol-related harms and alcohol dependence symptoms, respectively. Regarding binge drinking (consumption of 5 or more drinks on one occasion within the past year), 6.1% of alcohol user students reported binge drinking on a weekly basis, and 13.9% reported binge drinking on a monthly basis.

Table 5.1. Characteristics of survey respondents (N=1194)

Variable	n	%
Alcohol-use behavior		
Low risk of problematic alcohol-use (AUDIT (0-7))	980	82.1%
High risk of problematic alcohol-use (AUDIT ≥8)	214	17.9%
Gender		
Male	390	32.6%
Female	802	67.2%
Frequency missing	2	0.2%
Age groups		
Younger than 21	55	4.6%
21-24	688	57.6%
25-28	299	25.1%
Older than 28	152	12.7%
Ethnicity		
White	887	74.3%
African American	69	5.8%
Asian or Pacific Islander	160	13.4%
Hispanic	25	2.1%
Other	48	4.0%
Frequency missing	5	0.4%
Year in program		
1st year	440	36.9%
2nd year	322	27%
3rd year	329	27.5%
4th year	103	8.6%
Relationship status		
Single, never married	880	73.7%
Currently married	204	17.1%
Divorced or separated	28	2.3%
Non-marital committed residential relationship	81	6.8%
Frequency missing	1	0.1%
GPA		
≤2.5	32	2.7%
2.51-2.85	52	4.3%
2.86-3.25	247	20.7%
>3.25	815	68.3%
Not available	42	3.5%
Frequency missing	6	0.5%
Program		
Public	630	52.7%
Private	546	47.3%
Mental or psychiatric illness		
Yes	141	11.8%
No	1051	88%
Frequency missing	2	0.2%
Family history of psychiatric disorders		
Yes	405	33.9%
No	787	65.9%
Frequency missing	2	0.2%
Family history of problematic substance use		
Yes	514	43%
No	679	56.9%
Frequency missing	1	0.1%
Lifetime drug use		
Yes	475	39.8%
No	713	59.7%
Frequency missing	6	0.5%

Note. AUDIT: Alcohol Use Disorder Identification Test; GPA: Grade Point Average; SUD: Substance Use Disorder.

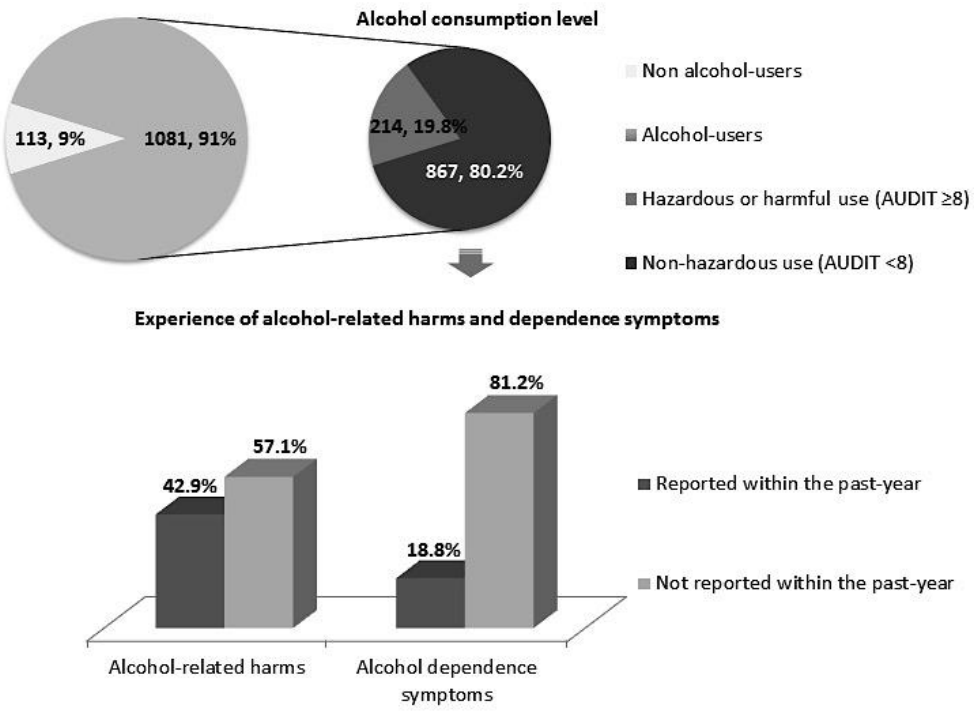

Figure 5.1. Alcohol consumption level and reported alcohol-related harms and dependence symptoms among study participants within the past-year.

With respect to current alcohol use (AUDIT1 ≥1), 1010 student pharmacists reported consuming alcohol during the past 12 months. The mean AUDIT score (±SD) for current alcohol users was approximately 5.0 (±3.8) with a median of (4.0) and interquartile range of 5.0 (Q1= 2.0 and Q3= 7.0). Among current users, 64% and 38% of them reported regular alcohol use and getting drunk (at least once weekly), respectively. Participants were asked to provide their "Age when realized alcohol and/or other substance gave relief from hangovers, anxiety, and other problems.*"* Approximately 32% of current users realized that substance use could help in relieving these problems. In addition, participants were asked to report their (i) "Age family and/or friends realized that you had a problem with drinking or use of other substances,″ and (ii) "Age first thought I had a drinking and/or substance use problem." Almost 12% of current alcohol users indicated a family and/or friends' notification about a substance use problem, and 15% of them at some age had a self-recognized substance use problem. Based on another item that asked students to provide their "age first tried to stop drinking or tried to stop using other substances," 20% of current alcohol user students had tried to stop using previously.

The distributions of the AUDIT scores across the four program years were significantly different (using Kruskal Wallis, H = 20.35, 3 d.f., P-value=0.0001). The multiple comparison post hoc tests for the Kruskal-Wallis analysis showed an evidence of a significant location difference in AUDIT scores between third year and first year students (P<0.05). First year students reported an average AUDIT score (±SD) of 3.7 (±3.9) with a median of 3.0 and IQR of 4.0 (Q1= 2.0, Q3= 6.0), while third year students reported a mean AUDIT score (±SD) of 4.7 (±3.9) with a median of 4.0 and IQR of 5.0 (Q1= 2.0 and Q3= 7.0). No difference was found between first year students and second or fourth year students.

Table 5.2. Associations between participants' characteristics and hazardous or harmful alcohol-use (AUDIT ≥8)

	Alcohol-use (hazardous vs. non-hazardous)			
Demographic Characteristics	**AUDIT ≥8 N**	**AUDIT<8 N**	**Chi-square χ^2**	**P-value**
Age				
Younger than 21	7	48	9.33	0.025
21-24	135	553		
25-28	57	242		
Older than 28	15	137		
Gender				
Male	110	280	41.36	<0.0001
Female	104	698		
Race				
White	179	708		
African American	3	66	22.88	0.0001
Asian or pacific islander	14	146		
Hispanic	7	18		
Other	10	38		
Year in school				
1st year	67	373		
2nd year	56	266	5.76	0.12
3rd year	72	257		
4th year	19	84		
Program				
Public	116	514	0.22	0.65
Private	98	466		
GPA				
≤2.5	3	29		
2.51-2.85	13	39	3.75	0.44
2.86-3.25	45	202		
>3.25	146	669		
Not available	6	36		
Relationship status				
Single, never married	183	697		
Currently married	13	191	24.43	<0.0001
Divorced or separated	3	25		
Non-marital committed residential relationship	15	66		

Note. AUDIT: Alcohol Use Disorder Identification Test; GPA: Grade Point Average

Significant associations between student's behavior of problematic alcohol use (AUDIT ≥8) and demographic characteristics (age, gender, ethnicity, and relationship status) were found (Table 5.2). In addition, there was a significant correlation between AUDIT scores and age of first alcohol use (Spearman correlation coefficient= -0.36, $p<0.0001$).

Logistic regression analyses of behavior of hazardous or harmful alcohol use within the past 12 months

Due to missing data, 17 participants were dropped from the analysis, leaving a total of 1062 participants, who reported lifetime alcohol use. The predictor set for the logistic regression analysis (demographic and other risk factors among alcohol users) had a significant effect on the behavior of hazardous and/or harmful alcohol use (likelihood ratio $\chi^2= 209.5$, $p<0.0001$). The Hosmer and Lemeshow goodness-of-fit test showed that the fitted model was adequate ($\chi^2= 5.9$, $p=0.66$). The pseudo R^2 statistic indicated that an estimated 29.42% of the variance in alcohol use behavior (hazardous or harmful alcohol use vs non-hazardous or non-harmful alcohol use in the past year) could be explained by the predictor set of variables (Table 5.3). Gender (Wald Chi-Square=43.7, $p<0.0001$), age (Wald Chi-Square=8.0, $p=0.005$), ethnicity (Wald Chi-Square=10.8, $p=0.03$), class year (Wald Chi-Square=9.3, $p=0.03$), and relationship status (Wald Chi-Square=18.9, $p=0.0003$) were all significant demographic factors that distinguished student pharmacists who reported hazardous or harmful alcohol use within the past-year. Among other risk factors, age of first alcohol use (Wald Chi-Square=13.5, $p=0.0002$), lifetime drug use (yes/no) (Wald Chi-Square=33.7, $p <0.0001$), mental or psychiatric diagnosis (presence/absence) (Wald Chi-Square=3.9, $p=0.046$), and family history of substance use disorders (Wald Chi-Square=6.7, $p=0.009$) were significantly associated with the behavior of problematic alcohol use (AUDIT ≥8). Table 5.3 shows that single (OR=4.12, $p<0.0001$), male (OR=3.39, $p<0.0001$)

students in third year (OR=1.94, p=0.004) were more likely to report problematic alcohol use in the past-year. Whereas, African American students (OR=0.11, p= 0.007) were less likely to engage in problematic alcohol use behaviors. Furthermore, participants who reported other risk factors such as other drug use (OR=2.96, p<0.0001), family history of SUD (OR=1.57, p= 0.01), and concurrent mental problems (OR=1.76, p= 0.02) were more likely to engage in problematic alcohol use. However, participants with later age of first alcohol use (OR=0.86, p= 0.0001) were less likely to engage in this behavior.

Logistic regression analyses of experienced alcohol-related harms

For the second analysis, we tested the influence of this set of predictor variables on alcohol user student's experience of alcohol-related harms. Similar to the first logistic regression analysis, the predictor set had a significant effect on experience of alcohol-related harms (likelihood ratio χ^2= 328.6, p<0.0001). The Hosmer and Lemeshow goodness-of-fit test showed that the fitted model was adequate (χ^2= 5.33, p=0.72). The pseudo R^2 statistic indicated that the predictor set of variables could explain an estimated 39.9% of the variance in alcohol user student pharmacists' experience of alcohol-related harms within the past-year (Table 5.3). Ethnicity (Wald Chi-Square=11.9, p=0.02), class year (Wald Chi-Square=7.8, p=0.04), and relationship status (Wald Chi-Square=21.6, p<0.0001) were the only significant demographic factors that distinguished student pharmacists who have experienced alcohol-related harms within the past 12 months. Among other risk factors: age of first alcohol use (Wald Chi-Square=5.3, p=0.02), lifetime drug use (yes/no) (Wald Chi-Square=9.7, p=0.002), and family history of SUD (yes/no) (Wald Chi-Square=4.2, p=0.04) were significantly associated with the experience of alcohol-related harms in the past-year. Table 5.3 shows that single student pharmacists (OR=2.99, p= 0.0008) in the third year (OR= 1.74, p= 0.01) were significantly more

likely to experience alcohol-related harms. However, Black students (OR= 0.23, p= 0.001) were less likely to experience alcohol-related harms as compared to White students. Regarding other risk factors, students with reported lifetime drug use (OR=2.07, p<0.0001) and family history of SUD (OR=1.38, p= 0.03) were more likely to report experiencing alcohol-related harms within the past 12 months.

Discussion

The present study assessed alcohol use behaviors among student pharmacists and examined the associations between demographic and other risk factors and problematic alcohol use. Student pharmacists reported a high prevalence of hazardous or harmful alcohol use (18%) and a high rate of alcohol-related harms experience (39%). These findings indicate the need to increase the awareness about the extent of alcohol use behaviors and their associated outcomes in pharmacy schools.

