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REVIEW ARTICLE

A Mini-Review on the Abuse of Psychotropic Substances in Malaysia

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ABSTRACT

Psychotropic substance use is a global issue that may pose unprecedented threats to nation-building and socioeconomic growth. The essential feature of substance use disorder (SUD) is a cluster of cognitive, behavioural and physiological symptoms indicating the individual continues to use the substances despite significant substance associated problems. Opioids, alcohol, cannabis, psychostimulants such as cocaine, amphetamine, and methamphetamine, as well as hallucinogens are among the substances that are commonly abused. Despite enormous efforts directed towards addressing the use of drugs or psychotropic substances use concerns, the cases associated with such use have increased significantly year after year. The transition from plant-based to synthetic drugs poses new challenges for drug policy and public health strategies in most of the countries including Malaysia. Furthermore, newly emerging drugs which include new psychoactive substances (NPSs) that recently spiked in the drug market, makes it increasingly difficult to tackle this problem. The purpose of this review was to summarize the existing literature on psychotropic substance use in Malaysia including drug treatment and rehabilitation program, identify challenges and provide directions for future research.

Contribution/Originality: This study contributes to the existing literature on the current patterns of psychoactive substance use in Malaysia, focusing on its prevalence, causes, and societal impacts. In addition, it explores classification of substances, emerging drug trends, and implications for policy and intervention. This article also highlighted the challenges and future directions in combating substance abuse in the country for better societal and national development.

1. Introduction

Psychotropic or psychoactive substances are chemicals that can alter brain function and cause changes in perception, emotion, consciousness, cognition, or behavior (Presti,

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2012). Several types of psychoactive substances have therapeutic values, including anaesthetics, analgesics, anticonvulsants, and drugs used to treat neuropsychiatric disorders such as antidepressants, anxiolytics, antipsychotics, as well as stimulant drugs. These medications are typically administered under medical supervision and prescribed by qualified healthcare professionals (Moncrieff et al., 2013). However, these substances have the potential to be misused if they are used for non-therapeutic or non-medical purposes.

Thus, the abuse of drugs or psychotropic substances for the purpose of obtaining pleasurable effects such as euphoria is a social problem that concerns every country worldwide (Taha & Hadi, 2024). These substances can also lead users to develop physical and psychological dependence as well as increasing tolerance (Simpson & McDonnell, 2007). Chronic substance use not only fosters dependence but also drives users to progressively higher doses to achieve the same effect. As a result, it can cause addiction and damage to the neurological system and brain (Tolomeo et al., 2021), making it difficult for an individual to function normally in daily life. The consequences of substance abuse and dependence are widely documented to impact not just individuals, but also family institutions and society, resulting in societal issues such as violence and crime. As a result, it indirectly threatens a country's peace, harmony, and development. As a developing country, Malaysia is not exempt from this socioeconomic crisis. Despite more than a decade of campaigns and initiatives carried out by various government agencies, corporate sectors, and organizations, the drug epidemic has yet to be fully managed and is worsening.

According to a current report from the National Anti-Drug Agency (NADA) (2024), the rate of drug abuse in Malaysia is increasing with more than 160,000 drug addicts recorded nationwide for the first nine months (January to September) of 2024, a 31.6 percent increase compared to the same period last year. Among the drugs or psychoactive chemicals recorded were opiates (such as heroin, morphine and methadone), amphetamines (such as syabu, ice, horse pills and ecstasy), marijuana, ketamine, benzodiazepines (midazolam, diazepam and alprazolam) and other types of drugs, including kratom or ketum. According to the latest statistical report from NADA, the drug category "amphetamine-type stimulants" (ATS) was recorded as the highest with 119,410 cases of use, followed by the drug category opioids with 38,854, cannabis with 6,750 and finally followed by psychotropic pills and other drug categories where 2,563 and 2,114 cases of use were recorded respectively (NADA, 2024).

