

Consumption of medicines, alcohol, tobacco and cannabis among university students: a 2-year follow-up

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Abstract

Objective To determine the prevalence of medicine consumption among Spanish university students and its association with alcohol, tobacco and cannabis consumption.

Method We carried out a cohort study among Spanish university students ($n = 2,700$). Consumption of medicines during the previous 15 days, risky alcohol use, and tobacco and cannabis consumption were measured using questionnaire. Logistic regression models were generated using consumption of medicines as dependent variables at the beginning of the study and for a 2-year follow-up.

Results A multivariate logistic regression model showed at the beginning of the study that being female (OR = 1.71), living away from home (OR = 1.35) and being a smoker (OR = 1.40) are associated with consumption of medicines. Furthermore, the model shows a significant interaction between risky alcohol use and cannabis consumption (OR = 2.00). The 2-year follow-up shows that only being female (OR = 1.44) and risky alcohol use (OR = 1.36) are associated with the considered dependent variable.

Conclusions Our results reveal a very high intake of medicines among university students; most of them are

without a medical prescription. Probably, this consumption of medicines is another form of poly-consumption of drugs.

Keywords Pharmacoepidemiology · Alcohol · Tobacco · Cannabis · University students

Introduction

Over recent years, various epidemiological studies carried out not only on the general population (Sung et al. 2005; Carrasco-Garrido et al. 2008; Figueiras et al. 2000) but also on university populations (Cabrita et al. 2002; Boyd et al. 2007; McCabe et al. 2005, 2006a, b, c) have shown that medicine consumption by the young constitutes a public health problem. Indeed, the non-medical use of prescription pain medication among students has been increasing (McCabe et al. 2007).

In Spain, several studies have shown a high consumption of medicines without prescription among young people (Carrasco-Garrido et al. 2008; Figueiras et al. 2000; Cabrita et al. 2002). Additionally, cross-sectional studies have revealed an association between the consumption of medicines, with and without prescription, and consumption of alcohol and tobacco (Carrasco-Garrido et al. 2008). No data is available about the association of cannabis.

The factors which are associated to these practices have also been tackled, and the literature reveals that not only an individual's characteristics (Carrasco-Garrido et al. 2008; Figueiras et al. 2000; Cabrita et al. 2002), but also the characteristics of his/her education centres (Boyd et al. 2007; McCabe et al. 2005, 2006a, b, c) are associated with consumption of medicines.

Notwithstanding, the results of these studies lack external value, and therefore it is difficult to extrapolate them to

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our environment, given that the access to medicines is significantly different in different countries (Caamaño-Isorna et al. 2004; Caamaño et al. 2000). In Spain, to date there are no longitudinal studies that have looked into the association between consumption of medicines and the consumption of alcohol, tobacco and cannabis.

The aim of this study is to determine the prevalence of medicine consumption among Spanish university students and its association with that of alcohol, tobacco and cannabis.

Methods

Design, population and sample

A cohort study was carried out to determine the prevalence of medicine consumption among Spanish university students and its association with the consumption of alcohol, tobacco and cannabis. The study population included the first year students (18–19 years old) studying at the University of Santiago de Compostela ($n = 2,700$). Initial data collection was carried out by means of a questionnaire completed by students in the classroom (October 2005 to February 2006). The subjects were analysed again for a 2-year follow-up (October 2007 to February 2008).

Data collection procedures

The consumption of medicines was measured using a questionnaire. The subjects were asked about their consumption of different medicines, with and without prescription, during the previous 15 days using the Spanish National Health Survey questions regarding this topic (INE 2003). The questionnaire was anonymous, and the research group assured the participants that the data from the questionnaires would only be used for this study.

Alcohol use was measured using the Galician validated version of the AUDIT (Saunders et al. 1993; Varela et al. 2005). In this version, for a screening of risky alcohol use, the cut-off value is 5 for men and 4 for women.

At the same time as the AUDIT, we used another questionnaire that asked about tobacco and cannabis use. Specifically, we asked about tobacco and cannabis use not only when going out, but also in other situations. The subjects could choose one of the four answers: never, sometimes, often and always. Data collection procedures have been described in detail in previous articles (Caamaño-Isorna et al. 2008; Mota et al. 2010).

