Non-medical Use of Prescription Drugs and its Association with Socio-demographic Characteristics, Dietary Pattern, and Perceived Academic Load and Stress in College Students in Puerto Rico

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Objective: Stress can have deleterious effects on health and academic performance. Common stress-relieving activities among college students include the non-medical use of prescription drugs (NMUPD). The aim of this study was to determine the associations between self-perceived academic load and stress, NMUPD (stimulants, depressants, and sleeping medication), and dietary pattern in college students in PR.

Methods: A questionnaire to evaluate academic load and stress, NMUPD, and dietary pattern was used on a representative sample of 275 first- and second-year students from one campus.

Results: In total, 27.6% reported NMUPD in the past 6 months, with higher use among students aged 21-30 years (93.4%) than in those aged 31-53 years (6.6%; p=0.062). Those with high levels of stress had higher NMUPD (42.1%) than did those with low (26.3%) or moderate (31.6%) stress levels, after controlling for age and sex (p=0.03). Among those who reported NMUPD over the previous 6 months, 74% reported that such use was effective as a coping strategy, and 35% reported that it helped them to improve academic performance. Although no significant association was found between NMUPD and dietary pattern, 57% of the participants reported that their appetites decreased when they engaged in NMUPD.

Conclusion: To our knowledge, this is the first study that has associated self-perceived academic load and stress, NMUPD, and dietary pattern among college students in Puerto Rico. NMUPD's prevalence was 27.6%, which prevalence appeared to be higher in students aged 21-30 years than in those of any other age. High levels of stress were significantly related to high NMUPD in this sample. [P R Health Sci J 2013;2:89-94]

Key words: Academic load, Stress, Non-medical use of prescription drugs, Dietary patterns

Stress is seen today as a modern day illness (1), and it is becoming more common among college students (2,3). High levels of stress can result in different kinds of physical and psychological distress, which in turn can have deleterious effects on health and academic performance (4,5). Common stress-relieving activities among college students include the non-medical use of prescription drugs (NMUPD) (6), which has been defined as the use of medications "without a doctor's prescription, in larger amounts than prescribed, or for a longer period than prescribed" (7-9).

NMUPD has increased over the past decade among United States (US) college students (10,11) and is a major and growing public health concern (12-14) because it could heighten the risk of drug abuse in that population (15). The prevalence of NMUPD in US college students has increased from 8.3% in 1996 to 14.6% in 2006 (10). Several studies reveal that NMUPD is most prevalent among young adults, 18 to 25 years

old (10,11,13,14). Researchers have suggested that college students may be at a higher risk for NMUPD than are other groups, given the accessibility of different prescription drugs in medical college settings and the probability that some students share their legitimate prescriptions with others (13,14). In college students, the prevalence of legitimately used prescription sleep aids is 3.3%, while the non-legitimate use of such drugs has a prevalence of 2.0%; the prevalence of the legitimate

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and non-legitimate uses of sedatives/anxiety medications is 3.4% and 2.9%, respectively; and the prevalence of prescribed stimulants versus non-prescribed stimulants is 2.2% and 5.4%, respectively (16).

In Puerto Rico, NMUPD has been poorly studied although it is not a new phenomenon. A study of 277 students from 2 medical schools in Puerto Rico described how these students used different stimulants to improve academic performance (17). In order of the frequency of use, the stimulants used by the members were caffeine (56.2%), energy drinks (27%), stimulant drugs (8%), nicotine (6.9%), and other substances (1.8%).

Prescription drugs are associated with serious health risks when taken without medical supervision (18,19). Psychoactive prescription drugs, for example, are highly addictive since they operate on the same receptors and brain systems as illegal drugs do (18,20). Moreover, these medications can cause such potentially harmful cardiovascular problems as precipitous increases in blood pressure and heart rate, can increase risk of heart failure or stroke, and can even lead to death (20). In addition to the multiple health risk factors associated with the use of these drugs (18,20), there are other potentially serious consequences, such as alterations in appetite and dietary pattern, that have not been explored and that have not received careful attention.

To our knowledge there are no published studies examining the possible associations of academic load and stress, NMUPD, and dietary pattern in college students. Thus, given the high prevalence of NMUPD among college students and the potential health risks, we conducted this study to explore NMUPD as a coping strategy used by first- and second-year students at the Medical Sciences Campus (MSC) of the University of Puerto Rico (UPR) and to examine its associations with academic load and stress and dietary patterns.

