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Illicit Drug Use and Traumatic Dental Injuries in Adolescents

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Illicit Drug Use and Traumatic Dental Injuries in Adolescents

Objective: To explore the association between illicit drug use and traumatic dental injuries (TDI) among adolescents.

Method: We used data from 618 adolescents who participated in Phases I and III of Research with East Adolescents Community Health Survey (RELACHS), a longitudinal school-based study of adolescents in East London. Illicit drug use was collected when participants were 11-12 and 15-16 years old (Phases I and III respectively). Clinical examinations for TDI were conducted in Phase III only. The association of lifetime prevalence of illicit drug use at ages 11-12 and 15-16 years with TDI was evaluated in crude and adjusted binary logistic regression models.

Results: Overall, 6.3% and 25.4% of adolescents reported having ever used illicit drugs at ages 11-12 (Phase I) and 15-16 years (Phase III), respectively. Also, 8.7% of adolescents were found to have TDI at age 15-16 years. There was no significant association between lifetime prevalence of illicit drug use reported at age 11-12 years (Odds Ratio: 1.07; 95% Confidence Interval: 0.45-2.54) or age 15-16 years (OR: 1.19; 95% CI: 0.74-1.93) and TDI.

Conclusion: This study found no support for an association between illicit drug use and TDI among adolescents from East London.

Keywords: street drugs, tooth injuries, prevalence, adolescent

INTRODUCTION

Illicit drugs are psychoactive substances whose non-medical consumption is banned according to international drug control treaties [1]. The term illicit drug use refers to the abuse of illegal drugs and/or the misuse of prescription medications or household substances [2]. Recent evidence shows illicit drug use is a cause of considerable loss of life and life-long disability [3]. There is higher vulnerability and faster systemic dependency among younger groups, especially during adolescence [2, 4]. Under the influence of illicit drugs, individuals may be at greater risk of facial lesions [4, 5]. This is because, drugs would affect the cognitive judgment, psychomotor skills, reaction time, visual function and concentration and hence making the offender more prone to either intentional or accidental injuries [6]. Compulsive drug-seeking behaviour due to drug dependence would also often lead to self-harm as well as risk-taking behaviours such as involvement in violent, rebellious act and accidents [7].

Very few studies have explored the association between illicit drug use and traumatic dental injuries (TDI). Early hospital-based studies showed that illicit drug use was common among patients visiting emergency/trauma clinics with facial lesions [8, 9]. More recently, two cross-sectional studies in Brazil have reported contradicting findings. The first study, conducted among 891 15-19-year-old schoolchildren from Belo Horizonte, reported no association between ever use of any illicit drugs (marijuana, cocaine, stimulants, sedatives, inhalants, hallucinogens, and opiates), measured with the Alcohol, Smoking and Substance Involvement Screening Test (ASSIST), and TDI in a regression model also including social vulnerability index, school type and adolescents' sex, age, overjet and risk of alcohol use as explanatory variables [10]. The second study, conducted among 701 14-19-year-old schoolchildren in Diamantina, showed no differences in TDI prevalence between never/occasional and abusive users of illicit drugs (determined using ASSIST) either. In further analysis, the authors found that TDI was 1.54 times (95% Confidence Interval: 1.06–2.24) more prevalent in students who

consumed marijuana and/or cocaine at some stage of their lifetime than among those who had never consumed those substances. However, these estimates were only adjusted for participants' age, gender and overjet [11]. The lack of adjustment for socioeconomic status could explain differences between the two studies. What is clear, though, is that further work is needed to shed some light into this area. The aim of this study was to examine the association between illicit drug use and TDI among adolescents from East London.

MATERIALS AND METHODS

Data source

The Research with East London Adolescents Community Health Survey (RELACHS) is a longitudinal school-based study of a representative, ethnically diverse sample of adolescents attending 28 state secondary schools in East London, UK. RELACHS included three cross-sectional surveys of adolescents from year 7 (11-12 years) in 2001 (phase I), year 9 (13-14 years) in 2003 (phase II), and year 11 (15-16 years) in 2005 (phase III). Adolescents were selected using a stratified two-stage cluster sampling in 2001. All 42 eligible schools in the boroughs of Hackney, Tower Hamlets and Newham were initially stratified by borough and school type (comprehensive, voluntary and other). Thirty schools were selected randomly and balanced to ensure representation by single- and mixed-sex. In each of the 28 schools that agreed to participate, two representative mixed ability classes from year 7 were selected [12]. Ethical approval was obtained from the East London and City Local Research Ethics Committee. Written informed consent was sought from each school's head teacher and from each adolescent. Parents were fully informed about the study and given the opportunity to opt out.

