What's being used to spike your drink? Alleged spiked drink cases in inner city London

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Objectives: To determine the incidence and character of drink spiking in an urban population of patients within the UK presenting to an emergency department concerned they had consumed a deliberately contaminated drink.

Study design: Prospective case series determining the presence and quantity of sedative and illicit drugs, and ethanol in biological samples (blood and urine) obtained from consenting patients >18 years of age presenting to a large inner city London emergency department alleging they had consumed a spiked drink within the previous 12 h.

Results: Biological samples were obtained from 67 (blood) and 75 (urine) of 78 study participants. 82% of participants were female, mean age 24 years. Mean time from alleged exposure to biological sampling was 5.9 h (range 1–12 h). Ethanol was detected in 89.7% of participants. Mean serum ethanol concentration was 1.65 g/l (range 0.04–3.1 g/l); 60% of participants had a serum ethanol concentration associated with significant intoxication (>1.5 g/l). Illicit drugs were detected in 12 (15%) participants; 7 denied intentional exposure (3 methylenedioxymethamphetamine, 3 cannabis, 1 γ -hydroxybutyrate). Medicinal drugs were detected in 13 participants; only 1 exposure was unexplained (benzodiazepine). Overall illicit or medicinal drugs of unexplained origin were detected in 8 (10%) participants. Unexplained sedative drug exposure was detected in only 2 (3%) participants.

Conclusions: Use of sedative drugs to spike drinks may not be as common as reported in the mainstream media. A large number of study participants had serum ethanol concentrations associated with significant intoxication; the source (personal over-consumption or deliberate drink spiking) is unclear.

Reports in the UK mainstream media have made “drink spiking” a hot topic of discussion among the general public, particularly among younger people who enjoy Britain's pub and club culture.^{1–4} Media coverage has generated widespread concern that “drink spiking”, more accurately defined as “the unsolicited addition of a drug to a drink consumed in a social setting” is relatively common.

Drink spiking has been associated with “date rape” or drug facilitated sexual assault (DFSA).^{5–7} Alleged cases of DFSA are not uncommon in the UK; the Forensic Science Service analyses over 500 samples annually from alleged cases presenting to police forces in the southern half of England and Wales, an area potentially covering half of the total UK population.⁷ Numerous medical case reports and media articles have associated sedative drugs including flunitrazepam (Rohypnol), ketamine and γ -hydroxybutyrate (GHB) with DFSA.^{8–11} Studies in the UK, USA and Australia examining the incidence and character of drugs involved in alleged cases of DFSA have found alcohol to be the most common substance associated with DFSA, while sedative drugs are detected in <5% of cases.^{5–7 12 13}

Despite the apparent public and media perception that drink spiking using sedative drugs is a common occurrence, only one study in the UK has determined the prevalence of sedative or illicit drugs within a cohort of individuals who claim their drink has been spiked, and this was undertaken in a relatively small mixed rural/urban population area.¹⁴ We decided to study a population of patients within a metropolitan area of a large city in an attempt to quantify the true prevalence of drink spiking in individuals who seek medical care after consuming an alcoholic drink, but who believe they have also been exposed to an additional unsolicited substance. Quantifying the prevalence of drink spiking and identifying the drugs involved may help

guide clinicians in the investigation and management of similar presentations, and may have implications for public health and law enforcement agencies in terms of education and prevention. We carried out toxicological analyses on biological samples obtained from patients presenting to a large inner city London emergency department (ED), concerned they had consumed a spiked drink.

METHODS

Patients older than 18 years who presented to a large inner city London ED (140 000 attendances per annum) alleging that their drink had been spiked during the previous 12 h were considered eligible for the study. Approval was obtained from the Hospital Ethics Committee. Patients were recruited between December 2004 and October 2005.

All patients provided written informed consent (obtained by ED clinicians) before participating in the study. Study participants provided details of alcohol and recreational drugs they had knowingly ingested during the previous 12 h, including times and place (club, pub, or private residence) of ingestion. This information was obtained through a questionnaire administered by the ED clinician caring for the patient. Medicinal pharmaceutical use in the previous 24 h was recorded.

