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REVIEW

Toxicological aspects of *chemsex*[☆]

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Abstract Chemsex is a phenomenon in which the consumption of drugs is associated with the practice of sex, mainly among men who have sex with men (MSM).

Methamphetamine, mephedrone and GHB/GBL are the most commonly abused drugs in “sex parties”. However, the recent introduction of new psychoactive substances may have changed the pattern of consumption. The severity of this problem, as well as the frequency of this pattern of consumption in communities other than the above mentioned, remain unknown.

Although this review presents a toxicological approach to chemsex, sexually transmitted diseases or mental health problems as a result of chemsex play a key role in the holistic understanding of this phenomenon and appropriate actions must be taken to address the problem and its consequences.

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PALABRAS CLAVE

Chemsex;
Drogas;
Nuevas drogas
psicoactivas

Aspectos toxicológicos del *chemsex*

Resumen El chemsex es un fenómeno en el que la práctica del sexo, mantenido fundamentalmente entre hombres, se asocia el consumo de drogas (HSH).

La trilogía de drogas conocidas como las más frecuentes en estos casos son la metanfetamina, mefedrona y GHB/GBL, aunque más recientemente la introducción de las nuevas drogas psicoactivas puede que haya cambiado el patrón de consumo desconociéndose tanto la dimensión como si su práctica es también frecuente fuera de la comunidad antes referida.

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Aunque esta revisión presenta un enfoque toxicológico del chemsex, problemas relacionados como las enfermedades de transmisión sexual o problemas de salud mental, tienen un papel muy relevante e implican la comprensión holística de este fenómeno. Las medidas a tomar deben abordar el problema y sus consecuencias.

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Introduction

Chemsex refers to the consumption of stimulating substances in association with the practice of sex in the population of men who have sex with men (MSM).¹ One particular form of chemsex is *slamming*, which is considered to be the hard side of chemsex. It is characterised by the administration of psychostimulant drugs by intravenous injection, with the additional problem of shared syringes. Another form is *bloody slamming*, which consists of introducing blood into the syringe used to share a drug.

Apart from these definitions, in practice mobile applications are used to make contact through social networks with individuals for sexual encounters that last for several hours or days.² The latter aspect should be underlined, given that a longer time means higher risk and greater harm.³

In a similar way to other acronyms for actions which take place under the influence of drugs, such as driving (DUID), some authors propose abbreviating the overwhelming desire for sexual relations under the influence of drugs (chemsex) as SUID: sex under the influence of drugs.⁴

This phenomenon emerged initially among the lesbian, gay, bisexual and transgender population, and the most widely consumed drugs are methamphetamine (crystal meth, Tina or Ice), mephedrone, γ -hydroxybutyrate (GHB) and, to a lesser degree, drugs of abuse such as cocaine and ketamine, while polyconsumption is also common.⁵

Although only cases associated with methedrone have been described, the new psychoactive substances (NPS) in the drugs market are very probably also affecting this practice.⁶ As many of these substances favour a lack of inhibitions, they lead to a relaxation in the use of contraceptives and the resulting increase in cases of sexually transmitted diseases such as syphilis, gonorrhoea and infection by human immunodeficiency virus (HIV).

2017 data from the extensive survey conducted from 2011 to 2012 on the diagnosis of HIV showed that half of those surveyed reported they consumed recreational drugs (NPS), while a quarter of them reported polyconsumption.⁷

There has been no lack of population studies which focus on infectious epidemiology, associated mental alterations and the influence of drug consumption. Specific European Conferences have been held (the European Chemsex Forum) and multidisciplinary workgroups have been set up in different countries including Spain, to establish and agree suitable strategies for its prevention, risk reduction and damage limitation among the population which practice chemsex. As the recent report on chemsex in Spain indicates, different

proposals have emerged apart from scientific publications, including training courses for professionals, new projects for prevention and the reduction of harm by non-government organisations, epidemiological studies and the implementation of new action in the 2017–2024 National Strategy for Addictions. Some of the autonomous communities also have addiction strategies, such as Catalonia or cities such as Madrid.³

Papers were reviewed using PubMed, with no time limit and in English and Spanish, with the key words *chemsex* and then *chemsex AND drogas (drugs)*. The first review found 153 papers, and the second one found 108. The highest number of papers (47) were found in 2018, followed by 29 in 2019. Of these, the ones that centre on the study of sexually transmitted infections were ruled out, together with those about high risk forms of sexual behaviour and the mental health problems which are associated with such behaviours.