This secondary analysis used longitudinal data from RELACHS phases I and III to achieve temporal ordering between exposure and outcome (illicit drug use and TDI, respectively). A

power calculation based on a previous study, where 25% of non-users had TDI and the odds ratio for the association between illict drug use and TDI was 2.25 [11], indicated that a sample of 537 adolescents was the minimum size required to identify a difference in TDI between drug users and non-users, assuming 80% statistical power, 95% confidence level and a non-users/users ratio of 7-to-1.

Variable selection

The outcome measure was TDI from oral clinical examinations conducted in Phase III according to the World Health Organization (WHO) survey protocol [13]. Two trained and calibrated examiners (GS and PE) carried out the oral clinical examinations with participants seated on an adjustable chair. Participants' teeth were not brushed or professionally cleaned prior to examination. Teeth were dried with cotton pellets and examined with plane mouth mirrors under illumination by Daray X100 examination lamps. Diagnosis was based on visual examination only and no radiographs were taken. TDI were recorded according to the classification described by Glendor et al. [14], which contains seven codes (0=no injury, 1=treated dental injury, 2=enamel fracture only, 3=enamel/dentine fracture, 4=pulp injuiry, 5=missing tooth due to trauma and 9=excluded tooth). Both examiners were trained and calibrated before the main survey. Training on the criteria for TDI assessment was carried out through the WHO oral health surveys manual [13] and computer-based practical exercises. At the end of this exercise, Kappa values for intra-examiner reliability were 0.87 and 0.91 for the two examiners, and 0.80 for inter-examiner reliability.

The exposure was illicit drug use measured at phases I and III through validated questions taken from the UK Office for National Statistics (ONS) survey for teenagers [15, 16]. Participants were enquired about consumption of 9 illicit drugs in the UK market, namely Cannabis, Glue/solvent/gas, Ecstasy, Crack, Heroin, Amphetamines, Lysergic acid

diethylamide (LSD), Cocaine and Khat. Slang names for drugs were included in the drugs questions to ensure understanding by all the schoolchildren. A bogus drug (decoppan) was also included to detect false positive response [17]. Only five participants responded that they had used deccopan and they were excluded from these analyses. Due to the low rates of consumption of individual drugs (cannabis=1.5%, glue=4.2%, ecstasy=0.2%, crack=0.5%, heroin=0.3%, amphetamines=0.2%, LSD=0.7%, cocaine=0.8% and Khat=0.3% at ages 11-12 years and cannabis=23%, glue=6.4%, ecstasy=1.1%, crack=0.5%, heroin=0.5%, amphetamines=0.2%, LSD=0.2%, cocaine=1.4% and khat=0.2% at ages 15-16 years), we combined positive responses to all questions to determine lifetime drug use at ages 11-12 and 15-16 years (Phases I and III respectively) [18].

Several demographic, socioeconomic and clinical factors were included in the analysis as potential confounders of the association between illicit drug use and TDI. Ethnicity was self-assigned using an adaptation of the 2001 UK census categories, including 24 ethnic sub-categories grouped into 5 main groups (White, Asian, Black, Mixed and Other). Family socioeconomic position was assessed through parental employment status (both employed, one employed, both unemployed), household crowding (>1.5 persons/room) and family car ownership. In addition, adolescents' eligibility for free school meals was obtained from school records. It has been previously shown that parental employment was the most sensitive socioeconomic measure of the four assessed in this sample [19, 20]. Therefore, only this measure was used during analysis. Clinical factors were overjet and lip coverage assessed during oral clinical examinations. Overjet was recorded as increased if it was greater than 6 mm and lip coverage was recorded as inadequate if the lips were not in contact during rest position [21, 22, 23].