Definition of variables

(1) *Consumption of medicines* consumption of each medicine during the previous 15 days (yes = 1/no = 0). (2)

Consumption of medicines with prescription consumption of each medicine with prescription during the previous 15 days (yes = 1/no = 0). (3) *Consumption of medicines without prescription* consumption of each medicine without prescription during the previous 15 days (yes = 1/no = 0). (4) *Risky alcohol use* dichotomous variable. A cut-off value was established according to gender: >4 for women; and >5 for men. (5) *Tobacco consumption* and (6) *cannabis consumption*. These last two dichotomous variables were generated using the following question: “How often do you consume tobacco/cannabis when you go out or in any situation?” which was coded as follows: never = 0, sometimes = 1, often = 1 and always = 1. Moreover, several socio-demographic variables were considered such as gender, place of residence, and maternal educational level.

Statistical analysis

A statistical analysis was carried out using the SPSS 15.0 software package. Logistic regression was used to estimate odds ratios (OR) with a confidence interval of 95% for two dichotomous dependent variables: (1) consumption of medicines during the previous 15 days at the beginning of the study, and (2) consumption of medicines during the previous 15 days for the 2-year follow-up. Maximal models were generated including all theoretical independent variables. From these maximal models, final models were generated. The final models included all significant variables and also no significant variables when their exclusion changed the OR of other variables by more than 10%.

Results

The response rate at the beginning of the study among students who were in class on the survey day was 99%. For the 2-year follow-up, participation rate was 64%. Table 1 shows the characteristics of the initial study sample and of the follow-up sample. There are no significant differences between these samples regarding socio-demographic aspects.

The prevalence of risky alcohol use, tobacco consumption, and cannabis consumption at the beginning of the study and for the 2-year follow-up for the follow-up sample are shown in Table 1. The prevalence of risky alcohol use shows a significant increase of 36.1 versus 54.6%. Proportion of tobacco and cannabis users does not show differences between both the periods.

Table 2 shows the proportion of students who have consumed medicines during the previous 15 days. The prevalence for total, with prescription, and without prescription consumption of medicines does not show

Table 1 Characteristics of the subjects: Initial study sample and follow-up sample

	Percentage (95% confidence interval)		
	Sample ($n_1 = 1,369$)		Follow-up sample ($n_2 = 877$)
	Initial study	Initial study	2-year follow-up
Age (mean)	18.5 (18.4–18.6)	18.4 (18.3–18.5)	20.3 (20.1–20.6)
Female	72.5 (70.1–75.0)	76.3 (73.4–79.2)	76.3 (73.4–79.2)
Residence: Outside the parents' home	74.1 (71.8–76.5)	75.6 (72.7–78.5)	76.4 (73.5–79.3)
Maternal educational level			
Primary school	38.6 (36.0–41.2)	29.3 (26.2–32.4)	
High school	31.4 (29.0–33.9)	41.7 (38.4–45.1)	
University studies	28.4 (26.0–30.8)	27.7 (24.7–30.7)	
Risky alcohol use	37.1 (34.5–39.7)	36.1 (32.9–39.4)	54.6 (51.3–57.9)
Tobacco consumption	30.1 (27.6–32.6)	29.2 (26.1–32.3)	29.4 (26.7–32.1)
Cannabis consumption	20.8 (18.6–23.0)	21.0 (18.2–23.7)	17.0 (14.4–19.5)

Maternal educational level was not measured in the follow-up questionnaire

Table 2 Proportions of subjects that have consumed medicines during the previous 15 days