1.1. Research Objectives

This review article critically examines the current patterns of psychoactive substance use in Malaysia, focusing on its prevalence, causes, and societal impacts. In addition, it explores classification of substances, emerging drug trends, and implications for policy and intervention.

2. Research Methods

A literature review was the main method used in this study to examine and compile prior research articles, reports, and policy documents on psychotropic substance use in Malaysia. The identification method requires a thorough assessment of relevant and available papers in databases such as Scopus, ScienceDirect, and Google Scholar, as well as related articles in specific fields.

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3. Findings and discussions

This review paper highlighted various current trends in the abuse of psychotropic substances in Malaysia, including: (1) the categories of substances that are abused (2) the growing trend of psychotropic substances (3) the treatment program and rehabilitation (4) the challenges in managing psychotropic substance use (5) future directions in combating substance abuse.

3.1. Amphetamine Type Stimulants (ATS)

Amphetamine type stimulants (ATS) are a group of synthetic psychostimulants that include amphetamine, methamphetamine, and related compounds that stimulate the central nervous system and are chemically derived rather than plant-based (Damiri et al., 2023). The United Nations estimates that there were more than 35 million ATS users last year, making ATS among the most commonly abused illicit drugs worldwide. This figure highlights the scale of ATS-related public health challenges globally. ATS has grown in popularity among Asian populations due to the rapid shift in the market from plant-based drugs to synthetic drugs. In turn, this growth in supply has led to a decline in the price of ATS, increasing affordability and access, particularly in urban and economically disadvantaged communities (Kulsudjarit, 2004; Pedersen et al., 2022). More drug users are switching from opioids to ATS. This transition may be driven by perceived ease of access and lower cost, though comparative studies are limited. To date, Southeast Asia has become the world's largest producer of synthetic chemicals, where ATS is easily accessible through the black market (Istiqomah, 2010; Othman, 2004). In Malaysia, a report from the NADA itself shows that stimulant abuse has surpassed opioids since 2017, making ATS the most abused drug or illicit substance category to date (NADA, 2024).

Methamphetamine (abbreviated as meth) or other names ice, chalk, glass, speed, crystal from the powder type while the pill form is called WY, `horse' pill, `yaba' pill and `go' pill is one of the most potent and addictive ATS drugs in circulation (McAvoy, 2009). The crystal form of meth is considered the most effective because it is easily absorbed into the blood when inhaled, which is faster than the effects of taking meth in pill form. It is usually heated, and the vapor is inhaled and can also be injected after being dissolved in water. Meth can be addictive and harmful because it is a type of chemical that has the most pronounced effect on the nervous system (brain and spinal cord) leading to acute intoxication, altered perception, psychological dependence, and long-term behavioral disorders (Nazari et al., 2023).

3, 4-Methylenedioxymethamphetamine (MDMA), or commonly known as ecstasy is a powerful central nervous system (CNS) stimulant that acts by increasing the activity of several neurotransmitter systems (Mustafa, 2020). MDMA is commonly found in tablet or capsule form but can also be a powder or crystal. The effects of MDMA are usually felt about 20 minutes to an hour after it's taken and last for around three to five hours. The psychological effects that associated with its use include elevated mood, feelings of emotional warmth, increased empathy, and heightened sensory perception (Gouzoulis-Mayfrank & Daumann, 2009). It has been reported that among the monitored illicit drugs, MDMA or ecstasy had the highest estimated per capita consumptions (Du et al., 2020). One of the reasons these synthetic drugs are gaining popularity is their cheaper cost compared to traditional narcotics, which reduces economic barriers to use for vulnerable populations (Karila et al., 2012; Larchenko et al., 2017). It has also been reported that Malaysian youth abuse MDMA and ATS synthetic substances at the greatest rates. As a

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result, chronic youth exposure to ATS is associated with a cascade of health, social and developmental issues, including poor peer connections, juvenile delinquency, and a low quality of life (Mohd Nawawi et al., 2024).