This study showed a very high percentage of student pharmacists reported lifetime alcohol use (90.5%). This percentage is higher than the 86.8% reported in the general population ≥ 18 years old.[33] In this study, 84.6% of participants reported alcohol use within the past-year, whereas only 70.7% was reported by the general population.[33] Furthermore, student pharmacists showed a higher rate of alcohol consumption (90.5%) when compared to (86%) reported by a national sample of medical students (N=2710).[28] Nevertheless, this study found similar rates of problematic alcohol use (AUDIT ≥8) among student pharmacists (18%) as compared to medical students with rates > 15%.[28]

Table 5.3. Summary of logistic regression analysis predicting hazardous or harmful alcohol use and the experience of alcohol-related harms among alcohol-user students (N=1064) during the past-year

Predictor variable	β	P-value	OR	95% CI	SE
Hazardous or harmful alcohol-use (AUDIT ≥ 8)[a]					
Gender (ref: female)	1.22	<0.0001	3.39	2.37-4.85	0.18
Age	-0.10	0.003	0.91	0.85-0.96	0.03
Age of first alcohol use	-0.15	<0.0001	0.86	0.80-0.92	0.04
Class year (ref: first)					
Third	0.66	0.004	1.94	1.24-2.92	0.23
Race (ref: white)					
Black	-2.17	0.007	0.11	0.02-0.55	0.58
Relationship status (ref: married)					
Single, never married	1.42	<0.0001	4.12	2.12-7.99	0.34
Lifetime drug use	1.15	<0.0001	2.96	2.03-4.33	0.19
Family history of SUD	0.45	0.01	1.57	1.10-2.23	0.18
Concurrent psychiatric or mental disorders	0.57	0.02	1.76	1.08-2.76	0.24
Experience of alcohol-related harms [b]					
Age of first alcohol use	-0.13	0.02	0.93	0.83-0.93	0.03
Class year (ref: first)					
Third	0.56	0.01	1.74	1.23-2.47	0.19
Race (ref: white)					
Black	-1.49	0.001	0.23	0.11-0.49	0.46
Relationship status (ref: married)					
Single, never married	0.80	0.0008	2.99	1.98-3.41	0.22
Lifetime drug use	0.55	<0.0001	2.07	1.54-2.78	0.16
Family history of SUD	0.31	0.03	1.38	1.01-1.81	0.15

Note. OR: odds ratio; CI: confidence interval; SE: Standard Error; AUDIT: Alcohol Use Disorder Identification Test; SUD: Substance Use Disorder.

[a] Model statistics for hazardous or harmful alcohol-use (within the past-year): likelihood ratio χ^2= 209.5 ($p<0.0001$); pseudo R^2 =0.294. [b] Model statistics for the experience of alcohol-related harms (within the past-year): likelihood ratio χ^2= 328.6 ($p<0.0001$); pseudo R^2 =0.399.

Compared to previous research that employed the AUDIT for assessing the behavior of alcohol use in samples of student pharmacists, this study found a slightly lower rate (18%) of problematic alcohol use than the 25.2% and 23.2% reported by English et al. and Oliver et al., respectively.[9,10] Since this study sample is comparable to English et al study's sample of student pharmacists (from 9 schools of pharmacy, N=1161),[9] our findings suggest a slight reduction in the rate of problematic alcohol use among student pharmacists between 2009 and 2014. However, the rate of lifetime alcohol consumption by student pharmacists was increased from 86.4% to 90.5%. These changes in rate of alcohol use behaviors overtime may be explained by the increased number of students who have a postsecondary experience (e.g. 3 or more years of college or baccalaureate degree) before applying to schools of pharmacy.[34]

With respect to risk factors, findings from this study were consistent with previous findings among general college and professional students.[9,35,36] Age, gender, ethnicity, relationship status, and other risk factors (e.g. age of first alcohol use, lifetime drug use, family history, and concurrent psychiatric or mental disorders) were expected to correlate with problematic alcohol use behaviors in student pharmacists. Although being male was associated with a higher probability of problematic alcohol use, female student pharmacists were at the same risk to experience alcohol-related harms. Thus, the current study highlights the need for equal attention for both male and female student pharmacists with regard to alcohol use behaviors from alcohol researchers and service providers (e.g. educators or counselors).

Compared to previous studies conducted with professional students,[9,28] we examined differences in students' alcohol use across years of matriculation (first, second, third, and fourth). In previous studies, professional students in the first 2 years were more likely to report hazardous or harmful alcohol use as compared to students in the last 2 years.[9,28] However, in this study third

year students reported the highest rate of problematic alcohol use (21.88%) compared to rates of 15.23%, 17.39%, and 18.45% among students in first, second, and fourth year, respectively. Kruskal Wallis post hoc analysis supported the results of students in the third year being significantly more likely to report higher AUDIT scores compared to students in other program years. A plausible explanation for this finding is related to the legal age for drinking alcohol. In contrast with students in the first 2 years, all students in third year reached the age of 21 years (legal age for alcohol drinking). Students who are 21 years of age may have easier access to alcoholic beverages, which may have led to the increased frequency and quantity of alcohol use (i.e., hazardous or harmful alcohol use). This study finding suggests that screening and prevention programs should target students in their third year.

Similar to other professional healthcare programs,[37] pharmacy education is highly demanding.[38] The demanding curricula in colleges of pharmacy may contribute to the increased risk for problematic alcohol use behaviors.[39,40] Existing research on alcohol use behaviors among college students suggest that hazardous or harmful levels of alcohol consumption are associated with increased use of nonmedical drugs.[41] This study also found an association between problematic alcohol use and lifetime report of other drug use among student pharmacists. Given their easy access to controlled substances and prescription drugs, this significant association suggests that student pharmacists and future professional pharmacists might be at higher risk for developing SUD including alcohol use disorder (AUD).[14,42] Since student pharmacists are the pharmacists of tomorrow, with their responsibility of providing high quality pharmaceutical care and reinforcing healthy habits among patients, it may be useful to provide a more consolidative education on alcohol use behaviors, risk factors, and AUD in pharmacy schools. Such educational models should be included within a comprehensive curriculum for pharmacy

substance abuse and addictive disease,[43] which might include information about drinking and nonmedical drug use behaviors in professional and/or non-professional college students. These curricular contents may serve as guidance for student pharmacists to identify signs, symptoms, and risk factors associated with problematic substance use behaviors among themselves and their colleagues.[44]

Screening for problematic alcohol use, preventive and brief consultation might be another method of intervention in schools of pharmacy. The American Association of Colleges of Pharmacy (AACP) has recommended for each pharmacy school to develop and implement such programs,[45] yet no published research that describes or assesses any developed programs in pharmacy schools and college settings has been located. Available research on regular screening and brief interventions programs has shown evidence of effectiveness in controlling alcohol use among college students,[46,47] however, these interventions have never been adopted or applied for student pharmacists.

Based on the AUDIT users' manual, figure 5.2 depicts the levels of risk associated with alcohol use according to the reported AUDIT scores within the study sample. It also provides the best intervention for each risk level as recommended by the WHO.[26] The majority of student pharmacists (82%) reported no to low alcohol use risk (AUDIT range (0-7)). A small but still significant percentage (16%) of student pharmacists reported mild-risk related to alcohol use, with AUDIT scores ranging between 8 and 15. Alcohol education and brief counseling represent the core intervening strategies for dealing with problematic alcohol use behaviors in sampled student pharmacists. Thus, the integration of alcohol education, screening, and brief counseling to intervene on an individual basis with student pharmacists may be very effective in controlling problematic alcohol use in pharmacy schools. Furthermore, based on the level of alcohol-related

risks, these interventions might also be applicable to other professional healthcare students and general college students.

Limitations and Directions for Future Research

There are limitations to this study that should be acknowledged. First, although the sample size for this study is large and collected from multiple pharmacy schools (n= 6), this is a non-randomized, cross-sectional study. Therefore, our ability to generalize findings to the overall professional student pharmacists was limited. Second, study variables were assessed based by self-reported data. Study results may be subject to recall and social desirability biases.[48] Third, several variables in the study were generated from single items. It is impossible to establish reliability estimates based on single item measures.[49] Although these items have face validity, many single item predictors may compromise the internal validity of the study.[50] Finally, our study design precludes firm conclusions regarding any cause and effect relationships among the variable sets of interest.

Despite the above limitations, our study provides valuable information regarding alcohol use behaviors among a large sample of professional student pharmacists in the United States. Findings from this study also provide important information for pharmacy educators and counselors who may be interested in further investigations and examinations of the impact of alcohol education curriculum and/or alcohol preventive interventions (e.g. screening programs or brief counseling) on alcohol use behaviors in pharmacy campuses. Moreover, study findings yield preliminary data for investigating further associations between risky alcohol use behaviors, psychological factors, and personality factors.

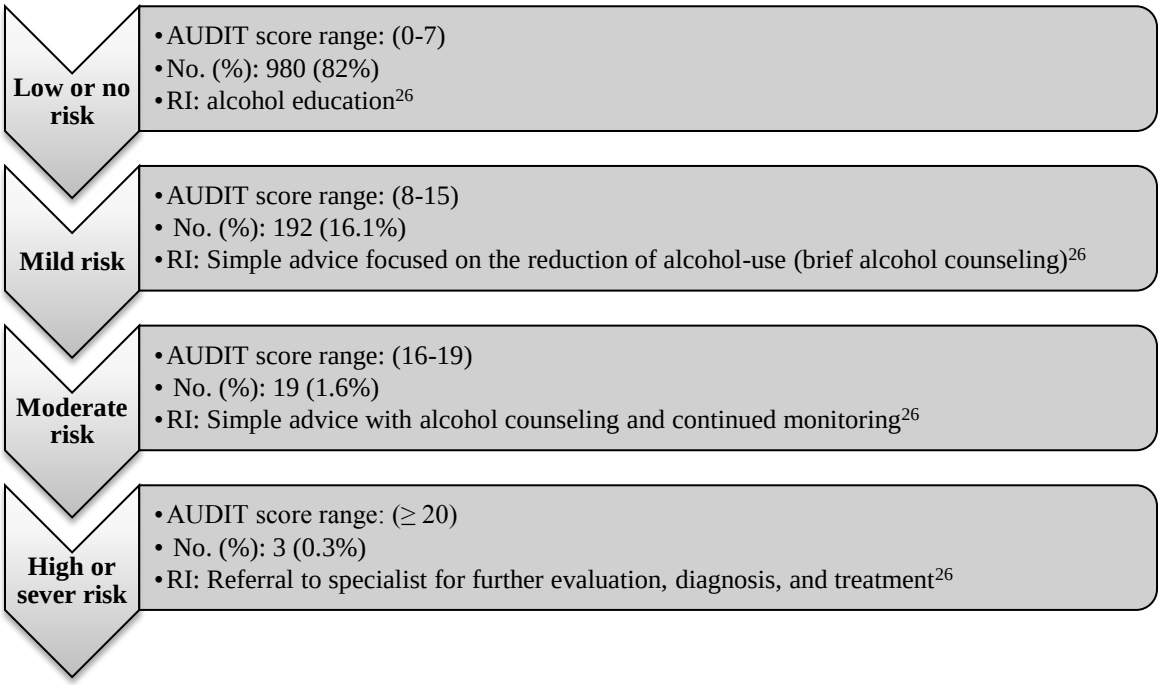

Figure 5.2. Levels of risk related to alcohol-use among study sample (No. (%)) based on reported AUDIT scores and recommended interventions (RI) as suggested in the AUDIT user's manual.[26]

Findings suggest that some non-modifiable risk factors (race, gender, class year, age of first use, family history) indeed account for the variability in alcohol use behaviors among student pharmacists. Future research should be conducted to validate these findings in a broader and representative random sample of student pharmacists attending different pharmacy schools and/or colleges. Findings from this research may lead to the identification of factors that could be used to screen and select student pharmacists for intervention. Based on that, professional college counselors can establish effective prevention, early intervention, and treatment programs.

Implications for Professional College Counselors and University Counseling

The results of this study have important implications for intervention efforts aimed at controlling problematic alcohol use behaviors in professional students. Ninety percent of the study sample reported lifetime alcohol use, in which approximately 1 out of 5 student pharmacists is engaged in problematic alcohol use behaviors, and 42.9% reported experiencing alcohol-related harms. These results suggest a high rate of undiagnosed drinking problems among student pharmacists. Efforts are needed to identify student pharmacists (routine screening) who have problems with alcohol use and help them reduce or cease drinking (preventive or treatment interventions). The study findings suggest that assessing demographic and other risk factors such as family history of problematic substance use and first age of alcohol use, in addition to regular measures of quantity and frequency of alcohol use would help counselors identify student pharmacists who are at high risk for problematic alcohol use and alcohol-related outcomes.

