



The Abuse of Central Nervous System Stimulants and its Impact on the Youth of Eastern Nigeria

M. O. Nwokike^{1*}, C. A. Anusiem², C. O. Arinze³ and A. O. Ogbonna⁴

¹*Department of Pharmacology and Therapeutics, Ebonyi State University, Abakaliki, Nigeria.*

²*Department of Pharmacology and Therapeutics, University of Nigeria, Enugu, Nigeria.*

³*Department of Ophthalmology, Alex Ekwueme University Teaching Hospital, Abakaliki, Nigeria.*

⁴*Government House Medical Centre, Enugu, Nigeria.*

Authors' contributions

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ABSTRACT

The class of drugs designated as central nervous system (CNS) stimulants includes the four social drugs that find use among some youth of Eastern Nigeria; caffeine, nicotine, cocaine and marijuana. CNS stimulants increase or enhance the activity of monoamines (such as dopamine and nor epinephrine) in the brain, which leads to increased heart rate, blood pressure, and respiration. They also have a high potential for addiction. Addiction is defined as a chronic, relapsing brain disease that is characterized by compulsive drug seeking and use, despite harmful consequences. It is considered a brain disease because these drugs change the brain structure and function. The aim of this review is to answer the following questions: What are the common types of CNS stimulants abused in Eastern Nigeria? What prompts people to start taking these drugs? Why do people become addicted to these drugs? How does CNS stimulant abuse gain foothold in Eastern Nigeria? What are the implications of this drug taking for the users and the development of youth? How does the abuse of these stimulants affect the Eastern Nigerian society? How can the use of CNS stimulants among youth of eastern Nigeria be prevented or discouraged? Is there any treatment available for the youth addicted to CNS stimulants in Eastern Nigeria?

*Corresponding author: E-mail: matthew.nwokike@gmail.com;

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1. INTRODUCTION

Addiction is a chronic, relapsing brain disease that is characterized by compulsive drug seeking and use, despite harmful consequences [1]. It is considered a brain disease because these drugs change the brain structure and function [2]. The Central Nervous System Stimulants cause brain changes that can be long lasting and lead to much harmful, often self-destructive, behaviour [3]. There are different types of CNS stimulant but the commonly abused ones among some youth in Eastern Nigeria are Caffeine, Cocaine, Marijuana and Nicotine each of which is highlighted below.

2. MARIJUANA

Marijuana, or Cannabis, refers to the dried leaves, flowers, stems, and seeds from the hemp plant *Cannabis sativa*. Marijuana is also known here with a vast number of other slang terms like *igbo*, *anwuru*, *grass*, *weed*, *kaya*, *wee-wee* or *ganja* and grows well on the soil of Eastern Nigeria. This plant material can also be concentrated in a resin called *hashish* or a sticky black liquid called *hash oil*. The main psychoactive chemical in marijuana, responsible for most of the CNS stimulant effect is *delta-9-tetrahydrocannabinol (THC)* [4]. The chemical is found in resin produced by the leaves and buds primarily of the female cannabis plant. The plant also contains numerous other chemicals, including other compounds that are chemically related to THC, called *cannabinoids* [5]. Some people smoke marijuana in hand-rolled cigarettes called *joints*; in pipes, water pipes or marijuana rolled in cigar wraps [6]. Marijuana can also be used to brew tea and is frequently mixed into foods. Stronger forms of marijuana include *sinsemilla* (from specially tended female plants) and concentrated resins containing high doses of marijuana's active ingredients.

Cannabis is believed to have been introduced to Eastern Nigeria by soldiers and sailors returning from conflict zones in North Africa and the Far East during and after World War II. The British colonial authorities were reported to also have engaged in small-scale cannabis and coca cultivation as early as the 1930s [7]. The cultivation of cannabis spread rapidly during the 1960s thereby making it a public issue in Nigeria after its abuse by individuals and psychiatric patients [8]. Possession and consumption of

marijuana, regardless of its purpose, is illegal in all jurisdictions of Eastern Nigeria.

The short-term effects of marijuana include problems with memory and learning, distorted perception, difficulty in thinking and problem-solving, and loss of coordination [9]. Among youth, heavy cannabis use is associated with cognitive problems and increased risk for psychiatric disorders, including psychosis (schizophrenia), depression, anxiety, and substance use disorders [10]. One research suggests that smoking high-potency marijuana every day could increase the chances of developing psychosis by nearly five times compared to people who have never used marijuana [11]. The amount of drug used, the age at first use, and genetic vulnerability has all been shown to influence this relationship. The strongest evidence to date concerns links between marijuana use and psychiatric disorders in those with a pre-existing genetic or other vulnerability [12].

Another research using longitudinal data from the National Epidemiological Survey on Alcohol and Related Conditions examined associations between marijuana use, mood and anxiety disorders, and substance use disorders found no association between marijuana use and mood and anxiety disorders [13]. The only significant associations were increased risk of alcohol use disorders, nicotine dependence, marijuana use disorder, and other drug use disorders [13].

