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NOVEL PSYCHOACTIVE SUBSTANCES: EPIDEMIOLOGY AND MEDICAL AND SOCIAL IMPLICATIONS. LITERATURE REVIEW.

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Abstract

Background. The increasing prevalence of the use of novel psychoactive substances (NPS), especially among the younger generation, and the difficulties in their legal regulation.

Aim: To summarize data on the epidemiology of novel psychoactive substances (NPS) use, risk factors, and their medical and social consequences.

Search strategy. Literature search was conducted in the PubMed, Scopus, Web of Science, Google Scholar, and CyberLeninka databases, as well as on the websites of UNODC and EMCDDA. The following keywords were used: new psychoactive substances, synthetic drugs, bath salts, spice, legal highs, designer drugs, risk factors, epidemiology, prevalence, medical consequences, death, mortality, social consequences, sociodemographic correlates. Articles published between 2013 and 2024 were included.

Results. Novel psychoactive substances (NPS) represent a heterogeneous category engineered to imitate the effects of traditional drugs. NPS can be classified by chemical structure, pharmacological action, and intended effects. Research showed young people, more than older generations, and men, more than women, are likelier to use NPS. Users were often from socially vulnerable groups. The 2022 European Drug Report highlighted that today's adolescents use drugs more frequently than previous generations. NPS have various medical consequences, with unpredictable toxic effects leading to overdoses. Synthetic stimulants are linked to cardiovascular, neurological, and psychiatric symptoms, sometimes resulting in fatal outcomes. NPS can also cause physical and psychological dependence. NPS use has social, economic, and legal implications. Their distribution and use are often illegal, leading to criminal liability. NPS consumption is linked to homelessness, incarceration, and using other substances.

Conclusion. Overall, NPS represent a major challenge for both public health and drug control organizations due to the ever-changing formulations, the complexity of monitoring and the unpredictability of effects and health harms.

Keywords: novel psychoactive substances, synthetic drugs, synthetic cathinones.

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Резюме

НОВЫЕ ПСИХОАКТИВНЫЕ ВЕЩЕСТВА: ЭПИДЕМИОЛОГИЯ И МЕДИЦИНСКИЕ И СОЦИАЛЬНЫЕ ПОСЛЕДСТВИЯ. ОБЗОР ЛИТЕРАТУРЫ

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Введение: Увеличивающаяся распространенность употребления новых психоактивных веществ (НПВ), особенно среди молодого поколения, в купе с трудностями их законодательного регулирования.

Цель: обобщение данных об эпидемиологии употребления НПВ, факторах риска, а также медицинских и социальных последствиях.

Стратегия поиска: Поиск литературы проводился в PubMed, Scopus, Web of Science, Google Scholar, Киберленинке и на веб-сайтах организаций: UNODC, EMCDDA с использованием ключевых слов: novel psychoactive substances, synthetic drugs, bath salts, spice, legal highs, designer drugs, risk factors, epidemiology, prevalence, medical consequences, death, mortality, social consequences, sociodemographic correlates. Включались статьи 2013–2024 годов.

Результаты: Новые психоактивные вещества (НПС) представляют собой гетерогенную категорию, разработанную для имитации эффектов традиционных наркотиков. НПВ можно классифицировать по их химической структуре, фармакологическому действию и моделируемым эффектам. Исследования показали, что молодые люди чаще, чем старшее поколение, и мужчины чаще, чем женщины, участвуют в употреблении НПВ. Потребители чаще, чем непотребители, относились к социально уязвимым группам населения. В Европейском докладе о наркотиках 2022 года отмечалось, что нынешние подростки употребляют наркотики чаще, чем предыдущие поколения. НПВ имеют разнообразные медицинские последствия. Токсические эффекты данных классов веществ непредсказуемы и могут вести к передозировкам. Синтетические стимуляторы ассоциированы с сердечно-сосудистыми, неврологическими и психическими симптомами, которых в некоторых случаях приводили к летальным исходам. Кроме того НПВ способны формировать физическую и психическую зависимость к ним. Употребление НПВ также имеет социальные, экономические и правовые последствия. Использование и распространение НПВ зачастую являются незаконными и могут повлечь за собой уголовную ответственность. Употребление НПВ часто ассоциировано с бездомностью, нахождением под стражей, употреблением других видов психоактивных веществ.

