Research Article

Sexually Transmitted Infections and Emergency Contraception in University Students in Majorca, Spain

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Abstract

The aim is to analyze emergency contraception (EC) use and sexually transmitted infections (STIs) among university students (UE). It is a cross-sectional descriptive study conducted at the University of Balearic Islands. Female and male UE were invited to complete a self-administered questionnaire. The dependent variable was the presence of an STI. The independent variables were sociodemographic characteristics, drug use, sexual behavior and use of EC. We recruited 1588 students. The median age was 20; 807 (67%) were women; and 51 UE reported an STI in the last 12 months (3.9%, 95%CI, 2.9-4.4): chlamydia (13.7%), genital herpes (13.7%) and candidiasis (54.9%). The variables associated with STIs were taking oral contraceptives (OR=0.37, 95%CI, 0.19-0.74), first sexual experience before the age of 16 (OR=1.94, 95%CI, 1.08-3.50), having had 3-5 sexual partners (OR=2.27, 95%CI, 1.04-4.90), 6-9 (OR=2.79, 95%CI, 1.56-9.22) or ≥10 (OR=4.59, 95%CI, 1.98-10.68), and irregular use of condoms OR=3.62, 95%CI, 1.53-8.57). In the adjusted model, having an STI in the previous 12 months was related to age (OR=0.87, 95%CI, 0.79-0.96), female sex (OR=7.02, 95%CI, 2.52-19.53), irregular condom use (OR=4.60 95%CI, 0.10-0.51), having 3-5 (OR=2.47, 95%CI, 1.04-5.85), 6-9 (OR=3.98, 95%CI, 1.45-10.89), or ≥10 (OR=5.77, 95%CI, 1.99-16.67) sexual partners, and illegal drug use (OR=2.25, 95%CI,1.05-4.79). EC use and oral contraception exerted a protective effect against STIs. EC users had less risk of acquiring an STI, and EC use in our study seemed to have a protective effect against STIs. Our findings suggest that UE may engage in less risky sexual health behaviors than their non-university peers and that there may be a tendency towards overprotection in this setting.

INTRODUCTION

Developed countries have made considerable efforts in recent years to facilitate access to emergency contraception (EC) as a means of reducing unintended pregnancy and abortion [1]. EC is currently used by over 100 million women worldwide and this number is on the rise. In the USA, the percentage of EC users increased from 4% in 2006 to 10% in 2008 [2]. In Spain, 30% of women of childbearing age and 38% of those aged between 25 and 34 years report having used EC at some time in their life [3].

Various studies have shown that EC users are typically single women in their 20s who use condoms as their main method of contraception [4,5]. The most common reasons cited for EC use are a broken condom, unprotected sex, and a missed contraceptive [6,7].

On September 28, 2009, the Spanish government approved over-the-counter access to EC in pharmacies, sparking a debate on whether this would result in higher-risk sexual behavior and, consequently, an increase in sexually transmitted infections (STIs) [8,9]. A number of European and US studies have shown that compared with non-users, EC users have more sexual partners [10,11], start sexual intercourse at an earlier age [2,5], use condoms more frequently [10], and are more inconsistent in their use of condoms and other contraceptive methods [11]. EC use has also been linked to alcohol and other drugs [12].

STI risk has been associated with various sexual behaviors and risk factors, such as inadequate sexual health information, frequent unprotected sex with different partners, use of psychoactive substances, and sexual debut before the age of 16 [9]. STIs also tend to be more common in young, single people living in urban areas. Although adolescents and young adults (15-24 years) comprise 25% of the sexually active population, they account for almost 50% of those who acquire an STI [9].

STIs have become a major public health challenge worldwide, as they place a considerable economic strain on healthcare systems and cause significant morbidity and mortality [13,14].

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There has been an increasing trend in STI diagnosis in Spain since the early 2000s, and with the exception of chlamydia, men are infected more often than women [13]. The most common STIs are chlamydia, genital herpes, human papillomavirus infection, syphilis, HIV infection, candidiasis, scabies, and crab louse (caused by *Pthirus pubis*) [15].