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CHAPTER 6

ALCOHOL USE, RELATED HARMS, AND MENTAL HEALTH IN PROFESSIONAL STUDENT PHARMACISTS[**]

[**] **Al-Shatnawi S,** Young HN, Perri M, Tackett R, Norton M. To be submitted to the *Journal of Substance Abuse.*

ABSTRACT

Background: Problematic alcohol use and other mental health problems are prominent in healthcare professional students. However, limited research exists on student pharmacists. This study examined problematic alcohol use behaviors and mental health in a cross-section of student pharmacists. *Methods*: A large sample of students (N=1194) enrolled at 6 pharmacy schools in the southeastern U.S. completed an online survey in 2013-2014. Students' alcohol use behaviors and related harms, anxiety levels, depressive symptomatology, perceived stress, and personality traits were assessed, and the relationships between these variables were investigated. *Results:* Of students who reported lifetime alcohol use, 20% indicated problematic alcohol use and 43% reported alcohol-related harms in the past-year. Participants reported elevated stress scores of 18.8 (±5.3); however, perceived stress was not associated with alcohol use behaviors and related harms. Anxiety levels and depressive symptomatology were associated with problematic alcohol use and harmful experiences, respectively. Nevertheless, their influence was not significant after controlling for students' impulsivity traits. The role of personality traits associated with impulsive behaviors, specifically negative urgency and lack of premeditation, was most significantly associated with problematic alcohol use behaviors and related harms. Being single, male, in the third year, with an early age of first alcohol use (<21 years) and any reported lifetime drug use, in addition to high levels of negative urgency and lack of premeditation were associated with risky alcohol use and the experience of alcohol-related harms. *Conclusion:* This study provides pharmacy schools and colleges with data to better understand their students' alcohol use behaviors. Available resources at pharmacy schools should be subject for evaluation and reassessment. More targeted efforts (alcohol awareness or

prevention programs) should primarily focus on students who use alcohol and who report high levels of negative urgency and lack of premeditation relative to their colleagues.

Key Words: Alcohol use, Anxiety, Depression, Perceived stress, Impulsivity, Student pharmacists, Pharmacy schools

Introduction

Alcohol use is very common among college students and potentially quite problematic.[1] Problematic alcohol consumption might carry significant risks of negative social, academic, psychological, and physical health consequences among college students.[2] In order to effectively curb these negative consequences, it is important to examine not only the patterns and prevalence of alcohol use, but also the factors that might influence college students' alcohol use and experience of associated harms.[2] Factors other than the quantity and frequency of alcohol use might significantly predict alcohol use behaviors and the experience of alcohol-related harms among college students.[3] Potential predictors include: (i) psychological factors such as anxiety, depression, and stress, and (ii) personality factors such as impulsivity traits.[4-6]

Due to alcohol's sedative effect and its ability to mitigate an individual's distress experiences,[7] the self-medication hypothesis of alcohol use proposed that elevated levels of distress can predict higher levels of alcohol use and associated harms.[8] Although not yet demonstrated experimentally, the experience of high stress has been found to predict higher levels of alcohol consumption and more alcohol-related problems in college students.[9,10] In addition to high stress levels, anxiety and depression are among the most common mental health problems facing college students.[11] However, research has highlighted the problem of

underutilization of mental health services in college students.[12,13] Thus, these findings suggest that alcohol use is a potential self-medication behavior adopted by college students to cope with their psychological distress.

In addition to psychological factors, recent research has elucidated various impulsivity-related behavioral domains and explored their relationships with problematic alcohol use in college students.[14-16] While a four-factor impulsivity model has been described,[17] a fifth domain was recently proposed.[18,19] The five-factor impulsivity model encompasses domains including negative urgency, positive urgency, sensation seeking, lack of premeditation, and lack of perseverance.[20] Negative and positive urgency refers to maladaptive behaviors (rash actions) as a response to significant negative and positive emotions, respectively.[18-20] Sensation seeking describes behaviors disposed toward exciting or novel experiences, such as risky or dangerous actions (e.g. skydiving or high-speed automobile racing).[20] Lack of premeditation describes engaging in activities without regard to consequences, and lack of perseverance denotes failure to complete a task due to boredom or fatigue.[20] Significant associations between alcohol use and different impulsivity domains have been demonstrated,[16,21] and thus, support the consideration of multi-dimensional personality traits related to impulsive behaviors when evaluating problematic alcohol use and the experience of alcohol-related harms among college students.

Professional healthcare students

Students in professional programs (e.g. medicine, dentistry, and nursing) face excessive levels of stress.[22] In 2001, one study suggested "medical programs might cause stress that is harmful to psychological well-being of medical students." [23] Several studies have revealed high levels of stress, depression, and anxiety in professional programs.[24-27] Similar to other healthcare professional programs, pharmacy education is highly demanding, requiring dedication,

commitment, and hard work by students.[28] Accordingly, student pharmacists may perceive extensive training and curricular requirements as highly stressful.[29,30] However, few studies exist assessing stress, anxiety and depression among student pharmacists,[22,31] while no study has yet been conducted to examine the relationships of these important psychological factors to alcohol use behaviors in this population.

Despite their medical education, research shows that problematic substance use is evident among professional healthcare students.[32-36] Concurrent mental problems and problematic substance use behaviors have been documented in samples of professional students.[37,38] This evidence might indicate a higher vulnerability for psychological or substance use related impairments in future healthcare professionals. Thus, the overall healthcare process and patients' health might be threatened. Regardless of their future professional career's responsibilities in providing pharmaceutical healthcare services, less research has been conducted to examine student pharmacists' psychological problems and its impact on problematic behaviors (such as alcohol use) compared to other healthcare students.

Alcohol use in student pharmacists

Among student pharmacists, problematic alcohol use has been reported since 1985.[39-44] Alcohol has been identified as the most used substance by student pharmacists.[35,44] Approximately 1 in 4 student pharmacists has acknowledged problematic alcohol use.[45-47] Previous studies also highlighted the problem of binge drinking (consumption of 5 or more drinks in one occasion) within schools of pharmacy, where significant proportions (≥30%) of sampled student pharmacists reported episodes of binge drinking.[39,46,48] Although studies uncovered important demographic factors that might influence substance use among students entering the profession, they neither used validated measures nor examined psychological and

personal characteristics related to alcohol use.[39,45,46,49] Some of the studies had limited generalizability of their results, as they included students from single institutions.[39,47]

Stress, anxiety, and depression among student pharmacists

It is important to highlight the extent of psychological problems among student pharmacists as it may influence deleterious health behaviors such as alcohol use. One study showed that student pharmacists suffered from more stress than medical and dental students.[50] Nevertheless, research concerning stress among student pharmacists is of recent development. There is a dearth of studies investigating stress in student pharmacists as compared to other healthcare students.[22] Interestingly, the number of studies relating to student pharmacists' stress levels, stressors, and coping strategies is gradually increasing. Recent studies confirmed the experience of high stress levels by student pharmacists, and showed that stress has a negative impact on the students' health related outcomes, such as quality of life.[29,51,52] Notably, student pharmacists in one study reported alcohol use as a way to deal with their undue amount of stress.[51] With respect to anxiety and depression, little research has been conducted to examine these psychological problems among student pharmacists.[31]

This study was specifically designed to address the void in the literature by assessing anxiety, depression, impulsivity, perceived stress, and alcohol use behaviors in a large sample of student pharmacists. Further, this study examined the associations between these psychological factors, alcohol use behaviors, and the experience of alcohol-related harms among student pharmacists.

Methods

Design and Procedures

Student pharmacists enrolled at 6 pharmacy schools in the southeastern United States were contacted through their faculty members who agreed to participate and invite their students to participate in this research. Participants completed measures as a part of an anonymous, voluntary, comprehensive battery "*the Student Pharmacists Chemical Health Scale (SPCHS).*" This battery was designed to assess substance use behaviors and risk factors that may influence problematic substance use in student pharmacists.[53] The "*SPCHS"* survey was administered online through Qualtrics. Data for the current study was collected over one academic year-period (2013-2014); there were no significant differences between fall and spring cohorts for any of the included measures (P >0.1). All measures and research procedures were reviewed and approved by the Institutional Review Board at the University of Georgia, and all participants provided online informed consent.

Measures

Participants completed the Alcohol Use Disorders Identification Test (AUDIT).[54] The AUDIT is a 10-item, self-reported measure that assesses individual's alcohol outcomes (problematic use behaviors, related harms, and dependence symptoms).[55] This tool has been validated among college students to measure and assess problematic alcohol use and related harms.[56] Total AUDIT scores can range between (0-40), with a cutoff score of 8 or more indicating high-risk or problematic alcohol use behaviors.[56] The total AUDIT score was used and a good internal consistency was observed (α=0.81) (Table 6.1). The experience of alcohol-related harms was assessed using harmful alcohol use items (items 7-10) within the AUDIT. Specifically, these items assess an individual's harmful experiences such as guilty feelings after

alcohol use, blackouts, alcohol-related injuries to self or others, and others' concerns about alcohol use.[55] Scores on each item were added to represent the experience of alcohol-related harms outcome; coefficient alpha =0.71 (Table 6.1).

The Zung's Self-rating Anxiety Scale (Z-SAS)[57] was used to evaluate anxiety levels. This instrument consists of 20 self-reported items that assess an individual's level of anxiousness, with higher scores indicating more anxiety symptoms.[58] The Z-SAS has been widely utilized and tested in studies of young individuals and college students.[57-61] In the present study, a very good internal consistency (α =0.87) was obtained (Table 6.1). Scores obtained from this instrument can be categorized as: 25-44 indicating normal anxiety levels; 45-59 indicating mild to moderate anxiety levels; and $\geq$ 60 indicating marked to sever anxiety levels.[58] Participants were also asked to complete the Beck Inventory-II (BDI-II), a self-reported tool designed to assess the presence and severity of depression symptoms.[62,63] This tool contains 21 self-reported items and takes approximately 5-10 minutes to complete.[62] The BDI-II has been used extensively in research to assess depressive symptomatology because of its brevity and ease in scoring.[63,64] In particular, it has been utilized in research assessing depressive symptoms in medical students.[65] This tool is highly reliable and valid.[66,67] In the current study, an excellent coefficient alpha of 0.93 was obtained. Based on the BDI-II manual, BDI scores in college students can be categorized as: minimally depressed (0-13); mildly depressed (14-19); moderately depressed (20-28); and severley depressed ($\geq$29).[62] The Perceived Stress Scale-10 (PSS-10) was utilized to assess levels of psychological stress among student pharmacists. The PSS-10 is a self-administered scale with 10 items; each item has a score ranging from (0-4). The total summated score, therefore, can range between (0-40), with a higher score indicating higher psychological stress level. PSS-10 is a reliable and valid tool with coefficient alpha >0.80 and it has been shown to be widely valid, as

it correlates with different measures of stress.[68,69] In this study, PSS-10 scale was reliable as it showed a good coefficient alpha of 0.84.

The UPPS-P impulsive behavioral scale was used to measure impulsivity. This scale was primarily developed and tested in samples of college students.[19,70] It contains 59 self-reported items: 12 items measure negative urgency, 14 items for positive urgency, 12 items for sensation seeking, 11 items for lack of premeditation, and 10 items for lack of perseverance. The reliability and validity of the UPPS-P have been well documented within samples of college students.[70,71] Similarly, these scales demonstrated adequate internal consistency in this study (Cronbach's alphas: negative urgency= 0.82; positive urgency= 0.85; sensation seeking= 0.86; lack of premeditation= 0.82; and lack of perseverance= 0.80) (Table 6.1). In addition to all described measures, students were asked to report their basic demographic characteristics (e.g. age, gender, race, relationship status, and year in program), as well as some other alcohol use-related risk factors (e.g. age of first alcohol use, other drug use, family history of substance use disorders, and mental or psychiatric disorders).

Data analysis

Descriptive statistics were used to describe alcohol use, depressive symptomatology, and anxiety. Since the collected data violated normality assumption for parametric analyses, nonparametric tests were used to compare levels of anxiety, depression, perceived stress, and alcohol use behaviors across sample characteristics.[72] Bivariate analyses were conducted to test for significant covariates. Multiple logistic regression analyses were performed to examine the associations between psychological and personality factors and the engagement in problematic alcohol use (AUDIT cut-point ≥ 8), and the experience of alcohol-related harms among student pharmacists. Of 1194 participants, all completed the AUDIT scale; however, 83 students had

several missing items (from the perceived stress scale, impulsivity, depression, and anxiety). The extent of overall missing data was minimal (<7%), therefore, we assumed that data was missing completely at random.[73] Hence, the pairwise deletion method was applied in this research.[73]

Results

Participants were 1194 students (67.3% female) who completed measures while being enrolled at pharmacy programs (37% first-year, 27% second-year, 27% third-year, and 9% fourth-year). The average age of respondents was 24.8 (±4.3) years, with a range of 18-53 years. Approximately 75% of participants were self-identified as White, 13% Asian, 6% African-American, 2% Hispanic, and 4% as others.

