

Risky substance use among young adults in the nightlife arena: an
underused setting for risk-reducing interventions?

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Abstract

Aims: Alcohol and illicit substance use among young adults carries the risk of adverse consequences like violence, injuries, risky sexual behaviour and ultimately development of possible addiction. The nightlife arena is a risk-setting for excessive substance use and the aims of this study were to examine prevalence rates and identify high-risk subgroups in this context. **Methods:** Patrons ($n = 1099$, response rate 76%) entering or exiting 12 popular licensed premises in downtown Oslo, Norway, completed an anonymous self-administered questionnaire and their Blood Alcohol Concentration (BAC) levels were measured using a breathalyzer. **Results:** The average BAC levels were similar ($t = 1.67$, $df = 936$, n.s.) and high both for males (1.03‰) and females (0.97‰). A total of 67% reported ever using illicit drugs, 43% reported last year use, 25% last month use, and 14% use during the last 48 hours. High-risk groups included the youngest patrons (16-20 years) where 50% reported illicit drug use in the last year. Males reported more use of illicit drugs than females, whereas females had equally high alcohol consumption frequency and intoxication levels as males. Young age, male gender, frequent alcohol intoxications and age <15 for first alcohol intoxication experience were associated with increased risk of illegal substance use in multivariate analyses. **Conclusions:** The high levels of alcohol and illicit drug use, particularly among patrons younger than 21 years, should be of concern to the community, policymakers and the nightlife industry. The nightlife arena may be an under-utilized setting for implementation of risk-reducing interventions.

Key words: illicit drug use; new psychoactive substances; club drugs; alcohol use; nightlife setting; blood alcohol concentration (BAC); drug prevention; young adults; high-risk groups; high-risk settings

Introduction

Substance use among young adults carries the risk of many adverse short- and long-term consequences. Short-term consequences include factors such as increased risk of aberrant driving, violence, injuries and sexual risk taking (Bellis et al., 2003; Gripenberg-Abdon et al., 2012; Schnitzer et al., 2010). Long-term consequences may be manifested by somatic and psychiatric illnesses; drop out from – or reduced productivity in - educational or employment activities; and ultimately possible development of substance addiction (Degenhardt and Hall, 2012). Thus, an important target for public health interventions is to reduce these risks, as reflected by the many national drug and alcohol strategies implemented over the years (e.g. Miller et al., 2009a).

Risk-reduction strategies comprise an array of interventions including school-based intervention programmes and public campaigns. However, evaluations have suggested that these programmes may have only a limited impact on reducing high-risk use among young students (Babor et al., 2010). Currently, there are also few programmes that focus in particular on young adults known to have elevated risk of substance use. The health authorities are therefore looking for means and settings for further interventions (Foxcroft and Tsertsvadze, 2011).

The identification of high-risk groups is essential for creating targeted interventions. The well-known weaknesses of population surveys (e.g. Groves, 2006) suggest that alternate identification strategies should be considered. One option is to approach *segments* of the population within *settings with increased risk* of hazardous substance use. For example, young adults who are out partying in bars and nightclubs may constitute such a high-risk group in a high-risk setting.

At bars, nightclubs (i.e. licensed premises) and music events, young adults are likely to be influenced by alcohol and also by other drugs (Chinet et al., 2007; Wells et al., 2010).

For instance, among people exiting electronic music dance events (EMDE) in the United States, about 50% of the participants were intoxicated or impaired by alcohol and 25% of the participants tested positive for illicit drugs (Miller et al., 2013). In an EMDE in Sweden, 10% tested positive on oral fluid drug testing for illicit drugs, and 94% tested positive on alcohol with an average BAC level of 1.00‰ (Gripenberg-Abdon et al., 2012). Further, in a Swiss study where EMDE attendees were surveyed about their alcohol and drug use in the previous 30 days, the figures were high: alcohol (87%), cannabis (54%), ecstasy (23%) and cocaine (21%) (Chinet et al., 2007). Sixty-eight percent of gay club patrons in Southern England reported use of illicit drugs in the previous month and 43% had used drugs during the study night (Measham et al., 2011). In another British study, BAC levels were measured during student pub crawls. Here, almost 95% of participants had consumed alcohol and the median BAC of drinkers was 1.00‰ (Quigg et al., 2013).