ATS causes an enhanced energy level, decreases appetite, and creates euphoria for a range of 6 to 12 hours, but over time it causes long-term dependence that interferes with social functions. This is because ATS drugs will secrete the neurotransmitter dopamine, which is a type of chemical that stimulates brain cells, thus overwhelming the user with a very enjoyable feeling (Gu et al., 2024). Overstimulation of this pathway leads to neuroadaptive changes, including receptor desensitization and reduced natural dopamine production. Continuous intake over time will result in tolerance where the effects of pleasure (euphoria, hallucinations) become less and more intake of the substance is needed to achieve the optimal desired effect. Users may escalate their mode of administration from oral or nasal intake to injection or smoking to intensify the drug's effect and bypass tolerance (Kramer et al., 1967).

The adverse effects experienced by users of stimulant drugs are dry mouth, excessive sweating, dilated pupils, trembling and headaches (Götrick et al., 2009; Greene et al., 2008; Uddin et al., 2017). After the euphoric effect subside, users may feel restless, agitated, confused, hallucinate, become irritable and may act violent. Addicts often experience weight loss and develop skin conditions such as scabies due to constant scratching prompted by delusions of insects crawling on or under their skin (Dluzen et al., 2012; Lipman & Yosipovitch, 2021). Digestive disorders may also occur due to prolonged starvation and the toxicity of drug components (Li et al., 2022). Symptoms of addiction also lead users to neglect personal health, hygiene, proper nutrition and sleep. They may experience severe depression, paranoia, uncontrollable anger, psychotic episodes, and violent behaviour, unreasonable suspicion, being fierce and angry, uncontrolled violence and psychotic behavior. In addition to mental and emotional health deterioration, ATS users contribute significantly to social problems. For example, risky sexual behaviour without protection is commonly reported among users, increasing their vulnerability to HIV/AIDS, hepatitis and other sexually transmitted diseases (Passaro et al., 2015). Taking ATS can also lead to irrational and aggressive behavior, such as domestic violence, robbery, sexual assault, and murder, thereby contributing to rising crime rates in society.

3.2. Opioids

Opioids are a group of drugs that bind to opioid receptors (receptor sites for the action of hormones) in the body, especially the nervous system and digestive tract. They are broadly classified into natural opioids (i.e. morphine, codeine), semi-synthetic opioids (i.e. heroin), and synthetic opioids (i.e. methadone), all of which primarily act via the mu-opioid receptors. They are traditional medicines extracted from the poppy plant (*Papaver somniferum*) such as morphine and codeine that are commonly prescribed by doctors or medical practitioners to relieve pain. The clinical benefits of opioids as painkillers (Brose et al., 2020) led to the development of synthetic opioid drugs such as methadone and heroin (Marovino et al., 2022). Opioid administration often produces intense euphoria, contributing to its high abuse potential. When a person becomes dependent on opioids such as heroin, cessation leads to withdrawal symptoms due to physiological adaptation. These include anxiety, feeling cold, watery eyes and nose, muscle and joint cramps, vomiting, loss of appetite, insomnia, and increased palpitations and heart rate (Maria et al., 2021). Such symptoms reflect the body's response to declining opioid levels and often perpetuate the cycle of use.

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Compulsive heroin use can lead to the development of chronic dependence, characterized by the individual's inability to stop using the drug, despite the known harmful health and social consequences. To avoid the painful withdrawal symptoms, addicts will use opioids compulsively and repeatedly. As a result, the number of individuals affected by opioid use disorder (OUD) is increasing. According to the National Anti-Drug Agency (NADA), opioids were the second most abused drug category in Malaysia in 2024, with 38,854 recorded cases (NADA, 2024).

There are many routes of administration of this type of opioid drug, however, most users prefer to use intravenous injection due to the faster effect of the substance and higher bioavailability (Colucci et al., 2014; Bertin et al., 2023). Therefore, this can increase their risk of being infected with the Human Immunodeficiency Virus (HIV) and result in increased transmission of HIV in the community.

