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Gender differences in substance use and psychiatric distress among medical students: A comprehensive statewide evaluation

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ABSTRACT

Background: Medical student wellness has emerged as an important issue in medical education. The purpose of the present study was to obtain a comprehensive assessment of substance use, psychological distress, and help-seeking among male and female medical students in order to identify targets for continued intervention efforts. **Methods:** Medical students from all 9 medical schools in the state of Florida were invited via e-mail and/or announcements to complete an anonymous online questionnaire assessing their well-being. Of 5053 matriculating medical students, 1137 (57.1% female) responded to the questionnaire. Descriptive statistics, *t* tests, and chi-square analyses were computed using SPSS 20. **Results:** Over 70% of students acknowledged binge drinking, with men reporting higher frequency than women ($\chi^2 = 13.90, P = .003$), and 22.7% ($n = 201$) reported marijuana use during medical school, with higher rates ($\chi^2 = 9.50, P = .02$) among men (27.0%, $n = 99$) than women (18.9%, $n = 93$). A significant minority of students reported nonmedical use of prescription stimulants and prescription opioids. In addition, 3.3% of male students ($n = 12$) compared with 0.6% of female students ($n = 3$) reported problematic drug use. Further, almost 2/3 of respondents reported decreased psychological health since beginning medical school, with women noting greater reductions ($\chi^2 = 12.39, P = .05$) and higher levels of stress ($\chi^2 = 16.30, P = .003$). Over 10% of students ($n = 102$) endorsed “thoughts of committing suicide” during medical school, and 70.1% felt they would benefit from mental healthcare (79.3% of women vs. 59.6% of men; $\chi^2 = 41.94, P < .001$), although only 39.8% accessed help. **Conclusions:** Despite efforts to address medical student wellness, students continue to report concerning levels of psychological distress, suicidal ideation, and substance use. More work is needed to effectively address medical student mental health and well-being.

KEYWORDS

Gender differences; medical education; medical student wellness; physician impairment; substance use disorders

Introduction

Medical school is recognized as an arduous undertaking,^{1–3} with high levels of associated stress.⁴ Medical students around the world report high rates of anxiety and depression,^{5–7} burn-out,⁸ and general psychiatric distress.⁹ As a result, there has been increased attention to the issue of medical student wellness, and medical educators have been called to search for remedies to the persistent problem of medical student distress.¹⁰ Male and female medical trainees appear to experience different stressors and utilize different coping strategies during medical school;¹¹ however, little is known about gender differences in awareness of available mental health resources or likelihood of seeking help among medical students who are struggling.

Updated data are also needed to understand current rates of substance use among medical students. Recent studies have demonstrated that alcohol use disorders are relatively common among medical students in the United States¹² and France,¹³ with almost a third of students screening positive on the Alcohol Use Disorders Identification Test, and anecdotal evidence

suggests that rates of hazardous drinking may be even higher. Similarly, misuse of prescription stimulants by medical students has emerged as an area of concern,¹⁴ but it has received relatively little empirical attention. Finally, data regarding medical student use of other substances are generally lacking or outdated, particularly for American medical students. For example, studies in France¹³ (using the Cannabis Abuse Screening Test) and Australia¹⁵ (using the Cannabis Use Disorders Identification Test) both report significant use of marijuana by medical students. Nevertheless, despite recent expansion of legal access to “medical marijuana” and “recreational marijuana” in the United States, no recent data are available describing the prevalence of use by American medical students. Similarly, despite the fact that tobacco remains the leading cause of preventable death in the United States,¹⁶ current estimates of the prevalence of medical student tobacco use, including use of waterpipes (hookah) and e-cigarettes, are unavailable.

The purpose of the present study was to address these gaps in the current literature base by obtaining a multi-institutional

assessment of substance use, psychological distress, and help-seeking among male and female medical students in one state.

Methods

Participants

The participants were 1137 medical students (57.1% female), who were recruited from the 9 medical schools (7 allopathic, 2 osteopathic) across one state. Medical students from both public and private institutions were invited to participate in order to obtain a representative picture of the general population of medical students. In order to protect student anonymity, and at the request of the medical school deans, no identifying information was collected for the students or their medical schools. General sample demographics are listed in Table 1.