Methods

Study design and sample characteristics

A cross-sectional descriptive study was conducted on a convenience sample of students from the UPR-MSC who completed their first or second year during the 2010/2011 academic year. The sample size was calculated using the enrollment lists of the 2010/2011 academic year, which lists were provided by the Office of Planning, Research, and Assessment of UPR-MSC to ensure that all of the schools were represented within the selected academic year. The proportion of students from each school was determined by dividing the total population of each school by the overall population of students who were eligible to participate. This proportion was then multiplied by the total number of students enrolled at each school. The total sample size was calculated as 252, with a distribution of 26 (14.7%) from the School of Nursing, 7 (7.5%) from Pharmacy, 94 (35.4%) from Medicine, 10 (7.9%)

from Dental Medicine, 41 (16.5%) from Health Professionals, and 74 (17.8%) from Public Health. The inclusion criteria called for students who completed either their first or second year at UPR-MSC during the 2010/2011 academic year while students in their third or fourth year, those under 21 years of age, those in special enrollment programs, those enrolled in joint programs, and those who were pregnant were excluded from participating in the study.

Data Collection

Subjects were recruited through email, flyers posted at various strategic locations of the different schools around the campus, and direct contact. At first, the potential study participants were given an informational letter explaining the purpose of the study, the procedures to be followed, and the study's duration and assuring the individual of the confidentiality of the process. Those who agreed to participate completed the questionnaire. The study protocol was approved by the IRB of UPR-MSC in August 2011.

Questionnaire

A self-completed questionnaire was used to collect the data. It consisted of the following 6 sections:

i. Demographic data

This included the student's school within the UPR-MSC system, age in years, gender, and the annual household income (low [$0–$24,999], moderate [$25,000–$74,999], or high [$75,000–$100,000]) in his or her home.

ii. Perception of academic load

This consisted of a question delving into each student's perception of his or her academic load and having the following response options: low, moderate, and high.

iii. Perception of stress

This included a validated perception-of-stress scale adapted from the Systemic Cognitive Model of Academic Stress (Modelo Sistémico Cognitivista del Estrés Académico, in the original Spanish) (21) and on which students reported how frequently they experienced certain physiological, psychological, and/or behavioral responses to academic stress. Each response had a possible score from of 1 to 5, and a total score was obtained by combining the scores from each of the statements for a possible stress scale of fewer than 67 points (indicating low stress), 68 to 81 points (indicating moderate stress), and more than 82 points (indicating high stress).

iv. Dietary pattern

This was estimated using a semi-quantitative food frequency questionnaire. It asked the respondent to report the number of meals consumed per day throughout the period of time under

study, the frequency of consumption and the serving sizes for the following food groups: grains and starchy vegetables, fruits, dairy products, meat and meat substitutes, oil, and water; and the frequency of consumption of snacks (those typically found in the vending machines on the UPR-MSC campus), soft drinks, and nutritional drinks. Each participant's diet quality was assessed with a modified Diet Quality Index (DQI), based on the USDA Food Pattern for 2010 (11) using the following 3 primary aspects: variety, adequacy, and moderation. Scores for each component were calculated for each of the 3 main categories, and the scores for all 3 categories were tallied, resulting in a total DQI score that could range from 0 to 65. Based on participant's total score, dietary pattern was classified as adequate, if total scores ranged from 33 to 65 points (>50% of dietary recommendations) or inadequate, if total scores were less than 33 points (<50% of dietary recommendations). More details of the dietary pattern calculations have been published (22).

v. Stress coping strategies

These were measured with questions inquiring into the use of prescription drugs, the consumption of caffeinated beverages, levels of physical activity, alcohol and smoking practices, and sources of social support. The present analysis focuses on prescription-medication use as a coping strategy. Information regarding the other strategies has been published (23) or is being published elsewhere.

Use of prescription medication

We assessed the use of 3 common categories of prescription drugs (stimulants, depressants, and sleeping medications) using the following question: "Indicate on how many occasions you used prescription drugs during January-May 2011". Respondents were asked to report the frequency with which they had used these medications, which are listed by the National Institute on Drug Abuse as being drugs that are commonly abused (19). The response scale for each class of drugs included the following ranges: once per month, 2-3 times per month, 1-2 times per week, 3-4 times per week, 5-6 times per week, once per day, 2-3 times per day, and 4 or more times per day.