Di Forti et al. in 2012 reported that people who use marijuana and carry a specific variant of the *AKT1* gene, which codes for an enzyme that affects dopamine signalling in the striatum, are at increased risk of developing psychosis. One study found that the risk of psychosis among those with this variant was seven times higher for those who used marijuana daily compared with those who used it infrequently or used none et al. [14].

Whether adolescent marijuana use can contribute to developing psychosis later in adulthood appears to depend on whether a person already has a genetically based vulnerability to the disorder. A study found an increased risk of psychosis among adults who had used marijuana in adolescence and also carried a specific variant of the gene for *catechol-O-methyltransferase (COMT)*, an enzyme that

degrades neurotransmitters such as dopamine and norepinephrine [15]. Marijuana use has also been shown to worsen the course of illness in patients who already have schizophrenia.

Consumption of this drug leads to a risk of addiction and dependence, along with interaction with other drugs [16]. The symptoms of addiction to marijuana are similar to those of any other addictive substance. The addictive nature of marijuana leads to its potential for overdose.

3. CAFFEINE

Coffee and tea are the most common sources of caffeine. Tea is made from the leaves of the *Camellia sinensis* plant while Coffee is made from the berries of species of the genus *Coffea*, in particular *Coffea Arabica* and *Coffea Robusta*. Caffeine is a most widely-used psychoactive substance. Caffeine is contained in a varied range of social drinks used in this society and Up to 400 milligrams (mg) of caffeine a day appears to be safe for most healthy adults [17].

The caffeine content in popular beverages varies and this adds up to the daily caffeine intake often times unconsciously. Also the actual caffeine content of a cup of coffee or tea can vary quite a bit. Factors such as processing and brewing time affect the caffeine level. The tables below provide numbers that can only be used as a guide [18].

Table 1. Caffeine content in popular beverages drink sizes are in millilitres (mL) while caffeine is shown in milligrams (mg)

Coffee drinks	Size (mL)	Caffeine (mg)
Brewed	237	96
Brewed, decaf	237	2
Espresso	30	64
Espresso, decaf	30	0
Instant	237	62
Instant, decaf	237	2

Source: USDA Food Data Central
<https://fdc.nal.usda.gov/index.html>

Caffeine in powder or liquid form can provide toxic levels of caffeine, the U.S. Food and Drug Administration have cautioned [18]. Just one teaspoon of powdered caffeine is equivalent to about 28 cups of coffee. Such high levels of caffeine can cause serious health problems and possibly death. Caffeine use cuts across all age groups but although it may be safe for adults in

most cases, children, adolescents and young adults is more easily prone to the toxic effects. Women who are pregnant or who are trying to become pregnant and those who are breast-feeding should talk with their doctors about limiting caffeine use to less than 200 mg daily [19]. Even among adults, heavy caffeine use can cause unpleasant side effects. Some young persons in Eastern Nigeria take this to people feel better in general, keep awake and have more energy. Most of the users do not think of it as a drug, but caffeine is a powerful stimulant [20]. Although its use is legal, Caffeine is quite addictive overdosing on it can be fatal. Tolerance and a tendency to increase intake are common, and withdrawal symptoms will occur if consumption is stopped [21]. Caffeine causes an increase in cellular activity in the CNS and behavioural and emotional responses. After consuming caffeine, people report thinking more clearly, having more energy, and having faster reaction times [21]. Increases are seen in respiratory rate, amplitude of reflexes, and the rate and force of the heart's contractions (systolic blood pressure). The stimulating effects of caffeine can take up to 12 hours to wear off. Caffeine causes disruptions in the normal sleeping pattern of the user [22]. Caffeine causes a general vasodilatation (opening) of the systemic blood vessels, including the coronary arteries, resulting in an increase in blood flow to the heart. The duration of systemic vasodilatation is brief and is accompanied by a vasoconstriction (tightening) of the vessels in the brain. Central vasoconstriction is the mechanism by which caffeine provides relief from both hypertensive and migraine headaches. This is one reason why caffeine is often found in some analgesic drugs. Regular caffeine consumption causes both psychological dependence and physiological tolerance [23].

4. NICOTINE

Nicotine is obtained from the tobacco plant, *Nicotiana tabacum*, which is said to be native to the western hemisphere [24]. The tobacco plant and its products reached the shores of Eastern Nigeria with the invasion and colonisation by Europeans. Presently in Eastern Nigeria, both some young and elderly persons engage in the act of inhaling finely ground tobacco particles through the nose (snuffing), chewing and smoking tobacco. Tobacco smoking is the practice of inhaling and exhaling smoke from cigarettes, cigars or pipes (consisting of burnt particle and gaseous phases). A more broad

definition may include simply taking tobacco smoke into the mouth, and then releasing it, as is done by some with tobacco pipes and cigars. Chewing or snuffing tobacco products usually releases more nicotine into the body than smoking.