Procedure

The University of Florida Institutional Review Board approved all study procedures. Institutional review boards from the remaining 8 participating schools also reviewed and approved or exempted the protocol. During the 2014 spring semester, student leaders at each participating institution informed their peers about the opportunity to participate in an anonymous study of medical student wellness via in-meeting or in-class announcements, e-mail, and/or flyers. Students were provided the link to the study questionnaire, hosted on surveymonkey.com, and asked to complete the questionnaire at their convenience. Students had 5 weeks to complete the questionnaire.

In order to ensure anonymity, the requirement for written informed consent was waived. Instead, students read information about the study on the first page of the online questionnaire, which explained that no identifying information would be collected (including name, school name, e-mail address, personal health information [PHI] in any form, IP address, etc.),

Table 1. Self-reported participant demographics ($N = 862 \pm 2$).^{*}

| Characteristic | <i>n</i> (%) |
|------------------------------------|--------------|
| Gender | |
| • Male | 369 (42.9%) |
| • Female | 491 (57.1%) |
| Year in medical school | |
| • First year | 294 (34.0%) |
| • Second year | 254 (29.4%) |
| • Third year | 166 (19.2%) |
| • Fourth year | 146 (16.9%) |
| • Fifth year or higher | 4 (0.5%) |
| Living situation** | |
| • Alone | 212 (24.6%) |
| • With spouse or significant other | 254 (29.4%) |
| • With child(ren) | 40 (4.6%) |
| • With parents | 59 (6.8%) |
| • With sibling(s) | 39 (4.5%) |
| • With friend(s) | 202 (23.4%) |
| • With other relative(s) | 10 (1.2%) |
| • With roommate(s) NOS | 176 (20.4%) |

Note. ^{*} Isolated cases of missing data resulted in the number of respondents for each demographic question ranging from 860 to 864 students.

^{**}Participants could select multiple categories, resulting in > 100% total.

then clicked an item indicating that they understood what they read and wished to participate. Participants had the option to skip items or discontinue the questionnaire at any point. There were no incentives for participation.

Measure

The research questionnaire was created specifically for this study. A panel of 5 researchers with expertise in psychiatric epidemiology research and/or clinical research involving patients with substance use disorders provided suggestions for the initial pool of items. Content validity was established via consensus of the expert panel. Face validity was established in consultation with the medical school deans, administrators of the state physician health program, and medical students from 10 different schools (9 in Florida and 1 in Connecticut). These individuals provided feedback on early drafts of the questionnaire, including overall length, content, and clarification of specific items in order to improve reliability of the study questionnaire. No formal reliability analysis was conducted. The final questionnaire consisted of 98 items and took approximately 15–30 minutes to complete, depending on branching logic (e.g., students who denied any history of cigarette use were not administered additional items addressing cigarette use). The questionnaire included both fixed-choice and open-response questions. Items addressed overall well-being, coping strategies, substance use, psychiatric symptoms, and suggestions for improving the medical school experience.

Data analysis

This descriptive research study employed a cross-sectional survey design and focused on items assessing psychological health, suicidal ideation, help-seeking, and substance use. Quantitative data were analyzed using IBM SPSS Statistics version 20 (IBM Corp., Armonk, NY). Descriptive statistics (e.g., mean/standard deviation/range or percentages) were computed for variables of interest, and *t* tests and chi-square analyses were used to examine gender differences for continuous variables and categorical variables, respectively.

Results

Response rate

Of the 1144 students who clicked the link for the questionnaire, 1137 (99.4%) provided consent and continued to the questionnaire items. This represented 22.5% (1137/5053) of the full population of matriculating medical students across all 9 schools in Florida. Response rates dropped toward the end of the questionnaire, such that only 862 students (75.8% of the sample) completed the total survey. Given the sensitive nature of the topic and validity concerns inherent to self-report data, the final item asked, “How honest were you in completing this survey?” Of the respondents ($n = 862$), 91.2% reported being “completely honest,” 8.4% reported being “mostly honest,” 0.4% reported being “somewhat honest,” and 0.0% reported being “not at all honest.”

Substance use

Tobacco

Students generally reported low levels of tobacco use. Although 26.9% ($n = 241$) acknowledged a history of smoking cigarettes at some point during their life, with an average initiation age of 17 ($SD = 3.00$; range = 7–25), only 6.4% ($n = 57$) reported smoking cigarettes in the past 6 months. Of the current smokers, 83.9% reported smoking fewer than 5 cigarettes per day. Male students were more likely to have ever smoked cigarettes ($\chi^2 = 17.69$, $P < .001$), but there were no significant gender differences in history of a quit attempt ($\chi^2 = 3.44$, ns) or use of cigarettes in past 6 months ($\chi^2 = 1.87$, ns).