Drug consumption in a sexual context is an emerging problem that has become especially interesting in recent years as, although it is traditionally practiced by the MSM population, changes in consumption profiles due to the introduction of new psychoactive drugs and the possibility of the practice in the general population mean that the real magnitude of this phenomenon is unknown.

The aim of this study is to clarify the toxicological aspects of chemsex with an overview of current knowledge about the prevalence of the drugs used and the consequences of consuming them, generally a mix of drugs, which are often associated with a range of psychological and psychiatric problems, while others involve the risk of acute toxicity and even death.

Contextual framework

Although drug use associated with sexual relations has been known for some time, the special characteristics of chemsex mean that it is linked to MSM, making them more vulnerable to the risks and harm associated with the practice.³ In recent years more attention has been paid to this subject due to the association between the effects of drug use and high risk sexual behaviour and other dangers, such as overdosing and death.⁸

Men's behaviour and why they use drugs with sex are specific to each individual.⁹ Within the context we are examining it may be a response to a particular set of changes which have occurred during the rise of neoliberalism into a hegemony and the impact which this has had

on sexual practices between men, together with the historical replacement of collective thinking by competitive individualism.¹⁰

The practice of combining drug use with sex among MSM was first detected more than a decade ago in the United States (*Party and Play* or *High-Horny culture*) and it entered Europe via the United Kingdom. The term chemsex was first used in the latter to describe sex under the influence of drugs and more specifically mephedrone, GHB, gamma butyrolactone (GBL) and crystal meth, alone or mixed to facilitate long sex sessions lasting for hours or days, with multiple partners. Anecdotal reports and a few small qualitative studies in the United Kingdom describe people who take part in chemsex having better sex with these drugs, reducing their inhibitions and increasing their pleasure.¹¹

In 2011 the British National Health Service (NHS), due to the consideration that chemsex was frequently being practised, started to develop treatment strategies aimed specifically at the health problems associated with this phenomenon.¹⁰ Later, a publication in the British Medical Journal in 2015 stated that although few studies had been conducted on drug consumption in a sexual context, this was a minority phenomenon within the gay community. It cited data from The Chemsex Study, which in turn was based on the study European Men-who-have-sex-with-men Internet Survey (EMIS).¹¹

Other population studies using surveys of bisexuals and MSM, such as the one undertaken in Norway in 2016, reveal that there were no significant differences between both groups in terms of chemsex frequency. However, the consumption profile was different, as cocaine was used more often by the first group while methamphetamine, mephedrone and GHB were used more frequently by the second group.¹²

Drug consumption within the context of *sex partying* is associated with states of anxiety or depression, as well as with high-risk sexual behaviours, as some of the most widely used drugs such as sildenafil or methamphetamine stimulate self-esteem. When chemsex is seen within the context of a syndemic theory (a synergy between health problems which affects a population in its social and economic aspects) high levels of anxiety associated with drug consumption were found in group of 3017 Australian gays and bisexuals. Nevertheless, no significant association was found between mental health problems and drug consumption, or between poor mental health and high-risk sexual behaviours.¹³

Another contextual framework of chemsex consists of cases when due to drug consumption decision-making power is weakened. This may be due to a state of diminished awareness and/or intoxication, and it gives rise to problems in association with consent. As Cruz et al. state, in the majority of cases subjects do not dare to report anything due to fear that their credibility will be called into question, or sometimes because they stigmatise themselves.¹

