**Literature Review**

Cognition in its broadest sense as meaning all the mental activities that allow us to perceive, integrate and conceptualize the world around us. These include the global functions of consciousness, attention, and orientation and the specific domains of memory, executive function, language, praxis and perception (Birrel, 2013).

According to modern neuroscience, object perception involves bottom-up signals from sensory organs and top-down signals from internal mind’s representations (memories) of objects. During perception, the mind matches subsets of bottom-up signals corresponding to objects with representations of object in the mind (and top-down signals). This produces object recognition; it activates brain signals leading to mental and behavioral responses (L. Perlovsky & Ilin, 2012).

Cognition is the mental action or process of acquiring knowledge and understanding through thought, experience, and the senses. Human cognition can be conscious and unconscious, concrete or abstract, as well as intuitive (like knowledge of a language) and conceptual (like a model of a language). It encompasses many aspects of intellectual functions and processes such as attention, the formation of knowledge, memory and working memory, judgment and evaluation, reasoning and computation, problem solving and decision making, comprehension and production of language (Zhang, 2019).

Cognitive mechanisms driving the human mind both toward and away from creativity are related to ancient mechanisms of adaptive behavior. A paradoxical role of language is discussed: on the one hand, language makes higher cognition possible; on the other, language enables heuristic thinking, using millennial truths instead of original creative thinking. Creativity requires overcoming cognitive dissonances and choosing task relevance over salience. Functions of conceptual, emotional, conscious, and unconscious mechanisms are analyzed and related to various brain regions (L. I. Perlovsky & Levine, 2012).

Cognition fundamentally controls our thoughts and behaviors and these are regulated by discrete brain circuits which are underpinned by a number of neurotransmitter systems. There are a number of brain chemicals which play major roles in regulating cognitive processes; including dopamine, noradrenaline, serotonin, acetylcholine, glutamate and GABA. Our distinct cognitive functions arise because of processes occurring within certain parts of our brain, but only some of these, end up entering our conscious awareness (Valenzuela, Puglia, & Zucca, 2011).

Cognition in a broad sense means information processing. It denotes a relatively high level of processing of specific information including thinking, memory, perception, motivation, skilled movements and language. The hippocampus contains the neural circuitry crucial for cognitive functions such as learning and memory. It refers to the perceptual and intellectual aspects of mental functioning. Among the specific functions that may be assessed in determining the intactness or adequacy of cognition are orientation, the ability to learn necessary skills, solve problems, think abstractly, reason and make judgements, the ability to retain and recall events, mathematical ability and other forms of symbol manipulation, control over primitive reactions and behaviour, language use and comprehension, attention, perception and praxis (Trivedi, 2006).

* **Concept of cognitive impairment**

Memory, attention, perception, action, problem solving, and mental imagery are functions of cognitive development central to adaptive capability. These functions originate early in life and continue to develop through adolescence and adulthood before starting to decline in old age. Cognitive impairment is not caused by any one disease or condition, nor is it limited to a specific age group. Several studies have demonstrated that the provision of a cognitively enriched environment in early life can lead to improvements in intellectual performance and in cognitive, language, and motor indices (Juturu, 2015).

Cognitive impairment is a broad term that encompasses a multitude of diseases, both genetic and acquired, and brain damage caused via accidents. It is defined as difficulty processing thoughts that lead to memory loss, decision-making difficulties, inability to concentrate, and learning difficulties. This impairment is not confined to people of a certain age, gender or any other demographic. Anyone can be impaired through an action, inaction, or a genetic abnormality. Heart failure and atrial fibrillation are risk factors for cognitive impairment and late-life anxiety is also associated with cognitive impairment (Hugo & Ganguli, 2014).

Cognitive impairment can arise from virtually any poorly controlled chronic disease of the brain or the body’s organs, including hypertension, high cholesterol, heart disease, stroke, hypothyroidism, diabetes, kidney disease, infections, depression, anxiety, bipolar disorder, multiple sclerosis, epilepsy, certain medications that get into the brain can impair cognition, such as tranquilizers, anticonvulsants, antipsychotics, older antidepressants, pain medications, older bladder incontinence medications and substance use and addictive disorders. Cognitive impairment creates significant challenges for patients, their families and friends, and clinicians who provide their health care. Early recognition allows for diagnosis and appropriate treatment, education, psychosocial support, and engagement in shared decision-making regarding life planning, health care, involvement in research, and financial matters (Morley et al., 2015). Cognitive impairment results in a person having trouble remembering, learning new things, concentrating, or making decisions that affect his or her everyday life. Cognitive impairment ranges from mild to severe. With mild impairment, people may begin to notice changes in cognitive functions but still be able to do their everyday activities. Severe levels of impairment can lead to losing the ability to understand the meaning or importance of something and the ability to talk or write, resulting in the inability to live independently (Juturu, 2015).