Nicotine is the main central nervous system stimulant in tobacco. Today, nicotine is widely used in almost every nook and cranny of Nigeria [25] and the youth of Eastern Nigeria are not left behind in patronage for this foul smelling and mind numbing central nervous system stimulant, as its purchase and use by anyone over the age of 18 is legal. Some persons claim that nicotine improves memory and concentration among other reasons ranging from improving their spirituality and physical stability. But the movement to this habit often start with adventure, peer pressure and a feeling of inadequacy. But nicotine containing substances are highly addictive and difficult to give up. When a body is exposed to nicotine, the individual experiences a "kick." This is partly caused by nicotine stimulating the adrenal glands, which result in the release of adrenaline [26]. This surge of adrenaline stimulates the body. There is an immediate release of glucose, as well as an increase in heart rate, breathing activity, and blood pressure. Nicotine also makes the pancreas produce less insulin, causing a slight increase in blood sugar or glucose [27]. Indirectly, nicotine causes the release of dopamine in the pleasure and motivation areas of the brain and the user experiences a pleasurable sensation. Dopamine is a brain chemical that affects emotions, movements, and sensations of pleasure and pain. A rise in brain dopamine levels increases the feeling of contentment. Dopamine and endorphins released on nicotine stimulation and promote the urge to continue to take it with attending tolerance to its effect. As users become more tolerant to nicotine, they require higher doses to enjoy the same effects. First the man takes a smoke; the smoke drags another one, up to a time that the cloud takes the man.

The side effects of nicotine can affect the heart, hormones, and gastrointestinal system as nicotine is both a sedative and a stimulant [28]. Many substances in cigarette smoke trigger chemical reactions in nerve endings, which heighten heart rate, alertness [29] and reaction time, among other things [30]. Many of the side effects are quite damaging to health. Blood clots can form, plaque can build up in the arteries, and

the aorta can become enlarged. Nicotine can cause indigestion and ulcers. Blood pressure increases and the risk of stroke become much higher. Respiratory difficulties also arise and lung cancer is the ultimate threat.

When a person smokes, those chemicals are released into the air. Second hand smoke increases the risk by 30% of developing lung cancer. Smoking is not an isolated activity. It also raises the risk for developing emphysema.

Third hand smoke has also been recently discussed as being harmful to others. This would be the chemical remaining in the hair, on the skin and clothes, and hands after smoking then touching others and items. For example, if a person smokes a cigarette then holds a baby, that child is still exposed to the tobacco.

Some of the chemicals found in tobacco smoke include: Nicotine, Hydrogen cyanide, Formaldehyde, Lead, Arsenic, Ammonia, Radioactive elements, such as polonium-210, Benzene, Carbon monoxide, Tobacco-specific nitrosamines (TSNAs) and Polycyclic aromatic hydrocarbons (PAHs). Although nicotine is the ingredient that causes physical dependency, it is the resinous, partially-combusted particulate matter produced by the burning of tobacco that contains most carcinogens [31]. There are around 1.1 billion smokers worldwide and about 80% of these live in low- and middle-income countries (LMICs), where more than two-thirds of smoking-related deaths occur [32] It accounts for more than 7 million deaths annually with about 10% of these resulting from second-hand smoke. The WHO estimated about 13 million smokers in Nigeria in 2012 [33], with over 16,000 deaths attributable to smoking [34].

There is no data for smoking related fatalities in Eastern Nigeria, but using nicotine, particularly through smoking, is much more harmful than using many other legal drugs in terms of the number of illnesses smoking causes, the costs of treating those illnesses, and the high fatality rates among habitual users in other climes.

5. COCAINE

Cocaine is derived from the leaves of the coca plant, which is said to grow in South America, India and regions of Africa and Indonesia. It is a white powder that is typically snorted. Cocaine, also known as coke, is a strong stimulant mostly used as a recreational drug [35]. It is commonly inhaled as smoke, snorted or dissolved and

injected into a vein [36]. Laced with marijuana for smoking it is referred to as gbona in this clime. Crack cocaine is a potent CNS stimulant which consists of pellets or “rocks” that are smoked in a glass pipe. Crack cocaine is particularly addictive because the high only lasts a few minutes. Users will keep taking the drug throughout the day. Mental effects from the use of cocaine may include loss of contact with reality, an intense feeling of happiness, or agitation [36]. Physical symptoms may include an increased heart rate, sweating, and large pupils [36]. High doses can result in high blood pressure or increased body temperature [37]. Effects begin within seconds to minutes of use and last between five and ninety minutes [36]. Cocaine is addictive due to its effect on the reward pathway in the brain. After a short period of use, there is a high risk that dependence will occur [38]. Its use also increases the risk of stroke, myocardial infarction, blood infections, sudden cardiac arrest and lung problems in those who smoke it [38-39]. Cocaine can be lethal, particularly if taken by injection. Fatality can result from heart failure, respiratory depression, stroke, or seizures [39].