Although several observations have appeared in the Spanish media after the 2015 BMJ publication, to date few scientific publications have appeared, and the majority of papers centre on infectious diseases. Primary HIV infection was said to increase together with hepatitis C among MSM together with other sexually transmitted diseases,

within the broad context of sexual practices associated with chemsex.¹⁴

Information available in Spain and other countries indicates that the drug user profile associated with chemsex differs from that of drug users in the 1980s and 1990s, and they themselves consider this to be so. Their sociodemographic context, epidemiological characteristics and motivations are all different, so that the approach has to be specific for this group and for this phenomenon, with specific training for medical personnel.³

In spite of the sustained interest in the media, few data are available regarding estimation about the prevalence of chemsex among MSM, and there are few quantitative data about the associated sexual practices.¹⁵

Drug prevalence in chemsex

Those individuals who use recreational drugs in the context of chemsex do not consider themselves to be users or that drug use in this context is problematic, so that they would be not be likely to use traditional medical services for this reason.⁸

Regardless of the motivations for taking part in chemsex, drug use in this context may have serious implications for the users. Consumption may cause undesirable side effects, such as agitation, anxiety, paranoia, aggression and psychosis. The most frequently used drugs may lead to dependency, overdose and death. GHB/GBL are particularly associated with very high rates of overdosing and the effects of intoxication. In some studies the annual proportion was one intoxication in every 5 cases of declared chemsex practice.⁹

While the use of opiates has historically been low in the MSM community, ecstasy, cocaine and MDMA, together with alcohol, have traditionally been very popular according to data published in 2009, where concomitant consumption is described with ketamine (38%), GHB (38%), methamphetamine (39%) or crack (40%). A lower proportion also consume poppers (18%) or marijuana (21%), although in general it could be said that these individuals are highly familiarised with abuse drugs, that is, that they were habitual consumers.¹⁶

Subsequently a swift transition to the use of mephedrone occurred, which was legal in the United Kingdom until 2010, together with GHB/GBL and methamphetamine. Use of the latter increased rapidly over a short time, although it was less widespread than the former. The speed of this transition may lead to a lack of information about the danger of NPS, as opposed to the knowledge about the so-called classic drugs.

From 2011 survey data and clinical evidence indicate that consumption of the new psychoactive drugs has increased, particularly mephedrone and GHB/GBL, with a fall in the consumption of ecstasy or cocaine. The low and relatively stable use of methamphetamine has increased in the decade after the study, although not as sharply as the aforementioned drugs.⁷

We can state that while in the 1990s the majority of commonly used drugs in the party and sex context were cannabis, ecstasy, amphetamines and cocaine, more recently chemsex has been associated with new psychoactive and sexually stimulating drugs such as GHB and similar substances, mephedrone, methamphetamine,

agents against erectile dysfunction and alkyl nitrites (or poppers).⁴

In 2010 the EMIS carried out a study in 38 European countries of 180,000 men to determine the knowledge, attitudes, needs and behaviours associated with sexually transmitted diseases; however, the majority of the data on chemsex centred on the United Kingdom, where it was studied in greater depth. The results indicated that alcohol was the most widely consumed drug, with a fall in the consumption of LSD and speed, while the polyconsumption of GHB/GBL, mephedrone and methamphetamine increased considerably.¹⁷ The incidence of alcohol consumption remained stable in the 2017 EMIS. The latter reported that 39% had consumed cannabis while 10%–20% had consumed cocaine, ecstasy, amphetamines and GHB/GBL. The consumption of other drugs such as ketamine, LSD, methamphetamine, mephedrone, synthetic cannabinoids, heroin and cocaine stood at 2%.¹⁸

A prevalence study carried out in the United Kingdom with similar populations in 2 time periods, from June 2013 to September 2014 and from November 2014 to April 2016 is highly interesting; a smaller group than was the case in the first period took part in the latter, with fewer individuals under the age of 25 years. It studied the changes in the type of chemsex drugs consumed, and it detected a similar prevalence for cocaine, cannabis and MDMA and an increase in the consumption of mephedrone in one third, an increase in GHB/GBL in approximately half and a similar increase in methamphetamine. Ketamine consumption fell in comparison with other drugs, while the percentages of cannabis and other drugs such as heroin, crack, opium, morphine, khat, codeine or LSD remained approximately at the same level of prevalence.