The aim of this study was to examine substance use and reveal high-risk groups within a high-risk setting. We did this by comparing substance use by gender and age and by testing multivariate associations between a wide-range of demographics and recreational life style characteristics with BAC levels, frequency of alcohol intoxication and illicit substance use. This study is the first to focus on illicit drug use among young adults in the nightlife arena in Norway.

Method

To establish a broad and heterogeneous nightlife sample we obtained a list of all licensed premises in Oslo. With the help of an expert group and a set of inclusion criteria based on factors such as popularity, opening hours, and geographical spread in downtown Oslo, we reduced the list to 12 licensed premises, (see Nordfjærn et al., 2016 for more details). Twenty research assistants were recruited and trained to assist the data collection, which was

conducted 11.00 p.m. to 03.00 a.m. on Friday and Saturday nights. Previous studies in Finland (Warpenius et al., 2010) and England (Measham et al., 2001) used a similar approach.

Procedures

A research station was located outside each of the selected licensed premises. Patrons who entered or exited the licensed premises were asked to fill out a questionnaire and use a breathalyzer. Gender and estimated age of non-respondents were registered. The respondents were informed about the study, voluntary participation and assured anonymity. Free food was used as a response incentive. Respondents who did not understand Norwegian received an English questionnaire (see Nordfjærn et al., 2016 for more details). The study was approved by the Regional Committee for Medical and Health Research Ethics in Oslo, Norway (2014/192).

Among the 1452 approached patrons, 1116 (76%) agreed to participate. A total of 17 questionnaires were excluded from final analysis because they did not contain valid responses, leaving 1099 questionnaires available for analysis.

Measures

Recorded demographics included gender, age, level of education (primary/secondary school; high school occupational; high school academic, university/college; other; do not know), main occupational activity (full time job; part time job; student; unemployed; home maker; on sick leave; other) and region of origin (Norway; rest of Europe; Asia; Africa; America; Australasia). The time of data collection was registered for each respondent.

The frequency of licensed premises visits after 11.00 p.m. was measured by one item (several times a week; once a week; 1-2 times a month; more rarely). Alcohol consumption during the last year was measured by: 'Have you consumed alcohol during the last 12 months

(no, yes). If, yes how frequently' (daily/almost daily; 2-3 times a week; once a week; 2-3 times a month; once a month; more rarely). By using the same response categories, alcohol intoxication frequency during the last year was ascertained. A question on age of first alcohol intoxication experience was also included.

Illicit substance use within various time frames was recorded. The substances included for lifetime/ever used, use during the last year and the last month were: marijuana/hashish, amphetamines or amphetamine-alike substances, ecstasy/MDMA, cocaine, LSD, heroin, GHB, anabolic steroids and new psychoactive substances (e.g. synthetic cannabis, 'legal highs', 'spice', research chemicals etc.). A dummy substance (MOP) was included to examine the validity of self-reporting and to indicate the extent of over-reporting. We recorded any use of these substances using dichotomous (no/yes) items, whereas use during the last year and last month was obtained by asking how frequently the substances had been used (0; 1-4; 5-10; 11-25; 26-50; or more than 50 times). We also recorded information (no, yes) about use during the last 48 hours of marijuana/hashish, amphetamines, cocaine, ecstasy/MDMA and new psychoactive substances. In addition, the questionnaire included an item that measured whether the respondents had ever used substances other than those listed (no, yes). If they responded positively, the respondents were requested to note the names of the specific substance(s).

BAC levels were measured using the Lion AlcolmeterTM 500. The instrument complies with the EN15964 (2011) standard and the maximum error tolerance is about +/-0.04‰ with a measured BAC up to 0.40‰. When a higher value is measured the error tolerance is within 10% of the measured value. . The device displays the BAC level immediately after measurement and participants were informed about their own level upon request.

Statistical procedures

Independent samples t-tests and chi-square (χ^2) tests were conducted to compare participants and non-participants on continuous and categorical demographic variables, respectively. Descriptive statistics described sample characteristics and substance use in the sample. Proportion tests and independent samples t-tests examined differences in substance use by age groups and gender. A multivariate logistic regression analysis was conducted to test characteristics associated with BAC levels ($<1.00\%$; $\geq 1.00\%$) (e.g. Johnsson and Berglund, 2003). Multivariate logistic regression was also used to examine characteristics associated with last year frequency of alcohol intoxication and illicit substance use.