When under the influence of all central nervous system stimulants, including caffeine, cocaine, marijuana and nicotine, many young people involve in uncontrollable and oftentimes less than honourable acts due to their effect on decision making and cognitive functions [40].

6. CAUSES OF CNS STIMULANT ABUSE

When young People are introduced to CNS stimulants, they are attracted to their ability to increase energy levels. They feel powerful and unstoppable. Some of these substances will also create feelings of euphoria and give the user high levels of self-confidence and feelings of being in control. These effects of the drug are so enticing that people can quickly become addicted to them and the substance abuser may feel the need to keep on taking more so as to reclaim the good feelings [41]. These persons are known to spend a majority of their time seeking out and using the drug. They continue to seek the drug despite adverse effects on their life and health. They have to take larger and larger amounts to feel the same effects. And oftentimes have tried to give up or cut down on their use without successful outcome. There are risk factors that predispose young people to CNS stimulants use and these include; poverty, social dysfunction, weak families, poor education, poor upbringing, and substance-abusing peer groups [41-43].

Certain types of drugs, and methods of using them, are also more addictive than others [44]. The risk factors only influence an individual's initial decision to use substances of abuse [45].

7. GENETICS

The chemical reactions that happen in the brain with an addiction are quite different than those that happen in one without addiction. That explains why one person may be able to smoke cigarettes every so often for pleasure, while another needs them on a daily basis to function. Heredity is a major risk factor for addiction. According to the National Institute on Drug Abuse, up to half of the risk for addiction to alcohol, nicotine, or other drugs is based on genetics. Though no particular gene has been identified as the “addiction gene,” individuals who suffer from addiction tend to have children who also suffer from addiction at much higher rates. [46].

8. BRAIN CHEMISTRY

In the center of the brain are two masses of nerve cells called the nucleus accumbens. partaking in any activity that promotes survival (like eating or having sex) makes this region to be flooded with dopamine, which provides a sense of pleasure from the activity.

Individuals with naturally low levels of dopamine are susceptible to substance abuse because drugs cause an abnormally large surge in dopamine levels, activating the pleasure response. As a substance abuser continues to take the drug, the brain will become exhausted by the surges of dopamine and begin producing less and less of its own as a result. This chemical response to the drug being repeatedly introduced into the body produces physical dependency on the drug due to the now exacerbated dopamine deficiency. Similarly, serotonin deficiency—linked to depression, anxiety, and Obsessive-Compulsive Disorder—has recently been found to also pose risk for addiction. In particular, ethanol, cannabinoids, opioids, and psycho stimulants have been used by many to raise the previously low levels of serotonin in the body at the risk of physical dependence [47].

9. ENVIRONMENT

Environmental factors can also raise your risk of addiction. For children and teens, lack of parental involvement can lead to greater risk-taking or experimentation with drugs of abuse. Young

people who experience abuse or neglect from parents may also use drugs to cope with their emotions.

Peer pressure is another risk factor for addiction, especially among young people. Even when it's

not overt or aggressive, pressure from friends to fit in can create an environment of "experimentation" with substances that can lead to addiction. The availability of a substance in a social group can also affect the risk of becoming an addict [43].

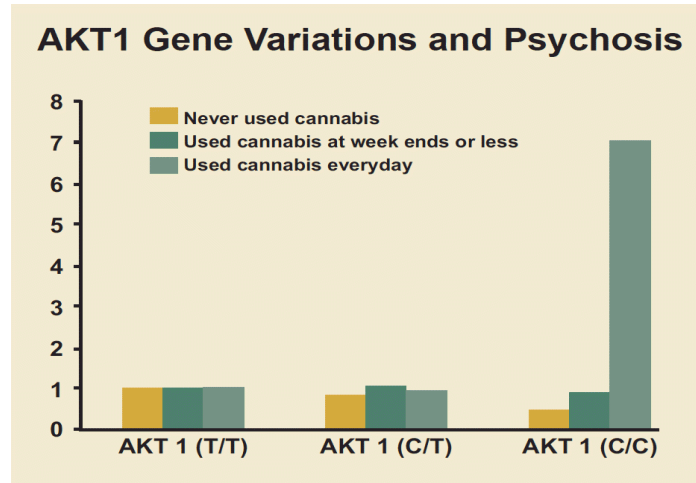


Fig. 1. AKT1 gene variation and the risk of psychosis
 Source: Di Forti et al. *Biol Psychiatry*. 2012