In addition to HIV/AIDS infection, abuse of this substance, especially through injection, causes adverse effects on the body such as heart failure, hepatitis (Hep B, Hep C), depression, mental disorders, dependence and severe withdrawal symptoms such as muscle and joint cramps, abdominal pain, vomiting and severe diarrhea (Sanvisens et al., 2013). The effects of opioid overdose can cause urinary retention, hallucinations, delirium, hypothermia, respiratory arrest and seizures (Sivanesan et al., 2016). In addition to increasing rates of health problems, the problems of abuse and dependence and addiction to opioids are also associated with high rates of mental health problems, criminal activity and significant social decline (Montiel Ishino et al., 2020).

3.3. Cannabis

Cannabis and hemp are plant species from the cannabis family. Cannabis contains various chemical compounds known as cannabinoids, with the two main types of cannabinoids in cannabis being Tetrahydrocannabinol (THC) and Cannabidiol (CBD) (Rock & Parker, 2021). Unlike THC, CBD is reported to have a very low activation effect on the cannabinoid receptors CB1 and CB2 (Pertwee, 2008). For this reason, CBD is not intoxicating and is traditionally considered a non-psychoactive substance. Hemp, which contains a higher percentage of CBD than THC, is usually sold in the form of oil, supplements, extracts and more (Kraft et al., 2021; Lindekamp et al., 2024). It also serves various industrial purposes including the production of paper, textiles, construction materials, fuel, and food. Due to its low THC content, many countries have legalized the cultivation and processing of industrial hemp under regulated frameworks (Cherney & Small, 2016; Leonard et al., 2020).

There are many studies reporting that cannabis has medicinal potential in treating various diseases including HIV/AIDS, insomnia, cancer and asthma (Fernández, 2000; Kaur et al., 2022; Sánchez et al., 2024). Among the various cannabinoids, THC is the most pharmacologically active compound, acting as a partial agonist at CB1 and CB2 receptors predominantly located in the central nervous system (Kulkarni et al., 2025). This interaction stimulates dopamine release and contributes to the euphoric and psychotropic effects associated with cannabis. Consequently, THC has drawn both therapeutic interest and recreational misuse concerns due to its neuroactive properties.

Cannabis-derived products are consumed through diverse routes, including smoking, vaporizing, oral ingestion, or infusion into food and beverages. These methods apply to

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various cannabis forms such as dried flowers (buds), cannabis resin (hashish), and cannabis concentrates like butane hash oil or wax. The primary psychoactive component, THC, induces a state of relaxation and altered perception, but may also lead to adverse effects such as paranoia, anxiety, impaired motor coordination, and drowsiness (Sharpe et al., 2020).

Prolonged and heavy cannabis use is associated with cognitive deficits, particularly in memory, attention, and executive functions. Long-term adverse effects may also include decreased motivation, emotional withdrawal, and social disengagement, often described as amotivational syndrome. Although users may remain unaware of these behavioral and cognitive changes, they are often recognized by family members and close acquaintances. Emerging evidence also points to an increased risk of developing cannabis use disorder (CUD) with chronic use, especially when initiated during adolescence.

3.4. The emergence of New Psychoactive Substances (NPS)

Among the new trends that are worrying is the emergence and use of non-medical substances known as New Psychoactive Substances (NPS) or also known as "designer drugs" or "legal highs". By definition, NPS means drugs or substances that are not yet controlled under existing laws (the 1961 Convention on Narcotic Drugs or the 1971 Convention on Psychotropic Substances and others) that can cause addiction and severe side effects and pose a threat to public health. NPS-type drugs do not necessarily refer to newly discovered drugs as some have been on the market for over 40 years. The chemical structure of most NPS drugs is based on compounds extracted from biomedical literature studies or patents, while others are analogues of illicit drugs or prescription drugs. These types of drugs are created to mimic the effects of existing drugs and are usually created to avoid the existing drug control laws (Bryson, 2015; Santos et al., 2024). These substances can be classified as stimulants, cannabinoids, depressants, or hallucinogens. Examples of NPS drugs include ketum, flakka, khat, synthetic cannabis (K2, Spice) cathinone and others (NADA, 2024).