Выводы: В целом, НПВ представляют собой серьезную проблему как для общественного здравоохранения, так и для организаций, занимающихся контролем за незаконным оборотом наркотиков, с связи с постоянно меняющимися формулами, сложностью мониторинга и непредсказуемостью эффектов и вреда для здоровья.

Ключевые слова: новые психоактивные вещества, синтетические наркотики, синтетические катионы.

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Түйіндеме

ЖАҢА ПСИХОБЕЛСЕҢДІ ЗАТТАР: ЭПИДЕМИОЛОГИЯ ЖӘНЕ МЕДИЦИНАЛЫҚ ЖӘНЕ ӘЛЕУМЕТТІК САЛДАРЫ. ӘДЕБИЕТТІК ШОЛУ.

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Кіріспе: Жаңа психобелсеңді заттарды қолданудың, әсіресе өскелең ұрпақ арасында, оларды заңнамалық реттеудегі қиындықтармен қатар, таралуының артуы.

Мақсаты: Жаңа психобелсеңді заттарды (ЖПЗ) тұтыну эпидемиологиясы, тәуекел факторлары, сондай-ақ медициналық және әлеуметтік салдары туралы деректерді қорыту.

Іздеу стратегиясы: Әдебиетке шолу PubMed, Scopus, Web of Science, Google Scholar, Киберленинка дерекқорларында және UNODC, EMCDDA ұйымдарының веб-сайттарында жүргізілді. Іздеуге келесі кілт сөздер қолданылды: novel psychoactive substances, synthetic drugs, bath salts, spice, legal highs, designer drugs, risk factors, epidemiology, prevalence, medical consequences, death, mortality, social consequences, sociodemographic correlates. 2013–2024 жылдары жарияланған мақалалар қосылды.

Нәтижелері: Жаңа психобелсеңді заттар - бұл дәстүрлі есірткінің әсерін имитациялауға арналған жасалған гетерогенді санатты білдіреді. Жаңа психобелсеңді заттар химиялық құрылымына, фармакологиялық әсеріне және модельденетін әсерлеріне қарай жіктелуі мүмкін. Зерттеулер көрсеткендей, жастар егде жастағы адамдарға қарағанда, ал ер адамдар әйелдерге қарағанда жаңа психобелсеңді заттарды пайдалану мүмкіндігіне ие. Тұтынушылар тұтынушы еместерге қарағанда халықтың әлеуметтік осал топтарына көбірек жатады. 2022 жылғы Еуропалық есірткі туралы есеп

қазіргі жасөспірімдер есірткіні бұрынғы ұрпақтарға қарағанда жиі қолданатынын көрсетеді. Жаңа психобелсенді заттар әртүрлі медициналық салдары бар. Осы кластағы заттардың уытты әсерлерін болжау мүмкін емес және артық дозалануға әкелуі мүмкін. Синтетикалық стимуляторлар кейбір жағдайларда өлімге әкелетін жүрек-қан тамырлары, неврологиялық және психиатриялық белгілермен байланысты. Сонымен қатар, жаңа психобелсенді заттар оларға физикалық және психикалық тәуелділікті қалыптастыруға қабілетті. Осы заттар пайдаланудың әлеуметтік, экономикалық және құқықтық салдары да бар. Жаңа психобелсенді заттар пайдалану және тарату көбінесе заңсыз болып табылады және қылмыстық жауапкершілікке әкелуі мүмкін. Жаңа психобелсенді заттар қолдану көбінесе үйсіздікпен, түрмеде отырумен және психоактивті заттардың басқа түрлерін қолданумен байланысты.

Қорытынды: Тұтастай алғанда, жаңа психобелсенді заттар тұрақты өзгеретін формулаларға, бақылаудағы қиындықтарға және әсерлер мен денсаулыққа зияндарды болжауға болмайтындығына байланысты қоғамдық денсаулық сақтау және есірткіні бақылау ұйымдары үшін айтарлықтай қиындық тудырады.

Түйінді сөздер: жаңа психобелсенді заттар, синтетикалық есірткілер, синтетикалық катинондар.