Respondents and non-respondents did not differ significantly by gender ($\chi^2 = 0.07$, n.s). However, those who responded were significantly younger than non-respondents ($M = 26.91$ vs. 28.28 , $t = -3.27$, $p < .001$). Participants were more likely to be recruited after 01.00 a.m., while more people declined to participate before 01.00 a.m. ($\chi^2 = 27.03$, $p < .001$).

Results

The majority of the sample was males (65%) and the average age was 27 years ($SD=6.78$, range=16-64) (Table 1). About 75% of the participants were under 30 years of age. Two-thirds of the sample (67%) reported full time or part time employment as their current main occupational activity, whereas 29% were students and 4% were either unemployed or homemakers. The sample included 63% with an education at the university or college level. About half of the sample (49%) reported going out at licensed premises once a week or more frequently.

Table 1 about here

Alcohol and illicit substance use of the complete sample, and the sample split by age groups is presented in Table 2. Almost everyone (97%) reported last year alcohol consumption. Among users, 71% reported an alcohol intoxication frequency of 2-3 times a month or more frequently. Further, 34% of the sample reported their first alcohol intoxication experience at the age of 14 years or younger. BAC levels and intoxication frequency did not vary significantly across age groups, except for individuals aged 16-20 years, who were more likely to report frequent alcohol intoxication than those above the age of 30 years.

We did not detect any measurable level of alcohol in 11% ($n = 75$) of the males and in 12% ($n = 45$) of the females. When these patrons were excluded, the average BAC was 1.03‰ for males and 0.97‰ for females ($t = 1.67$, $df = 936$, n.s.). A BAC level above 1.00‰ was reported by 42% of the sample, again with no significant gender difference. Similar proportions of males and females reported their first alcohol intoxication at the age of 14 or younger and there were no gender differences in alcohol intoxication frequency.

Two-thirds (67%) of the sample reported having ever used an illicit substance, 43% reported use during the last year, 25% during the last month and 14% during the last 48 hours (Table 2). Young individuals (16-20 years) were more likely to have used drugs during the last year, the last month and during the last 48 hours, than individuals aged 31 years or above. There were statistically significant gender differences in ever use of illicit drugs ($\chi^2 = 10.25$, $p < .001$), with males (70%) reporting more use than their female (60%) counterparts. These differences were consistent for all time periods (not reported in Table 2).

Table 2 about here

Self-reported use of illicit substances is reported in Table 3. Cannabis (marijuana/hashish) was the most frequently used illicit substance across the different time frames (65% reported ever use, 40% during the last year, 22% the last month and 11% the last

48 hours). Cocaine was the second most frequently reported illicit substance across all periods, whereas ecstasy/MDMA consistently ranked third. A relatively large proportion of the sample also reported lifetime (15%) and last year use (6%) of amphetamines as well as lifetime LSD use (9%). Use of new psychoactive substances was reported by 7%, whereas 5% reported use of other substances (e.g. psychoactive mushrooms, mescaline and poppers). Only 0.4% of the sample reported any use of the dummy substance (MOP).

Table 3 about here

The final step was to examine multivariate associations between demographic characteristics and recreational life style factors with BAC levels, frequency of alcohol intoxication in the previous year and finally substance use in the previous year (Table 4). Those who participated after 01.00 a.m. had a higher risk of a high BAC level and more frequent alcohol intoxication. Participants from non-western regions were less likely to have high BAC levels and frequent alcohol intoxication. Experiencing the first alcohol intoxication at 15 years or older was also associated with a low BAC level. Participants in the youngest age group and people who had used illicit drugs the last year had higher risk of frequent alcohol intoxication.

The factors most strongly associated with an increased risk of illicit substance use were young age and an alcohol intoxication of 2-3 times a month or more. Female gender and an age of first alcohol intoxication experience at 15 years or above, were associated with a reduced risk of illicit substance use.