Only 5.5% of respondents ($n = 49$) reported using smokeless tobacco at some point in their lifetime, with male students significantly overrepresented in this group ($\chi^2 = 58.92$, $P < .001$). However, 7.3% ($n = 65$) of students endorsed trying e-cigarettes, with male students more likely to have done so ($\chi^2 = 5.11$, $P = .02$). It is noteworthy that 12.5% of respondents ($n = 110$) reported smoking tobacco in a waterpipe (hookah) in the past 6 months, with no differences in use between male and female students ($\chi^2 = 0.21$, ns).

Alcohol

Almost 96% of medical students reported using alcohol at some point in their lives. Rates of alcohol use in the past 6 months are listed in Table 2. It is noteworthy that most variables exhibited a wide range with a positive skew, meaning that most students reported use at the lower end of the spectrum. Overall, rates of alcohol consumption were high, with male students consuming significantly more standard drinks in the past week, more standard drinks per typical drinking day, and more standard drinks on the day they drank the most, compared with their female counterparts. Average number of days reflecting “heaviest use” in the past 6 months did not significantly differ between male and female students.

About 70% of medical students acknowledged binge drinking after examinations (defined in the questionnaire as 5 or more drinks for male students and 4 or more drinks for female students), with 40.3% of students admitting they “often” or “usually” engage in binge drinking after exams. Male students reported binge drinking at greater frequency than female students did ($\chi^2 = 13.90$, $P = .003$). Of concern, 31.3% of medical students reported that their alcohol consumption had increased since beginning medical school. Male students were significantly more likely than female students to indicate attempts to quit or cut down on their drinking ($\chi^2 = 8.08$, $P = .04$) either during medical school (18.6% vs. 14.6%, respectively) or beforehand (5.5% vs. 3.4%). Male students were also more likely than female students to report being personally concerned that they

had a drinking problem ($\chi^2 = 9.39$, $P = .03$), either during medical school (8.7% vs. 5.5%) or beforehand (7.2% vs. 3.6%).

Marijuana

Within this sample of medical students, 46.8% ($n = 414$) reported a lifetime history of marijuana use, with male students reporting higher rates (51.4% compared with 43.0%; $\chi^2 = 5.93$, $P = .02$). Of the respondents, 22.7% ($n = 201$) admitted using marijuana during medical school. Rates were higher ($\chi^2 = 9.50$, $P = .02$) among male students (27.0%, $n = 99$) than female students (18.9%, $n = 93$). The majority of students who used marijuana during medical school reported decreasing their use (53.6%, $n = 90$); however, 22 students (12.2%) acknowledged increasing their use since beginning medical school (no gender differences; $\chi^2 = 0.54$, ns). Of note, 17.9% of the current marijuana users ($n = 36$) reported using on at least a weekly basis, with 13 students reporting daily or almost daily use.

Prescription stimulants

Lifetime history of prescription stimulant use was reported by 28.7% of students ($n = 252$), with 18.6% of students ($n = 163$) reporting prescription stimulant use during medical school. Whereas 19.8% of prescription stimulant users ($n = 22$) decreased their use since beginning medical school, 46.9% ($n = 52$) increased their use. Only 35.7% of prescription stimulant users ($n = 90$) exclusively used medication that was specifically prescribed for them. Indeed, 55.2% of prescription stimulant users ($n = 139$) only used pills that were not prescribed for them, and the remaining 9.1% ($n = 23$) had used a combination of prescribed and nonprescribed pills. There were no gender differences in rates or patterns of prescription stimulant use or misuse.

Prescription opioids

Lifetime history of any prescription opioid use was reported by 32.4% of students ($n = 283$), with 9.1% ($n = 79$) reporting any use during medical school. Only 3 students reported increasing their use of opioids during medical school. Of those endorsing any history of opioid use, 79.3% ($n = 230$) indicated that the pills were specifically prescribed for them; 9.3% ($n = 27$) admitted only using pills that were not prescribed for them, and 11.4% ($n = 33$) reported using a combination of prescribed and nonprescribed pills. There were no gender differences in rates or patterns of prescription opioid use or misuse.