Alcohol use and alcohol-related harms

Among participants who reported any alcohol use, 20% met the criteria for problematic alcohol use behaviors and 43% experienced alcohol-related harms within the past 12 months. The mean AUDIT total score was 4.2 (±3.9), and the mean AUDIT harms score was 1.1 (±1.7) (Table 6.1). Notably, male gender was associated with a higher risk of problematic alcohol use (χ^2=41.4, P <0.0001) and the experience of alcohol related-harms (χ^2=7.7, P=0.005) (Table 6.2).

Table 6.1. Spearman correlations, means, standard deviations, and internal consistencies for AUDIT, PSS-10, BDI-II, Z-SAS, and impulsivity scale domains.

	1	2	3	4	5	6	7	8	9	10	n	Mean	SD	α
1. $AUDIT_{total}$	1										1194	4.2	3.9	.81
2. $AUDIT_{harms}$	.78***	1									1194	1.1	1.7	.71
3. PSS-10	.04	.07	1								1111	18.8	5.3	.84
4. BDI-II	.11***	.15***	.31***	1							1127	6.2	7.5	.93
5. Z-SAS	.07*	.11***	.18***	.58***	1						1113	40.9	10.0	.87
6. Negative urgency	.27***	.32***	.13***	.36***	.35***	1					1162	1.94	.46	.82
7. Positive urgency	.25***	.25***	.03	.19***	.23***	.64***	1				1157	1.81	.38	.85
8. Sensation seeking	.34***	.26***	.01	.004	.004	.30***	.42***	1			1159	2.45	.59	.86
9. Lack of premeditation	.22***	.19***	-.05	.05	.05	.37***	.21***	.34***	1		1159	1.89	.38	.82
10. Lack of perseverance	.10**	.14***	-.09**	.18***	.22***	.44***	.31***	.07*	.46***	1	1160	1.75	.42	.80

Note. AUDIT: Alcohol Use Disorders Identification Test; PSS-10: Perceived Stress Scale-10; BDI-II: Beck Depression Inventory II; SAS: Self-rating Anxiety Scale; SD: Standard Deviation; α: internal consistency measure (Cronbach's Alpha).

* P< .05.

** P< .01.

*** P< .001.

Depressive symptoms

Of the participants, 2.13% of reported BDI-II scores ≥ 29 (severely depressed), 3.37% reported scores of 20-28 (moderately depressed), 7.37% reported scores of 14-19 (mildly depressed), and 87.13% reported scores ≤13 (minimally depressed). The mean BDI-II score was 6.2 (±7.5) with a median of (4.0) and a range of (0-59). With respect to specific depressive symptoms, sleep changes and problems such as insufficient sleep per night (54.2%), loss of energy (46.14%), tiredness and fatigue (43.66%), and agitation (31.65%) were the most frequently reported symptoms by student pharmacists in this study. Interestingly, based on the Wilcoxon-Mann-Whitney test, female students reported higher BDI-II scores than male students ($z = -5.23$, $P < 0.001$) (Table 6.2).

Anxiety level

On the Z-SAS, 72.3% of participants scored 25-44 (normal anxiety level), 22.5% scored 45-59 (mild to moderate anxiety level), and 5.2% scored over 59 (marked or sever anxiety level). The mean anxiety score in this study was 40.9 (±10.0). Similar to BDI-II scores, the Wilcoxon-Mann-Whitney test showed that female students reported higher anxiety scores than male students ($z = -5.06$, $P < 0.0001$) (Table 6.2).

Perceived stress

The mean PSS-10 score in this study was high (18.8 ± 5.3). Compared to male students, females reported significantly higher stress scores ($z = -6.99$, $P < 0.0001$) (Table 6.2).

Impulsivity domains

Regarding the UPPS-P scale, 1162 completed negative urgency items, with a mean score of 1.94 (±.46); 1157 completed positive urgency items, with a mean score of 1.81 (±.46); 1159 completed sensation seeking items, with a mean score of 2.45 (±.59); 1159 completed lack of

premeditation items, with a mean score of 1.89 (±.38); and 1160 completed lack of perseverance items, with a mean score of 1.75 (±.42) (Table 6.1).

Bivariate analysis

Among participants who reported lifetime alcohol use, problematic alcohol use (AUDIT ≥8) was significantly associated with several background factors. Age (Wald χ^2=5.8, P=0.016), gender (χ^2=44.3, P<0.0001), ethnicity (χ^2=21.2, P=0.0003), year in school (χ^2=21.1, P=0.002) and relationship status (χ^2=22.3, P=0.0005) were significant covariates associated with problematic alcohol use behaviors. Other risk factors such as: age of first alcohol use (Wald χ^2=55.0, P<0.0001), family history of problematic substance use (χ^2=16.5, P<0.0001), lifetime drug use (χ^2=79.2, P<0.0001), and mental or psychiatric disorders (χ^2=11.7, P=0.0006) were significantly associated with at high-risk alcohol use. These factors were later entered into logistic regression models.

Main effects

Logistic regression analyses were performed to predict at high-risk alcohol use behaviors and the experience of alcohol-related harms based on different psychological and impulsivity factors among student pharmacists. After controlling for covariates, anxiety level was associated with problematic alcohol use behaviors (αOR=1.25, P=0.008). Depressive symptomatology score was associated with the experience of alcohol-related harms within the past-year (αOR=1.20, P=0.026) (Table 6.3). Neither problematic alcohol use behaviors, nor the experience of alcohol-related harms were associated with reported perceived stress levels (P>0.05). Negative urgency was significantly associated with problematic alcohol use behaviors and the experience of alcohol-related harms (αOR=2.55, P=0.002 and αOR=2.62, P=0.0002, respectively). However, sensation seeking and lack of premeditation (αOR=1.44, P=0.026 and

αOR=1.75, P=0.014, respectively) were associated with the experience of alcohol-related harms (Table 6.3).

These factors were collectively included in multiple logistic regression models that predict problematic alcohol use behaviors and the experience of alcohol-related harms. Contrary to what was found in separate logistic regression models, in the full models anxiety, depression, and perceived stress scores were insignificant in predicting problematic alcohol use behaviors and the experience of alcohol-related harms (Table 6.3). However, higher levels of negative urgency (αOR=2.65, P=0.005 and αOR=2.96, P=0.0001) and lack of premeditation (αOR=1.97, P=0.025 and αOR=1.74, P=0.02) were significantly associated with problematic alcohol use behaviors and the experience of alcohol-related harms, respectively. With respect to other factors, problematic alcohol use was associated with lifetime drug use (αOR=1.55, P=0.05), age (αOR=0.91, P=0.04), male gender (αOR=1.90, P=0.007), single relationship status (αOR=3.1, P=0.004), and ethnicity (αOR=0.27, P=0.05). While the experience of alcohol-related harms was associated with earlier age of first alcohol use (αOR=0.91, P=0.01), third program-year (αOR=1.6, P=0.01), single relationship status (αOR=2.36, P=0.002), and ethnicity (αOR=0.26, P=0.02).

Table 6.2. Comparisons for alcohol use, anxiety, depression, and stress across sample characteristics

	Alcohol-use behavior AUDIT score (n=1194)		**Anxiety** SAS score (n= 1113)		**Depression** BDI-II score (n= 1127)		**Stress** PSS-10 score (n=1111)	
	Mean ± SD	Median (Range)	Mean ± SD	Median (Range)	Mean ± SD	Median (Range)	Mean ±SD	Median (Range)
Gender								
Male (n=390)	**5.3**± 4.5**	**5.0 (0-24)**	39.0 ± 9.7	37.5 (25-78)	4.9 ± 7.0	2.5 (0-48)	17.3 ± 5.8	18 (0-36)
Female (n=802)	3.6 ± 3.5	3.0 (0-19)	**41.9**±10.0**	**40.0 (25-91)**	**6.8**± 7.7**	**5.00 (0-59)**	**19.5**± 4.9**	**19 (0-36)**
Race								
White (n=878)	**4.6**± 3.9**	**4.0 (0-24)**	41.0 ± 10.2	40.0 (25-90)	6.2 ± 7.5	4.0 (0-59)	19.0 ± 5.2	19.0 (0-36)
Asian (n=157)	2.6 ± 3.1	1.0 (0-15)	41.0 ± 9.7	38.8 (25-91)	7.0 ± 8.4	4.0 (0-48)	18.0 ± 4.9	18.0 (0-36)
Black (n=69)	2.3 ± 2.4	1.0 (0-11)	36.9 ± 7.2	36.9 (25-64)	4.8 ± 5.6	3.0 (0-27)	18.0 ± 6.5	18.0 (0-30)
Hispanic (n=25)	4.1± 4.2	4.0 (0-18)	42.5 ± 12.1	42.5 (25-80)	4.7 ± 6.8	3.0 (0-25)	18.5 ± 6.9	18.0 (0-28)
Other (n=48)	4.0 ± 4.4	2.0 (0-19)	41.4 ± 9.4	40.0 (25-63)	6.7 ± 7.8	4.0 (0-37)	18.9 ± 5.8	19.0 (0-30)
Year in school								
First (n=440)	3.7 ± 3.9	3.0 (0-24)	39.7 ± 9.4	37.5 (25-88)	5.0 ± 6.1	3.0 (0-42)	18.2 ±5.2	18.0 (0-36)
Second (n=322)	4.3 ± 3.9	3.0 (0-21)	**43.2**±11.0**	**41.3 (25-91)**	**8.0**± 8.8**	**6.0 (0-48)**	17.9 ± 5.5	19.0 (0-36)
Third (n=329)	**4.7**± 3.9**	**4.0 (0-19)**	40.8 ± 9.4	40.0 (25-90)	6.5 ± 7.5	4.0 (0-59)	**20.1**± 5.2**	**20.0 (0-34)**
Fourth (n=103)	4.5 ± 4.1	4.0 (0-15)	40.1 ± 10.7	38.8 (25-88)	5.4 ± 7.7	2.0 (0-37)	19.3 ± 4.9	19.0 (5-31)
Program								
Public (n=630)	4.2 ± 3.8	3.0 (0-24)	40.7 ± 10.1	39.0 (25-91)	**6.5**± 6.7**	**4.0 (0-42)**	18.5 ± 4.1	19.0 (0-31)
Private (n=564)	4.2 ± 4.1	3.0 (0-21)	41.3 ± 9.9	41.0 (25-90)	5.9 ± 8.3	3.0 (0-59)	**19.1*± 6.5**	**19.0 (0-36)**
Alcohol use								
No use (n=113)	0.0 ± 0.0	0.0 (0-0)	40.6 ± 9.3	40.0 (25-71)	6.0 ± 8.6	3.0 (0-48)	**17.1*± 6.1**	**18.0 (0-28)**
Non-hazardous use (n=867)	3.1 ± 2.0	3.0 (0-7)	40.5 ± 9.8	38.8 (25-91)	6.0 ± 7.2	4.0 (0-48)	19.0 ± 5.2	19.0 (0-36)
Hazardous use (n=214)	**10.9 ± 3.1**	**10.0 (8-24)**	**43.1**±11.0**	**41.3 (25-90)**	**7.3*± 8.1**	**5.0 (0-59)**	18.8 ± 5.1	19.0 (0-32)
Age first alcohol use (n=1081)								
< 21 (n=897)	**5.2**± 3.9**	**4.0 (0-24)**	41.0 ± 9.9	40.0 (25-91)	6.3 ± 7.5	4.0 (0-59)	18.7 ± 5.3	19.0 (0-34)
≥ 21 (n=184)	2.0 ± 2.1	1.0 (0-15)	40.6 ±10.6	38.8 (25-77)	5.8 ± 7.4	3.0 (0-42)	19.4 ± 5.4	19.0 (0-36)
Drug use								
Yes (n=444)	**6.1****± 4.3	**5.0 (0-24)**	**42.4**±10.5**	**41.3 (25-91)**	**7.2* ± 8.0**	**5.0 (0-59)**	19.1 ± 5.4	19.0 (0-34)
No (n=678)	3.0 ± 3.1	2.0 (0-19)	39.9 ± 9.5	38.8 (25-88)	5.5 ± 7.0	3.0 (0-48)	18.5 ± 5.2	19.0 (0-36)
Family history (SUD)								
Yes (n=510)	**5.1**± 4.4**	4.0 (0-24)	**42.0*± 10.9**	40.0 (25-90)	**7.1**± 8.2**	**5.0 (0-59)**	**19.5**± 5.2**	**19.0 (0-36)**
No (n=671)	3.6 ± 3.4	3.0 (0-19)	40.2 ± 9.2	38.8 (25-91)	5.5 ± 6.8	3.0 (0-48)	18.2 ± 5.4	18.0 (0-36)

Mental health problems								
Yes (n=141)	**5.4**** **± 4.4**	**4.0 (0-19)**	**46.4**** **±11.8**	**44.0 (25-88)**	**11.0**** **±**	**9.0 (0-48)**	**19.9*** **± 4.9**	**20.0 (0-31)**
No (n=1039)	4.0 ± 3.8	3.0 (0-24)	40.2 ± 9.5	39.0 (25-91)	**9.4** 5.6 ± 6.8	3.0 (0-59)	18.6 ± 5.3	19.0 (0-36)
Overall sample	4.2 ±3.9	3.0 (0-24)	40.9 ±10.0	40.0 (25-91)	6.2 ± 7.5	4.0 (0-59)	18.8 ± 5.3	19.0 (0-36)

Note. AUDIT: Alcohol Use Disorder Identification Test; SAS: Self-rating Anxiety scale; BDI-II: Beck Depression Inventory-II; PSS-10: Perceived Stress Scale-10; SD: Standard Deviation.