These results contrast with those found in Australia in 2016, where the prevalence of drug consumption in chemsex had not varied during the previous 3 years. This study divided consumption into 2 groups of drugs, separating the questions about them when undertaking the surveys on the “habitual” polyconsumption of drugs associated with chemsex, which centred on mephedrone, crystal methamphetamine and GHB/GLB.¹⁹

One of the most recent studies described a series of harmful psychological, social and relationship effects associated with chemsex, as well as a propensity for overdosing. It showed a low general prevalence of drug consumption in sexual contexts in comparison with relatively high levels of illegal drug consumption at an individual level. Data from this study indicate that while almost half of the participants had consumed illegal drugs at some time in their lives (cannabis, ecstasy or cocaine, etc.), drug use in the context of chemsex at some time in their lives was far lower (crystal methamphetamine 5.1%; mephedrone 9%; GHB/GBL 10%; ketamine 11.5%). Even fewer of them reported using these drugs in the previous year (crystal methamphetamine 2.5%; mephedrone 4.5%; GHB/GBL 4.9%; ketamine 3.8%). Previous forensic data from the same region indicated a 119% increase in deaths associated with overdose of GHB/GBL from 2014 to 2015, with one chemsex-related death every 12 days.¹⁵

Other results which are also recent reveal that the highest percentage of interviewees did not especially consume one specific drug (29.5%), followed by polyconsumption (21.7%), mephedrone (23.0%), GHB/GBL (20.5%), metham-

phetamine (15.8%) and ketamine (11.3%). The data on slamsex were similar, although the in the group consulted the low consumption of GHB/GBL in this practice stands out.¹⁸ Samples which are rarely used in forensic toxicology, such as those from the finger — and toenails, could be of use in conjunction with other sample for retrospective studies of consumption. Busardo et al. determined the levels of the most frequently used drugs for this practice in such samples, and they also found new psychoactive drugs such as butylone or synthetic cannabis (JWH 081, JHW 398 or JHW 122) which had not emerged until this approach was used.²⁰

Studies were performed in 22 Madrid hospitals in Spain (the U-Sex Study), in which 54% of a sample of 511 patients with HIV who belonged to the MSM collective reported having used drugs during sexual relations in the previous year, and 62% reported having been diagnosed with a sexually transmitted disease.

Another study in the Hospital Clínico, Barcelona of 5500 patients with HIV showed that of the 1032 who answered, 428 had consumed substances associated with chemsex (41%) and 1% had practiced slamming.

As well as these data, which were supplied by Dr. Blanco Arévalo in a symposium on chemsex, organised by the *Cátedra Extraordinaria de Salud, Crecimiento y Sostenibilidad MSD-Universidad Internacional Menéndez Pelayo* and the *Cátedra de Enfermedades Infecciosas y Vacunología Universidad Rey Juan Carlos*, he had already pointed out in 2016 that the physical, family and professional problems associated with this phenomenon justified considering it to be a public health problem, given the number of people practicing it and the implications that this may have.²

In a study on the prevalence of drug use during chemsex in Spain, Zaro et al. state that poppers are in first place (85.2%), followed by GHB (70.8%), sildenafil and similar drugs (70.4%), alcohol (69.1%), cocaine (63.2%), ecstasy (60.9%), mephedrone (56.0%), methamphetamine (41.6%), ketamine (39.5%), LSD (7.0%), mushrooms (3.7%) and heroin (1.0%). Polyconsumption tends to occur, with a mix of habitually consumed drugs and other new ones. It was not possible to reduce the definition of chemsex to a specific and exclusive use of certain substances, but rather the consumption of substances associated with sexual contexts.²¹