Participants were asked to provide 10–20 ml of urine and a 5 ml sample of blood. Samples were numerically coded to ensure patient information and results were only available to study investigators.

Abbreviations: DFSA, drug facilitated sexual assault; ED, emergency department; GHB, γ -hydroxybutyrate; MDMA, methylenedioxymethamphetamine

Table 1 Detection methods and limits of detection for illicit and potentially sedating drugs screened for in urine and blood of study participants

Drug	Detection method	Limit of detection in urine	Maximum detection time* in urine (h)	Limit of detection in blood	Maximum detection time* in blood (h)
Amphetamines	Immunoassay/gas chromatography	500 µg/l	24–72	20 µg/l	24–36
Barbiturates	Immunoassay/gas chromatography	300 µg/l	24–72	500 µg/l	48
Benzodiazepines (including flunitrazepam)	Immunoassay	300 µg/l	At least 24	20 µg/l (10 µg/l)	24 (6)
Cannabis	Immunoassay	50 µg/l	At least 120	N/A	
Cocaine	Immunoassay/gas chromatography	300 µg/l	48–96	20 µg/l	10
Ethanol	Gas chromatography	20 µg/l	Up to 24	20 µg/l	8
GHB	Gas chromatography	10 mg/l	12	10 mg/l	6
Ketamine	Gas chromatography	200 µg/l	24	20 µg/l	24
MDMA	Immunoassay/gas chromatography	300 µg/l	24–72	20 µg/l	24
Opiates	Immunoassay	300 µg/l	24–48	Codeine/ dihydrocodeine 20 µg/l	10
				Morphine 2.5 µg/l	12
Methadone metabolite (EDDP) only in urine. Methadone and EDDP in blood	Immunoassay/gas chromatography	100 µg/l	At least 72	20 µg/l for both	At least 72

EDDP, 2-ethylidene-1, 5-dimethyl-3, 3-diphenylpyrrolidine; GHB, γ -hydroxybutyrate; MDMA, methylenedioxymethamphetamine.

*Estimated time following standard therapeutic or typical recreational dose.

Patients who were unconscious or too intoxicated to provide informed consent, but who were accompanied by a friend or relative who expressed concern about possible drink spiking, were not enrolled in the study during initial clinical assessment. However, once clinically well enough to provide informed consent, patients were approached to participate in the study if they expressed concern they may have consumed a spiked drink. In these cases any suitable biological sample (blood or urine) taken as part of routine clinical patient management before study consent was obtained was used for analysis. If no biological samples had been taken, they were obtained after consent. Biological samples were not taken solely for study purposes in any patient who had not provided written informed consent.

Patients presenting to this hospital ED with an allegation of sexual assault are referred to a dedicated clinical and forensic service at the time of presentation. Therefore this case series did not include patients with alleged DFSA.

Biological samples were stored in a locked refrigerator and analysed within 48 h of collection. A toxicological screen using immunoassay, capillary gas chromatography and gas chromatography/mass spectrometry was undertaken on blood and urine samples and included cocaine, methylenedioxymethamphetamine (MDMA or ecstasy), cannabis, benzodiazepines, amphetamines, ketamine, barbiturates, opiates, opioids, GHB, and ethanol. Detection method and limits of detection (concentration and time interval) for these drugs are summarised in table 1. The toxicological screen was able to detect the benzodiazepine alprazolam and the hypno-sedatives zolpidem, zopiclone and zaleplon. Nimetazepam is a potent benzodiazepine, which would not be formally identified by this analytical toxicology screen; however, nimetazepam is not commercially available in the UK and its use as an agent to spike drinks in the UK has not been reported. The toxicological screen also detected classes of drugs with sedating properties including anticholinergics, anticonvulsants, antidepressants, antihistamines, atypical and typical antipsychotics, and hypnotics/sedatives.

Amphetamines, cocaine, cannabis, GHB, heroin, MDMA and ketamine were classified as illicit drugs for the purpose of this study, consistent with current legal classification. Although a number of these drugs (amphetamines, heroin, ketamine and cannabis) are used therapeutically as medicinal drugs in the UK, the term illicit as used in this article is a descriptive term

rather than relating to the manner of the patient's exposure to the drug (illicit use or medicinal use). The ED clinician asked all patients about their use of medicinal drugs in the previous 24 h. In all cases where an illicit drug (as classified above) was detected in this study there was no history of medicinal use given by the patient.