Difference between groups was assessed based on Wilcoxon-Mann-Whitney test results (when number of groups=2), and by Kruskal-Wallis Test (when number of groups >2).

* P<0.05.

** P<0.001.

Evaluating effects of personality traits (related to impulsive behaviors) on the relationship between inner psychological states (anxiety, depression, and perceived stress) and alcohol use outcomes (problematic use and harms)

Potential moderators' effect (impulsivity domains) on the relation between psychological factors and problematic alcohol use was examined. For moderation analyses, we included interaction terms of the predictor variables (e.g., anxiety level, depression, and perceived stress) and the moderators (e.g., UPPS-P scale scores) as predictors in a series of logistic regression analyses. In which, the magnitude and significance of the coefficients for the psychological and impulsivity, and interaction terms of the estimated regression equations were examined. None of these factors was a significant moderator of the psychological/alcohol use relation (P's >0.1). Additionally, the inclusion of these interaction terms negatively impacted our models' significance (larger likelihood ratios, reduced pseudo R^2, and significant lack of fit models' tests with $P<0.05$).

Discussion

This is the first study to examine the relationships between psychological or mental conditions and alcohol use and related-harms in student pharmacists. One novel component of this study was the focus on personality traits (impulsivity domains) and their relationships with alcohol use outcomes (problematic use and experience of harms) among student pharmacists. This study primarily investigated the rates of depressive symptoms, anxiety levels, perceived stress, and risky alcohol use as well as the comorbidity of these conditions in this special population. In addition to fill the void in literature, our results might inform and extend available intervention efforts to lessen several psychological and mental problems among student pharmacists.

Specifically, the current study investigated whether anxiety, depressive symptomatology, and perceived stress are associated with alcohol outcomes (problematic use and experienced harms) among a large sample of student pharmacists. Commonly identified correlates of problematic alcohol use behaviors were also examined, including personality traits related to impulsive behaviors, [16,21] other risk factors (e.g., age of first alcohol use, family history, lifetime drug use, and mental or psychiatric disorders),[39,74] and demographic factors.[45,46] With regard to alcohol consumption, our results demonstrate a significant percentage of student pharmacists at high-risk of problematic alcohol use (18%). Notably, male students were more likely to engage in problematic alcohol use when compared to females. However, gender differences in psychological states revealed that female students experienced significantly more anxiety, depressive symptomatology, and perceived stress than male students. These results are consistent with available literature on mental or psychological problems among general and professional college students.[38,51,75,76]

According to the self-medication hypothesis, and the incorporation of impulsivity role in problematic alcohol use, we hypothesized that (i) anxiety, depression, perceived stress, and impulsivity scores are correlated with reported AUDIT (total and harms) scores, (ii) student pharmacists with higher anxiety, depression, and/or perceived stress levels would be more likely to report problematic alcohol use and to experience alcohol-related harms than students with lower anxiety, depression, and/or perceived stress levels, and (iii) personality traits associated with impulsive behaviors are significantly associated with alcohol use outcomes and can moderate the relationships between psychological or mental conditions and alcohol use among student pharmacists.

Table 6.3. Logistic regressions of at high-risk alcohol use behaviors and the experience of alcohol-related harms with psychological factors and impulsivity domains (N=1104).

Model	Independent	At high-risk alcohol use behaviors ($AUDIT_{total} \geq 8$)			Experience of alcohol-related harms ($AUDIT_{harms} \geq 1$)		
		αOR	95% CI	P	αOR	95% CI	P
1	Anxiety	**1.25**	**1.01-1.05**	**0.008**	1.10	0.99-1.03	0.070
2	Depression	1.01	0.99-1.05	0.130	**1.20**	**1.003-1.05**	**0.026**
3	Perceived stress	0.99	0.96-1.03	0.680	1.10	0.97-1.03	0.890
4	Impulsivity						
	Negative urgency	**2.55**	**1.40-4.60**	**0.002**	**2.62**	**1.59-4.31**	**0.0002**
	Positive urgency	1.16	0.59-2.29	0.670	1.05	0.57-1.92	0.880
	Sensation seeking	1.21	0.79-1.82	0.380	**1.44**	**1.05-1.98**	**0.026**
	Lack of premeditation	1.94	0.77-2.60	0.070	**1.75**	**1.12-2.73**	**0.014**
	Lack of perseverance	1.15	0.67-1.97	0.610	0.69	0.43-1.30	0.150
5	**Full model**						
	Psychological factors:						
	Anxiety	1.01	0.98-1.04	0.450	0.99	0.97-1.01	0.30
	Depression	0.99	0.95-1.02	0.570	1.00	0.98-1.03	0.80
	Perceived stress	0.99	0.95-1.03	0.650	0.99	0.96-1.02	0.70
	Impulsivity:						
	Negative urgency	**2.65**	**1.22-4.03**	**0.005**	**2.96**	**1.80-5.1**	**0.0001**
	Positive urgency	1.30	0.64-2.67	0.470	1.21	0.64-2.27	0.60
	Sensation seeking	1.17	0.76-1.79	0.480	1.39	0.99-1.93	0.06
	Lack of premeditation	**1.97**	**1.09-3.57**	**0.025**	**1.74**	**1.08-2.71**	**0.02**
	Lack of perseverance	1.02	0.58-1.78	0.960	0.64	0.38-1.06	0.08
	Risk factors:						
	Age of first alcohol use	0.92	0.98-1.08	0.059	**0.91**	**0.86-0.98**	**0.01**
	Family history of SUD	1.46	0.97-2.20	0.072	1.20	0.85-1.64	0.30
	Mental health problems	1.50	0.85-2.60	0.160	1.10	0.62-1.63	0.80
	Drug use	**1.55**	**1.01-2.40**	**0.050**	1.50	0.96-1.92	0.08
	Demographics						
	Age	**0.91**	**0.85-0.97**	**0.041**	0.95	0.91-1.1	0.06
	Gender: male	**1.90**	**1.19-2.90**	**0.007**	0.72	0.49-1.1	0.09
	Year: third (ref: first)	1.40	0.99-2.20	0.060	**1.60**	**1.05-2.3**	**0.01**
	Ethnicity: black (ref: White)	**0.27**	**0.07-0.90**	**0.050**	**0.26**	**0.11-.61**	**0.02**
	Relationship: single (ref: married)	**3.10**	**1.70-6.70**	**0.004**	**2.36**	**1.50-3.71**	**0.002**

Note. αOR: adjusted odds ratio; CI: confidence interval; SE: Standard Error; AUDIT: Alcohol Use Disorder Identification Test. Odds ratio adjusted for demographic factors and other risk factors (age of first alcohol use, family history of substance use, mental or psychological problems, and other drugs use). Full model statistics for hazardous or harmful alcohol-use (within the past-year): likelihood ratio χ^2= 270.5 ($p<0.0001$); pseudo R^2 =0.46. Full model statistics for the experience of alcohol-related harms (within the past-year): likelihood ratio χ^2= 372.8 ($p<0.0001$); pseudo R^2 =0.42.

Results indicate that research hypotheses were partially supported. While significant correlations between anxiety levels, depressive symptomatology, some personality traits (e.g. negative urgency and lack of premeditation) and alcohol outcomes (problematic alcohol use and the experience of alcohol-related harms) were found, no correlations existed between the perceived stress levels and alcohol outcomes (Table 6.1). Although students who never used alcohol reported significantly lower PSS-10 scores than alcohol user students (Table 6.2), perceived stress was an insignificant predictor of problematic alcohol use or the experience of alcohol-related harms. These findings suggest that student pharmacists consume alcohol as a recreational drug in a more social environment, regardless of their stress levels. This is consistent with what has been reported in general college students.[77] However, previous research showed that significant proportions of student pharmacists (12%-20%) reported alcohol drinking as an adopted stress-coping strategy.[35,51] Although this study applied a general measure of perceived psychological stress, it neither included measures of alcohol use motives or expectancies, nor controlled for stress coping mechanisms among student pharmacists. Future research should rather rely on more specific stress measures, sources, and coping strategies that can eliminate alcohol use behaviors variation not related to stress, such as light to moderate alcohol use in social settings, in order to examine the stress influence on alcohol use outcomes among this population.

Significantly higher levels of anxiety and depressive symptoms were evident among students who reported at high-risk alcohol use (AUDIT≥8) (Table 6.2). Anxiety level was associated with student pharmacists' behavior of problematic alcohol use, and depressive symptomatology score was associated with the experience of alcohol-related harms (Table 6.3). Consistent with the self-medication hypothesis, these results suggest that students with increased

severity of anxiety and depression symptoms might use more alcohol to cope with their psychological symptoms and problems.[78]

With respect to different personality traits' role in problematic alcohol use among student pharmacists, our findings suggest that those with low impulsivity traits are buffered against problematic alcohol use. When impulsivity traits were added to models of psychological factors predicting engagement in problematic alcohol use, the influence of psychological factors (anxiety and depression) on alcohol outcomes was attenuated (P >0.05) (Table 6.3, model 5). Negative urgency and lack of premeditation demonstrated a primary role by influencing both problematic alcohol use and the experience of alcohol-related harms. Student pharmacists who scored high (versus low) on negative urgency and lack of premeditation scales were approximately 2-2.7 times and 2-3 times more likely to report problematic alcohol use and to experience alcohol-related harms, respectively (Table 6.3). These findings indicate a tendency among student pharmacists to use more alcohol in response to negative emotions or under conditions of distress without considering alcohol-related consequences. Previous studies of impulsivity-related behaviors and alcohol use in college students found similar results,[79] as students with lower negative urgency scores were less likely to engage in problematic alcohol use.[16,70] Further, this trait is more closely related to the experience of alcohol related harms.[80] In addition to negative urgency, sensation seeking and lack of premeditation were associated with the experience of alcohol related harms among student pharmacists. It is not surprising that students who showed high sensation seeking and lack of premeditation traits were at higher risk to experience alcohol-related harms; such personalities might lead to the consumption of large amounts of alcohol without considering negative outcomes.[81,82] Similar to general college

students, this study supports the role of different impulsivity traits in understanding problematic alcohol use and its consequences among student pharmacists.

Since impulsivity factors play an important role in predicting alcohol use outcomes, student pharmacists' decisions for engagement in problematic alcohol use might be curbed through providing more education on alcohol use and its related outcomes (e.g. negative consequences). Educational efforts should focus on alcohol-related consequences and positive strategies to cope with distress and negative emotions. Because students high in negative urgency and lack of premeditation may not consider alcohol-related consequences when feeling distressed or upset, it would be useful to provide strategies to enhance adequate recognition of potential negative outcomes. Higher level interventions that focus on environmental access and strict alcohol use screening and monitoring programs might attenuate the influence of personality factors on problematic alcohol use in schools of pharmacy. For example, periodical screening and alcohol use monitoring programs might help students with identified alcohol use problems or who are at high risk for problematic alcohol use (high AUDIT scores) to control and reduce alcohol consumption.