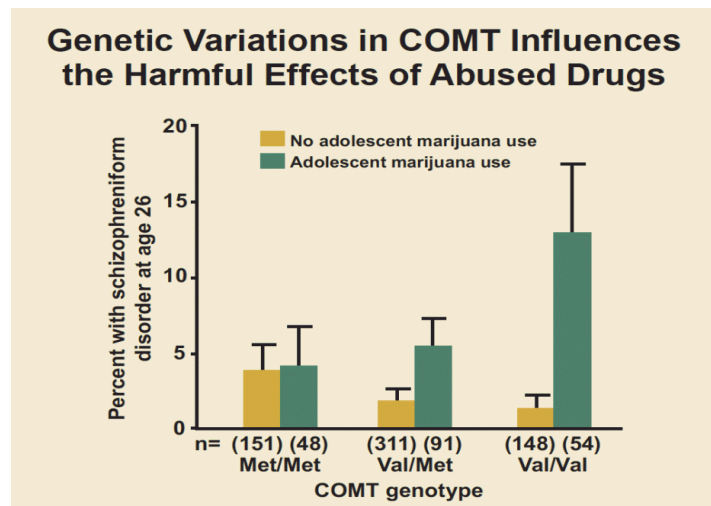


Fig. 2. Genetic variation in COMT influences the harmful effect of abused drugs
 Source: Di Forti et al. *Biol Psychiatry*. 2012

Table 2. Caffeine content in teas

Teas	Size (mL)	Caffeine (mg)
Brewed black	237	47
Brewed black, decaf	237	2
Brewed green	237	28
Ready-to-drink, bottled	237	19

Source: USDA Food Data Central <https://fdc.nal.usda.gov/index.html>

10. EARLY EXPOSURE

Another risk factor for addiction is the age at which one begins the behaviour. Addictive behaviour among young people can also impact the brain development, making them more prone to mental health disorders as the addiction progresses [43]. Substance use in young people (aged 10–24 years) might disrupt key periods of transition that occur as the adolescent brain undergoes cognitive and emotional development, and key psychosocial transitions are made. Adolescence is the peak time for initiation of substance use, with tobacco and alcohol usually preceding the use of illicit drugs. Substantial variation is noted between countries in the levels, types, and sequences of substance use in young people, indicating that a young person's use of substances depends on their social context, drug availability, and their personal characteristics [43].

11. WHY DO PEOPLE BECOME ADDICTED TO THESE DRUGS?

11.1 The Central Nervous System

The central nervous system is comprised of the brain and spinal cord with the brain as the control centre. The brain processes sensory information from throughout the body, guides muscle movement and locomotion, regulates a multitude of bodily functions, forms thoughts and feelings, modulates perception and moods, and essentially controls all behaviour. The fundamental functional unit of the brain's circuits is a specialized cell called a neuron; a cell that is specialized to conduct nerve impulses both electrically and chemically. The function of the neuron is to transmit information: It receives signals from other neurons, integrates and interprets these signals, and in turn, transmits signals on to other, adjacent neurons.

Within neurons, the signals are carried in the form of electrical impulses. But when signals are sent from one neuron to another, they must cross the synapse. At the synapse, the electrical signal within the neuron is converted to a chemical signal and sent across the synapse to the target receiving neuron. This chemical signal is conveyed via neurotransmitters that attach receptors on the outer surface of the target neuron. The attachment of the neurotransmitters to the receptors consequently triggers an electrical signal within the target neuron.

Neurotransmitters may have different effects depending on what receptor they activate. Some increase a receiving neuron's responsiveness to an incoming signal (an excitatory effect) while others may diminish the responsiveness (an inhibitory effect). A balance of the stimulant and depressant effects of the neurotransmitters is necessary for the normal effects of the central nervous system.

11.2 The Brain Reward System

The brain reward system spans between the ventral tegmental area (VTA) and the nucleus accumbens. Natural activities such as eating, drinking, and sex activate the nucleus accumbens. This internal communication leads to the release of dopamine. The released dopamine produces feelings of pleasure and elation. As dopamine levels subside, so do the feelings of pleasure. But if the activity is repeated, then dopamine is again released, and more feelings of pleasure and euphoria are produced. The release of dopamine and the resulting pleasurable feelings positively reinforce such activities and motivate the repetition of these activities.

When the nucleus accumbens is functioning normally, communication among its neurons occurs in a consistent and predictable manner. First, an electrical signal within a stimulated neuron reaches its point of connection (i.e., the synapse) with the target neuron. The electrical signal in the presynaptic neuron triggers the release of dopamine into the synapse. The dopamine travels across the synaptic gap until it reaches the target neuron. It then binds to the postsynaptic neuron's dopamine-specific receptors, which in turn has an excitatory effect that generates an internal electrical signal within this neuron. However, not all of the released dopamine binds to the target neuron's receptors. Extra dopamine may be chemically deactivated, or it may be quickly reabsorbed by the releasing neuron through a system called the dopamine reuptake transporter. As soon as the extra dopamine has been deactivated or reabsorbed, the two cells are "reset," with the releasing neuron prepared to send another chemical signal and the target neuron prepared to receive it. Influence of drugs of abuse thus tilts the balance of brain functionality to an excitatory or inhibitory state.