Data analysis

All data analysis was performed using the Statistical Package for Social Studies (SPSS) for Windows version 22 (IBM®, Armonk, New York). We first compared the socio-demographic profile of the study sample (participants who were followed-up) with that of adolescents who were lost follow-up using the Chi-square test. Thereafter, the lifetime prevalence of illicit drug use at ages 11-12 and 15-16 years was compared by sex, age, ethnicity and parental employment using the Chi-square test.

The association of lifetime prevalence of illicit drug use at ages 11-12 and 15-16 years with TDI was assessed in crude, adjusted and mutually adjusted models using binary logistic regression as the outcome was a dichotomous variable. Odds Ratios (OR) were therefore reported as the measure of association. The adjusted model controlled for demographic (sex, age and ethnicity), socioeconomic (parental employment) and clinical factors. The mutually adjusted model controlled for demographic, socioeconomic and clinical characteristics along with the other indicator of lifetime drug use. Sensitivity analysis was performed to evaluate the effect of alternative socioeconomic measures on the results. Results were not affected by the measure of family socioeconomic position included in regression models.

RESULTS

A total of 1382 11-12 years-olds (83% response rate) and 1030 15-16-years-olds (71% response rate) participated in RELACHS phases I and III, respectively. Of the 975 pupils who had an oral examination in phase III, 689 also participated in phase I. Seventy-one participants were excluded from this analysis due to missing values in one or more variables. The characteristics of the study sample are shown in Table 1. The study sample included significantly more females, Asians and adolescents with at least one parent employed than those lost to follow-up. The lifetime prevalence of illicit drug use was 6.3% in Phase I and 25.4% and Phase III (when participants were 11-12 and 15-16 years, respectively). In addition, the prevalence of

TDI at age 15-16 years was 8.7%. A very low number of adolescents had increased overjet or inadequate lip coverage (9 and 3 participants, respectively).

Table 2 presents the lifetime prevalence of illicit drug use at ages 11-12 and 15-16 years, by baseline demographic and socioeconomic characteristics. The only significant difference was found for ethnicity. The prevalence of illicit drug use at age 15-16 years was higher for adolescents of mixed/other ethnicity and White origin, 38.2% and 32.6% respectively, than for Asians (20.3%) and Blacks (23.3%).

Table 3 presents the regression models for the association of lifetime prevalence of illicit drug use as reported at ages 11-12 and 15-16 years with TDI at age 15-16 years. Since there were only 3 participants with inadequate lip coverage, this variable was not included in the regression analysis. The association between lifetime prevalence of illicit drugs use at age 11-12 years and TDI was not statistically significant in crude or adjusted models (adjusted OR: 1.08, 95% Confidence Interval: 0.46-2.57). Similarly, the association between lifetime prevalence of illicit drug use at the age of 15-16 years and TDI was not significant in either crude or adjusted models (adjusted OR: 1.20, 95% CI: 0.74-1.93). These results remained unchanged even after mutual adjustment (Model 3) or in sensitivity analysis using alternative measures of family socioeconomic position. Only gender was associated with TDI, with greater odds of experiencing TDI among male than female adolescents.

DISCUSSION

This study provided no support for the association between illicit drug use during adolescence and TDI experience at age 15-16 years. The finding was robust to the timing for the assessment of illicit drug use (early or late adolescence) and adjustment for participants' sociodemographic characteristics. The findings support the two earlier studies of negative findings for the association between lifetime use of any illicit drugs and TDI [10, 11].

Some explanations for the non-significant findings can be laid down before stating there is no association between illicit drug use and TDI. Some may argue that the study sample could have been relatively small to detect a significant number of illicit drug users, and subsequently, the hypothesised association. However, our study sample was larger than the minimum required sample size (618 versus 537 adolescents). A second explanation is the measurement of illicit drug use. Illicit drug use may have been underestimated because of stigmatisation on people who consume illicit drugs [24]. Such stereotyping involves the association of illicit drug use to evilness, danger, thieving and a life-long labelling that affect several aspects of an individual's life [24, 25]. As such, negative attitudes from society due to drugs consumption and its potential impact on family life influence the way participants answer sensitive questions [26]. RELACHS attempted to minimise this problem by using self-reports rather than face-to-face interviews as the latter are thought to be more intrusive [17]. Adolescents were also reminded that responses were strictly confidential during classroom discussions prior to the survey and through reminders on each page of the survey questionnaire. Although there are more objective methods to assess drug use, they are still unsuitable for use in epidemiological surveys because they are costly and not without limitations [27, 28, 29]. In addition, studies that have compared self-reports with objective measures of drug use have concluded that confidential self-reports in adolescents provide accurate and reliable data [30, 31].