Both healthcare providers and EC users are therefore concerned that easier access to EC might increase risky sexual behaviors and STIs.

The most recent information available on sexuality and sexual health in the general Spanish population is from the 2019 National Sexual Health Survey [16]. Few studies thus far have analyzed the relationship between STIs and EC use in Spain. A better understanding of this relationship is essential for informing effective preventive interventions [17]. The aim of this study was to analyze EC use and STIs in a population of university students in Majorca, Spain. This aim is in line with the 2030 Agenda and its 17 Sustainable Development Goals (SDGs) from the United Nations, approved by the Spanish Government on September 25, 2015. Concretely, with the goals related to decreasing transmissible diseases and integrating sexual health in national strategies and programs [18].

MATERIAL AND METHODS

Design, Population, and Sample

This was a cross-sectional descriptive study in which male and female university students from the University of the Balearic Islands (UIB) in Palma de Mallorca, Spain completed a self-administered questionnaire. Only students who had engaged in vaginal intercourse were included in our analysis. We included both male and female students as, even though EC is used by women, we consider that both men and women should take responsibility for their sexual and reproductive health. The full description of the study methodology is available elsewhere [12].

Data Collection

The study questionnaire was developed *ad hoc* following a review of the literature. It was piloted among 50 nursing students who checked its comprehensibility, rated the adequacy of the different items, and estimated the time required for completion. The questionnaire was then modified before being distributed to the study population, recruited from the largest degree courses at the UIB. The tutors responsible for these courses were contacted to request their collaboration and to schedule the administration of the questionnaire. The self-administered, anonymous and voluntary questionnaire was distributed by a field researcher in the selected classrooms in 2016.

Definition of Variables

The dependent variable was the presence of an STI, assessed by the question "Have you had an STI in the last 12 months"? [19] a proxy for STI diagnosis, we assessed use of sexual healthcare services in the same period, as reported by Habel et al., [2]. This was assessed by the question "Have you received STI counseling, testing, or treatment in the last 12 months?". The students were also asked to specify the type of STI. The main variable was use of EC in the last 12 months ("Have you or your sexual partner

used EC in the last 12 months"?), and frequency of EC use. The independent variables were sociodemographic characteristics (gender, age, marital status, country of birth, place of residence [city of Palma of Majorca vs. elsewhere on the island], cohabitants, parents' level of education and current job situation), and current smoking, alcohol consumption and illegal drug use. We also asked whether they had ever used specific illegal drugs (cannabis, cocaine, ecstasy, ketamine, and heroine); as well as details about their sexual behavior (age at first sexual intercourse, frequency of intercourse, number of lifetime sexual partners, frequency of intercourse without a condom, use of contraception during the last three sexual encounters, and usual type of contraception).

Statistical Analysis

A descriptive analysis was performed for all variables. We calculated percentages for categorical variables and mean and standard deviations for quantitative variables. Bivariate analysis for the presence of an STI in the last 12 months as the dependent variable was also performed. Crude odds ratios (ORs) with 95% confidence intervals (CIs) were calculated. Significant factors in the bivariate analysis and other variables deemed relevant (age, marital status, country of origin, alcohol consumption, use of condom as a contraceptive, age at first sexual intercourse, frequency of sexual intercourse, use of contraceptive in the last three sexual encounters) were included in a multivariate logistic regression model to identify independent predictors for the presence of an STI in the last year with the backward LR method. Variations of the model were compared using maximum likelihood estimation, with elimination of variables that did not have a significant impact on outcome and testing of all interactions. We evaluated goodness of fit of the model with the Hosmer Lemeshow test and the receiver operating characteristic. The collinearity of variables was assessed through calculation of variance inflation factor (VIF) values. Analyses were performed in IBM SPSS (version 23).

Ethical considerations

The study was approved by the Balearic Islands Research Ethics Committee (IB-790/14) and the research committee of the UIB. The study was performed in accordance with the principles of the Declaration of Helsinki. Participation was voluntary and anonymity was maintained at all times. Participation or non-participation did not have any academic or other repercussions for students.