Limitations and Conclusions

Although the results of this study have potentially important implications, there are limitations that should be considered in future research. This large cross-sectional study was limited as it utilized a non-randomized voluntary sample of student pharmacists. Study results can be generalized to student populations of participating schools only. In addition, the research design precludes firm conclusions regarding any cause and effect relationships among studied variables. This study relied on students' self-reported data (e.g. alcohol use within the past-year), thus "recall bias" was possible. Even though data collection was completely anonymous,

potential participants might have chosen not to participate, complete all items, or include their data in this study to avoid any documented substance use issues that might affect their future career (e.g. licensing and practice regulations). Thus on one hand, this study was subject to "non-response bias." While on the other hand, these concerns might have resulted in underreported alcohol use behaviors and an underrepresentation of the actual alcohol use problems among participating student pharmacists "social desirability and report biases." Finally, this study did not control for factors such as: (i) sources of stress (e.g. academic, relationship, and financial) and (ii) coping strategies. These factors might help in explaining more variation in the link between alcohol use behaviors and psychological status among student pharmacists. Future research should include more rigorous mediation and moderation analyses that control for stress sources and coping in explaining the associations between alcohol use behaviors and psychological factors in professional student pharmacists.

Despite these limitations, this study provides important information about the extent of concurrent mental or psychological problems and problematic alcohol use behaviors among a large sample of student pharmacists. Future research should focus on mental and behavioral problems that might impact students' and future pharmacists' quality and productivity. The observed high rates of problematic alcohol use, depressive symptomatology, and perceived stress among student pharmacists highlight the need for further educational and preventive or treatment interventions that target mental, psychological, and behavioral health of students on pharmacy campuses.

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CHAPTER 7

ALCOHOL CONSUMPTION AND ACADEMIC PERFORMANCE AMONG STUDENT PHARMACISTS[‡‡]

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ABSTRACT

Objective: To assess the association between alcohol use behaviors and academic performance in a cross-section of student pharmacists. **Methods**: An anonymous web-based survey was administered to students enrolled at 6 pharmacy schools in the southeastern United States. The Alcohol Use Disorders Identification Test (AUDIT) was utilized to assess alcohol use behaviors, and students were asked to provide their Grade Point Average (GPA) as an indicator of academic performance. **Results**: A total of 1194 student pharmacists (59% response rate) agreed to participate in this study. The majority of participants (90.5%) reported consuming alcohol at least once in lifetime. Among participants who reported lifetime alcohol use, 20% indicated problematic alcohol use (AUDIT ≥8). Higher AUDIT scores were associated with lower GPA. **Conclusion**: Alcohol consumption is a potential factor that can impact student pharmacists' academic performance. More efforts (alcohol education, screening, and counseling) are recommended to control problematic alcohol use behaviors by which students' academic performance in pharmacy schools may improve.

Key Words: academic performance, alcohol consumption, student pharmacists, schools of pharmacy.

Introduction

In the U.S., alcohol use is a very prominent problem among college students.[1] Alcohol consumption has been linked to poor memory and impaired learning skills.[2] Significant associations between college drinking and distinct academic problems, such as missing classes, performing poorly on exams and projects, and spending less time studying have been

demonstrated.[3-7] Several studies show that alcohol use can also affect students' educational attainment and academic performance.[4,5,8-10] Grade Point Average (GPA) is a common measure of student's academic performance in college.[11] Maintaining a good GPA is critical for academic success and is a significant indicator of future career success.[12-14] Therefore, there is an increased concern on examining factors (e.g. alcohol use behaviors) that have the potential to impact students' academic performance represented by cumulative GPA. Research has demonstrated an inverse relationship between alcohol use and GPA, as alcohol consumption increased the students' academic performance (GPA) decreased.[10,15]

In general, professional or graduate level students are required to maintain a high GPA that represents their understanding of course materials and applying professional skills to facilitate their academic and professional advancement.[16] A cumulative GPA of 3.0 or more indicates a good standing in professional programs.[16] Despite the highly selective admission criteria and policies employed by pharmacy schools, significant variations in student pharmacists' success (e.g. cumulative GPA and performance in the North American Pharmacists Licensure Examination-NAPLEX) remain challenging.[17-19] Several studies have focused on determinants of student pharmacists' academic performance such as the Pharmacy College Admission Test (PCAT),[17] self-efficacy and personal study goals,[20] sleep patterns,[21] academic and test competence,[16] and achievement of previous degrees.[22] Although problematic alcohol use is evident among professional student pharmacists,[23-27] less research has been conducted to examine the association between alcohol use behaviors and academic performance in pharmacy schools.

Recent studies have highlighted the problem of hazardous or harmful alcohol use (alcohol use patterns that increase the risk for negative consequences or result in the experience of alcohol

related harms)[28] among student pharmacists.[26,27] Yet studies that have examined educational alcohol-related negative outcomes (e.g. attending classes under the influence, missing classes, and receiving poor grades or evaluations) are very limited.[24-26] While these studies evaluated the extent of alcohol use-related educational outcomes, only one study focused on the association between student pharmacists' alcohol use and academic performance (GPA).[26] In this study, English et al. reported an insignificant association between participants' AUDIT scores and GPA based on Chi-square analysis.[26] Since pharmacy schools face enormous pressure to achieving improved academic outcomes,[17-19] more research is needed to provide pharmacy educators and schools' stakeholders with evidence about student pharmacists' alcohol use behaviors and academic success.

The current study is exploratory of alcohol use behaviors and their association with academic performance in a cross-section of student pharmacists enrolled at multiple schools of pharmacy in the southeastern United States.

Methods

A group of professional student pharmacists at 6 pharmacy schools in the southeastern United States completed an anonymous, voluntary, self-administered online survey through Qualtrics software in 2013-2014. The Student Pharmacists Chemical Health Scale (SPCHS) was designed to assess substance use behaviors and risk factors in professional student pharmacists.[29] This scale includes several validated measures that assess alcohol use behaviors (Alcohol Use Disorders Identification Test (AUDIT) and other risk factors such as impulsivity traits. To ensure respondents anonymity, a username and password unique to the survey administration time block was given to each group of students. Additionally, the Qualtrics survey recorded each response with a randomly generated 15-digit code to exclude the possibility of linking sensitive data to

individual participants. Participants were advised that their responses would only be used in aggregate with other responses collected from multiple schools, and they were not asked to identify their specific college or school. Researchers assured students that participation was voluntary and that they could refuse to participate or even withdraw at any time without any consequences. Participants were not compelled to provide answers to every survey question, but were encouraged to be as truthful and complete as possible. At the end of the survey, participants had the option to exclude their responses from the study. A cover letter and link to the online survey (including the consent form) were emailed to 2027 students enrolled at multiple pharmacy schools. Students were allowed 30 minutes to complete the survey in their schools and were provided a debriefing form (with needed contact information to give their feedback or if they had any questions and/or concerns about the study) after submitting their responses. The survey link was active for two weeks. The Institutional Review Board (IRB) at the University of Georgia (UGA) approved this study.

Study Measures

(i) *Alcohol use behaviors*. The AUDIT scale was utilized to assess student pharmacists' alcohol use behaviors. This tool contains 10 self-reported items developed by the World Health Organization (WHO) for assessing alcohol use within the past-year.[28] The first section (3 items) in this scale assesses the quantity and frequency of consumed alcohol, the second section (3 items) screens for and evaluates symptoms of alcohol-dependence, and the last 4 items assess the experience of alcohol-related harms. In particular item 3 in the AUDIT scale assesses the behavior of binge drinking (consumption of 5 or more drinks in one occasion), where individuals can report the frequency of binge drinking on daily, weekly, and monthly basis.[28] Each item in the AUDIT scale has a score of 0-4, with

AUDIT composite scores of 0-40. Higher scores indicate higher levels of problematic alcohol use within the past-year.[28] According to the AUDIT guidelines, alcohol use risk level can range from level I–IV. AUDIT scores ranging between 0-7 represent risk level I, 8-15 risk level II, 16-19 risk level III, and 20-40 risk level IV.[28] A cut-off point of 8 or more was identified as an indicator of problematic alcohol use behavior. [28,30] Student pharmacists were categorized based on their reported alcohol use risk level I–IV. Further, total AUDIT score was dichotomized according to the cut-off point as social drinking (AUDIT $\leq$ 7) and problematic alcohol use (AUDIT $\geq$ 8).[28] Internal consistencies (coefficient alphas) of alcohol use related measures are presented in Table 7.1.

(ii) *Alcohol use-related risk factors.* Risk factors associated with student pharmacists' alcohol use were identified.[31] These factors include age of first alcohol use, family history of problematic substance use, other drug use, and mental or psychological problems. Participants were asked to report their age of first substance use (alcohol and other drugs), and if students have never used alcohol and/or other drugs they were asked to type "*Not Applicable.*" Participants with any reported age of first alcohol use were defined as lifetime alcohol users vs. participants who never used alcohol. In addition, participants were asked to report their first age of other drug use. Responses were coded as 0 (absence of lifetime drug use) if participants reported "*Not Applicable"* or 1 (presence of lifetime drug use) if any age of first drug use was reported. Further, participants were asked to indicate any known substance use problems among their family members (grandparents, parents, siblings, spouse, or kids). Responses were coded as 0 if no family member had problems and/or if participants chose "*do not know*", or 1 if at least one family member had problems with substance use. In addition, participants were asked to indicate the

presence of any diagnosed mental or psychiatric problems, and responses were coded as 0 if no mental or psychiatric problem was reported or 1 if any problem was indicated.

(iii) *Impulsivity traits.* Participants were asked to complete measures impulsivity traits (e.g. lack of perseverance). The UPPS-P impulsive behavioral scale was included within the survey. It contains 59 self-reported items: 12 items measure negative urgency, 14 items for positive urgency, 12 items for sensation seeking, 11 items for lack of premeditation, and 10 items for lack of perseverance.[32,33] This study focused on the measure of lack of perseverance, which denotes failure to complete a task due to boredom or fatigue.[34] Internal consistency (coefficient alpha) of lack of perseverance is presented in Table 7.1.

(iv) Demographic factors. Participants were asked to provide their exact age, GPA and year in pharmacy school (e.g. first, second, third, and fourth). Participants also were asked to choose the best choice that reflects their gender (male vs. female), ethnic group (White, African American, Asian or Pacific Islander, Hispanic, and other), and relationship status (single never married, single separated: "*single divorced"* or "*single widowed"*, married, and committed in a non-marital residential relationship).

Data Analysis

Responses were downloaded from the Qualtrics software into Microsoft Excel, where data was checked and imported into SAS (version 9.4, Cary, North Carolina). Descriptive statistical analyses were conducted to describe participant characteristics, alcohol use behaviors, and academic performance. Spearman correlation coefficient was generated to test for significant associations between AUDIT scores and reported GPA. Frequency tables and Chi-square analyses were used to evaluate unadjusted relationships between participants' characteristics (e.g. alcohol use behaviors, alcohol use related risk factors, and demographic factors) and

academic performance (GPA categories). Differences between AUDIT scores and cumulative GPA across program years (P1, P2, P3, and P4) were assessed using the Kruskal Wallis test. AUDIT scores and GPA data violated normal distribution assumption for parametric tests (e.g. ANOVA), Shapiro Wilk test $p<0.0001$. Thus, a non-parametric test was performed. Finally, multiple logistic regression analysis was conducted to identify significant factors associated with the students' academic standing (GPA<3 vs. GPA≥ 3) while controlling for several covariates. A priori alpha value of 0.05 was used.

Results

The survey was sent to 2027 students enrolled at 6 pharmacy schools in the southeastern United States. A total of 1194 student pharmacists completed the web-based survey (59% response rate). Participants reported an average age of 24.8 years (±4.3) within the range of (18-53) years (Table 7.1). With respect to academic performance, while 1146 participants reported their cumulative GPA, 42 participants preferred not provide it and 6 participants missed this item. Among those who completed the GPA item, an average score of 3.44 (±0.39) was documented (Table 7.1). On a scale of 0-4, approximately 90% of participants had a GPA≥ 3. Regarding alcohol use, a mean AUDIT score of 4.2 (±3.9) was found with scores ranging between 0 and 24. Participants who reported lifetime alcohol use started to use alcohol at a mean age of 17 years (±2.7) with a range of (5-27) years (Table 7.1). Most participants were female (67.2%), White (74.3%), single (73.7%), and used alcohol with low risk AUDIT level (82.1%). Demographic characteristics and academic performance across sample characteristics are summarized in Table 7.2.

Of the 1194 participants, 1081 (90.5%) reported consuming alcohol at least once during their lifetime, while only 113 (9.5%) reported that they have never used alcohol (Table 7.3).