A third explanation relates to the diagnostic criteria used to assess TDI. Glendor's classification is based on visible signs of trauma only [14] as it was specifically designed for epidemiological surveys. Some TDI such as root fractures and injuries to soft tissues and tooth-supporting structures may have not been recorded. This implies that the prevalence of TDI in this population is likely to be underestimated, which in turn could have affected the ability to identify significant associations. Although detection could have been improved with the use of radiographs, pulp vitality tests or trans-illumination, such diagnostic aids are rarely available

in epidemiological surveys. That said, the prevalence of TDI in our sample was higher than the 10% found among 15-year-olds in the 2013 Children's Dental Health Survey [32].

It is also possible that illicit drug use and TDI are not truly associated with each other. The estimates for the association in these adolescents was rather weak (odds ratio of 1.08 for lifetime drug use at age 11-12 years and 1.20 for lifetime drug use at age 15-16 years), suggesting that even if significant findings were found using larger samples, they may not be clinically meaningful compared to the effect of well-known risk factors for TDI. Our odds ratios were within those reported in the two previous cross-sectional studies where the same criteria for TDI assessment were used [10, 11]. That said, our estimates might be closer to reality given the adjustments for family socioeconomic position that were not included in the two previous studies [10, 11].

Some limitations of this study need to be considered. The first limitation relates to the impact of attrition (only 45% of participants at baseline were followed-up). We found differences in the sociodemographic profile between the study sample and those lost to follow-up. Thus, the present findings represent valid relationships between the variables of interest but cannot be inferred to the study population. A second limitation relates to the lack of baseline assessment for TDI, needed to estimate incidence over the four years studied. Without baseline assessment, it was not possible to identify cases of TDI which existed prior to the assessment of baseline drug use. However, we used lifetime drug use at two timepoints to ensure TDI occurred at least at the same time (concurrently) as the exposure. Even without data on TDI incidence, this study is an improvement compared to previous cross-sectional studies.

The present findings have some implications. Even though illicit drug use is a known risk factor for various injuries, morbidities and even mortality [7], there is not yet enough evidence to back up the claim that TDI are among the list of injuries experienced by drug users. From that standpoint, further studies using stronger research designs are greatly needed. New longitudinal

studies with multiple assessments to address the dynamic nature of drug consumption and estimate incidence of TDI would be extremely valuable. Such studies will provide a better understanding of the putative role of illicit drug use on TDI and support the development of public policies to mitigate any detrimental effects.

In conclusion, this study provides no support for an association between illicit drug use and TDI among adolescents in East London. Illicit drug use either during early or late adolescence was not associated with TDI.

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CONFLICTS OF INTEREST

The authors declare no conflicts of interest in relation to this work.

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Table 1. Characteristics of the study sample and comparison against the full sample of participants at baseline

Explanatory variables	Full Sample (n= 1382)		Study sample (n= 618)	
	n	%	n	%
Sex				
Male	691	50.0%	281	45.5%
Female	691	50.0%	337	54.5%
Age				
11-12 years	441	31.9%	200	32.4%
15-16 years	931	67.4%	418	67.6%
Ethnicity				
White	386	27.9%	141	22.8%
Asians	542	39.2%	286	46.3%
Black	297	21.5%	136	22.0%
Mixed/Others	127	9.2%	55	8.9%
Parental employment				
Both unemployed	465	33.6%	202	32.7%
At least one employed	847	61.3%	416	67.3%
Incisors overjet				
Up to 6mm	676	48.9%	609	98.5%
More than 6mm	11	0.8%	9	1.5%
Lip coverage				
Adequate	684	49.5%	615	99.5%
Inadequate	3	0.2%	3	0.5%
Ever used drugs at age 11-12 years				
No	1252	90.6%	579	93.7%
Yes	83	6.0%	39	6.3%
Ever used drug at age 15-16 years				
No	566	41.0%	461	74.6%
Yes	192	13.9%	157	25.4%