	Percentages (95% confidence interval)					
	With prescription		Without prescription		Total	
	Initial study	2-year follow-up	Initial study	2-year follow-up	Initial study	2-year follow-up
Medication for colds, flu	12.4 (10.6–14.2)	4.7 (3.2–6.1)*	21.7 (19.5–23.9)	15.2 (12.7–17.6)*	33.9 (31.3–36.4)	19.5 (16.8–22.2)*
Medication for pain or fever	7.9 (6.4–9.3)	6.3 (4.6–7.9)	15.9 (13.9–17.8)	19.0 (16.4–21.7)	23.6 (21.3–25.9)	25.2 (22.3–28.1)
Contraceptives ^a	12.4 (10.3–14.5)	25.9 (22.5–29.3)*	3.2 (2.1–4.4)	4.6 (3.0–6.3)	15.6 (13.5–17.9)	30.5 (26.9–34.6)*
Antibiotics	11.5 (9.8–13.3)	5.7 (4.1–7.3)*	3.1 (2.2–4.1)	1.4 (0.5–2.1)*	14.6 (12.7–16.5)	7.1 (5.3–8.8)*
Vitamins, minerals, tonics	5.3 (4.1–6.6)	2.6 (1.52–4.1)	6.8 (5.4–8.2)	8.1 (6.2–10.0)	12.1 (10.3–13.8)	10.7 (8.3–12.8)
Medication for allergies	7.7 (6.2–9.1)	9.4 (7.4–11.3)	1.2 (0.6–1.9)	1.0 (0.3–1.7)	8.9 (7.3–10.5)	10.4 (8.0–12.5)
Anxiolytics, sedatives	1.9 (1.1–2.6)	1.7 (0.8–2.6)	3.0 (2.1–3.9)	2.6 (1.5–3.7)	4.9 (3.7–6.1)	4.3 (2.9–5.7)
Antidepressants, stimulants	0.9 (0.3–1.4)	2.4 (1.3–3.4)	0.5 (0.1–0.9)	0.3 (0.07–1.0)	1.4 (0.7–2.0)	2.7 (1.3–3.9)
Any medication ^b	31.2 (28.7–33.7)	27.7 (24.7–30.7)	35.4 (32.9–38.0)	32.9 (29.8–36.1)	57.8 (55.1–60.4)	52.2 (51.9–58.6)

^a Out of the total number of female students

^b Contraceptives excluded

* Comparison of two proportions, $p < 0.05$

differences between the initial study and the 2-year follow-up. Significant differences in medication consumption are only observed among medication for colds (33.9% for the initial study vs. 19.5% for the 2-year follow-up), antibiotics (14.6 vs. 7.1%), and contraceptives (15.6 vs. 30.5%).

Table 3 presents the proportions of medicine consumption during the previous 15 days in relation to cannabis, tobacco and alcohol use at the beginning of the study and for the 2-year follow-up. The prevalence of consumption of medicines without prescription among cannabis, tobacco and alcohol users is greater than among non-users. However, for the 2-year follow-up this prevalence is only significant among cannabis users and cannabis non-users. In relation to the consumption of medicines with

prescription, there are no significant differences between consumers and non-consumers, neither at the beginning of the study nor for the 2-year follow-up.

Finally, Table 4 shows univariate and multivariate ORs for dependent dichotomous variables at the beginning of the study and for the 2-year follow-up. For the initial study, the multivariate logistic regression model showed that being female, living away from home, and being a smoker are associated with the consumption of medicines during the previous 15 days. Furthermore, the model shows a significant interaction between risky alcohol use and cannabis consumption. For the 2-year follow-up, only being female and risky alcohol use show association with the considered dependent variable.

Table 3 Percentages of medicine consumption during the previous 15 days in relation to the use of cannabis, tobacco and alcohol for the initial study and for the 2-year follow-up