Дәйексөз үшін:

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Introduction

Over the past few years, the frequency of problems that are caused by the use of novel psychoactive substances has become an increasing worry for both the medical community and society as a whole. The term "novel psychoactive substances" (NPS) refers to chemicals that are abused in either their pure form or as a part of an illicit substance composition. These drugs are not considered to be prohibited substances according to the Single Convention on Narcotic Drugs of 1961 or the Vienna Convention on Psychotropic Substances of 1971. These substances replicate the effects of conventional drugs [71]. Otherwise, they are called "legal drugs", "designer drugs", and "club drugs" [45; 51]. The constantly changing chemical structure of these substances allows them to avoid current drug laws, making it difficult to regulate their manufacturing and distribution [40; 71]. Also, for this purpose, manufacturers often label them as "plant fertilizers", "air fresheners", "herbal incense", "spices", "bath salts" and "chemical reagents" [67]. As a result of all of this, the number of newly identified psychoactive substances that have recently emerged on a global scale has risen drastically, becoming serious threat to the health of the general population around the world. Thus, according to the United Nations Office on Drugs and Crime's (UNODC) Early Warning Advisory Portal (accessed February 2025), 1286 NPS of unique chemical structure from 150 countries have been reported so far. The number of registered substances is increasing annually, with 44 NPS reported to the Early Warning Advisory Portal in 2022 and 87 in 2021 [70]. Approximately 880 NPS were being monitored by EMCDDA by the end of 2021. Synthetic stimulants, synthetic depressants (including opioids and benzodiazepines), synthetic cannabinoids, synthetic hallucinogens, and dissociatives are the categories that are used to classify synthetic psychoactive substances. The term "novel psychoactive substances" refers to a broad and diverse category of narcotic substances. These substances are classified according to their effects. [64]. Classification based on chemical structure is comprehensive and encompasses the following categories: cannabinoids, cathinones, phenethylamines, opioids, tryptamines, arylalkylamines, benzodiazepines, arylcyclohexylamines, piperazines, piperidines, pyrrolidines, plants and extracts, aminoindanes, and substances from other chemical groups [28; 71].

Data on the prevalence of NPS use remain limited, largely due to monitoring challenges, such as the existence of different local drug names, the lack of awareness of the substance and the absence of specific screening tests [50; 71]. According to the UNODC Early Warning Advisory Portal, by 2020, cases of NPS use have been reported in 77 countries. In high-income countries, there were reports that use of this class of drugs was declining, but remained high among marginalized populations. As for the countries of the former Soviet Union, there had been an increase in this phenomenon [71]. In the European region, the level of NPS use went from 0.1% in Latvia to 5.1% in Romania, as stated in the report that was produced by the EMCDDA in 2022 [28].

Novel psychoactive substances (NPS) may seem attractive because of their easy availability and perceived legal status. However, they are associated with significant risks to both physical and mental health. The consequences of NPS use disorders extend beyond the individual, affecting families, friends and whole communities. These substances place a heavy burden on health care and social support systems, exacerbating existing public health challenges.

Aim is to summarize scientific data on the epidemiology of novel psychoactive substance use, risk factors, medical and social consequences of mental and behavioral disorders due to use of these substances.

Search strategy. The search of literature references in the open access was carried out using databases of scientific publications and search engines: PubMed, Scopus, Web of Science, Google Scholar, Cyberleninka; materials from the websites of the following organizations: United Nations Office on Drugs and Crime, The European Monitoring Centre for Drugs and Drug Addiction. Articles published between January 2020 and January 2025 were included. The following keywords were used: *novel psychoactive substances, synthetic drugs, bath salts, spice, legal highs, designer drugs, risk factors, epidemiology, prevalence, medical consequences, death, mortality, social consequences, sociodemographic correlates.* *Inclusion criteria:* meta-analyses and systematic reviews, literature reviews, cross-sectional studies, original full-text articles in English and Russian in the open access. *Exclusion criteria:* newspaper articles, expert opinions in the form of short reports.

Results

Classification of novel psychoactive substances

The design and distribution of NPS are driven by the desire to avoid legal restrictions, resulting in the constant

emergence of novel substances on the market. The classification of NPS can be based on their chemical structure, pharmacological and mimicked effects (Table 1).

Table 1.

Classification of Novel Psychoactive Substances (NPS) by Chemical Structure, Pharmacological Effects, and Reference Substances.