Additionally, other questions explored the reasons for the use of these medications, the effectiveness of the use of such medications as a stress coping strategy, the change in appetite brought about by the use of these medications, and the student's perceptions regarding the possible harmful health consequences of using these medications.

Data Analysis

Descriptive statistics (mean, standard deviation, and percentages) were used for summarizing the continuous variables. Associations between study variables were measured using Pearson's Chi-Squared or Fisher's Exact tests. Logistic regression was performed to assess the association between stress and NMUPD, after controlling for socio-demographic covariates. The analysis was performed with the use of the statistical software SPSS (Statistical Package for the Social Sciences, version 17.0).

Results

Sample characteristics

The total sample consisted of 275 students, which was higher than what was determined to be adequate in the sample-size calculation and contained representativeness from each school in the UPR-MSC system (Table 1). Most of the participating students were female (67.6%), ranged in age from 21 to 30 years old (88.0%) and lived in households with low annual incomes (42.7%).

Table 1. Socio-demographic characteristics of the sample (n = 275)

Socio-demographic characteristics	N	(%)
Gender		
Male	89	32.4
Female	186	67.6
Age		
21-30 years	242	88.0
31-53 years	33	12.0
*Household income**		
Low	117	42.7
Moderate	101	36.9
High	56	20.4
Total	**275**	**100%**

*Missing data from 1 subject

Dietary pattern and the perception of academic load and stress

According to the DQI, 62% of the students had inadequate dietary patterns, while only 37.9% students had adequate dietary patterns. In addition, most of the participating students (68.2%) perceived their academic loads to be heavy, and a high percentage of them (36.7%) perceived their stress levels to be moderate (Table 2).

Prescription-medication use as a coping strategy

Table 3 shows the NMUPD prevalence and frequency among the participants by category (stimulants, depressants, and sleeping medications) for the 6 months prior to the survey. Stimulants were used by 23.3% (n = 59) of the sample, being used mostly on a weekly basis (8.7%). Anxiolytics were used by 10.6% (n = 29) of the sample, being used mostly on a monthly basis (6.2%). Sleeping pills were used by 7% (n = 19) of the sample, being used mostly on a weekly basis (4.4%). Given that the frequency of use of each type of medication studied was low, all of the figures for NMUPD were combined into 1

broad category, and we therefore report here on the use (27.6%; n=76) or non-use of prescription medications (72.4%; n=199) (Table 4).

Table 2. Perceived levels of academic load and stress in the sample

Level	Academic load* N (%)	Stress levels† N (%)
Low	8 (2.9)	36 (13.1)
Moderate	79 (28.8)	166 (60.6)
Heavy/high	187 (68.3)	72 (26.2)

*Missing data from 1 subject; †Missing data from 1 subject.

Table 3. NMUPD frequency in the sample

Frequency	Type of medication		
	Stimulants N (%)	Anxiolytics N (%)	Sleeping pills N (%)
Monthly	20 (7.3)	17 (6.2)	6 (2.2)
Weekly	24 (8.7)	9 (3.3)	12 (4.4)
Daily	15 (5.5)	3 (1.1)	1 (0.4)
Total use	**59 (21.5)**	**29 (10.6)**	**19 (7)**

Table 4. NMUPD by socio-demographic characteristic, dietary pattern, and perceived level of academic load and stress

Socio-demographic characteristics	Medications use		
	Used N (%)	Never used N (%)	X^2
Gender			
Male	28 (36.8)	61 (30.7)	p = 0.39
Female	48 (63.2)	138 (69.3)	
Age			
21-30 years	71 (85.9)	171 (93.4)	p = 0.062
31-53 years	5 (6.6)	28 (14.1)	
Stress level			
Low	20 (26.3)	67 (33.7)	p = 0.069
Moderate	24 (31.6)	77 (38.7)	
High	32 (42.1)	55 (27.6)	
*Academic load**			
Low-Moderate	20 (26.7)	67 (33.7)	p = 0.27
High	55 (73.3)	132 (66.3)	
Dietary pattern†			
Inadequate	45 (63.4)	119 (61.7)	p = 0.80
Adequate	26 (36.6)	74 (38.3)	

*Missing data from 1 subject; †Missing data from 11 subjects.