Participants and their general practitioners were posted written results of final analyses. Participants were given contact details of study investigators in case they had any questions regarding results.

RESULTS

A total of 82 patients were recruited for the study. Insufficient information was collected for two patients and analysis results were excluded for two patients who presented more than 12 h after alleged drink spiking. At least one biological sample of either blood (67 participants) or urine (75 participants) was available for analysis for each of the final 78 study participants.

Eighty-two per cent (64) of study participants were female. Mean age of study participants was 24 years (range 19–52 years) and the median was 22 years. Mean time between earliest estimated spiked drink exposure and obtaining a biological sample was 5.9 h (range 1–12 h). Peak time of presentation was between 02:00 and 03:00. Peak time of the week was Friday and Saturday evenings, with 67% of cases presenting between 18:00 on Friday and 12:00 on Sunday. Fifty per cent of exposures were reported to have occurred in a club, 32% in a bar, 8% in a private residence, and in 10% of cases the precise place of exposure was unknown.

All patients complained of feeling "unwell" at presentation. Commonly reported symptoms included nausea, vomiting, ataxia, dizziness, slurred or slow speech, blurred vision and headache. All study participants recovered fully and were discharged home from the ED after supportive treatment and a period of observation.

Table 2 provides a summary of analytical results of serum and urine samples from all study participants. All patients reported a history of ethanol ingestion during the 12 h period before biological sampling. Overall, ethanol was detected in the blood or urine of 70 (89.7%) of study participants. Average serum ethanol concentration (67 samples, 86% of participants) was 1.65 g/l (range 0.04–3.1 g/l). Serum ethanol was greater than 1.5 g/l (a concentration usually associated with significant intoxication) in 47 (60%) of study participants. Seventy-four

Table 2 Summary of combined analytical urine and serum results of study participants

	Number of participants (%)
Total participants	78 (100)
Participants who tested positive for:	
Any substance	76 (97)
Ethanol or illicit drug	75 (96)
Ethanol	70 (90)
Ethanol only	51 (65)
Positive detection of illicit drug with no history of use	7 (9)
– MDMA 3	
– cannabinoids 3	
– GHB 1	
Illicit drug only	5 (6)
Medicinal drugs (tested positive/source*)	13 (17)
– benzodiazepine (2/1ED, 1 UNK)	
– citalopram (1/TSA)	
– cyclizine (3/ED)	
– metoclopramide (10/ED)	
– venlafaxine (2/TSA)	
Medicinal drugs only	1 (1)
Medicinal drug with no history of use or administration	1 (1)
Sedative illicit or medicinal drug with no history of use or administration	2 (3)
No substance detected	2 (3)

*ED, emergency department administration; GHB, γ -hydroxybutyrate; MDMA, methylenedioxymethamphetamine; UNK, unknown source; TSA, therapeutic self administration.

per cent of study participants had a serum ethanol concentration greater than the UK legal driving limit (0.8 g/l).

Illicit drugs were detected in biological samples of 12 (15%) participants (table 2). No participant tested positive for more than one illicit drug. In five cases the illicit drug was the only substance detected. Seven study participants tested positive for an illicit drug, but denied a history of self ingestion or administration (table 2).

Medicinal drugs were detected in biological samples from 13 (17%) participants (table 2), only one of which originated from an unexplained source—benzodiazepine metabolites detected by immunoassay in the urine of one participant who denied any drug use (see below and table 3). Drugs administered therapeutically in the ED were detected in 12 participants.

Overall, illicit or medicinal drugs of unexplained origin were detected in 8 of 78 (10%) study participants; these cases are

summarised in table 3. Two of these cases (3% of study participants) involved drugs with sedative properties (GHB and a benzodiazepine).

GHB was detected in significant quantities in urine and blood of one male study participant who was in a club with friends and started behaving bizarrely after ingesting what he thought was an alcoholic drink. He subsequently became drowsy, but recovered after a period of observation in the ED. No ethanol or other drug was detected.