Among participants who reported lifetime alcohol use, 20% (214/1081) reported high total AUDIT scores (≥8), which indicate problematic alcohol use. Within the past-year, 464 (43%) and 203 (19%) of lifetime alcohol users reported the experience of alcohol-related harms and alcohol dependence symptoms, respectively (Table 7.3). Regarding binge drinking (consumption of 5 or more drinks on one occasion within the past year), 6.11% of alcohol users reported binge drinking on a weekly basis, and 13.88% reported binge drinking on a monthly basis. With respect to participants in different program years, on the one hand AUDIT scores were significantly different across program years (using Kruskal Wallis, H = 20.35, 3 d.f., p =0.0001). The multiple comparison post hoc tests for the Kruskal-Wallis analysis showed evidence of a significant difference in AUDIT scores between third year and first year students (P<0.05). First year students reported an average AUDIT score (±SD) of 3.7 (±3.9) with a median of 3.0 and IQR of 4.0 (Q1= 2.0, Q3= 6.0), while third year students reported a mean AUDIT score (±SD) of 4.7 (±3.9) with a median of 4.0 and IQR of 5.0 (Q1= 2.0 and Q3= 7.0). On the other hand, GPA data was significantly different across program years (using Kruskal Wallis, H = 24.23, 3 d.f., p <0.0001). Kruskal-Wallis post hoc analysis indicated a significant difference in GPA data between the third and first year participants (P<0.05). First year students reported a mean GPA (±SD) of 3.5 (±.37) with a median of 3.5 and IQR of 0.5 (Q1= 3.3, Q3= 3.8), while third year students reported mean GPA (±SD) of 3.37 (±0.4) with a median of 3.40 and IQR of 0.7 (Q1= 3.0 and Q3= 3.7). In addition, male participants reported higher AUDIT scores (5.3 (±4.5)) and lower GPA (3.39 (±0.37)) compared to females with mean AUDIT scores of (3.7 (±3.5)) and average GPA of (3.46 (±0.39)). The differences in AUDIT scores and GPA between males and females were significant at P< 0.01.

A significant but weak negative correlation between AUDIT scores and cumulative GPA (Spearman correlation coefficient= -0.062, p =0.036) was found. Chi-square analyses revealed a significant association between alcohol use behaviors (non-drinking, social drinking, and hazardous or harmful drinking) and categories of GPA (<2.5, 2.5-3.0, and >3.0), χ^2= 20.12, p= 0.0099. In addition, reported GPA categories were associated with the presence or absence of mental or psychiatric conditions (χ^2= 5.47, p= 0.019), lifetime drug use (yes/no) (χ^2= 10.10, p= 0.038), and program year (P1, P2, P3, & P4) (χ^2= 26.85, p< 0.001).

The overall logistic regression model (predicting good academic performance (GPA≥3) vs. (GPA<3) poor academic performance) was significant at p<0.0001 according to the Likelihood ratio statistic (χ^2= 58.0). The Hosmer and Lemeshow goodness-of-fit test showed that the fitted model was adequate (χ^2= 10.7, p=0.22). Multiple logistic regression analysis showed that after adjusting for several covariates, past-year alcohol use behaviors were not statistically significant predictors of participants' academic performance (GPA< 3 vs. GPA ≥ 3). However, age of first alcohol use was significantly associated with academic performance (Wald Chi-Square=6.1, P=0.014). Participants who reported later age of first alcohol use (≥21) were more likely to report higher GPA (≥3) as compared to those with earlier onset of alcohol use (Table 7.4). Other factors such as age (Wald Chi-Square=3.9, P=0.04), year in program (Wald Chi-Square=18.5, P=0.003), reported mental or psychiatric problems (Wald Chi-Square=4.1, P=0.05), and lack of perseverance (Wald Chi-Square=4.5, P=0.03) were associated with academic performance (GPA).

Table 7.1. Spearman correlations, means, standard deviations, and internal consistencies for included measures.

	1	2	3	4	5	6	7	8	n	Mean	SD	α
1. AUDIT $_{total}$	1								1194	4.2	3.9	.81
2. AUDIT $_{harms}$	.78**	1							1194	1.1	1.7	.71
3. AUDIT $_{dependence}$	.56**	.52**	1						1194	.27	.71	.64
4. Age of first alcohol use	-.36**	-.29**	-.22**	1					1081	17.4	2.7	-
5. Binge drinking	.85**	.57**	.43**	-.33**	1				1194	.75	.88	-
6. GPA	-.062*	-.05	-.05	-.02	-.06*	1			1146	3.44	.39	-
7. Age	-.03	-.01	-.02	-.09*	-.02	-.22**	1		1194	24.8	4.2	-
8. Lack of perseverance	.10*	.14*	.10*	-.01	.08*	-.20**	.07*	1	1160	1.75	.42	.80

Note. AUDIT: Alcohol Use Disorders Identification Test; SD: Standard Deviation; α: internal consistency measure (Cronbach's Alpha).

* P< .05.

** P< .01.

Discussion

The present study assessed alcohol use behaviors among student pharmacists. A significant proportion of student pharmacists (18%) in this study reported problematic alcohol use. The majority of participants who indicated a lifetime alcohol use (84.5%) reported an early onset of alcohol use (< 21 years old). Binge drinking (consumption of 5 or more drinks in 1 occasion within the past-year) was reported (on monthly and weekly basis) by 51.3% of participants. Similar to previous studies,[23,25-27] these findings indicate that alcohol use behavior among student pharmacists is concerning. Thus, preventive and treatment interventions in pharmacy schools and colleges are needed.

Alcohol consumption is linked to poor memory and impaired learning skills.[2] This study examined the association between alcohol consumption and student pharmacists' academic performance (GPA). Such knowledge could be used in motivating student pharmacists and pharmacy schools to take actions that help to control or reduce alcohol use in this population. Although results from this study present a preliminary data in that direction, further research is necessary to provide strong evidence regarding the association between alcohol consumption and academic performance in pharmacy schools. Similar to studies conducted with general college students,[10,15] a statistically significant but weak negative relationship between alcohol use (AUDIT) and GPA was evident. As shown in Table 7.3, more alcohol use was associated with quantitatively small reductions in GPA. Limitations in this study including the reliance on self-reported data (potential to report bias) might account for these small or insignificant results.[35] Further, unobserved heterogeneity in the determinants of alcohol use behaviors and academic performance might have contributed to study results.[36] It is also possible that alcohol use might not directly affect the overall academic performance (cumulative GPA), research has

demonstrated indirect associations through other factors (e.g. sleep duration, time spent studying, and other social and/or emotional problems).[10,37]

Several factors might play significant roles in predicting students' academic performance, thus alcohol use behaviors might lose its significance when controlling for such factors.[36] Similar results were found in this study, as controlling for other covariates (e.g. age and year in program) within the logistic regression analysis resulted in attenuated associations between alcohol use behaviors and academic performance. However, Chi square and correlational analyses revealed significant associations. Noteworthy, age of first alcohol use was a significant predictor of academic performance. Previous studies indicated supportive findings, as an early onset of alcohol use was associated with immediate alcohol related problems (e.g. blackout, hangover, and poisoning) and increased individual's vulnerability for neurodegeneration, impaired functional brain activity, and defective neurocognition.[2] As a result, the learning and memory functions of the brain might be affected and thus academic performance in college would be negatively impacted.

Table 7.2. Demographic characteristics and academic performance among study participants (N=1194)

Variable	n	%	GPA mean (±SD)
Gender			
Male	390	32.6%	3.39 (0.37)
Female	802	67.2%	3.46 (0.39)
Frequency missing	2	0.2%	
Age groups			
Younger than 21	55	4.6%	3.65 (0.24)
21-24	688	57.6%	3.47 (0.39)
25-28	299	25.1%	3.39 (0.36)
Older than 28	152	12.7%	3.32 (0.40)
Ethnicity			
White	887	74.3%	3.44 (0.39)
African American	69	5.8%	3.39 (0.32)
Asian or Pacific Islander	160	13.4%	3.45 (0.39)
Hispanic	25	2.1%	3.36 (0.37)
Other	48	4.0%	3.45 (0.40)
Frequency missing	5	0.4%	
Year in program			
1st year	440	36.9%	3.50 (0.37)
2nd year	322	27%	3.42 (0.40)
3rd year	329	27.5%	3.37 (0.40)
4th year	103	8.6%	3.40 (0.30)
Relationship status			
Single, never married	880	73.7%	3.46 (0.38)
Currently married	204	17.1%	3.38 (0.40)
Divorced or separated	28	2.3%	3.23 (0.40)
Non-marital committed residential	81	6.8%	3.41 (0.34)
relationship	1	0.1%	
Frequency missing			
Program			
Public	630	52.7%	3.45 (0.40)
Private	546	47.3%	3.42 (0.37)
Mental or psychiatric illness			
Yes	141	11.8%	3.19 (0.45)
No	1051	88%	3.45 (0.37)
Frequency missing	2	0.2%	
Family history of SUD			
Yes	514	43%	3.42 (0.37)
No	679	56.9%	3.44 (0.39)
Frequency missing	1	0.1%	
Lifetime drug use			
Yes	475	39.8%	3.39 (0.38)
No	713	59.7%	3.46 (0.39)
Frequency missing	6	0.5%	

Note. GPA: Grade Point Average; SD: Standard Deviation; SUD: Substance Use Disorder.

Table 7.3. Alcohol use behaviors and academic performance among study participants

Variable	n	%	GPA mean (±SD)
Alcohol-use behavior			
Non-drinkers	113	9.5%	3.48 (0.40)
Social drinking (AUDIT ≤7)	867	72.6%	3.44 (0.39)
Hazardous or harmful drinking (AUDIT ≥8)	214	17.9%	3.40 (0.36)
Alcohol-use risk level (AUDIT)			
Level I (0-7)	980	82.08%	3.44 (0.39)
Level II (8-15)	192	16.08%	3.42 (0.36)
Level III (16-19)	19	1.59%	3.40 (0.38)
Level IV (≥20)	3	0.25%	3.26 (0.50)
Experience of alcohol-related harms			
Yes	465	39%	3.40 (0.38)
No	729	61%	3.45 (0.38)
Reported alcohol dependence symptoms			
Yes	203	17%	3.40 (0.36)
No	991	83%	3.44 (0.39)
Binge drinking			
Yes	613	51.3%	3.40 (0.37)
No	581	48.7%	3.45 (0.39)
Age of first alcohol-use (n=1081)			
<21 years	896	82.9%	3.42 (0.41)
≥21 years	185	17.1%	3.45 (0.38)

Note. GPA: Grade Point Average; SD: Standard Deviation; AUDIT: Alcohol Use Disorders Identification Test.

Certainly this research has provided some insights into the potential association between alcohol consumption and academic performance among student pharmacists and is indeed important given that student pharmacists experience academic difficulties and several challenges in pharmacy programs. Schools of pharmacy should provide more education on alcohol use and its related outcomes among professional student pharmacists. Problematic alcohol use does not necessarily represent a clinically diagnosable Alcohol Use Disorder (AUD); however, increasing the awareness about the link between alcohol use behaviors and academic performance among student pharmacists might help in controlling problematic alcohol use in pharmacy schools. Furthermore, early screening for alcohol use behaviors might help in identifying student pharmacists at risk for problematic alcohol use in order to provide them with preventive and treatment interventions. Ultimately, controlling alcohol use in pharmacy schools may directly or indirectly improve the student pharmacists' academic performance.

Table 7.4. Summary of logistic regression analysis predicting academic performance (GPA≥ 3 OR GPA<3) among participating student pharmacists (N=1146)

Predictor variable	β	SE	OR	95% CI	P-value
Age	-0.05	0.03	0.91	0.90-0.99	0.04
Age of first alcohol use	0.58	0.28	1.85	1.03-3.10	0.01
AUDIT score	-0.03	0.03	0.97	0.91-1.03	0.15
Class year (ref: first)					
Third	-1.1	0.29	0.34	0.19-0.59	0.002
Psychiatric or mental disorders (ref: no)					
Yes	-0.42	0.29	0.65	0.38-0.99	0.05
Lack of perseverance	-0.57	0.25	0.56	0.34-0.92	0.02

Note. GPA: Grade Point Average; OR: adjusted odds ratio; CI: confidence interval; SE: Standard Error; AUDIT: Alcohol Use Disorder Identification Test.

This study has limitations that can be addressed in future research. First, self-reported GPA data might be subject for "response and report biases." Future studies should use official school records to avoid bias related to measures of academic achievement. Second, although the study was conducted at multiple pharmacy schools and included a large sample of student pharmacists, the generalizability of the study results is questionable as it utilized a non-randomized sampling strategy. Future research should obtain a randomized national representative sample of student pharmacists. Third, this study lacks heterogeneity in variables that might impact the link between alcohol use and academic performance. Future studies should account for different factors that might be associated with student pharmacists' academic performance in addition to factors associated with alcohol use behaviors (e.g. sleep duration and peers or social support).