The proportion of female students who reported having used these medications was higher (63.2%) than that of male students (36.8%), although it was not statistically significant (Table 4). The proportion of students aged 21 to 30 years engaging in NMUPD (93.4%) was higher than that of those aged 31 to 53 years (6.6%) (p = 0.062).

With respect to stress level or academic load (Table 4), those with higher levels of stress had higher NMUPD (42.1%) than did those with low (26.3%) or moderate (31.6%) stress levels (p = 0.069). The logistic regression analysis showed that NMUPD was significantly associated with stress, after controlling for age and sex (odds ratio=1.482; 95% C.I. 1.036, 2.120; p=0.03). However, no significant association was found between NMUPD and academic load, even after controlling for age and sex (odds ratio 1.354; 95% C.I. 0.774, 2.369; p=0.29).

Overall, the main reasons for taking a particular prescription medication were to enhance academic performance (34.5%), to stay awake (28.6%), to handle stressful situations (21.4%), because it was diagnosed (7.1%), and to go to sleep (3.6%). Also, we found that 74% reported that NMUPD was effective as a coping strategy. Additionally, 45% reported that NMUPD had harmful health consequences while 46% considered that there were no harmful health consequences to such use.

No significant association was found between NMUPD and dietary pattern (Table 4). However, of those who reported NMUPD, 57% also reported experiencing a decrease in appetite in association with NMUPD.

Discussion

To our knowledge, this is the first report in college students in Puerto Rico that attempted to determine the associations between NMUPD, self-perceived stress and academic load, and dietary patterns. In addition, this report provides additional insight into the frequency of use and prevalence of each type of medication studied (stimulants, anxiolytics, and sleeping pills) in the 6 months prior to the study; the findings suggest that a considerable proportion of the students (27.6%) reported having used non-medical prescription drugs in that time.

Results from this study support and expand on previous findings about NMUPD by college students. The prevalence of NMUPD found in this study (27.6%) was similar to that of a study with a sample of 465 college students at a Midwestern US university (31%) (24) but higher than those of both a study in Lebanon with a sample of 570 college students (20%) (25) and a study in another Midwestern US university (20%) with a sample of 3,639 undergraduate students (26). Although this is not a representative sample of the population of Puerto Rico, our findings suggest that NMUPD is relatively prevalent in the college population in Puerto Rico.

The prevalence of stimulant-medication use was higher (21.5%) than was the prevalence of either anxiolytic use (10%) or sleeping-pill use (7%). These differences may be related to the main reason for their use that was reported by the sample, which was to enhance academic performance (34.5%). The prevalence of stimulant-medication use in the participants of the present study is lower than that reported in a sample of 1,811 college students from a US university (34%) (27) but higher

than those of both a study of 1,253 US college students (19.6%) (28) and a study of 401 dental students from a university in the south-central region of the US (12.4%) (29).

Other studies have found higher NMUPD by males compared to such use by females (8,10,15); however, we found greater NMUPD by females (although it was not significant). Also, we found that those ranging in age from 21 to 30 years appear to have greater NMUPD than their older counterparts, which is similar to what has been found by other studies of college-age populations (15,25). This could be related to the high accessibility of different classes of prescription drugs in the university setting, specifically in terms of stimulant drugs (3). Also, these medications are highly prevalent because of the reoccurring motivations for their use, which are to enhance academic performance, to increase concentration, and to stay awake (27). NMUPD for these purposes may not be considered to be necessary in less stressful settings (1).

Among those who reported NMUPD, 74% stated that it was effective as a coping strategy. We also found that those with high levels of stress had significantly higher NMUPD compared to those with low or moderate stress levels, after controlling for age and gender. We also found that those admitting to NMUPD also reported an increase in NMUPD in moments of high stress.

Limited studies have associated stress with NMUPD. In a study conducted at 2 medical schools in Puerto Rico (17), the use of stimulant medications is probably related to the high levels of stress commonly experienced by medical students, although stress was not assessed in terms of or found to be associated with the use of prescription medication. Major theories of addiction postulate that stress plays an important role in the motivation to use psychoactive substances (30-32). Furthermore, several studies have suggested that some individuals use such drugs to reduce the negative effects of affective disorders as well as those effects that are related to stress (32,33). However, the relationship between stress and drug use is a complex phenomenon influenced by environmental factors (34).