Cognitive Impairment, particularly in executive functioning and decision-making are now recognized as common features of substance dependence with 69% of polydrug users (including cocaine and opiates) have been found to exhibit global executive functioning impairment (Fernández-Serrano, Pérez-García, Perales, & Verdejo-García, 2010).

Although these estimates do not include people with alco-holism who develop permanent Cognitive deficits such as Wernicke-Korsakoff syndrome, they do include the enduring visuospatial information-processing deficits observed in people without dementia and with alcohol use disorders (Schandler, Clegg, Thomas, & Cohen, 1996).

* **Signs and symptoms of Cognitive Impairment**

Family and friends might notice that someone with cognitive impairment is confused, or agitated, or very moody. They might notice a change in their speech or behavior, or that they have difficulty with their usual daily tasks. Cognitive impairment can come and go. In this situation, it is often called delirium. Delirium can be a sign of serious medical problems. Cognitive impairment can be mild, or severe, or anything in between.

Functional cognitive disorder is probably best considered as a form of functional neurological symptom disorder, with similar root causes to other conversion disorders. The diagnostic criteria for functional neurological symptom disorder require motor or sensory symptoms that are incompatible with recognized neurological or medical conditions, cannot be better explained by an alternative diagnosis and cause significant distress or functional impairment. Functional cognitive disorder closely resembles this, but has cognitive rather than motor or sensory symptoms. The risk factors are also similar: previous childhood adversity, stressful life events and maladaptive personality traits. Patients may have a pre-existing diagnosis of a psychiatric condition, typically mild depression or anxiety. The presence of a major psychiatric diagnosis such as severe depression or bipolar disorder is an exclusion criteria for functional cognitive disorder, as major mental health problems can themselves cause significant cognitive difficulties (Pennington, Newson, Hayre, & Coulthard, 2015).

Cognitive Impairment may result in the inability to (Trivedi, 2006):

1. pay attention
2. process information
3. quickly remember and recall information
4. respond to information quickly
5. think critically, plan, organize and solve problems
6. initiate speech

* **Types of Cognitive Impairment**

Cognitive disorders are a part of the neurocognitive disorder classification in the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-V). Cognitive disorders are defined as any disorder that significantly impairs the cognitive function of an individual to the point where normal functioning in society is impossible without treatment.

In the DSM-5, Neurocognitive Disorders are a group of disorders in which the primary clinical deficit is in cognitive function, and that are acquired rather than developmental, that is, impaired cognition has not been present since birth or very early life, and thus represents a decline from a previously attained level of functioning. In DSM-IV, Neurocognitive Disorders (NCDs) were known as “Dementia, Delirium, Amnestic, and Other Cognitive Disorders (Ganguli et al., 2011).

Some common cognitive disorders include:

1. Dementia
2. Developmental disorders
3. Motor skill disorders
4. Amnesia
5. Substance-induced cognitive impairment

* **Concept of Substance**

McLellan (2017) defined as any psychoactive compound with the potential to cause health and social problems, including addiction. These substances may be legal (e.g., alcohol and tobacco); illegal (e.g., heroin and cocaine); or controlled for use by licensed prescribers for medical purposes such as hydrocodone or oxycodone (e.g., Oxycontin, Vicodin, and Lortab).

* **Types of Substance Use**

These substances can be arrayed into seven classes based on their pharmacological and behavioral effects (McLellan, 2017):

1. Nicotine — cigarettes, vapor-cigarettes, cigars, chewing tobacco, and snuff
2. Alcohol — including all forms of beer, wine, and distilled liquors
3. Cannabinoids — Marijuana, hashish, hash oil, and edible cannabinoids
4. Opioids — Heroin, methadone, buprenorphine, Oxycodone, Vicodin, and Lortab
5. Depressants — Benzodiazepines (e.g., Valium, Librium, and Xanax) and Barbiturates (e.g., Seconal)
6. Stimulants — Cocaine, amphetamine, methamphetamine, methylphenidate (e.g., Ritalin), and atomoxetine (e.g., Stratera)
7. Hallucinogens — LSD, mescaline, and MDMA (e.g., Ecstasy)

* **Concept of Substance Use Disorder**

Substance use disorder (SUD) is characterized by an intense, enduring, and often irresistible desire for subjective effects of substances (cravings); impaired insight; poor judgment and risky decision-making about substance-seeking behavior; markedly reduced desire for naturally rewarding social relationships and activities; reduced sensitivity to euphoric effects of substances over time (tolerance); uncomfortable and sometimes life-threatening withdrawal symptoms that develop when stopping substance use; negative emotions when unable to obtain access to substances (e.g., dysphoria, anxiety, irritability); compulsive substance seeking that persists despite repeated damaging consequences to self, family, and society; and multiple relapses (Najavits, Hyman, Ruglass, Hien, & Read, 2017).