1. How did CNS stimulant abuse gain foothold in Eastern Nigeria?

“Illicit drugs as we know them today is not indigenous to Nigeria, they were imported. The tobacco and its products sailed in with the British to Nigeria. Marijuana was introduced to Nigeria by soldiers who fought the Second World War in the Middle East and also sailors”. After its introduction, the Nigerian soil became very fertile for its growth, mostly in the tropical parts of the country [41].

Marijuana became a source of worry when in the 1960s cannabis farms were discovered in parts of southern Nigeria and there were also reports of psychological disorder which was connected to the use of cannabis. Tobacco and Cannabis are the main CNS stimulant drugs produced within the country. With its toxicity, tobacco is still big business in Nigeria and gets government support. Its legal status makes it the most patronised psycho stimulant in Nigeria, Cocaine has similar history like the introduction of cannabis, only that it is not produced within the country; Nigeria is only a transit point for cocaine [41]. Cigarette smoking finds more patronage in Eastern Nigerian Cities than marijuana and cocaine put together. Marijuana comes second in use while cocaine is rarely encountered among the ordinary youth of this environment,

2. What are the implications of this drug taking for the users and the development of youth?

The central nervous system stimulants exert their effects by disrupting or modifying the normal communication that occurs among brain neurons and brain circuits. Cocaine has been shown to specifically disrupt the dopamine neurotransmitter system. This disruption is accomplished by over stimulating the receptors on the postsynaptic neuron, either by increasing the amount of dopamine in the synapse through

excessive presynaptic release or by inhibiting dopamine's pattern of reuptake or chemical breakdown [19]. The use of cocaine increases the amount of available dopamine in the brain, which leads to mood elevation (e.g., feelings of elation or euphoria) and increased motor activity. As the stimulant level in the brain decreases, the dopamine levels subside to normal, and the pleasurable feelings dwindle away [2,19].

On a short-term basis, stimulants exert their effects by disrupting or modifying the normal communication that occurs among brain neurons and brain circuits. Cocaine has been shown to specifically disrupt the dopamine neurotransmitter system. This disruption is accomplished by over stimulating the receptors on the postsynaptic neuron, either by increasing the amount of dopamine in the synapse through excessive presynaptic release or by inhibiting dopamine's pattern of reuptake or chemical breakdown [19]. The use of cocaine increases the amount of available dopamine in the brain, which leads to mood elevation (e.g., feelings of elation or euphoria) and increased motor activity. As the stimulant level in the brain decreases, the dopamine levels subside to normal, and the pleasurable feelings dwindle away. Cocaine acts by inhibiting the reuptake of serotonin, norepinephrine, and dopamine [25]. This results in greater concentrations of these three neurotransmitters in the brain [25]. It can easily cross the blood–brain barrier and may lead to the breakdown of the barrier [29-30].

Nicotine consumption causes the release of nor epinephrine, dopamine, and serotonin in the CNS. This leads to feelings of both stimulation and decreased reactivity. It is now thought that nicotine withdrawal itself does not increase baseline anxiety. The release of DA is probably what leads to the reinforcing experience of

Table 3. Caffeine content in sodas

Sodas	Size (mL)	Caffeine (mg)
Citrus (most brands)	237	0
Cola	237	22
Root beer (most brands)	237	0

Source: USDA Food Data Central <https://fdc.nal.usda.gov/index.html>

Table 4. Caffeine content in energy drinks

Energy drinks	Size (mL)	Caffeine (mg)
Energy drink	237	29
Energy shot	30	215

Source: USDA Food Data Central <https://fdc.nal.usda.gov/index.html>

pleasure associated with tobacco use (this release of DA is similar to that observed with other addictive drugs. Genetic differences have been found between people who become dependent upon cocaine and those who remain casual users. Results suggest that variation in an enzyme, catechol-O-methyl transferase (COMT), which breaks down NE, 5-HT and DA, is related to the risk of dependency. Similarly, genetic differences may explain why some people become dependant on nicotine [31].

Three main mechanisms of action of caffeine on the central nervous system have been described. Mobilization of intracellular calcium and inhibition of specific phosphodiesterases only occur at high non-physiological concentrations of caffeine. The only likely mechanism of action of the methylxanthine is the antagonism at the level of adenosine receptors. Caffeine increases energy metabolism throughout the brain but decreases at the same time cerebral blood flow, inducing a relative brain hypoperfusion. Caffeine activates noradrenalin neurons and seems to affect the local release of dopamine. Many of the alerting effects of caffeine may be related to the action of the methylxanthine on serotonin neurons [15]. The methylxanthine induces dose-response increases in locomotor activity in animals. Its psycho stimulant action on man is, however, often subtle and not very easy to detect. The effects of caffeine on learning, memory, performance and coordination are rather related to the methylxanthine action on arousal, vigilance and fatigue. Caffeine exerts obvious effects on anxiety and sleep which vary according to individual sensitivity to the methylxanthine. However, children in general do not appear more sensitive to methylxanthine effects than adults. The central nervous system does not seem to develop a great tolerance to the effects of caffeine although dependence and withdrawal symptoms are reported [16].