Despite not finding any significant association between NMUPD and dietary pattern in those who reported NMUPD, 57% of the participants reported experiencing a decrease in appetite with NMUPD. Although one of the side effects of using these drugs is a loss of appetite (21), the lack of association with dietary pattern might be explained by the fact that the instrument used in the present study focused on the 6 months prior to the study and could not estimate changes in food intake. On the other hand, other studies show that the abuse of prescription medications, such as stimulants, has been reported to have a serious impact on an individual's nutritional profile because of the side effects that results from their use (18,19), which effects include anorexia, insomnia, cardiovascular and cerebrovascular problems, drug dependence, psychological and psychiatric problems, the acquisition of infectious diseases, and death (35). Concerning student perceptions regarding harmful

health consequences resulting from the use of prescription medication, the present study determined that about half of the sample considered there to be no harmful health consequences. However, contrary to these perceptions, this type of drug use can be detrimental to one's health and to academic outcomes (18,19,21). NMUPD is a risky behavior that should be prevented, and stronger regulations regarding the access of these types of drugs are needed to minimize either or both of the previously mentioned outcomes, among others.

The present study had some limitations. The results may not be generalizable to all college students in Puerto Rico. The data were collected at a single point in time; a longitudinal study would be a better design to support the study findings. This study did not distinguish between individuals who used prescription drugs for specific treatments and those who used them for other purposes; this may have contributed to the higher prevalence rate; however, only 7% reported using prescription medication that had been legally dispensed to address a specific condition. Future research should examine NMUPD in a larger sample in Puerto Rico and should objectively determine prescription medication use, the health risks associated with that use, and whether or not such use is linked to a subsequent loss of appetite.

In conclusion, NMUPD was relatively prevalent in this population (27.6%), with an apparent greater use by students aged 21-30 years. The medication most frequently used was stimulants (21.5%), which were used on a weekly basis. Those with high levels of stress had higher NMUPD. Students reported an increase in NMUPD in moments of high stress. Although no significant association with dietary pattern was found, appetite decreased in most students who used these drugs. NMUPD was reported as an effective coping strategy for enhancing academic performance and enabled users to stay awake, with about half of the sample members perceiving there to be no harmful health consequences to such use. These findings indicate the need for stress management programs aimed at college students.

Resumen

Objetivo: El estrés puede tener efectos negativos en la salud y rendimiento académico. El uso de fármacos no recetados (NMUPD, en sus siglas en inglés) es unas de las actividades comunes entre los estudiantes para afrontar el estrés. El propósito de este estudio es determinar la asociación entre la percepción del estrés y carga académica, NMUPD (estimulantes, sedantes y medicamentos para dormir) y hábitos alimentarios de estudiantes universitarios en PR. Método: Se utilizó un cuestionario para evaluar carga y estrés académico, NMUPD y hábitos alimentarios en una muestra representativa de 275 estudiantes del primer o segundo año de un recinto. Resultados: En total, 27.6% reportó NMUPD en los pasados 6 meses, con mayor uso en estudiantes de 21-30 años (93.4%) comparado con aquellos de 30-53 años (6.6%; p=0.062). Aquellos

estudiantes con más estrés tuvieron mayor NMUPD (42.1%) comparado con bajo (26.3%) o moderado (31.6%) estrés, después de controlar por edad y sexo (p=0.03). Entre aquellos que reportaron NMUPD, 35% informó que lo usó para mejorar el rendimiento académico y 74% informó que su uso fue eficaz como estrategia de afrontamiento. Aunque no se encontró una asociación significativa entre el NMUPD y los hábitos alimentarios, 57% informó que su apetito disminuyó con su uso. Conclusión: A nuestro entender, este es el primer estudio que ha asociado carga y estrés académico, NMUPD y patrones alimentarios en Puerto Rico. La prevalencia de NMUPD fue de 27.6%, y al parecer fue más alto en estudiantes de 21-30 años. Mayores niveles de estrés se relacionaron significativamente con mayor NMUPD en esta muestra.

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