A 34-year-old woman who was drinking alcohol in a pub with friends attended the ED after feeling dizzy and unwell. Examination revealed ataxia and slurred speech. Urine gave an unexplained immunoassay result—positive for benzodiazepine metabolites; however, no significant parent drug or metabolite was detected in blood. Serum ethanol concentration was significantly elevated at 1.4 g/l (urine ethanol concentration 2.6 g/l). It is possible that this is a false positive result. We were unable to identify the urine benzodiazepine metabolite. It is also possible that this result represents a late presentation after benzodiazepine use during the days before alleged exposure to a spiked drink.

DISCUSSION

Illicit or medicinal drugs of unexplained origin were detected in a relatively low (10%) number of cases in this population of patients who were concerned they may have consumed a spiked drink. Unexplained drug exposure was detected through toxicological analysis of urine in all eight unexplained cases. Urine was not obtained from three study participants, a fact which may have underestimated total unexplained exposures.

Biological samples were obtained within 12 h of alleged exposure in all cases, a period enabling positive detection of the illicit drugs and commonly available sedative drugs associated with drink spiking that were screened for in this study (table 1). It is possible, however, that some study participants provided incorrect or inaccurate information regarding exposure time because of confusion caused by drug or ethanol intoxication, or in an attempt to ensure they were enrolled in the study and therefore able to undergo “toxicological analysis” (a service not routinely offered to patients). It is also possible that the toxicological screen did not detect a sedative drug such as nimetazepam, which potentially may have been used to spike a drink.

There were no patients who declined to be entered into the study, which is probably because this population of patients

Table 3 Summary of possible spiked drink cases (participants who tested positive for a drug, but denied self-administration)

Drug and concentration	Other substances and concentrations	Age	Sex	Place of alleged exposure	Greatest estimated time between alleged exposure and sampling (h)
MDMA: urine +ve	Ethanol: urine 1.6 g/l, serum 1.2 g/l	20	F	Club	5
MDMA: urine +ve, serum 0.14 mg/l	Nil	21	F	Club	3.5
MDMA: urine +ve, serum 0.10 mg/l	Nil	20	M	Club	3.5
Cannabis: urine +ve	Ethanol: urine 1.96 g/l, serum 1.7 g/l	20	M	Club	11.5
Cannabis: urine +ve	Ethanol: urine 2.5 g/l, serum 2.0 g/l	23	F	Pub	5.5
Cannabis: urine +ve	Ethanol: urine 2.1 g/l, serum 0.04 g/l	Unknown	F	Pub	9
Benzodiazepine metabolite: urine +ve	Ethanol: urine 2.6 g/l, serum 1.4 g/l	34	F	Pub	5
GHB: urine 975 mg/l (usually 0–10 mg/l), serum 132 mg/l (usually <4 mg/l)	Nil	Unknown	M	Club	7

F, female; GHB, γ -hydroxybutyrate; M, male; MDMA, methylenedioxymethamphetamine.

were those who alleged they had been exposed to a spiked drink and were therefore anxious to have their suspicions confirmed or denied. The number and characteristics of those patients who were not approached by ED clinicians for enrolment into the study because of time constraints or other reasons are unknown and therefore a potential source of bias.

Inaccurate or untruthful patient history regarding drug exposure is a potential source of reporting bias in this study. In addition the study population is not representative of the true population, as not all patients who are exposed to a spiked drink necessarily present to an ED.

Cannabis was detected in the urine of three study participants who denied self administration in the 24 h before ED presentation. In the case of cannabis it is also possible that intentional or non-intentional exposure occurred through ingestion of cannabis that had been placed within food. Cannabis can be detected in the urine for up to 2–5 days after exposure and the study protocol did not ask about personal use during this time frame. It is possible cannabis detection in these cases was secondary to self administration >24 h before ED presentation.