	Cannabis			Tobacco			Alcohol			Cannabis, tobacco and alcohol		
	No	Yes	<i>p</i> value	No	Yes	<i>p</i> value	No risk	Risk	<i>p</i> value	No	Yes	<i>p</i> value
Initial study												
Medication for colds, flu	32.0	41.0	0.004	31.8	38.8	0.011	32.3	37.2	0.080	30.9	45.3	0.001
Medication for pain or fever	22.0	29.5	0.009	22.2	26.9	0.050	22.0	26.4	0.092	21.4	32.4	0.005
Antibiotics	13.4	19.3	0.012	13.9	16.3	0.256	13.1	17.3	0.042	12.1	19.4	0.021
Contraceptives ^a	14.1	22.2	0.007	14.5	18.2	0.137	14.1	18.1	0.090	13.1	21.4	0.031
Vitamins, minerals, tonics	10.6	17.5	0.001	10.5	15.5	0.009	10.1	15.6	0.003	9.9	21.6	0.001
Anxiolytics, sedatives	4.2	7.4	0.030	4.1	6.8	0.032	4.0	6.5	0.037	4.0	9.4	0.009
Antidepressants, stimulants	1.0	2.8	0.021	1.2	1.7	0.518	1.3	1.6	0.661	0.7	0.7	0.947
All medicines ^b	55.5	66.3	0.001	54.2	66.0	<0.001	54.5	63.2	0.002	55.8	75.5	<0.001
All medicines without prescription ^b	32.8	45.3	<0.001	32.8	41.5	0.002	30.9	43.3	<0.001	33.3	54.7	<0.001
All medicines with prescription ^b	30.7	33.3	0.463	30.0	34.0	0.144	31.6	30.3	0.626	30.9	33.8	0.481
2-year follow-up												
Medication for colds, flu	19.1	21.5	0.504	19.7	18.8	0.805	17.4	21.3	0.152	19.2	22.7	0.469
Medication for pain or fever	24.0	30.9	0.079	23.9	30.6	0.069	22.9	27.2	0.146	24.4	33.3	0.090
Antibiotics	7.6	4.7	0.215	7.2	6.5	0.734	7.5	6.7	0.676	7.2	5.3	0.540
Contraceptives ^a	30.8	28.7	0.259	29.5	34.6	0.255	30.0	30.9	0.802	30.6	28.8	0.788
Vitamins, minerals, tonics	9.9	14.8	0.079	10.6	11.2	0.830	10.7	10.7	0.985	10.3	14.7	0.248
Anxiolytics, sedatives	4.1	5.4	0.495	3.7	7.1	0.050	3.7	4.8	0.421	4.2	5.3	0.656
Antidepressants, stimulants	2.6	3.4	0.611	2.7	2.9	0.856	3.2	2.3	0.406	2.9	1.3	0.436
All medicines ^b	52.1	59.1	0.119	52.1	58.2	0.147	49.5	56.4	0.041	52.9	57.3	0.459
All medicines without prescription ^b	31.5	40.3	0.037	32.5	34.7	0.588	30.1	35.4	0.098	32.2	41.3	0.106
All medicines with prescription ^b	28.0	26.2	0.646	27.0	30.6	0.350	26.9	27.6	0.926	27.9	25.3	0.631

^a Out of the total number of female students^b Contraceptives excluded

Discussion

The proportion of subjects that have consumed medicines without prescription at the beginning of the study and for the 2-year follow-up is the same, and this proportion is significantly higher than that revealed by the Spanish National Health Surveys (Sung et al. 2005; Carrasco-Garrido et al. 2008; Figueiras et al. 2000).

According to Carrasco-Garrido et al. (2008), the prevalence of self-medication among young people between the ages of 16–24 in the Spanish National Health Surveys was 20.85%, and among university students, it was 23.27%.

The reason for this lower prevalence may be due to the period in which the data was collected: October to February versus January to December (INE 2003). On the other hand, the short age range of our work deals with late adolescence, a period that is still related to high engagement in risk-taking behaviour (Spear 2000), which may facilitate the consumption of medication without control. In general, the ease with which medicines are dispensed without prescription in Spain (Caamaño-Isorna et al. 2004)

may explain part of this high prevalence of self-medication (Caamaño et al. 2000).

In the so far consumption of medication, our results are similar to those provided by Cabrita et al. (2002) for Portuguese university students.

In our study, significant differences between the consumption of medication for colds and of antibiotics have been found between the initial study and the 2-year follow-up. These differences are probably due to a lower incidence of the symptomatology for which they are indicated. On the contrary, the greater proportion of female students who consume contraceptives in the 2-year follow-up would probably be an effect of the cohort's age increase. This proportion is similar to that revealed by the Spanish National Health Surveys (Carrasco-Garrido et al. 2008).