Conclusion

Results of this study highlight the need for evaluating health-related behaviors such as alcohol use when examining academic performance in student pharmacists. Specifically, age of first alcohol use was important factor associated with academic performance in pharmacy schools. Focusing efforts to investigate factors that might moderate the relationship between alcohol use and academic performance would be helpful in understanding the link between alcohol use behaviors and academic outcomes. Providing more educational, preventive and treatment interventions toward alcohol use might assist student pharmacists in achieving academic success.

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CHAPTER 8

CONCLUSIONS

Substance use is an issue of concern in pharmacy schools and colleges. Previous studies suggest that student pharmacists engage in problematic substance use and may be at risk of developing substance use disorders. Particularly, the available literature is dominated by old reports (before 2000) indicating problematic alcohol use behaviors in student pharmacists. Research investigating current behaviors of alcohol use and examining risk factors associated with problematic alcohol use will be particularly useful to design and/or develop preventive and treatment interventions that address problematic alcohol use within schools and colleges of pharmacy.

The majority of student pharmacists (90%) in this research are lifetime alcohol users, in which approximately 1 out of 5 students is engaged in problematic alcohol use behaviors, and 42.9% have experienced alcohol-related outcomes. These results suggest a high rate of undiagnosed drinking problems among this population. Efforts are needed to identify student pharmacists (routine screening) who have problems with alcohol use and help them reduce or cease drinking.

As expected, alcohol use behaviors and outcomes are associated with several factors such as demographic factors (e.g. age, gender, ethnicity, relationship status, and class year), risk factors (e.g. age of first alcohol use, family history of problematic substance use, other drug use, and concurrent mental or psychiatric conditions), and personality/impulsivity factors (e.g. negative urgency and lack of premeditation). However problematic alcohol use and related

outcomes are associated with levels of anxiety and depression among student pharmacists, analysis suggests that impulsivity factors and other background factors are the most significant predictors of these behaviors and outcomes. On one hand, these findings suggest that some non-modifiable factors (e.g. gender, class year, ethnicity, age of first use, family history) indeed account for the variability in alcohol use behaviors and outcomes among student pharmacists. Thus, identifying these factors could help pharmacy school administrators and stakeholders screen for alcohol use issues among student pharmacists and aid student pharmacists in need of substance use services. On the other hand, since impulsivity factors play an important role in predicting alcohol use behaviors and outcomes, providing more education on alcohol use and its related outcomes might help students avoid alcohol when feeling distressed or upset. In addition, educational efforts should focus on positive strategies to cope with distress and negative emotions rather than deleterious health behaviors (e.g. alcohol drinking). Furthermore, higher level interventions that focus on environmental access and strict alcohol use screening and monitoring programs might attenuate the influence of personality factors on problematic alcohol use within schools of pharmacy.

Alcohol consumption is a potential factor that can impact student pharmacists' academic performance. Future research in pharmacy profession should focus on mental and behavioral problems that might impact their students' and future pharmacists' quality and productivity. The observed high rates of problematic alcohol use, depressive symptomatology, and perceived stress among student pharmacists in this research highlight the need for further educational and preventive or treatment interventions that target mental, psychological, and behavioral health of students on pharmacy campuses.

APPENDIX A

INSTITUTIONAL REVIEW BOARD LETTER

Phone 706-542-3199

The University of Georgia

Office of the Vice President for Research
Institutional Review Board

Fax 706-542-3660

APPROVAL OF PROTOCOL

July 10, 2014

Dear Merrill Norton:

On 7/10/2014, the IRB reviewed the following submission:

Type of Review:	Modification and Continuing Review
Title of Study:	Student Pharmacist Chemical Health Scale (SPCHS) Research Study II-2013-2014
Investigator:	Merrill Norton
IRB ID:	MODCR00000266
Funding:	None
Grant ID:	None

The IRB approved the protocol from 7/10/2014 to 7/9/2015 inclusive. Before 7/9/2015 or within 30 days of study closure, whichever is earlier, you are to submit a continuing review with required explanations. You can submit a continuing review by navigating to the active study and clicking Create Modification / CR.

If continuing review approval is not granted before the expiration date of 7/9/2015, approval of this study expires on that date.

In conducting this study, you are required to follow the requirements listed in the Investigator Manual (HRP-103).

Sincerely,

Larry Nackerud, Ph.D.
University of Georgia
Institutional Review Board Chairperson

629 Boyd Graduate Studies Research Center • Athens, Georgia 30602-7411
An Equal Opportunity/Affirmative Action Institution

APPENDIX B

THE STUDENT PHARMACIST CHEMICAL HEALTH SCALE: RESEARCH SURVEY SCRIPT

Dr. Merrill Norton Principal Investigator
222C Pharmacy South
University of Georgia
College of Pharmacy
Email: mnorton@rx.uga.edu
Office Phone: 706-542-5371

(This script must be read to any students prior to the administration of the survey)

This survey, The Student Pharmacists Chemical Health Scale, is a research study asking student pharmacists at several colleges and universities about attitudes and experiences with social and recreational drug use, including alcohol. It also covers a variety of other topics including personal demographics, medical history, family medical history, daily activities, health and well-being issues, perceptions of pharmacy practice, stress, and perceptions of personal substance use. This is an anonymous survey--you will NOT be asked to submit your name nor your specific college or university. The goal is simply to get a general profile of student pharmacists and their experience with substance use during their collegiate years. This information will be used to identify potential addiction predictability risk factors in student pharmacists in order to create an assessment instrument for determining addiction risk factors in future pharmacists. Any pharmacy student currently enrolled in an accredited school or college of pharmacy may volunteer to participate in the survey.

I understand that my participation is voluntary. I can refuse to participate or stop taking part without giving any reason, and without penalty. I can ask to have all of the information about me returned to me, removed from the research records, or destroyed. By completing the survey I am agreeing to participate in the research. Confidentiality is paramount in this research, but there is a limit to the confidentiality that can be guaranteed due to the technology itself. While this survey will be administered on a secure UGA website and computers, the investigators cannot ensure confidentiality during the actual internet communication procedures. The Qualtrics Survey Software used to administer this survey uses a RSA (2048 bits) public encryption key and the security certificate is valid from 09/11/2011 to 10/16/2014.The software also utilizes a secure server (SSL-2) which creates a secure connection between the user and the server while the survey is being accessed and submitted.

The reason for this study is to identify potential addiction predictability risk factors in student-pharmacists to create an assessment instrument in pharmacy for determining addiction risk factors in future pharmacists. These risk factors are:
1.) Age of First use;
2.) Family History of Addiction/Mental Illness;
3.) Current Alcohol Use;
4.) High Stress/Trauma History;
5.) Impulsivity;
6.) Negative Proscriptions;
7.)Protective Factors;
8.) Genetic Use Patterns.
9.) Stress Factors

The intent of gathering this information is in effort to develop a model for an effective Alcohol and Drug Education and Intervention Program that may be replicated nationally.

If I volunteer to take part in this study, I will be asked to do the following things:

1. Answer questions about my health, alcohol, and other drug use, medical history, family medical history, demographics, daily activities, perceptions on pharmacy practice, and perceptions of my own substance use;
2. My information will be kept and I maybe asked to participate in future surveys for the next 5 years for a follow up.

The benefits for me are my personal evaluation of my health and substance use, and the alcohol and drug education may help me understand and improve my health. The investigator also hopes to learn more about the addiction predictability risk factors of student pharmacists and how to identify them.

There are minimal risks associated with this study. However, if you found any part of this survey to be upsetting or emotionally stressful, there are services you may contact:

Dr. Merrill Norton(706-542-5371)
University Health Center Counseling and Psychiatric Service (CAPS) (706)-542-2273
Dr. Alan Wolfgang Ph.D. (706-542-7287)
Dr. Michael Fulford Ph.D. (706-542-5316)
Feedback and Information:
If you have feedback about this study or you would like more information, please contact Dr.

Merrill Norton at mnorton@rx.uga.edu or call (706)542-5371.

APPENDIX C

THE STUDENT PHARMACIST CHEMICAL HEALTH SCALE CONSENT FORM

I agree to participate in a research study titled "The Student Pharmacist Chemical Health Scale II "2013-2014" conducted by Principal Investigator Dr. Merrill Norton Pharm.D, D.Ph, ICCDP-D from the College of Pharmacy at The University of Georgia (706-542-5371). I understand that my participation is voluntary. I can refuse to participate or stop taking part without giving any reason, and without penalty or loss of benefits to which I am otherwise entitled. My grades and class standing will not be affected by my decision about participation. By completing the survey I am agreeing to participate in the research.

Confidentiality is paramount in this research, but there is a limit to the confidentiality that can be guaranteed due to the technology itself. While this survey will be administered on a secure UGA website and computers, the investigators cannot ensure confidentiality during the actual internet communication procedures. Internet communications can be insecure and there is a limit to the confidentiality that can be guaranteed due to the technology itself. The Qualtrics Survey Software used to administer this survey uses a RSA (2048 bits) public encryption key and the security certificate is valid from 09/11/2011 to 10/16/2016.The software also utilizes a secure server (SSL-2) which creates a secure connection between the user and the server while the survey is being accessed and submitted.

The reason for this study is to identify potential addiction predictability risk factors in student-pharmacists to create an assessment instrument in pharmacy for determining addiction risk factors in future pharmacists. These risk factors are:

1.) Age of First use;
2.) Family History of Addiction/Mental Illness;
3.) Current Alcohol Use;
4.) Trauma History;
5.) Impulsivity;
6.) Negative Proscriptions;
7.) Protective Factors;
8.) Genetic Use Patterns;
9.) Stress factors.

The intent of gathering this information is in effort to develop a model for an effective Alcohol and Drug Education and Intervention Program that may be replicated nationally.

If I volunteer to take part in this study, I will be asked to do the following things:
Spend about 30 minutes answering questions about my health, alcohol, and other drug use, medical history, family medical history, demographics, daily activities, current stress factors, perceptions on pharmacy practice, and perceptions of my own substance use. The benefits for me are my personal evaluation of my health and substance use, and the alcohol and drug education may help me understand and improve my health. The investigator also hopes to learn more about the addiction predictability risk factors of student pharmacists and how to identify them.

There are minimal risks associated with this study. There is a risk of discomfort to students who indicate on the survey sensitive (trauma, family history) and illegal activities (underage drinking or illegal drug use). In addition, there is the risk of harm due to breach of confidentiality. In order to minimize the risk of harm associated with sensitive questions, the survey instrument is formatted in a way that will allow you to skip questions that you do not wish to answer. To minimize the risk of harm due to a breach of confidentiality, the data will be collected anonymously. No identifying information, including IP addresses, will be collected, which will make it impossible to link any identifying information with a certain individual. The investigator will answer any further questions about the research, now or during the course of this project.

I understand that I am giving my consent to be a part of the study by clicking on the "YES" option.

I understand that I can contact Dr. Merrill Norton at mnorton@rx.uga.edu if I wish to obtain a copy of this consent form for my records. I also understand that I can contact the UGA IRB office with any complaints or other issues concerning this research. The IRB office can be contacted via phone at 706-542-3199, email at irb@uga.edu, or at their physical address at UGA 629 Boyd G.S.R.C, Athens,GA,30602

APPENDIX D

STUDENT PHARMACISTS CHEMICAL HEALTH SCALE RESEARCH STUDY

DEBRIEFING FORM

Dr. Merrill Norton Principal Investigator
This form must be given to student on completion of the SPCHS Research study.
Thank you for your participation in this survey!
Purpose of this study:
The reason for this research study is to identify potential addiction predictability risk factors in student-pharmacists to create an assessment instrument in pharmacy for determining addiction risk factors in future pharmacists. These risk factors are:

1.) Age of First use
2.) Family History of Addiction/Mental Illness
3.) Current Alcohol Use
4.) Trauma History
5.) Impulsivity
6.) Negative Proscriptions
7.) Protective Factors
8.) Genetic Use Patterns
9.) Stress Factors

The intent of gathering this information is in effort to develop a model for an effective Alcohol and Drug Education and Intervention Program that may be replicated nationally.

Your participation in this research study is valuable because it will allow us to understand which risk factors play an important role in the addiction process. The results of this study will enable us to gain a better understanding of addiction and by doing so help prevent addiction in future generations. There are minimal risks associated with this study. However, if you found any part of this survey to be upsetting or emotionally stressful, there are services you may contact:
Dr. Merrill Norton at (706)-542-5371, University Health Center Counseling and Psychiatric Service at (706)-542-2273, Dr. Alan Wolfgang at (706)-542-7287, or Dr. Michael Fulford at (706)-542-5316.
Feedback and Information:
If you have feedback about this study or you would like more information, please contact Dr.

Merrill Norton at: mnorton@rx.uga.edu or call (706)542-5371.