MDMA was detected in biological samples of three study participants (two with positive urine and blood, one positive urine) who denied self administration. Although MDMA does not produce sedation in typical recreational doses and is therefore not commonly associated with drink spiking, its ability to cause disinhibition and potentially facilitate sexual contact may explain a perpetrator's use of this drug.¹⁵

Unexplained detection of sedative drugs commonly associated with drink spiking only occurred in two cases (3% of study participants) in this study; this is consistent with studies in the UK and USA examining drink spiking in alleged DFSA cases, where evidence of deliberate drink spiking with sedative drugs has been found in <5% of cases.^{5–7 12 13} A similar study in Wales found that no cases from a population of 42 individuals presenting to an ED after alleged exposure to a spiked drink tested positive for GHB or a benzodiazepine.¹⁴ Amphetamine and opioid metabolites were detected in 19% of cases. Ethanol was detected at a concentration of >160 g/l in 65% of study participants, a similar finding to our study.¹⁴

Ethanol was detected in the serum of 89.7% of study participants reflecting the positive history of known ingestion provided by all participants. However, 60% of all study participants had a serum ethanol concentration associated with significant intoxication (>1.5 g/l) and the mean serum ethanol concentration was 1.65 g/l. It is perhaps unsurprising that the most common symptoms reported at the time of presentation in this population of patients were consistent with ethanol intoxication (nausea, vomiting, drowsiness, slurred speech, ataxia).

The significant number of study participants presenting with a serum ethanol concentration consistent with significant intoxication may be due to a number of factors. It is possible that study participants did in fact have their drink spiked, but with ethanol rather than a sedative or illicit drug as commonly advertised in the media. Ethanol will of course impair an individual's judgment and ability to provide informed consent, and therefore is potentially as dangerous as a sedative or illicit drug when used in the setting of attempted sexual assault.

In a series of 3033 alleged DFSAs, urinalysis from each individual found alcohol to be by far the most common drug involved and the sole drug detected in 44% of cases.¹² The Forensic Science Service in London found that in 60% of samples taken from 391 cases of alleged DFSAs, ethanol was present in excess of 1.5 g/l.¹⁶

It is also possible that the high serum ethanol concentrations found in this study population reflect a current climate of

What is known about this topic?

- One previous study examining the prevalence of drink spiking in a mixed rural/urban area of Wales found that most individuals presenting to an ED alleging their drink was spiked tested negative for illicit drugs, including sedatives such as benzodiazepines and GHB.
- This study found that ethanol was detected at high concentrations in a majority of study participants.

excess alcohol use among young people and that a proportion of study participants presented to the ED as a consequence of simply becoming unwell after over consumption. Numerous studies have raised concern at the recent increase in consumption of ethanol, particularly by young women, in Britain.^{17 18}

Whether the source of this excess ethanol observed in this case series is through drink spiking or personal over consumption is unclear and deserves further study. The public should be aware assailants could use alcohol rather than drugs to achieve their aims. Continued education of young adults in the responsible use and safe consumption of alcohol is important.

The results of this study do not support the routine use of toxicological screening for patients who present at ED alleging they have been exposed to a spiked drink. Biological samples for non-urgent toxicological screening should be collected for medico-legal purposes in cases where there is associated alleged assault.

Conclusions

The use of sedative drugs to spike drinks may not be as common as portrayed in the mainstream media. Sedative drugs commonly associated with drink spiking were detected in only a small minority of study participants. A similar number of cases detected involving the stimulant drug MDMA serves as a reminder that the disinhibiting effects of MDMA and similar drugs may also impair personal judgment and lead to unlawful assault. Routine toxicological screening of ED patients with alleged exposure to a spiked drink is not supported by the results from this study, but should be undertaken in selected cases for medico-legal purposes.

Learning points

- Illicit or medicinal drugs were detected in a minority of individuals presenting to an inner city London ED concerned they had consumed a spiked drink, and sedative drugs were detected in only 3% of cases.
- Common presenting complaints included nausea, vomiting, ataxia, dizziness, and slurred speech.
- Serum ethanol concentrations were high in this population; 60% of study participants had a serum ethanol concentration associated with significant intoxication (>1.5 g/l), and the mean serum ethanol concentration was 1.65 g/l.
- The use of sedative drugs to spike drinks may not be as common as portrayed in the mainstream media. The source of excess ethanol is not clear, but may be due to personal over consumption or the use of ethanol to spike drinks.

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