Other illicit drugs

When asked about lifetime history of using any substances other than those listed previously, 82.4% of students ($n = 716$) denied any use. Of those who endorsed use, 10.8% ($n = 94$)

Table 2. Rates of alcohol consumption in past 6 months per self-report ($N = 845$).

| Alcohol consumption | Total M (SD) range | Male M (SD) | Female M (SD) | t | P |
|---|--------------------------|-------------------|---------------------|------|-------|
| No. of standard drinks in past week | 4.24 (5.65) 0–50 | 5.59 (6.90) | 3.31 (4.39) | 5.76 | <.001 |
| No. of standard drinks/average drinking day in past 6 months | 2.24 (1.84) 0–20 | 2.67 (2.28) | 1.92 (1.36) | 5.86 | <.001 |
| No. of standard drinks on day when drinking most in past 6 months | 5.30 (3.51) 0–24 | 6.40 (4.07) | 4.49 (2.79) | 7.92 | <.001 |
| Total no. of “heavy” drinking days in past 6 months | 4.04 (7.76) 0–150 | 4.59 (10.57) | 3.71 (5.04) | 1.56 | .12 |

reported using MDMA (Ecstasy), 9.6% ($n = 83$) reported using hallucinogens, and 6.9% ($n = 60$) reported using nonprescription stimulants such as cocaine, methamphetamine, or speed. Others reported use of inhalants (4.0%, $n = 35$), synthetic drugs (e.g., Spice, K2, “bath salts”; 3.5%, $n = 30$), nonprescription opioids (e.g., heroin or opium; 2.4%, $n = 21$), and anabolic steroids (0.4%, $n = 3$). Almost half of these users (41.6%, $n = 64$) acknowledged continued use of at least one of these substances during medical school, with the majority (57.7%) reporting decreased use and 11.5% reporting increased use. Only 1 student reported using any of these substances more than 1–3 days per month, and 43.7% of those who admitted using during medical school indicated that they had not used any of these substances in the past 6 months. There were no gender differences in illicit drug use.

Perceived problem drug use

Male students were more likely than female students to report attempts to quit or cut down use of any illicit or prescription drugs ($\chi^2 = 11.47$, $P = .009$), with 21 male students (6.3%) attempting to cut down during medical school and 15 (4.1%) doing so beforehand, compared with 11 female students (2.3%) attempting to cut down during medical school and 9 (1.9%) doing so beforehand. Male students were also more likely than female students to report ever feeling concerned that they had a problem with drug use ($\chi^2 = 20.91$, $P < .001$). During medical school, 12 male students (3.3% of male students) compared with 3 female students (0.6% of female students) felt they had a problem; in addition, before medical school, 19 male students (5.2%) compared with 6 female students (1.2%) were similarly concerned.

General well-being and distress

Overall, 83.2% of students reported being satisfied with their medical training, with no differences between male and female students. There were no gender differences in past-month physical health ($\chi^2 = 2.06$, ns) or pre-medical school physical health ($\chi^2 = 8.66$, ns). However, 63.0% of students reported their physical health had worsened since beginning medical school and 60.6% noted a decrease in psychological health. Female students were more likely to report reductions in psychological well-being ($\chi^2 = 12.39$, $P = .05$). Indeed, 14.3% of women and 11.4% of men described their past-month psychological health as “poor” or “very poor,” compared with 3.1% of women and 2.7% of men who described their pre-medical school psychological health in such terms. In addition, 71.3% of students noted that they generally do not get enough sleep (no gender differences; $\chi^2 = 0.89$, ns), and 79.8% described their stress level as “significant” or “severe.” Female students noted greater levels of stress than their male counterparts did ($\chi^2 = 16.30$, $P = .003$).

Over 10% of students ($n = 102$) endorsed “thoughts of committing suicide” during medical school, with an even greater percentage (15.9%, $n = 156$) reporting thoughts during medical school that “it would be better if [they] were dead.” There were no significant gender differences. In addition, 70.1% of students reported feeling they would benefit from resources to help

students struggling emotionally or psychologically. This included 79.3% of female students compared with only 59.6% of male students ($\chi^2 = 41.94$, $P < .001$). Of concern, 59.3% of students admitted they had never used any such resources, even though all schools provide medical students with access to counseling services. Women were more likely to report using at least 1 mental health resource ($\chi^2 = 6.88$, $P < .01$), with 44.5% doing so compared with 35.5% of men. Male students were more likely to be aware of the state physician health program (PHP) as a resource available to medical students in the state ($\chi^2 = 11.54$, $P = .001$), and twice as many male as female students reported participating in the PHP (i.e., 6 men and 3 women).

