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GHB-involved crimes among intoxicated patients

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ABSTRACT

Introduction: In recent years, the involvement of GHB in drug facilitated sexual assaults has been one of the most frequently studied aspects of GHB in both clinical and non-clinical settings. GHB-involved acquisitory crimes, however, can be mentioned as understudied research topics, as well as the poisoning severity properties of GHB.
Measures: The medical reports of Péterfy Sándor Street Hospital Clinic and Casualty Centre's 408 GHB-intoxication cases (352 patients) were reviewed and registered. Analyzed data consisted of epicrisis, serum and urine concentration of various substances (including GHB), scores of Glasgow Coma Scale and Poisoning Severity Score.
Results: Majority of the patients were males, in their twenties. GHB was detected in 34.1% and it was solely consumed in 27.7% of all the cases. Ethanol was found to be the most frequently co-ingested substance. A higher rate of severe poisonings was observed among males. We found significant difference in the frequency of enduring sexual assaults and acquisitory crimes between intentional and unintentional GHB intake cases. Among unintentional GHB intake cases, 6.5% endured GHB-involved sexual assaults, whereas 21.7% endured an acquisitory crime. Among recurrent GHB intoxication cases generated by the same patients, voluntary and sole GHB consumptions were more frequently observed, however, enduring any crime was less characteristic.
Discussion: Our results regarding demographic and substance use characteristics and the frequency of GHB-facilitated sexual assaults are in line with former findings. Enduring acquisitory crimes due to unintentional GHB intake was found to be more inherent than enduring sexual assaults. Authors emphasise that the victims of these acquisitory crimes were typically males.
Conclusion: GHB's role in drug facilitated acquisitory crimes seems to be significant, although the decrease in GHB's popularity is observed among intoxicated patients as well. The need for further research on GHB's impact on cognitive impairment and on sexual correlates of intentional GHB use is addressed by the authors.

1. Introduction

GHB (gamma-hydroxybutyrate) was first synthesized by Laborit et al. in 1960 [1], however, it is also a naturally occuring compound of mammalian central nervous system and peripheral tissue [2,3]. The recreational use and abuse of this substance began in the 1990's [4], resulting in increasing numbers of intoxicated patients who needed urgent toxicological care. Dose-dependent effects of GHB can mainly be explained by its affinity for two receptors in the brain. At low doses, GHB might bind to the GHB-specific receptor [5] and by doing so, it inhibits presynaptic dopamine release and evokes stimulant-like effects [6]. At higher doses, GHB stimulates $GABA_B$ receptor resulting in an increase in dopamine levels and inducing depressant effects [7]. High oral doses of GHB (typically greater than 60 mg/kg) can result in coma, which usually last up to 4 h [8]. Further and most typical clinical symptoms of GHB-intoxicated patients consist of CNS and respiratory depression, unresponsiveness to pain, absence of gag reflex, acidosis, mild hypothermia, vomiting [9], gastrointestinal upset, bradycardia, myoclonus [10], cardiac arrest, general

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convulsions and pale skin [11]. An overdose of both GHB and it's precursor GBL can also result in fatal cases [12,13].

GHB is often identified as a date-rape drug by both experts and lay individuals, which may be linked to the fact that patients of toxicology wards frequently refer to their GHB intoxication case as an accidental event caused by an unknown offender. Results of scientific papers however demonstrate that the frequency of GHB-facilitated sexual assaults are over-estimated and therefore it is recommended to use the term of 'alleged sexual assault' [14–17]. It is also proved, however, that the relatively short half-life of GHB [18–20] makes it difficult to identify these cases. The potential role of GHB in acquisitory crimes on the other hand has been an understudied field of both addiction research and criminal toxicology, although GHB's sedative psychopharmacological effects create ideal circumstances for commiting such offences.

Our study therefore aims to assess the frequency of facilitated sexual assaults and acquisitory crimes in a clinical sample of patients administered to an emergency ward of toxicology. Our analyses further aimed to examine possible differences between intentional and unintentional GHB consumption, as well as between sole GHB use and GHB use as part of polysubstance use in terms of the level of neurocognitive impairment.

2. Material and methods

2.1. Sample

Data was collected by analysing patients' medical reports of the Clinical Toxicology Ward of Péterfy Sándor Street Hospital Clinic and Casualty Centre, the biggest toxicology centre in Hungary, with around ten thousands patients per year. Medical reports between 14th of September, 2009 and the 13th of June, 2013 were reviewed. Due to specific rearrengements in this centre (including a change in management board), more recent data was unavailabe for this study.

Every patient with either assumed or proven GHB consumption was added to the database. GHB use was established by patient self-reports in cases where analytical support was not available.

The names of the patients or any other information which would have made them recognisable — such as their addresses or exact dates of birth — were not entered in our database in order to protect their anonymity. Patients received a patient number instead as well as a case number as a lot of them were treated several times at the same clinical toxicology ward.