RESULTS

The study questionnaire was completed by 1588 students. Just one of the students approached refused to participate. In total, 1309 students (82.0%) reported having engaged in sexual intercourse at some time in their life, and of these, 58 (4.4%) did not answer the question on the presence of an STI in the last 12 months. We therefore analyzed responses from 1251 students. The sociodemographic characteristics of the group overall and stratified by reported presence/absence of an STI in the last 12 months are shown in Table 1. The median age of the students was 20 (IQR, 17-53 years), and 95% were younger than 32. Sixty-seven percent were women, approximately one-third had a partner, and 76% lived with their parents/guardians. One in ten

Table 1. Student characteristics overall and according to STI diagnosis.

Variable	TOTAL N (%)	STI n (%)	NON-STI n (%)	OR (95% CI)	P*
	N = 1251	N = 51	N = 1200		
Age: median (SD)	20 (5.4)	21.6 (3.8)	22.3 (5.4)	0.97 (0.91-1.03)	.22
Sex Male Female	393 (32.8) 807 (67.3)	7 (1.8) 45 (5.2)	393 (98.2) 989 (94.8)	1 3.06 (1.36-6.85)	<0.01
Marital status In a partnership Single/separated/ divorced/widow	458 (37.5) 802 (62.5)	21 (3.9) 30 (4.6)	437 (96.1) 733 (95.4)	1 0.85 (0.48-1.50)	0.58
Living with Parents/guardian Other	936 (75.7) 301 (24.3)	36 (3.8) 15 (5.0)	900 (96.2) 286 (95.0)	1 1.31 (0.78-2.43)	0.38
Country of birth Spain Other	1134 (90.9) 113 (9.1)	44 (3.8) 7 (6.1)	1090 (96.2) 106 (93.9)	1 1.63 (0.71-3.72)	0.23
Residence Palma Other	547 (44.2) 691 (55.8)	22 (4.0) 29 (4.2)	525 (96.0) 662 (95.8)	1 1.04- (0.59-1.84)	0.87
Mother's level of education No studies/primary Secondary University	211 (17.0) 680 (54.7) 353 (28.4)	8 (3.8) 26 (3.8) 17 (4.8)	203 (96.2) 654 (96.2) 336 (95.2)	1 1.10 (0.43-2.82) 1.32(0.47-3.71)	0.72
Father's level of education No studies/primary Secondary University	259 (20.9) 596 (48.1) 383 (30.9)	11 (4.2) 596 (3.7) 383 (4.7)	248 (95.8) 574 (96.3) 365 (95.3)	1 0.81 (0.34-1.89) 0.97 (0.38-2.44)	0.73

CI, confidence interval; EC, emergency contraception; OR, odds ratio; STI, sexually transmitted infection. *Chi square test

students had been born outside Spain and nearly half was living in Palma de Majorca. In total, 54.7% of mothers and 48.1% of fathers had a high school education.

Fifty-one students (3.9%, 95% CI 2.9-4.4) reported an STI in the last 12 months. Reported STI rates were significantly higher in female students. No differences were observed for the other sociodemographic variables. Over one-fifth of students (n=267, 21.3%) reported having received STI counseling, testing, or treatment in the last 12 months. The most common STIs mentioned in those who reported any STI were chlamydia (13.7%), genital herpes (13.7%) and candidiasis (54.9%).

Table 2 shows the self-reported STI by EC use and sexual/ lifestyle habits. There was no significant difference in reported STI rates between students who had never used EC and those who had used EC once or more. STI rates were significantly higher among students not taking oral contraceptive pills and those who had had their first sexual experience before the age of 16, those who had had 10 or more sexual partners, and those who did not use or only occasionally used condoms during sex. Students who reported an STI in the last 12 months were also more likely to have received STI counseling, testing, or treatment. Having an STI in the previous 12 months was not significantly associated with frequency of sexual intercourse or use of contraception in the last three sexual encounters. Finally, students who reported an STI were more likely to smoke and use illegal drugs, and have used cannabis, cocaine, ecstasy, and ketamine (only four students

declared ever having used heroin). No significant difference was observed for alcohol use.