Discussion

To our knowledge, this was the first multi-institutional study since the turn of the century to assess a broad range of substance use and demonstrate gender differences in substance use among American medical students. Medical students reported higher lifetime exposure to alcohol, marijuana, hallucinogens, inhalants, and prescription opioids than general population estimates.¹⁷ The findings that male students reported higher rates of alcohol consumption, binge drinking, marijuana use, and use of tobacco products (e.g., cigarettes, e-cigarettes, and smokeless tobacco) were generally consistent with research demonstrating higher rates of substance use among men compared with women within the general US population,¹⁷ as well as in a sample of Irish medical students.¹⁸

It is noteworthy that female students in the present study reported engaging in “heavy drinking” after exams as frequently as their male counterparts (i.e., about 4 times in the past 6 months), despite consuming a smaller amount when drinking. The men and women also reported equal rates of prescription stimulant use, prescription opioid use, tobacco water-pipe (hookah) use, and use of other illicit substances. These results are similar to the findings of a recent study demonstrating equal rates of alcohol use disorders among male and female American medical students.¹² Together, these findings suggest that more attention is needed to address the issue of substance use among male and female medical students. Although male medical students appear to be at higher risk for substance use disorders than female students are, the female medical students nonetheless appear to be at higher risk than their peers in the general population.

Further, although matriculating medical students generally report similar or better mental health and well-being than age-matched peers at the outset of medical school,¹⁹ the results of this study were consistent with previous research demonstrating increased levels of psychiatric distress,⁵ suicidal ideation,^{8,20} and substance use,^{12,14,18,21–23} coupled with low levels of help-seeking and difficulty accessing appropriate care,^{24,25} among medical students. As observed in a Pakistani medical school,³ female students were more likely to report high levels of stress and decreased psychological well-being. Both male and female students in the present study reported underutilization of available mental health services. Lack of attention to personal wellness among physicians is associated with a number of significant negative consequences, including physician

suicide,^{26,27} medical errors,²⁸ burnout,²⁹ substance abuse,³⁰ and considering leaving the practice of medicine.³¹ Physician health programs (PHPs) exist throughout most of the United States and some other countries to assist physicians (and medical students in some states) who are struggling with potentially impairing conditions.³² Despite this, results of the present study confirm that more effort is needed to inform medical students about these valuable resources.

Limitations

The results of this study should be interpreted within the context of some important limitations. The overall response rate was low and may represent an underreporting or overreporting of distress and substance use. However, the rate of response was comparable to some other recently published reports of medical student/resident/physician well-being and distress,^{19,33–37} and the relatively large sample (~1000 medical students) may help to mitigate some of this concern. Next, the exclusive use of self-report data increases concern regarding social desirability bias and other biases. Finally, it is unclear to what extent students arrived at medical school with preexisting psychiatric and substance-related concerns that may have influenced their responses.

Conclusions and future directions

Results of this study demonstrate that medical student psychiatric distress and substance use remain significant concerns meriting further attention, with the expression of these difficulties varying by gender. It is imperative that students and physicians be educated regarding the importance of self-care and the dangers inherent to using substances to self-medicate stress or enhance performance. The medical school curriculum should be explicit in teaching students that such substance use is associated with increased risk of developing the chronic disease of addiction, can lead to personal and professional failure, and has possible lethal consequences. Given the low levels of help-seeking reported by students who recognize they are struggling, future work should focus on improving wellness throughout their training and ensuring student access to appropriate mental health resources.

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Author contributions

Dr. Merlo contributed to formulation of the study question and study design, secured institutional review board approval, collected and analyzed data, and drafted the initial manuscript. Dr. Curran contributed to formulation of the study question and study design, was instrumental in recruiting participation, suggested additional analyses, and assisted with critical revisions of the manuscript and final approval. Dr. Watson contributed to formulation of the study question and study design, provided suggestions for data analysis, and assisted with critical revisions of the manuscript and final approval.

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