Table 4 about here

Discussion

Our study supports that nightlife participants not only have high levels of alcohol consumption, but also high levels of illicit drug use. Ninety-seven percent reported alcohol

use in the previous year and more than two thirds had on average been intoxicated at least 2-3 times per month. This is much higher than the general Norwegian population and higher than what is found in other European studies (Bye and Østhus, 2011; Rehm et al., 2012). On the night of the study, the average BAC level among the alcohol users was 1.01‰, which is high compared to the EMDE study in the United States (Miller et al., 2013) but in line with the British pub study (Quigg et al., 2013).

The figures for illicit drug use in this study were substantially higher than reported by comparable age groups in Norway (Sandøy, 2015). While Gripenberg-Abdon et al. (2012) reported lower lifetime rates for cannabis (42% vs. 65%) and cocaine (12% vs. 25%) than our study, Measham et al. (2011) reported much higher rates (77% and 73%, respectively). These latter studies have been carried out in specific contexts (i.e. cruise ship and gay clubs) and are therefore not directly comparable. Still, the high substance use rates found across studies are concerning.

One of the most notable findings in our study was the substantial use of illicit substances among adolescents (16-20 years). Every second person in this age group reported to have used an illicit substance during the last year, 31% during the last month and 20% during the last 48 hours. The corresponding figures among individuals above 30 years were 24%, 13% and 9%, respectively. This finding opposes Bellis et al. (2003) who reported that young people were more likely to consume alcohol, but found marginal age differences in rates of illicit substance use. The results are, however, in line with a study that reported increasing tendencies of illicit use among adolescents, while use decreased in older age groups (Van Havere et al., 2009). These findings also align with the maturing out hypothesis where people are hypothesized to consume less drugs as they grow older (Winick, 1962). Given the potential adverse consequences of illicit substance use on neurological and social development at a young age, this high rate of illicit drug use is particularly concerning.

Furthermore, alcohol intoxication frequency was substantially higher among young individuals aged 16-20 years than among those aged 30 years and older, and the measured BAC levels were just as high for this youngest age group as for those 21 years and older. This gives rise to additional concern. One third of respondents reported having been under alcohol intoxication for the first time before the age of 15, an experience that in previous research has been associated with problematic use at a later stage (Ohannessian et al., 2015). The regression analyses in this study revealed that an early debut of alcohol intoxication was associated with an increased risk of recent illicit substance use. These latter associations may, however, be caused by possible third variables, such as an unfavourable childhood environment. This can lead to both early alcohol intoxication and subsequent alcohol and illicit drug use.

Intriguingly, and contrary to several previous studies (e.g. Van Havere et al., 2009; Wells et al., 2010), our data did not reveal any gender differences in alcohol intoxication frequency, neither in the age of first alcohol intoxication, nor in BAC levels. That is, females and males participating in nightlife Oslo were rather similar in their alcohol consumption. This is, however, consistent with Gripenberg-Abdon et al. (2012) who did not find gender differences in risky alcohol consumption. Gender differences in risky alcohol consumption might be declining also elsewhere in Northern Europe (Van Havere et al., 2009). Increased female alcohol consumption in the nightlife setting constitutes a potential public health problem as a dose-response relationship for alcohol consumption and increased risk of subsequent harms is well established (e.g. Taylor et al., 2010).

There were, on the other hand, statistically significant gender differences in use of illicit drugs. The logistic regression revealed that even after accounting for the other independent variables, males were substantially more likely to have used illicit drugs in the

previous year. Further exploration of this gender difference is recommended, in order to improve prevention and intervention efforts.

The study has a few limitations that warrant discussion. We used self-reported data, which increase the risks for over- or under-reporting. However, only 0.4% reported use of the dummy substance (MOP), which suggests that over-reporting was not a substantial issue. Some studies also reported adequate correspondence between self-reports and answers from biological tests among young adults (Basurto et al., 2009; Harrison et al., 2007). Since the study focused on drug use in the nightlife setting overall, and not specifically drug intake inside the premises, we did not register whether the patrons were entering or exiting the licensed premises. On a few occasions the breathalyzers reflected false positive results. We mitigated the potential for inaccurate measurement of alcohol consumption by using BAC level groups with relatively large spans (0-0.50‰; 0.51-1.00‰; >1.01‰).