The results of the multivariate analysis are shown in Table 3. The variables associated with an increased likelihood of having had an STI in the last 12 months were age, female sex, and irregular condom use, number of sexual partners, smoking, and illegal drug use. EC use, oral contraception, and age (to the highest age) all exerted a protective effect against STI.

DISCUSSION

In this study, 3.9% of university students reported having had an STI in the previous 12 months and 21.3% reported receiving STI counseling, testing, or treatment in the same period. EC use was not significantly associated with a higher risk of having an STI. The risk was also insignificant in students who had used EC more than once. STIs were more common among students who had become sexually active before the age of 16, students who had more than 3 sexual partners, students who used condoms inconsistently, and students who used illegal drugs. The use of the oral contraceptive pill, by contrast, was associated with a lower likelihood of STIs. In the adjusted analysis, EC use also exerted a protective effect against STIs.

We have shown that the use of EC on one or more occasions does not increase the likelihood of STIs in university students. Similar results have been reported for women of childbearing age in the United States [2]. This finding is somewhat surprising as EC

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Table 2: EC use and sexual and lifestyle habits and according to self-reported STI.

Variable	TOTAL n (%)	STI n (%)	NON-STI n (%)	OR (95% CI)	P*
	N=1251	N=51	N= 12 00		
Type of contraception					
Condom (yes)	766 (61.2)	35 (4.6)	731 (95.4)	1.40 (0.76-2.56)	0.28
Oral contraception (pill) (yes)	516 (41.2)	11 (2.1)	505 (97.9)	0.37 (0.19-0.74)	0.004
Ever used EC					
No	738 (59.9)	28 (3.8)	710 (96.2)	1	
Yes	495 (40.1)	21 (4.2)	474 (95.8)	1.12 (0.63-2.20)	0.69
Frequency of EC use					
Once	280 (58.0)	9 (3.2)	70 (96.8)	1	
≥ 2 times	203 (42.0)	11 (5.4)	192 (94.6)	1.72 (0.70-4.24)	0.23
Age at first sexual intercourse					
≥16 years	928 (75.1)	31 (3.5)	867 (96.5)	1	
<16 years	307 (24.9)	19 (6.5)	273 (93.5)	1.94 (1.08-3.50)	0.02
Frequency of sexual intercourse					
Sporadic	458 (37.4)	18 (3.9)	440 (96.1)	1	
≥1 per week	765 (62.6)	33 (4.3)	732 (95.7)	1.10 (0.61-1.98)	0.74
No. of sexual partners					
1-2	584 (50.3)	12 (2.1)	572 (97.9)	1	
3-5	330 (28.4)	15 (4.5)	315 (95.5)	2.27 (1.04-4.90)	
6-9	122 (10.5)	9 (7.4)	113 (92.6)	2.79 (1.56-9.22)	0.003
≥10	125 (10.8)	11 (8.8)	114 (91.2)	4.59 (1.98-10.68)	
Frequency of intercourse without a condom					
Never	409 (32.2)	6 (1.5)	390 (98.5)	1	
Always/most of the time/sometimes	833 (67.8)	44 (5.3)	789 (94.7)	3.62 (1.53-8.57)	0.002
Use of contraceptive in last 3 sexual encounters					
Yes (all 3)	813 (67.5)	29 (3.6)	784 (96.4)	1	
Never/not in all 3	419 (32.5)	21 (5.4)	370 (94.6)	1.53 (0.86-2.72)	0.14
Receipt of STI counseling, testing, or treatment in last 12 months?					
No	965 (78.7)	7 (0.7)	958 (99.3)	1	
Yes	261 (21.3)	40 (15.3)	221 (84.7)	24.77 (10.95-56.02)	<0.001
Current smoker					
No	923 (79.2)	18 (7.4)	224 (92.6)	1	
Yes	242 (20.8)	31 (3.3)	892 (96.7)	2.31 (1.27-4.20)	0.005
Alcohol use					
Non-drinker/sporadic	923 (74.6)	35 (3.8)	88 (96.2)	1	
Drinker	315 (25.4)	15 (4.8)	300 (95.2)	1.26 (0.68-2.35)	0.45
Cannabis (ever used)					
No	768 (69.9)	25 (3.3)	743 (96.7)	1	
Yes	330 (30.1)	22 (6.7)	308 (93.3)	2.12 (1.17-3.82)	0.01
Cocaine (ever used)					
No	985 (83.1)	39 (4.0)	946 (96.0)	1	
Yes	66 (16.9)	8 (12.1)	58 (87.9)	3.34 (1.49-7.48)	0.002
Ecstasy (ever used)					
No	984 (94.8)	39 (4.0)	945 (96.0)	1	
Yes	54 (5.2)	8 (14.8)	46 (85.2)	4.21 (1.86-9.53)	<0.001
Ketamine (ever used)					
No	1012 (97.8)	40 (4.0)	972 (96.0)	1	
Yes	23 (2.2)	4 (17.4)	19 (82.6)	5.11 (1.66-15.73)	0.002
Illegal drug (current use)					
No	1020 (83.1)	32 (3.1)	988 (96.9)	1	
Yes	207 (16.9)	18 (8.7)	107 (91.3)	2.94 (1.61-5.34)	<0.001