Perelló et al. reported a prevalence of 87% of chemsex cases in a sample of 101 patients infected by HIV and treated in hospital emergency departments due to acute intoxication by cocaine, GHB and amphetamines. They found no new drugs of abuse associated with chemsex, such as the cathinones. Their results agree with those found in other European cities such as London, Paris or Berlin.²² In association with the above considerations, Fernández et al. reported the detection of drugs associated with chemsex in 2 clinical cases of patients infected with HIV with the suspicion of opportunist chemical or mixed chemsex-associated submission, with a 4 month gap between both cases. The presence of synthetic cathinones was a novelty in these cases (mephedrone, chloro-alpha-PVP, chloromethcathinone, methylethcathinone or N-ethylhexedrone) together with the usual drugs in such circumstances.²³

European data disagree with those obtained in Australia, fundamentally because of the way in which they are obtained. In Australia data gathering takes place online, with questions about methamphetamine, Viagra®

and Truvada[®], detecting an increase in the concurrent usage of methamphetamines and sildenafil. The European study (AURAH2) works with data obtained in clinics which research into mephedrone, methamphetamine and GHB/GBL, showing a fall in chemsex in general.²⁴

The effect of drugs in chemsex

The 3 most widely used drugs cause a lack of inhibition and have secondary effects such as impulsiveness and increased sexual excitation. This cocktail of psychological changes predisposes users to high-risk sexual activities which are directly associated with the transmission of HIV and other infections, which is also due to the long periods of activity involved. On the other hand, sleep and memory alterations in these situations may lead to users forgetting prophylactic precepts.¹⁷

In terms of toxic effects we can clearly distinguish mephedrone from methamphetamine, both of which are indispensable in keeping up with the rhythm imposed by chemsex. They lead to a feeling of euphoria and sexual attraction, while GHB is a potent remover of inhibitions and an analgesic.¹¹ Its biphasic profile is initially stimulating while its concentration in plasma increases, after which it functions as a sedative in a way that is not associated with its kinetics.

Its anaesthetic effect favours aggressive sexual practices such as *fisting* (brachioproctic insertion) as it relaxes the smooth muscle and raises the pain threshold. Overdosing with respiratory depression may be common, as its effect is increased when it is combined with other substances and it accumulates, which may trigger unconsciousness, memory lapses and vulnerability to possible sexual abuse.¹⁴

This simultaneous consumption of different substances which often have contrary effects increases the risk of acute toxicity (paranoid psychosis, stupor or arrhythmia) and when chronic it is associated with a range of psychological and psychiatric problems.¹

Likewise, the injection of substances (slamming), particularly methamphetamine, although this is only done by a minority, involves sharing needles, giving rise to the "perfect storm" for the transmission of HIV and hepatitis C.¹⁷ In such cases the results of drug analysis of the needles, although not easy, may offer important information on the drug involved, particularly when new harmful substances are involved.²⁵

Deaths have occurred as a result of intoxications in recent years. Overdosing with GHB is associated with the consumption of large amounts of the same as well as with multiple short amounts over short periods of time or concomitant ingestion with alcohol and other psychoactive drugs.²⁶

Unlike other drugs of abuse, it is not common to find adulterated GHB. Nevertheless, 2 cases of death in 2016 were caused by the use of sildenafil as an adulterant. The supposition is that this adulteration in the illegal market was due to the hypothesis of gaining a synergic action between both compounds, with the aim of increasing the promised effect.²⁷

In other cases GHB is substituted by GBL, which is cheaper and easier to obtain because of its industrial uses. GBL is pharmacologically stronger than GHB, as it is absorbed more

quickly due to its lipophilic properties, its high bioavailability and a faster onset of effects, although its effects are less powerful than those of GHB. The incidence of its adverse effects is unknown, as immediately after ingestion it turns into GHB. Nevertheless, and in spite of this limitation, it has been described as compatible with the cause as well as the manner of death in a case of intoxication due to the recent ingestion of GBL and 4-methcathinone within the context of chemsex with polyconsumption.²⁸

Methamphetamine is also used habitually, above all via IV. In this context, methamphetamine increases sexual confidence, duration and intimacy. It also facilitates participation in high-risk practices such as group sex with multiple partners or aggressive sexual practices. Chronic use of methamphetamine is associated with a potentially high level of dependency, mental health problems such as depression and/or psychosis, and the spread of blood-borne viruses, chiefly HIV.²⁶