The study has identified high-risk groups in a high-risk setting, including the *youngest patrons*, who reported concerning levels of both alcohol and illicit drug use, *males* who reported high levels of illicit drug use, and *females* who reported alcohol consumption and intoxication levels equal to those of males. The results suggest that health authorities should consider developing and implementing interventions targeting these groups in the nightlife setting. Previously, more efforts have aimed at reducing alcohol consumption in the nightlife arena, while there has been less focus on illicit substance use. Licensed premises may, however, represent an underutilized context also for illicit drug intervention initiatives. To our knowledge, such interventions have so far only been conducted in Sweden, and there as part of a multi-component intervention program which showed promising results (Gripenberg-Abdon et al., 2011a, Gripenberg-Abdon et al. 2011b). Interventions aimed both the licensed premises and their staff as well as directly at high-risk groups should be considered.

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Table 1. Sample characteristics (*n* = 1099)

	% (n)
Male	65 (707)
Age	
16-20	12 (123)
21-25	41 (432)
26-30	26 (275)
≥31 years	21 (226)
Main occupational activity	
No occupation	4 (40)
Full-time or part-time employment	67 (716)
Student	29 (309)
High education ¹	63 (680)
Western origin of birth	94 (1004)
Visits at licensed premises after 11.00 p.m. ≥once a week	49 (527)
Measured before 01.00 a.m.	50 (516)

¹University/college education

Table 2. Alcohol and illicit substance use by age groups (n = 1099)

	Total	16-20 years (n = 123)	21-25 years (n = 432)	26-30 years (n = 275)	≥ 31 years (n = 226)
<i>Alcohol</i>					
BAC level, <i>M</i> ‰ (<i>SD</i>)	1.01 (0.55)	1.05 (0.54)	0.98 (0.53)	1.02 (0.54)	1.02 (0.61)
BAC level ‰ (n)					
≤0.50‰	23 (198)	22 (22)	24 (77)	21 (46)	26 (47)
0.51‰-1.00‰	30 (259)	27 (27)	31 (97)	34 (75)	28 (51)
≥1.01‰	47 (397)	52 (52)	45 (144)	45 (97)	46 (85)
Age of first alcohol intoxication experience ≤14 years ‰ (n)	34 (331)	30 (36)	32 (125)	39 (100)	34 (61)
Alcohol consumption the last year ≥2-3 times a month ‰ (n)	68 (706)	68 (82)	68 (281)	71 (182)	66 (139)
Alcohol intoxication the last year ≥2-3 times a month ‰ (n)	71 (744)	80 (98)***	76 (320)	73 (190)	52 (111)***
<i>Illicit substances</i>					
Ever used ‰ (n)	67 (731)	64 (79)	68 (295)	71 (195)	60 (135)
Used ≥1 times last year ‰ (n)	43 (467)	50 (62)***	48 (207)	46 (126)	24 (53)***
Used ≥1 times last month ‰ (n)	25 (277)	31 (38)***	29 (126)	25 (68)	13 (30)***
Used last 48 hours [†] ‰ (n)	14 (156)	20 (25)**	14 (60)	16 (43)	9 (20)**

*** p < .001, ** p < .05

BAC level = Mean BAC level solely including individuals with measurable blood alcohol level

[†]Solely recorded for marijuana/hashish, amphetamines, ecstasy/MDMA, cocaine, and new psychoactive substances

Group differences were examined with proportion tests and t-tests

Significant group differences in bold

Comparisons were conducted between those aged 16-20 years and the remaining age groups (columns 2 vs. 3, 2 vs.4, and 2 vs. 5)

Table 3. Self-reported types of substance use (*n* = 1099)