NPS on the market produce subjective effects that resemble substances under international control law such as cannabis, heroin, methamphetamine, MDMA (ecstasy) and others with the potential for serious adverse effects and can be life-threatening (Souza et al., 2023). Adverse effects of NPS use include tachycardia, hyperthermia, psychosis, aggressive behaviour, coma, and can also lead to death (Shafi et al., 2020). According to a 2012 UNODC report, Asia ranks second only to the United States in NPS consumption, and several Asian countries have become major hubs for the synthesis and distribution of these substances due to advancements in chemical manufacturing and online marketplace (Soria Sanchez, 2017).The abuse of this type of drug, which is becoming increasingly accessible via the Internet raises concerns due to its serious impact on social and economic development.

Furthermore, the NPS drug market is constantly changing with many new drugs or substances emerging. Currently there are more than 800 types of NPS drugs that have been found, whether natural or synthetic, and the number is expected to increase (Graziano et al., 2019). Therefore, the use of NPS drugs can also threaten public health because there is no quality control in their manufacture or packaging, and their biological effects are unknown when these drugs first appear on the recreational drug market. In addition, the side effects of NPS drugs can be more harmful because they involve a potent chemical mixture and the type and dosage are unknown (Krabseth et al., 2016).

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3.5. Drug treatment and rehabilitation programs

The shifting trend in psychotropic substance use has introduced significant challenges to drug treatment and rehabilitation efforts in Malaysia. Drug addiction is now widely recognized as a chronic, relapsing condition that requires long-term and multifaceted intervention. Despite these challenges, individuals struggling with substance use disorders can achieve recovery with proper support and targeted strategies. The National Anti-Drug Agency (NADA) implements comprehensive treatment and rehabilitation frameworks through both institutional settings and community-based centers. These programs integrate pharmacological treatment, psychological therapy, vocational skills training, and spiritual or religious components to support holistic recovery (Abidin et al., 2022; Amri et al., 2019).

Methadone Maintenance Treatment (MMT) is one of the well-known "Harm Reduction" program methods for opioid users (Malini et al., 2019). The primary goal of MMT is to minimize the transmission of blood-borne infections such as HIV, Hepatitis B, and Hepatitis C, which are often associated with high-risk practices like needle sharing. MMT involves the supervised administration of methadone, a long-acting synthetic opioid agonist that binds to the same receptors as heroin and morphine. Unlike illicit opioids, methadone produces a milder effect, preventing withdrawal symptoms without inducing euphoria, thereby reducing the reinforcing cycle of abuse. Additionally, because methadone is administered orally, it circumvents the health risks tied to injectable drug use.

To date, methadone remains the most widely used synthetic opioid agonist for managing opioid dependence and alleviating withdrawal symptoms (Jamalian et al., 2019). However, some studies have raised concerns about polysubstance abuse among MMT patients, particularly involving amphetamine-type stimulants (ATS), which may compromise treatment outcomes (Ismail et al., 2023; Taylor, 2015). In response to such concerns, alternative medications like buprenorphine, a partial mu-opioid receptor agonist, have also been approved for opioid dependence treatment (Soyka, 2017; Wesson, 2004). Buprenorphine has a ceiling effect that reduces the risk of overdose and misuse, yet challenges remain, including patient noncompliance, side effects, and relapse risk (Fiellin et al., 2006; Opheim et al., 2021).

In contrast to opioid use disorders (OUD), treatment for methamphetamine (METH) use disorder (MUD) or other psychostimulant-related conditions is particularly complex due to the lack of approved pharmacological therapies. Currently, there are no widely accessible medications proven to reduce cravings or enhance abstinence rates in individuals with ATS-use disorders (Yates, 2024). This highlights an urgent need for research and innovation to develop evidence-based interventions that can effectively support recovery from stimulant dependence.