Chemical class	Class by pharmacological effects	Traditional analogues
Synthetic cannabinoids ¹	Cannabinoid receptor agonists	Delta-9-tetrahydrocannabinol (from marijuana)
Synthetic cathinones ²	Stimulants	Cathinone (from khat plant) Cathine (from khat plant)
Phenethylamines ³	Stimulants Empathogens Hallucinogens	Phenethylamine MDMA* Amphetamines
Aminoindanes ⁴	Stimulants Empathogens	Phenethylamine Amphetamines
Piperazines ⁵	Stimulants Empathogens	Amphetamines MDMA*
Tryptamines ⁶	Hallucinogens	Tryptamine Psilocybin
Arylcyclohexylamines ⁷	Dissociatives	Phencyclidine Ketamine
Synthetic benzodiazepines ⁸	Depressants	Benzodiazepine
Synthetic opioids ⁹	Depressants	Morphine

Sources: 1: [6; 54; 59]; 2: [8; 46; 66]; 3: [8; 46; 66; 49]; 4: [7; 14; 46; 49; 54; 61; 75]; 5: [2; 14; 46; 49; 54; 75]; 6: [31; 61]; 7: [53]; 8: [13; 26]; 9: [5; 13; 65; 76].
*MDMA – 3,4-methylenedioxymethamphetamine

Epidemiology

The increasing use of NPS among young people has emerged as a particularly alarming public health concern. The European Drug Report 2022 notes that current adolescents are using drugs more frequently than previous generations [28]. Supporting this trend, a survey conducted among 8th, 10th, and 12th graders in the United States from 2012 to 2014 found that synthetic cannabinoids were among the most popular drugs among schoolchildren [4]. Notably, the consumption of this class of drugs has been associated with an increase in emergency visits among adolescents [4]. Similarly, the situation in European countries also appears alarming. Approximately 8–10% of young people have reported ever trying NPS [4]. This growing trend is not limited to Western nations. For example, in their 2022 study, Altynbekova G.I. et al. reported a 60-fold increase in the number of NPS users in the Republic of Kazakhstan over a five-year period. Interestingly, this surge occurred against the backdrop of a declining prevalence of mental and behavioral disorders linked to the use of other psychoactive substances [1].

Moreover, it is evident that socially disadvantaged and marginalized populations are more susceptible to NPS use. For instance, a transnational study by Felvinczi, Benschop, and Urbán (2020) investigated marginalized users of novel psychoactive substances across various European nations. It highlighted that socioeconomic factors —such as unemployment, low educational attainment, and unstable housing - are significantly correlated with NPS usage, particularly when combined with traditional drugs [33]. The research also indicated a distinct age and gender distribution, with the majority of NPS users being younger males, predominantly aged 18 to 30, often unemployed or engaged in low-skill, precarious employment [33]. Conversely, older

individuals were underrepresented among NPS users, and while women were present, they reported lower frequency of use, typically in conjunction with other medications or under differing psychosocial conditions [33]. A survey conducted among homeless individuals in the United Kingdom revealed that approximately 68% had a history of NPS use. Comparatively, in other countries, the prevalence of NPS use among homeless populations has been reported to range from 20% to as high as 87% [16]. Further underscoring this issue, research undertaken with a sample of prisoners in West Yorkshire revealed that 62% had tried NPS at least once, compared to only 20% who had used traditional drugs [48]. These findings collectively highlight the widespread and increasing use of NPS, particularly among vulnerable groups, underscoring the urgent need for targeted prevention and intervention strategies.

Consequences of NPS use

New psychoactive substances (NPS) are highly unpredictable in both their formulation and pharmacological effects. Their use can lead to a wide range of consequences affecting both physical and mental health. These consequences may vary significantly depending on several factors, including the type of substance, dosage, route of administration, and individual characteristics of the user. Furthermore, the practice of polydrug abuse significantly increases the risk of adverse reactions. A systematic review summarizing the results of 20 studies conducted between 2007 and 2015 provides further insight into these trends. According to this review, users tended to prefer powdered forms of NPS, with oral and injectable routes of administration being the most commonly reported [50]. Among all types of NPS, cannabinoid receptor agonists and cathinones were the most frequently registered [50]. Notably, polydrug use was widespread, with

NPS often being consumed alongside alcohol, traditional illicit drugs, and even energy drinks - combinations that markedly increased the likelihood of side effects [50].

Due to the lack of long-term research and clinical data, the effects of many NPS on the human body remain poorly understood. As a result, toxic reactions are not uncommon. In some cases, acute poisoning occurs, necessitating immediate medical intervention [22]. Even more concerning are the reports of both intentional and accidental overdoses involving synthetic opioids, cannabinoids, and benzodiazepines, some of which have resulted in fatalities [27; 50; 74].