Methamphetamine is also commonly smoked or inhaled, often in combination with mephedrone and GHB. In this mix, while GHB is a nervous system depressor and even causes euphoria at low doses, mephedrone and methamphetamine are stimulants. All 3 are able to trigger emotions and also facilitate intense feelings of sexual excitation. Of all the substances most commonly used in the context of chemsex, methamphetamine is the most dangerous compound because of its addictive and neurotoxic effects and its consequences for health, in the case of healthy individuals as well as weakened ones.⁴

Mephedrone is one of the most popular of the NPS for recreational consumption, as it is a cheaper alternative to other drugs of abuse that are linked to the cathinone group. It is often consumed as a part of wider range of substances, and it may be administered in any way, as it is inhaled, ingested or added to a drink, and it is sometimes taken rectally, smoked or injected.

Mephedrone is consumed because it increases body temperature as well as its psychomotor stimulating effect in social situations. However, the relatively short duration of its effects generally leads to its being administered repeatedly during a single session. Its stimulating effects trigger increasing synaptic concentrations of serotonin, dopamine and noradrenalin, which also induce sympathomimetic activity. Its most common adverse effects are cardiac symptoms (hypertension, tachycardia, chest pain, palpitations, diaphoresis, hot flushes and peripheral vasoconstriction), psychiatric symptoms (anxiety, panic, depression, irritability, insomnia, paranoid delirium and psychosis over the short term) and neurological symptoms (paraesthesia, headache, tinnitus, convulsions, nystagmus and mydriasis).²⁹

It is important to emphasise that it is highly addictive, and when it is used intravenously the need for a new dose to obtain the same effects occurs after very short time periods, so that up to 15–20 injections may be needed in one day. This route of administration also favours the appearance of psychotic phenomena.²⁶

In the case of mephedrone, and given that in general the number of deaths associated with this drug is not very high in comparison with other drugs, it is harder to consider it a cause of death, and this is also the case when it is used in chemsex.^{5,30}

Polyconsumption always has to be considered normal practice in chemsex, and this in the case of mephedrone and methamphetamine may lead to the serotonin syndrome. This has traditionally been described as the triad of changes in mental state (anxiety, disquiet, disorientation and agitated delirium), autonomous hyperactivity (diaphoresis, tachycardia, hyperthermia, hypertension and diarrhoea) and neuromuscular anomalies (shaking, muscle rigidity, myoclonus and hyperreflexia), as well as potentially mortal adverse reactions to specific drugs or interactions between them.⁵

Polyconsumption and confusions with other clinical disorders such as cardiac diseases and infections are the most complex clinical cases. Commencing treatment in such cases may cause interactions or even aggravate the condition of the patient.²⁹

Final considerations

The absence of a common pattern for performing population studies leads to discordant results, as well as a limited or biased correspondence with reality. It would be advisable to draw up a standard that would make it possible to make comparisons that would help in understanding these behaviours and make it possible to treat or repair their consequences.

The individuals who practice chemsex place themselves and their partners at risk. This is so because of the effects of the drugs themselves, as well as the high-risk sexual practices involved and the consequent acquisition of sexually transmitted diseases. All of these factors justify study of the actual prevalence of this practice.

Although the profile of the drugs used in chemsex has been described, it is a dynamic phenomenon in which substance use varies over time. There is no knowledge of the use of the NPS in chemsex, especially in contexts which are propitious for this practice. The challenge for forensic toxicologists is to decide whether the detection of NPS in biological samples should be applied, to determine if they are used within the context of chemsex.

The data reviewed show that there is a lack of studies among the general population, and given that drug consumption is not rare, sensation-seeking by means of NPS consumption may be associated with sex, and sexual behaviour is occurring at increasingly early ages.

The consequences of chemsex are such that they merit a holistic study of the interactions between physical and mental health, the substances used and the risk which arise due to sexual behaviours. This would require the development of services for such studies, practical guides and the training of professionals in prevention as well as detection and treatment.

Conflict of interests

The author has no conflict of interests to declare.

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