CI, confidence interval; EC, emergency contraception; OR, odds ratio; STI, sexually transmitted infection
*Chi square test

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use and STIs share similar risk factors, such as age at first sexual intercourse, number of sexual partners, and use of illegal drugs [12,20]. In a randomized clinical trial of the impact of access to EC on unintended pregnancies and STIs published for Raine et al. [1], suggested that it did not seem reasonable to restrict EC access to clinical settings, as users who had received EC from more accessible sources did not have significantly higher STI rates. In line with other authors [2,5,21,22], we did not find significantly higher rates of STIs in EC users who had had multiple sexual partners. EC users in university settings may have more access to sexual and reproductive healthcare information and services and, thus, would be more aware than their non-university peers of the risks of STIs and the importance of using protective measures. In this sense, low educational attainment has been described as an important factor for risky sexual behavior and adverse health sexual health outcomes such as STIs in young women and men [23].

As noted in the description of the results, the mean age of the students was 20 (IQR, 17-53 years) and 95% were under 32 years of age. In the adjusted model, having had an STI in the last 12 months was also related to age (OR=0.87, 95%CI 0.79-0.96). This means that with each additional year of age, there is a lower chance of contracting an STI. We think that this effect could be explained by the fact that age may lead to less sporadic intercourse or to better use of oral contraceptives and condoms on a consistent basis.

Inconsistent condom use has been frequently linked to a greater likelihood of EC use and STI acquisition [24]. Ensuring consistent condom use is key to minimizing STI risk among young people.

We have found a link between STIs and tobacco consumption in accordance with the fact that smoking has been described as a factor associated with more risky sexual behavior [23]. Similarly to Aicken C et al., and Cook RL & Clarck DB [25,26] we found no association between STIs and alcohol use. Other authors, however, have found alcohol to be significantly associated with sexual risk behavior, EC use, and STIs [27]. The lack of association between alcohol use and STIs detected in our study could be due to our methodology, as we distinguished only between "drinkers" and "occasional/non-drinkers". Similar to other studies, however, we did find that the use of illegal drugs was a risk factor for STIs [27], possibly because the consumption of psychoactive substances may lower inhibitions and cloud judgment when it comes to safe sex. The protective effect observed for oral contraception is consistent with reports that women on the pill are more likely to be in a relationship, have used contraception in the last three sexual encounters, and have had fewer sexual partners [12].

Although healthcare service providers and users have expressed concern that facilitating access to EC might encourage irresponsible sex, possibly leading to an increase in STIs, this association has not been demonstrated. Nonetheless, as reported by several authors, the main reason for using EC is to avoid an unintended pregnancy, with users tending to be less concerned about STIs [18,23,27] and unaware that they are at risk of infection [28]. Considering that EC users share certain risk factors with people who acquire STIs, it is necessary to

Table 3: Adjusted logistic regression model showing independent predictors of STI.