Emerging data further underscore these risks. For instance, according to Lo Faro A. et al., during the COVID-19 pandemic, the most common cause of overdose deaths involving NPS was opioids—particularly fentanyl—followed by synthetic cannabinoids and synthetic cathinones [45]. This aligns with broader public health data: in 2019, the United States experienced a 10% increase in opioid-related overdoses compared to the previous year. Alarming, new synthetic opioids accounted for approximately 21% of all overdose cases during that period [12]. One contributing factor to this trend is the extreme potency of substances like fentanyl and its analogues. The potency of these synthetic opioids can range anywhere from 3 to 10,000 times higher than that of morphine, and they can be thirty to forty times more potent than heroin [12]. This makes them particularly hazardous, especially when users are unaware of their presence in the drugs they consume. For example, fentanyl analogues are frequently mixed with heroin or used to manufacture counterfeit prescription medications, significantly increasing the risk of fatal overdoses [12; 65]. Supporting this, a study analyzing accidental drug overdoses in San Francisco in 2022 found fentanyl analogues present in 7.8% of all cases [74]. These findings highlight the urgent need for continuous monitoring, public education, and improved detection methods to address the evolving threat posed by synthetic opioids and other forms of NPS.

From 2012 to 2019, 165 deaths were reported to the National Substance Misuse Mortality Program for England in which synthetic cannabinoids were detected in tissue samples. In 85.5% of these cases, synthetic cannabinoids were identified as the direct cause of death, while in 27.9% they may have contributed to the fatal outcome when acting in conjunction with other substances [47; 73]. The cardiovascular, respiratory, and nervous systems were the most commonly affected, indicating the multi-systemic toxicity of these substances [47; 73]. Notably, 90.3% of the victims were male, which represents a higher percentage compared to cases where synthetic cannabinoid receptor agonists were not detected [47; 73]. In addition, individuals whose deaths involved synthetic cannabinoids were significantly more likely to be from vulnerable populations: homeless (19.4% vs. 4.1%), prison residents (4.9% vs. 0.2%), or housed in dormitories (13.3% vs. 2.3%) [47; 73].

These findings are consistent with previous studies, which have shown that certain synthetic cannabinoids such as AB-CHIMINACA, ADB-FUBINACA, MDMB-CHMICA, and 5F-ADB are frequently implicated in fatal intoxications. The extreme potency and unpredictability of these compounds significantly elevate the risk of overdose and death [22].

Alongside cannabinoids, synthetic cathinones also present a serious public health concern. Particularly for individuals with pre-existing cardiovascular conditions, their use can be especially lethal [30; 62]. Supporting this, autopsies conducted on individuals who died following ingestion of synthetic stimulants have frequently revealed pulmonary edema and cerebral congestion—pathological findings that reflect acute circulatory disturbances [19; 38; 50]. To add to that, cardiovascular complications often accompany NPS use more broadly. In the case of cathinones, these substances have been associated with a variety of serious adverse cardiovascular events, such as cardiac arrest, elevated blood pressure, and tachycardia [62]. In addition to these, cathinones have been linked to a wide range of neurological complications. These include altered states of consciousness (ranging from confusion to coma), dysregulation of body temperature, sleep disturbances, vomiting, and seizures [8; 21; 35; 42; 47]. Thus, the health risks associated with cathinone use are both diverse and potentially life-threatening.

The dangers are not limited to stimulants. Synthetic hallucinogens, which encompass various classes such as phenylethylamines and amphetamine derivatives, are also associated with a wide range of toxic effects [3; 30; 77]. A striking example is the compound 25I-NBOMe, which has been repeatedly linked to severe clinical outcomes, including death [3; 30; 77]. Agitation, tachycardia, hypertension, and seizures are some of the adverse effects that have been reported as a result of its consumption [3; 30; 77]. The high frequency of severe complications, including intensive care unit admissions and fatalities, highlights the significant danger associated with this substance [3; 30; 77]. In addition, synthetic phenethylamines have been associated with unique physiological complications. One such condition is hyponatremia, which results from a serotonin-mediated increase in antidiuretic hormone secretion [3; 30; 58]. This leads to excessive water retention by the kidneys, profuse sweating, and intense thirst. In severe cases, this electrolyte imbalance can cause cerebral edema and coma, potentially resulting in death [3; 30; 58].