3.6. Kratom as a treatment for opioid dependence

Kratom or its scientific name *Mitragyna speciosa* is a tropical plant native to the Southeast Asian region, especially in Peninsular Malaysia and Thailand (Rusydan et al., 2022). This plant has been known for decades as a traditional herbal medicine for common ailments such as diarrhea, cough, fever, malaria, muscle pain, as well as improving blood circulation, sexual performance and treating diabetes, in addition to providing energy to increase work productivity (Ramanathan et al., 2021). Notably, kratom has also been

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traditionally used as a substitute for opioids, with historical accounts of its use in replacing opium in Malaysia dating back to 1895. In recent years, kratom has gained global attention for its analgesic properties and its potential role in managing opioid addiction and psychological conditions such as depression and anxiety (Edinoff et al., 2024).

Methods of kratom consumption in Southeast Asia include chewing fresh, de-veined leaves, swallowing crushed dried leaves, smoking, or brewing them as tea or decoctions (Eastlack et al., 2020; Ramanathan & McCurdy, 2020). In contrast, in Western countries where access to fresh kratom is limited, it is more commonly consumed in the form of capsules, pills, and liquid extracts, often purchased online or from herbal and tobacco shops (Prevete et al., 2023). The efficacy of kratom in managing opioid dependence and withdrawal symptoms has been widely reported in literature reviews. Its major alkaloid, mitragynine, acts as a partial agonist at mu-opioid receptors, a mechanism believed to underlie its potential for reducing opioid dependence and withdrawal symptoms. Although clinical studies supporting the use of kratom for opioid dependence treatment are still not available, preclinical studies have garnered a lot of scientific data to support the use of kratom or mitragynine in replacing opioids (morphine) using various animal models (i.e. rats, zebrafish) (Hassan et al., 2020; Damodaran et al., 2021).

Studies on mitragynine dependence potential in rats suggest that its withdrawal symptoms are milder, shorter in duration, and qualitatively different from those of opioids (Harun et al., 2020; Hassan et al., 2021). The findings are aligned with reports from human studies that kratom withdrawal symptoms are generally milder and self-manageable, which is different from opioid withdrawal symptoms (Boyer et al., 2008). In addition, kratom use, whether chronic or not, has also been reported to not lead to severe harm to daily life functions such as occupational, social, and other functions (Singh et al., 2015).

Despite its potential therapeutic benefits, kratom also carries risks of abuse and dependence. Its wide availability and affordability have contributed to non-medical use and recreational consumption (Chang-Chien et al., 2017). Although kratom is often perceived as safe due to its natural origin, both preclinical and clinical studies have documented risks including toxicity, adverse effects, and abuse liability (Edinoff et al., 2024; Li et al., 2023). These concerns have triggered debates in Malaysia about whether kratom should be legally regulated or restricted.

Although clinical reports and preclinical data have suggested promising findings for the development of kratom as a potential pharmacotherapeutic for the treatment of opioid dependence, robust clinical trials are necessary to determine its safety, efficacy, and appropriate dosing regimens. Moreover, ethical and regulatory considerations must be addressed before it can be formally integrated into treatment protocols. Thus, while kratom presents a potentially valuable alternative for opioid management, its development as a clinical treatment requires comprehensive scientific validation and policy oversight.

3.7. Challenges in managing psychotropic substance use crisis

Managing psychotropic substance use presents complex, interrelated challenges that hinder long-term recovery and effective enforcement in Malaysia. One persistent issue is the high relapse rate among drug users who have completed rehabilitation programs.

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While treatment may be successful in the short term, many individuals return to substance use due to psychosocial stressors, lack of community support, and insufficient coping mechanisms (Ibrahim & Kumar, 2009). This highlights the need for post-rehabilitation strategies that include long-term psychological counseling, peer support networks, and community reintegration efforts.

Relapses are a recognized challenge in the management of all behavioral and substance use disorders (Witkiewitz & Marlatt, 2004). The situation is compounded by the evolving landscape of drug abuse, marked by a transition from traditional narcotics like opioids to synthetic alternatives such as MDMA and New Psychoactive Substances (NPS). These substances are not only more potent and unpredictable but are also more accessible, especially among youth influenced by social trends and online availability. Limited treatment protocols and clinical expertise for managing synthetic drug dependence further exacerbate the issue.