In relation to the association between the consumption of medicines and the use of cannabis, tobacco and alcohol, the results demonstrate that the consumption of medicines without prescription among cannabis, tobacco and alcohol users is greater than among non-users. These results are consistent with those revealed by different studies (Sung

Table 4 Influence of subjects' characteristics on consumption of medicines for the initial study and for the 2-year follow-up

	Consumption of medicines during the previous 15 days [OR (95% Confidence Interval)] ^a			
	Initial study		2-year follow-up	
	Univariate	Multivariate ^b	Univariate	Multivariate ^b
Gender				
Male	1 ^c	1	1	1
Female	1.70 (1.33–2.16)	1.71 (1.33–2.19)	1.39 (1.02–1.90)	1.44 (1.05–1.97)
Residence				
At parents' home	1	1	1	
Outside the parents' home	1.44 (1.13–1.84)	1.35 (1.05–1.64)	1.31 (0.96–1.81)	
Cannabis consumption				
No	1	1	1	
Yes	1.58 (1.20–2.07)	0.91 (0.58–1.43)	1.32 (0.93–1.90)	
Risky alcohol use				
No	1	1	1	1
Yes	1.43 (1.14–1.80)	1.00 (0.76–1.31)	1.32 (1.02–1.72)	1.36 (1.04–1.78)
Tobacco consumption				
No	1	1	1	
Yes	1.64 (1.29–2.09)	1.40 (1.06–1.84)	1.28 (0.92–1.80)	
Risky alcohol use × Cannabis				
No		1		
Yes		2.00 (1.11–3.60)		

^a Contraceptives excluded^b Adjusted for the other independent variables included in the column^c Reference category

et al. 2005; McCabe et al. 2005, 2006c). Several studies have associated increased self-medication in young people as a greater need for self-affirmation and personal autonomy (Caamaño et al. 2000). Probably are the same reasons that could explain part of the largest consumer of drugs in users of tobacco, alcohol and cannabis. The greater accessibility to drugs in recent years makes this self-medication (Hemwall 2010).

However, after 2 years, cannabis, but neither alcohol nor tobacco, still presents as associated to medicine consumption without prescription. This data may suggest that the characteristics of cannabis users could be different from the characteristics of alcohol or tobacco users.

There has been much controversy as to whether the consumption of medication should be considered a consequence of the consumption of tobacco, alcohol and cannabis, even though today the majority of authors agree that the consumption of medicines is another form of poly-consumption of drugs (McCabe et al. 2006b). It has been demonstrated that the reinforcing and pathological effects of ethanol consumption might be mediated through the endogenous cannabinoid system (see Hungund and Basavarajappa 2004, for review). The CB1 receptor seems to play a critical role in clinically important aspects of

alcohol dependence. In animal models, alcohol preference and self-administration can be modulated with CB1 receptor agonists and antagonists. Furthermore, the stress (a relevant environmental factor in the vulnerability to alcohol) had no affect on alcohol preference in cannabinoid CB1 receptor-deficient mice (Racz et al. 2003). This commune neurophysiologic basis of evidence has prompted suggestion that alcohol/cannabis use may have pharmacological effects on brain function that increase the likelihood of using other drugs (Hall and Lynskey 2005).

Finally, multivariate logistic regression models show that being female and living away from home also represents risk factors for the consumption of medicines. With regard to gender, the prevalence of consumption of medicines among females is higher. These results are consistent with those put forward by various studies (Sung et al. 2005; Figueiras et al. 2000; Cabrita et al. 2002; Boyd et al. 2007). The greater consumption of medication for menstrual symptoms may explain, at least partially, this higher prevalence (Obermeyer et al. 2004).

With regard to the students' place of residence, it is likely that the greater degree of freedom afforded by living away from the family environment during the first year of university is associated with a less orderly lifestyle and

brings about a greater need for medicines for minor symptoms. Moreover, this interpretation is congruent with the disappearance of that association in the 2-year follow-up. Studies that have been carried out in other environments have also revealed an association between place of residence and the consumption of medication (McCabe et al. 2005, 2006a), although important cultural differences make the data comparison somewhat difficult.

There are two possible limitations in our study: (1) Selection bias, because of the loss of subjects in the follow-up. However, the absence of significant differences between the initial sample and the follow-up sample (Table 1) suggests an absence of this bias. (2) Given that the questions about the use of tobacco and cannabis are not specifically validated, the use of these may have not been correctly measured. Finally, consumption of medicines, tobacco and cannabis were self reported, which could underestimate these variables.

Our results reveal a very high intake of medicines among university students, most of them without a medical prescription. The consumption of medicines shows a significant association with consumption of alcohol, tobacco and cannabis, and it has a greater prevalence among women and those students who are living away from the parents' home. Probably, this consumption of medicines is another form of poly-consumption of drugs.

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Conflict of interest The authors declare that they have no competing interest.

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