Through the use of forensic samples (1,892 cases), consumer testing (6,316 samples), and referrals to poison centers (481 cases), a study that was carried out in the Netherlands between the years 2013 and 2017 revealed an emerging trend in the detection of NPS. Particularly, the percentage of NPS found in all drug samples went from 2.5% to 3.1% in forensic instances, from 7.4% to 11.3% in consumer samples, and from 4.1% to 10.6% in toxicology-related cases [39]. Among substances that were found in the most samples, phenethylamines, including 4-fluorophenamphetamine (4-FA), and cathinones, which were found in 11–21% of cases, were the most prevalent. Intoxications involving NPS were commonly associated with symptoms including rapid heartbeat (23%), increased blood pressure (10%), anxiety (17%), and hallucinations (15%) [39].

Attention must be drawn to the growing threat posed by new synthetic benzodiazepines. These substances are associated with a high risk of toxic effects, including profound sedation, memory loss, respiratory depression, and in severe cases, death—particularly when used in combination with opioids or other central nervous system

depressants [10]. Despite their frequent identification in cases of overdose, traffic accidents, and fatalities, their true prevalence remains underestimated due to limited awareness and insufficient detection methods. Forensic and clinical investigations consistently report that synthetic benzodiazepines such as ethizolam, flubromazolam, and fluprazolam appear regularly in toxicological findings, highlighting the need for increased monitoring and regulation [10].

Mental and behavioral effects included the development of addiction: many NPS cause severe psychological and physical addiction, accompanied by severe withdrawal symptoms. High-dose consumption or a predisposition to psychotic disorders may lead to hallucinations, paranoia, delirium, behavioral disorders, aggression, and impulsivity. These symptoms, in turn, can result in serious social and legal consequences [17; 44]. Psychotic disorders have been specifically associated with the use of synthetic cathinones, ketamine analogues, and herbal drugs [9; 20; 27; 44]. Moreover, the psychopathological spectrum of adverse effects related to synthetic stimulants is broad. It includes aggressive behavior, agitation, hallucinations (especially visual hallucinations), and paranoia [18; 44; 50]. Importantly, the mental health impact of NPS extends beyond psychosis. NPS have also been associated with suicidal ideation, suicide attempts and self-harm and, in some cases, are themselves a way of taking one's own life, especially cathinones and cannabinoids [15]. Further highlighting the severity of the issue, a 2023 scoping review reported that NPS were associated with violent suicides, with the synthetic cathinone mephedrone being particularly common in these cases [14].

Another emerging and increasingly concerning phenomenon is the spread of chemsex - a practice involving the use of psychoactive substances for sexual purposes. This is particularly relevant among men who have sex with men. In the context of chemsex, NPS are frequently consumed, especially synthetic cathinones like mephedrone, as well as central nervous system depressants such as gamma-hydroxybutyrate (GHB), gamma-butyrolactone (GBL), and their analogues. The choice of drugs may be explained by the fact that mephedrone has a euphorizing effect and increases sexual desire, while gamma hydroxybutyrate and its analogues have a disinhibitory effect and induce a state of relaxation [24; 25; 29]. Chemsex is frequently linked to unprotected sexual practices, which markedly elevate the risk of transmitting sexually transmitted infections such as syphilis, gonorrhoea, human immunodeficiency virus (HIV), and viral hepatitis. Supporting this, data from the Nantes addictovigilance center in France, collected between 2012 and 2019, revealed alarming rates of infection among individuals engaging in "slamming"- the practice of injecting drugs during sex sessions. Over 80% of participants were infected with HIV, a quarter had hepatitis C, and nearly 20% were co-infected with both viruses. Importantly, 100% of them practiced injecting drug use, which further heightened their vulnerability to infection and other health risks [62; 63].

Using NPS frequently results in substantial social, economic, and legal implications, in addition to the health-related problems that are associated with its use. The use and distribution of these substances, as well as driving

under their influence, are punishable by law and can lead to criminal or administrative liability [114, 115]. Moreover, drug use is frequently associated with aggressive or violent behavior, which may lead to the perpetration of crimes. At the same time, it also increases the likelihood of individuals becoming victims of criminal acts. For instance, a survey among homeless individuals in the United States found that while under the influence of "spice" (a slang term for synthetic cannabinoid receptor agonists), many had been subjected to robbery and other forms of victimization [18; 44]. NPS use is also associated with broader social challenges, including unemployment and housing instability, which further exacerbate the vulnerability of affected individuals [33; 41; 60; 72]. These factors can create a vicious cycle, where social exclusion and drug dependence reinforce one another.