Table 2. Lifetime prevalence of illicit drug use at age 11-12 and 15-16 years by sociodemographic and clinical characteristics (n=618)

Explanatory variables	Ever used illicit drugs at age 11-12 years			Ever used illicit drugs at age 15-16 years		
	n	%	p value[a]	n	%	p value[a]
Sex			0.451			0.909
Male	20	7.1%		72	25.6%	
Female	19	5.6%		85	25.2%	
Age			0.102			0.342
11 years	8	4.0%		46	23.0%	
12 years	31	7.4%		111	26.6%	
Ethnicity			0.756			0.005
White	11	7.8%		46	32.6%	
Asians	15	5.2%		58	20.3%	
Black	9	6.6%		32	23.3%	
Mixed/Other	4	7.3%		34	38.2%	
Parental employment			0.929			0.101
Both unemployment	13	6.4%		43	21.3%	
At least one employed	26	6.3%		114	27.4%	

[a] Chi-square test was used for comparison

Table 3. Models for the association between lifetime prevalence of illicit drug use and traumatic dental injuries (n=618)

Explanatory variables	TDI		Model 1	Model 2A	Model 2B	Model 3
	n	%	OR [95% CI]	OR [95% CI]	OR [95% CI]	OR [95% CI]
Ever used illicit drugs at age 11-12 years						
No	98	16.9	1.00 [Reference]	1.00 [Reference]		1.00 [Reference]
Yes	7	17.0	1.07 [0.46-2.50]	1.08 [0.46-2.57]		1.07 [0.45-2.54]
Ever used illicit drugs at age 15-16 years						
No	75	16.3	1.00 [Reference]		1.00 [Reference]	1.00 [Reference]
Yes	30	19.1	1.22 [0.76-1.94]		1.20 [0.74- 1.93]	1.19 [0.74-1.93]
Sex						
Male	59	21.0	1.00 [Reference]	1.00 [Reference]	1.00 [Reference]	1.00 [Reference]
Female	46	13.7	0.60 [0.39-0.91]*	0.58 [0.38-0.89]*	0.58 [0.38-0.89]*	0.58 [0.38-0.89]*
Age						
11 years	34	17.0	1.00 [Reference]	1.00 [Reference]	1.00 [Reference]	1.00 [Reference]
12 years	71	16.9	1.00 [0.64-1.56]	0.97 [0.62-1.54]	0.97 [0.62-1.53]	0.97 [0.61-1.53]
Ethnicity						
White	25	17.7	1.00 [Reference]	1.00 [Reference]	1.00 [Reference]	1.00 [Reference]
Asian	47	16.4	0.91 [0.54-1.56]	0.84 [0.49-1.45]	0.85 [0.49-1.48]	0.86 [0.49-1.49]
Black	21	15.4	0.85 [0.45-1.60]	0.85 [0.45-1.61]	0.86 [0.45-1.64]	0.86 [0.45-1.64]
Mixed/Other	12	21.8	1.30 [0.60- 2.80]	1.29 [0.59-2.81]	1.27 [0.58-2.77]	1.27 [0.58-2.78]
Parent employment						
Both unemployed	39	19.3	1.00 [Reference]	1.00 [Reference]	1.00 [Reference]	1.00 [Reference]
One/both employed	66	15.9	0.79 [0.51-1.22]	0.74 [0.47-1.16]	0.73 [0.47-1.15]	0.73 [0.47-1.15]
Overjet						
Up to 6mm	104	17.1	1.00 [Reference]	1.00 [Reference]	1.00 [Reference]	1.00 [Reference]
More than 6mm	1	11.1	0.61 [0.08-4.91]	0.48 [0.06-4.11]	0.50 [0.06-4.20]	0.49 [0.06-4.19]

Logistic regression was fitted and odds ratios (OR) reported. Model 1 was unadjusted; Model 2 was adjusted for sex, age, ethnicity, parental employment and overjet; and Model 3 was also adjusted for the other indicator of lifetime prevalence of illicit drug use.
*p <0.05