2.2. Measures

Available data from medical reports consisted of epicrisis (the circumstances of the intoxication as the ambulance found the patients or the patient's own statement about the case); serum and urine concentration of GHB, ethanol, amphetamines, cocaine, THC (Δ9-tetrahydrocannabinol), benzodiazepines and opioids; scores of Glasgow Coma Scale and Poisoning Severity Score.

2.2.1. Epicrisis

The epicrisis outlines the patient's chief complaints and responses to administered therapy as well as information about the circumstances of intoxication, such as the location, the time or the social context of the specific case or the presence or absence of blackouts and memory losses. Based on these information further data was collected on potential victimization due to drug facilitated sexual assault or acquisitory crime as well. In this cases, acquisitory crimes were characterized by the theft of someone's wallet (with either cash or credit card in it), smartphone, clothes or keys. Intentionality of GHB use was also registered, based on patients' statements.

2.2.2. Serum and urine concentrations: analytical procedure

Serum and urine concentrations (ng/ml) were administered in the database regarding all consumed substances. In case we had data on both serum and urine concentrations of the specific compound, we preferred using urine concentrations during our data analysis procedure as GHB — similarly to other psychoactive compounds — is detectable in urine at a higher load and with a longer duration than in serum, therefore the overall rate of available urine concentrations was higher. With regard to the analytic procedure of the samples, working solutions were prepared from the GHB stock solution (1000 mg/L in methanol). Blank serum and urine were spiked with these solutions at concentration levels of 1.0, 5.0, 10, 50, 250 and 10, 50, 250, 1000 mg/L respectively, with correlation coefficients typically exceeding 0.998. Hundred microlitres of serum/urine (calibrators and samples) were transferred to an Eppendorf-tube and 800 μL of internal standard solution (GHB-D_6) and 400 μL 0.05 M H_2SO_4 and 400 μL ethyl-acetate were added. After 5 min of mixing and 10 min of centrifugation (13 000 rpm). 200 μL of the supernatant solutions were transferred into autosampler vials. The solutions purged with nitrogen gas to dryness. The samples were reconstituted in 80 μL BSTFA. Derivatization was 60 min at 80 °C. 1 uL of the sample was injected. Recoveries of GHB from serum/urine achieved via LLE 29.50/23.70% (mean).

During the analysis the following reagents were used: GHB and GHB-D_6, BSTFA (*N,O-Bis*(trimethylsilyl)trifluoroacetamide) and sulfuric acid, HPLC-grade water, Ethyl-acetate (HiPerSolv CHROMANORM). Blank blood and serum were supplied by the blood donation center (Debrecen, Hungary). Finally, blank urine samples for calibration were collected from volunteers at the Institute of Forensic Medicine, Debrecen, Hungary.

For serum and urine samples the system consisted of an Agilent GCMSD controlled by ChemStation E.02.02.1431 software.

The GC–MS analyses were carried out using an Agilent 7890A Series II gas chromatograph coupled to an HP-5975C Series mass selective detector (MSD). The GC column used was an HP-5 MS capillary column (25 m × 0.2 mm I.D., 0.33 μm film thickness). The GC was operated in the splitless mode (i.e., purge off) when performing injection with the aid of an HP-7963 autosampler, but 1 min later the purge valve was turned on. The injector temperature was 250 °C.

For the analysis of BSTFA-derivatized GHB, the column temperature was programmed from 60 to 100 °C at 15 °C/min, then from 100 to 280 °C at 25 °C/min, with the initial temperature held for 1 min and final temperature held for 5 min. Helium of 99.999% purity was used as the carrier gas at a flow-rate of 1 mL/min. Effluents from the GC column was transferred via a transfer line held at 280 °C to a 70-eV electron impact (EI) ionization source held at 230 °C.

The instrument operated in selected ion monitoring mode (GC-EIMS SIM) to further evaluate the qualifier and quantifier ions: GHB 147, 117, 233 and GHB-D_6 147, 120, 239 respectively.

These samples were analyzed only once, there were no available data on reproducibility.

All samples were analyzed within 24 h. No specific procedure was applied in order to avoid GHB's in vitro formation.

2.2.3. Glasgow Coma Scale (GCS)

GCS as a neurological scale assess patients' actual state of consciousness [21] using three distinct indicators: (1) eye opening; (2) verbal response; and (3) motor response. Eye opening is scored on a 4-points scale, where 1 = no eye opening, 2 = eye opening to pain, 3 = eye opening to speech and 4 = spontaneous eye opening. Verbal response is scored on a 5-points scale, where 1 = no verbal response, 2 = incomprehensible sounds, 3 = inappropriate words, 4 = confused speech and 5 = oriented conversation. Motor response