The use of novel psychoactive substances can result in significant and enduring consequences, impacting both the user's health and their social environment. Recognizing the risks associated with these substances and implementing measures to prevent their spread is essential.

Policies and regulation for the control of novel psychoactive substances

NPS control policy and regulation face unique challenges due to the rapid emergence and evolution of these substances. NPS control strategies require global cooperation, legislative adaptability, and innovative approaches to monitoring and regulation. Many countries signed the United Nations international drug conventions, which require members to control certain narcotics and psychotropic substances. However, NPS are often not included in these lists due to their novelty. The World Health Organization and the International Narcotic Control Board are crucial in monitoring forming guidelines for the classification of new substances [69].

In their article, Kühnl et al. 2022 described the different strategies that Governments around the world use to address the challenges of regulating NPS. The authors emphasize that there are three main approaches to regulation, including specific substance lists, generic definitions, and the analog approach [43]. Specification includes listing substances by their chemical name, which is advantageous from a legal perspective. However, this approach has its limitations, as the process of legislating new substances can be complex. Many countries had introduced specifications under the United Nations drug conventions and may also accompany them with controls on generics and analogues [43]. The second approach, generic definitions, is based on the molecular structure of the substance and allows for the identification of controlled elements [43]. Lastly, the analog approach is utilized in the process of regulating substances on the basis of their similarity to substances that controlled by law. Despite this, the analog approach is less popular internationally as it is considered legally unsatisfactory due to the complexity of chemical structures of substances [43].

Several national examples illustrate how different countries implement these approaches. The Synthetic Drugs Act was enacted in the United States to address the rise of synthetic drugs, such as synthetic cannabinoids and cathinones, by designating them as controlled substances. The EMCDDA has become essential in the identification

and classification of NPS within the European Union. International cooperation programs, exemplified by the Council of Europe's initiative on new synthetic drugs, are significant for information sharing and the development of control strategies [54; 56].

At the national level, countries have implemented varied legal instruments. For instance, the United Kingdom has adopted the Psychoactive Substances Act (2016), which prohibits the producing, distributing, selling and supplying of psychoactive substances, with some exceptions for substances such as alcohol, tobacco, caffeine and medications [52]. Australia had adopted analogue legislation that allows substances similar in structure to already illicit drugs to be classified as controlled substances without the need to update the legislation each time [32]. Germany's Psychoactive Substances Act, passed in 2016, offers yet another model. It allows for the inclusion of entire substance groups in the list of controlled drugs, rather than requiring individual listing. Under this law, while the purchase and possession of NPS for personal use is technically prohibited, it is not considered a criminal offense. Criminal liability is instead limited to the trafficking, distribution, and production of such substances [43].

Overall, measures against NPS vary considerably across countries, reflecting a diversity of legal philosophies and enforcement capacities. These approaches range from strict prohibition to more flexible regulatory models and, in some instances, discussions around limited legalization. However, regardless of the strategy, one common understanding is clear: the effectiveness of these measures must be continuously evaluated and adapted to respond to the rapidly changing nature of novel psychoactive substances.

Conclusions

In summary, according to all reported studies, the prevalence of NPS use is increasing every year. The most frequent consumers of NPS are young men, especially from vulnerable social groups, the homeless and unemployed. The use of NPS begins in adolescence, with individuals who use this category of drugs becoming involved in drug use at an earlier age. The most popular NPS are synthetic cannabinoid receptor agonists and synthetic cathinones. They cause a variety of adverse reactions and in some cases are fatal. Poly-substance abuse is also quite common, which adds to the toxic effects and dangers of NPS. Another danger is the rise of sex parties involving drug usage, known as chemsex. During these parties, NPS are often used, and intravenous drug injection is prevalent. This risky behavior, combined with unprotected sexual contact, leads to the rapid spread of sexually transmitted infections, including HIV and hepatitis C. These parties are most commonly attended by men who have sex with men. Overall, NPS pose a serious challenge to both public health and drug control organizations due to constantly changing formulas, the complexity of monitoring, and the unpredictability of health effects and harms.

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