3. How does the abuse of these stimulants affect the Eastern Nigeria environment?

The impact of drug abuse among the youth has been a stigma of moral decadence, violence, madness and criminal activities. Addiction to CNS stimulants can have a devastating impact on the physical and mental well-being of an individual which can drive people to insanity and drastically decrease their quality of life. Unlike some other addictive substances it is not necessary for the individual to take CNS stimulants for long before they are addicted.

There are several dangers of this type of addiction:

Effect on academic performance: Abused stimulants are toxic to the brain. CNS stimulants impair cognitive development which in turn reduces academic achievement and disrupts academic progression. Studies also have shown that heavy adolescent substance use can lead to problems working with memory and attention due to brain activities and school dropout. Studies have associated poor academic performance, students missing classes, difficulty in keeping up with academic responsibility, failing tests, dropping out of school due to poor grades with drug use. Also, they may divert academic time to drug seeking and attendant consequences [39].

Driving and road accidents: CNS stimulants can have detrimental effects on a wide range of motor and cognitive skills necessary for the safe operation of a motor vehicle. Research has shown that low doses of stimulants can help counteract the detrimental effects of fatigue on attention and arousal, but the effect is only evident in drivers who are fatigued. There is no improved performance among healthy, well-rested individuals. When used to combat fatigue, however, the effect is temporary. As the stimulant effects wear off, the fatigue not only returns but can be intensified. Higher doses produce agitation, inability to focus, reduced ability to divide attention, increased risk taking, and deficits in balance and coordination. inattention, speeding, risk-taking, poor impulse control and aggressive driving are common attitudes of drivers under the influence of CNS stimulants. As drug levels wane, users experience fatigue, depression, inattention and sleepiness, all of which can affect the ability to operate a vehicle safely. The magnitude of the effects depends on the particular substance used, dose ingested, extent of prior use and manner of use. Though there is no data for the effect of CNS stimulant abuse on road safety in Eastern Nigeria, such exists in other climes and can translate to this environment [40].

Criminalization of the youth: It is illegal to use or cultivate CNS stimulants like marijuana in all parts of Nigeria and Conviction for one of these offences results in a criminal record, affecting future options for education, employment and travel. Driving while impaired by a stimulant such as cocaine, methamphetamine or amphetamine is an offence under the Nigerian Criminal Code and those convicted face a stiff penalty. The

Nigerian Drug Law Enforcement Agency was established to discourage the use and trafficking on all drugs of abuse. Many drug users go onto crime to support the expensive habit. Many youth in this environment are lured to cultism as an avenue to feed their drug appetite. Drug users generally fall behind their mates and do not have much sympathy from the society.

4. How can the use of these CNS stimulants among youth of eastern Nigeria be prevented or discouraged?

Having one or more addiction risk factors does not mean someone will become addicted, but it does mean the odds are greater. The more risk factors present, the greater the chance that an individual will develop the disease. While psychological and environmental factors appear to be more influential in determining whether an individual starts to use substances, genetic factors appear to have more of an influence in determining who progresses from substance use to addiction [30-31]. Still with many risks factors for addiction, one can combat or avoid it. Risk factors can increase the chance of becoming addicted, but they don't condemn one to addiction. Total abstinence and avoidance of risky relationships can stop one from using drugs, or practicing other addictive behaviours.

The negative physical, psychological, and social effects of marijuana are numerous and as such its use for any reason is highly discouraged. Federal and state laws continue to deem marijuana possession, as well as its distribution, as illegal. While the prosecution rates of individuals who carry small amounts of the substance is high.

Cutting back on caffeine can be challenging for instance. An abrupt decrease in caffeine may cause withdrawal symptoms, such as headaches, fatigue, irritability and difficulty focusing on tasks. Fortunately, these symptoms are usually mild and get better after a few days. To wean off the caffeine habit these tips are recommended [17]:

- **Keep tabs.** Start paying attention to how much caffeine you're getting from foods and beverages, including energy drinks. Read labels carefully. But remember that your estimate may be a little low because some foods or drinks that contain caffeine don't list it.

- **Cut back gradually.** For example, drink one fewer can of soda or drink a smaller cup of coffee each day. Or avoid drinking caffeinated beverages late in the day. This will help your body get used to the lower levels of caffeine and lessen potential withdrawal effects.
- **Go decaf.** Most decaffeinated beverages look and taste much the same as their caffeinated counterparts.
- **Shorten the brew time or go herbal.** When making tea, brew it for less time. This cuts down on its caffeine content. Or choose herbal teas that don't have caffeine.
- **Check the bottle.** Some over-the-counter pain relievers contain caffeine. Look for caffeine-free pain relievers instead.