Another major obstacle is the persistent drug trafficking networks operating within and beyond national borders. Methamphetamine trafficking remains a growing concern in the Mekong region, with large-scale manufacturing hubs reported in Cambodia, Indonesia, Malaysia, and the Philippines (McKetin et al., 2008). Malaysia geographical position, with its extensive coastline and numerous access points, has made it a key transit and processing hub for illicit drug operations.

Recent reports highlight the growing involvement of transnational drug syndicates that collaborate with local networks to smuggle in precursor chemicals for domestic drug production (Ahmad, 2025). These precursor chemicals are processed in clandestine laboratories, enabling large-scale manufacturing of synthetic drugs that are difficult to detect and intercept. This widespread distribution network complicates enforcement and undermines national drug control efforts.

To address these multifaceted challenges, Malaysia must adopt a coordinated, multi-sectoral strategy that includes stronger legal frameworks, international cooperation, enhanced surveillance of precursor chemicals, expansion of evidence-based treatment options, and reintegration-focused rehabilitation models. Without a holistic and sustained approach, the psychotropic substance use crisis will continue to strain public health, law enforcement, and societal stability.

3.8. Future directions in combating substance abuse

The shift in patterns of psychotropic substance use from traditional drugs such as opioids and cannabis to synthetic substances like methamphetamine and amphetamine-type stimulants (ATS) necessitates a corresponding shift in research and policy focus. Future studies should prioritize understanding the epidemiology, clinical presentation, and societal impact of emerging synthetic drugs, particularly New Psychoactive Substances (NPS). Longitudinal and cross-sectional studies are needed to map usage trends, identify at-risk populations, and monitor the effectiveness of policy interventions.

In addition, the therapeutic potential of kratom, a plant unique to Southeast Asia, warrants robust scientific inquiry. Kratom is traditionally used to alleviate opioid withdrawal symptoms, yet its pharmacological effects, safety profile, and long-term outcomes remain underexplored. Randomized controlled trials (RCTs) are needed to determine its efficacy and risk profile when used as medication-assisted treatment (MAT)

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for opioid dependence. Parallel to these efforts, it is essential to implement regulatory frameworks that govern kratom cultivation, standardize product quality, and restrict non-medical use, ensuring kratom is used exclusively for research and therapeutic purposes.

To complement biomedical efforts, future research should also emphasize the neurobiological and behavioral mechanisms underlying relapse. This includes investigations into stress response, environmental triggers, and craving pathways, which can inform the development of targeted pharmacological agents and cognitive-behavioral interventions.

Finally, a sustainable national response requires a multi-sectoral and multidisciplinary approach. Future strategies must integrate community outreach, social services, healthcare infrastructure, and law enforcement into a coordinated national framework. Such integration is crucial to bridge gaps between treatment access, legal regulation, and social reintegration, thereby improving both the effectiveness and efficiency of substance use management in Malaysia.

4. Conclusion

Substance abuse and dependence remain pressing global public health concerns, given their potential to cause both acute and chronic complications, including fatal outcomes. Despite substantial efforts by governments and public health institutions, ongoing challenges such as relapse, the emergence of synthetic drugs, and limited treatment options have hindered the success of intervention programs. As a result, the number of reported substances use cases continues to rise.

To address this escalating crisis, future efforts must focus on implementing comprehensive mechanisms within the public healthcare system. These should include expanding evidence-based treatment programs, strengthening post-rehabilitation support, regulating emerging psychoactive substances, and supporting research on alternative therapies such as kratom. Furthermore, a multi-sectoral approach involving healthcare, legal, educational, and social sectors is essential to effectively reduce the societal, economic, and health burdens associated with psychotropic substance use.

Ethics Approval and Consent to Participate

Not applicable

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Conflict of Interest

The authors reported no conflicts of interest for this work.

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