Variable	OR	95% CI	P
Age (years)	0.87	0.79-0.96	0.008
Sex Male Female	 1 7.02	 2.52-19.53	 <0.001
Marital Status **In a partnership** **Single/separated/divorced/widow**	 1 1.52	 0.77-3.02	 0.22
EC use No Yes	 1 0.39	 0.19-0.79	 0.01
Oral contraception use No Yes	 1 0.23	 0.10-0.51	 <0.001
Frequency of intercourse without a condom Never Always/most of the time/sometimes	 1 4.60	 1.60-11.60	 0.03
Number of sexual partners 1-2 3-5 6-9 ≥10	 1 2.47 3.98 5.77	 1.04-5.85 1.45-10.89 1.99-16.67	 0.04 0.007 0.001
Current Smoker **No** **Yes**	 1 2.14	 1.03-4.45	 0.04
Illegal drug (current use) No Yes	 1 2.25	 1.05-4.79	 0.03
ROC=0.83. Hosmer and Lemeshow goodness of fit= 0.52. Variance inflation factor (VIF) range between 1.25-1.10			

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promote safe sexual behavior in both populations to reduce those risks. Healthcare services and pharmacies should take steps to systematically provide advice on safe sex (particularly in relation to correct and consistent condom use) when dispensing EC. Large-scale implementations of interventions that have been shown to decrease STI risk [29] are necessary to reverse the increasing trend in STI cases.

Limitations and Strengths

As we used a self-administered questionnaire, there is a risk of social desirability bias. Serological testing may have detected a higher rate than the 3.9% detected. Studies in other countries have reported somewhat different STI rates. A nationwide British study, for example, reported a rate of 5.8% for males aged 16-24 years old and of 10.9% for females in the same age category [23], while in Ireland, a rate of 10% was reported for female university students [30]. In Spain, a study performed with Medicine and Law students found a slightly higher rate of STIs (5.9%) [31]. The STI rate according to the proxy question on receipt of STI counseling, testing, and treatment was 21.3%. Another limitation of our study is that we only looked at university students. Our findings, therefore, cannot be extrapolated to segments of the population with more diverse levels of education. Gender stratification would have enhanced the robustness of our study, but would have required an aggregate analysis; however, the low STI rate detected did not endorse this option. In addition, our STI rate could be underestimated because men tend to be unaware of the potential risk of sexual behavior in relation to STIs. Results from other studies show this possible bias with lower rates of STIs in men when compared to women [23].

Our study also has some strength. To minimize the risk of non-response bias, we piloted the questionnaire among a sample of university students to verify that the questions were clear and would not cause offense. We also guaranteed anonymity throughout the data collection and analysis stages, and we strived to create a climate of trust.

CONCLUSIONS

Users of EC on one or more occasions are no more likely than non-users to acquire an STI. We can therefore confirm that EC use in our population of university students does not significantly increase STI risk.

Female sex, sexual activity at an early age, multiple sexual partners, inconsistent condom use, smoking, and illegal drug use were associated with an increased risk of acquiring an STI.

One unexpected finding was that oral contraception use was associated with a lower risk of STI. In the adjusted analysis, older students are at less risk of STIs. EC use also exerted a protective effect against STIs. Our findings suggest that university students may engage in less risky sexual health behaviors than their non-university peers and that there may be a tendency towards overprotection in this setting.

FUNDING

AVAILABILITY OF DATA AND MATERIAL

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

AUTHORS' CONTRIBUTIONS

ML Bauzà conceived the study. MLB, SM and ME participated in the study design. MLB, AE, JM acquired the data. MLB, ME, and SM participated in the analyses and interpretation of the data. MLB, ME drafted the manuscript. MLB, ME, SM JM, AE made critical revisions of the manuscript for key intellectual content, and all authors read and approved the final manuscript.

ETHICS APPROVAL

The study received approval from the Research Ethics Committee of the Balearic Islands (IB-790/14) and from the research committee of the UIB. The study followed the standards of the Declaration of Helsinki.

CONSENT TO PARTICIPATE

As the questionnaire was anonym and voluntary, no informed consent was requested.

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