Nicotine is extremely addictive and known to be harmful in many ways to both individual youth and the Eastern Nigeria Society [33]. For this reason its use is discouraged by society but unfortunately government policy has not deemed it harmful enough to declare it illegal like marijuana. Advertisement for tobacco and its products are regulated in the main stream media in Eastern Nigeria but its use and sale restriction is not visibly enforced.

5. Is there any treatment for the youth addicted to CNS stimulants in Eastern Nigeria?

Society shows little sympathy for youth addicted to these CNS stimulants and this is made worse by the fact that specialised clinics hardly exist for the treatment of such unfortunate youth. Addiction to CNS stimulants is a treatable, chronic disease that can be managed successfully. The chronic nature of addiction means that relapsing to drug use is not only possible but also likely.

Behavioural and family-based treatments have been found to be effective for marijuana abuse and addiction. While most individuals with marijuana abuse or dependence are treated on an outpatient basis, admission to both outpatient and inpatient treatment programs for marijuana addiction has increased over the years. There is as yet no medication that has yet been shown to be a clearly effective treatment of marijuana-use disorders. The symptoms of marijuana withdrawal are similar to those of other drugs and include irritability, anger, depression, insomnia, drug craving, and decreased appetite.

The treatment of nicotine dependency aims to reduce the urges to consume nicotine as well as the associated risks and health problems. Combining behavioural therapy with medications, where available, is the best way to ensure success for most patients [33]. This can range from counselling as simple as advice from a primary care physician to stop smoking, to individual telephone and group therapy. Drug treatment options for nicotine dependency include [48]:

Nicotine replacement therapy (NRT): This is available in skin patches, nasal sprays, inhalers, and solutions that can be rubbed into the gums. These replace part of the nicotine normally supplemented by smoking cigarettes and reduce the severity of urges and cravings.

Bupropion: This was used in the first instance as anti-depressant medication. However, it was then found to be useful in reducing nicotine cravings. It has a similar rate of effectiveness to NRT.

Varenicline: This medication partially triggers a certain receptor in the brain that usually responds only to nicotine. It then blocks the receptor, preventing nicotine from doing the same. This reduces the urges a person experiences while quitting smoking. It may also reduce the satisfaction an individual gets from smoking, which in turn decreases the risk of a relapse.

Other drug treatments include:

- clonidine, an anti-hypertensive drug that has also shown to reduce symptoms of nicotine withdrawal but can also cause low blood pressure, dry mouth, constipation, and a slow heartbeat
- Nortryptiline, a tricyclic antidepressant whose effects can replace those of nicotine but has many of the major side effects of antidepressants.

Cocaine abuse is insignificant among the youth of Eastern Nigeria but where that exists, treatment interventions exist to manage the addicts. The behavioural interventions can help people with CNS stimulant drug dependency overcome the psychological aspects of withdrawal, such as low mood and irritability, while the medications help tackle the chemical side of dependency. People who regularly consume CNS stimulants and then suddenly stop experience withdrawal symptoms, which may

include: cravings, a sense of emptiness, anxiety, depression, moodiness, irritability and difficulty focusing or paying attention. These effects mostly wear off after a period of time.

12. CONCLUSION

Though there is no research based data to substantiate this, the proportion of youth in Eastern Nigeria that abuse cocaine are observably infinitesimal, maybe statistically below 0.01 percent, but addiction to marijuana, nicotine and caffeine are quite observable with the attendant effects. This has thus far contained the effect of drug abuse among this youth as a family problem instead of society problem. Such youth generally do not get the sympathy of both their mates and the society in general. The initial decision to take drugs is mostly voluntary. However, when addiction takes over, a person's ability to exert self-control can become seriously impaired. Physical changes occur in areas of the brain that are critical for judgment, decision making, learning, memory and behaviour control. These changes alter the way the brain works and may help explain the compulsive and destructive behaviours of an addicted person. Many Eastern Nigerian youth have been sentenced to death, underachievement and permanent disabilities due to the effect of central nervous system stimulants, but many more are blind to the predicaments of others and are drawn to and eventually hooked with the drug dilemma. What would make a rational and vibrant youth defy all the social, academic and parental caution against drug abuse? The lure to drug addiction in this environment are more from social and economic influences but are only curtailed to the level that it exists because of strong family and community influences that exist in Eastern Nigeria. Treatment approaches are tailored to address each patient's drug use patterns and drug-related medical, psychiatric, and social problems. With proper counselling, medications, or other treatment options, it is possible to recover from an addiction to these central nervous system stimulants and lead a healthy life.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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