Substance	Ever used % (<i>n</i>)	Used ≥ 1 times last year % (<i>n</i>)	Used ≥ 1 times last month % (<i>n</i>)	Used last 48 hours ¹ % (<i>n</i>)
Marijuana/hashish	65% (714) Male Female 69% (485) 58% (221)	40% (440)	22% (242)	11% (123)
Cocaine	25% (273) Male Female 28% (199) 18% (70)	14% (157)	8% (82)	4% (48)
Ecstasy/MDMA	19% (209) Male Female 22% (152) 14% (54)	11% (117)	5% (49)	1.3% (14)
Amphetamines	15% (164) Male Female 17% (123) 10% (38)	6% (64)	3% (33)	1% (12)
LSD	9% (94) Male Female 10% (72) 5% (19)	4% (42)	2% (19)	-
New psychoactive substances ²	7% (79) Male Female 9% (60) 5% (18)	1% (15)	0.3% (3)	0.1% (1)
Other substances ³	5% (52) Male Female 6% (43) 2% (9)	-	-	-
GHB	4% (48) Male Female 6% (39) 2% (9)	1% (11)	0.5% (5)	-
Anabolic steroids	2% (20) Male Female 3% (18) 0.5% (2)	0.7% (8)	0.4% (4)	-
Heroin	2% (17) Male Female 2% (12) 1% (5)	0.5% (5)	0.3% (3)	-
MOP ⁴	0.4% (4) Male Female 0.4% (3) 0.3% (1)	0.2% (2)	0.4% (4)	-

¹Solely recorded for marijuana/hashish, amphetamines, ecstasy/MDMA, cocaine, and new psychoactive substances

²E.g. synthetic cannabis, 'legal highs', 'spice', 'research chemicals' etc.

³E.g. mushrooms, mescaline, poppers. Solely recorded as having ever used.

⁴Dummy substance.

Table 4. Characteristics associated with BAC levels, frequency of alcohol intoxication and illicit substance use (n = 1099)

	BAC levels (<1.00‰; ≥1.00‰)		Frequency of alcohol intoxication (≤once a month; ≥2-3 times a month)		Illicit use last year (no, yes)	
	AOR (95% CI)	Wald	AOR (95% CI)	Wald	AOR (95% CI)	Wald
Gender (female)	0.95 (0.69; 1.30)	0.12	0.77 (0.55; 1.08)	2.24	0.55 (0.40; 0.76)	13.60****
Age						
16-20	1	-	1	-	1	-
21-25	0.67 (0.41; 1.07)	2.85	0.84 (0.48; 1.49)	0.35	1.13 (0.70; 1.82)	0.26
26-30	0.67 (0.39; 1.15)	2.12	0.62 (0.33; 1.17)	2.21	1.09 (0.63; 1.89)	0.09
≥31	0.91 (0.50; 1.67)	0.09	0.37 (0.19; 0.73)	8.29***	0.51 (0.27; 0.96)	4.39*
Education (high)	0.85 (0.61; 1.19)	0.87	0.82 (0.57; 1.20)	1.04	0.73 (0.52; 1.01)	3.57
Current main occupation						
No occupation	1	-	1	-	1	-
Employment	0.90 (0.42; 1.96)	0.07	1.29 (0.57; 2.92)	0.36	1.04 (0.48; 2.24)	0.01
Student	0.99 (0.44; 2.22)	0.00	1.31 (0.56; 3.11)	0.39	1.37 (0.61; 3.07)	0.60
Region of origin (non-western region)	0.49 (0.25; 0.96)	4.33*	0.44 (0.23; 0.86)	5.79*	0.96 (0.49; 1.88)	0.01
Frequency of licensed premises visits (≥once a week)	1.23 (0.93; 1.64)	2.04	1.16 (0.84; 1.59)	0.81	1.29 (0.96; 1.72)	2.93
Frequency of alcohol intoxication the last year (≥2-3 times a month)	-	-	-	-	1.84 (1.31; 2.59)	12.37****
Age of first alcohol intoxication experience (≥ 15 years)	0.73 (0.54; 0.99)	4.10*	0.72 (0.51; 1.02)	3.36	0.49 (0.36; 0.66)	20.85****
Time of data collection (after 01.00 a.m.)	3.03 (2.26; 4.06)	54.67****	1.55 (1.13; 2.13)	7.28**	1.28 (0.94; 1.73)	2.52
BAC level (≥1.00‰)	-	-	-	-	1.05 (0.78; 1.42)	0.10
Illicit substance use last year (yes)	1.10 (0.81; 1.48)	0.37	1.89 (1.35; 2.65)	13.58****	-	-

**** p < .001, *** p < .005, ** p < .01, * p < .05

AOR = adjusted odds ratio

CI = confidence interval