Substance use disorder (SUD, alcohol or illicit drug dependence or abuse) and substance misuse are associated with numerous health and social problems and increase the risk of hospitalization, nursing home placement and death among older adults. Moreover, 90% of older adults use prescription and over-the-counter medications, and many medications interact adversely with alcohol or illicit drugs. At least 25% of older adults use psychoactive medications with abuse potential. In addition, older adults experiencing emotional and social problems (e.g. bereavement, loneliness, social isolation) and medical problems (e.g. chronic pain, insomnia, dementia, depression or anxiety) are at greater risk for substance use. The same problems may also be aggravated by SUD (Han, Gfroerer, Colliver, & Penne, 2009).

Substance use disorders also engender cognitive, social, and psychiatric problems. Prolonged abuse of alcohol is associated with impairment in abstraction, problem solving, memory, and perceptual-motor tasks. Polydrug abuse, especially the use of opiates and depressant drugs, also compromises cognitive function. Related social impairment includes family, occupational, health, and legal problems (CAREY, CAREY, & SIMONS, 2003).

Most substances of abuse directly or indirectly target the brain’s reward system by flooding the circuit with dopamine which is related to emotion and feelings of pleasure. When activated at normal levels, this system rewards our natural behaviors. Over stimulating the system with drugs, however, produces euphoric effects, which strongly reinforce the behavior of drug use—teaching the user to repeat it. The structural brain abnormalities and associated cognitive and behavioral disruptions seen in individuals with SUD are so striking that many experts have come to refer to the disorder as a disease of the brain (National Institute of Health US Biological Sciences Curriculum Study & NIH Curriculum Supplement Series, 2007).

* **Signs and symptoms of substance use disorder**

Patients with severe mental illnesses such as schizophrenia and bipolar disorder are more likely to have substance use disorders than the general population. Substance use disorders in these patients are associated with a variety of negative outcomes, including relapses and rehospitalizations, homelessness, violence, and higher use of services (Mueser et al., 2000).

Different patterns of disease expression can be seen for the various substances of abuse depending on factors, such as dosing, duration of use, route of administration (e.g., intravenous versus inhalation), and even gender and culture (Najavits et al., 2017).

Scientific breakthroughs have revolutionized the understanding of substance use disorders. For example, severe substance use disorders, commonly called addictions, were once viewed largely as a moral failing or character flaw, but are now understood to be chronic illnesses characterized by clinically significant impairments in health, social function, and voluntary control over substance use. Although the mechanisms may be different, addiction has many features in common with disorders such as diabetes, asthma, and hypertension. All of these disorders are chronic, subject to relapse, and influenced by genetic, developmental, behavioral, social, and environmental factors. In all of these disorders, affected individuals may have difficulty in complying with the prescribed treatment (McLellan, Lewis, O’Brien, & Kleber, 2000).

* **Prevalence of cognitive impairments substance disorders**

Cognitive Impairment (CI), particularly in executive functioning and decision-making are now recognized as common features of substance dependence, exhibited in 50-80% of persons with alcohol use disorders (Bates, Bowden, & Barry, 2002). A recent meta-analysis concluded that CI is widespread and detectable up to one year following abstinence in alcohol-dependent individuals (Bates et al., 2002), whilst 69% of polydrug users (including cocaine and opiates) have been found to exhibit global executive functioning impairment (Fernández-Serrano et al., 2010).

Persons living with a severe and persistent mental illness (SPMI; e.g., schizophrenia, bipolar disorder) often abuse alcohol or other drugs. At least 20% of all persons diagnosed with a SPMI have a current substance use disorder (SUD), and approximately 50% meet criteria for a SUD during their life (Regier et al., 1990).

Neuroimaging studies in drug-dependent individuals have also documented significant functional and structural alterations in several brain regions .These regions include neocortical, mesolimbic, and neostriata brain regions that are known to be impacted by administration of licit and illicit drugs in both clinical and preclinical studies (Goldstein & Volkow, 2002).

According to United Nations Office on drugs and Crime, in 2015, around a quarter of a billion people used drugs, and approximately 29.5 million showed drug use disorders, including dependence (Drug & Trends, 2017).

According to a report published by UNODC (United Nations Office on Drugs and Crime), age of first volatile substance use is approximately 11, whereas average age of first cannabis use is 16, and average age of first ecstasy use is 17 years worldwide (United Nations Office on Drugs an Crime, 2008). It has been found that the age of first substance use in Turkey is 14. Adolescents constitute the most important risk group in substance use. The most frequent substance use disorders among adolescents are harmful use and abuse. Addiction is rarely seen until late adolescence (Drost et al., 2016). The programs which may assist in the problem of substance use are prevention and early intervention programs. There are two important reasons with regard to these programs: labor spent and cost of substance use prevention programs are less than the labor and cost spent for treatment and reintegration of substance addicts. Prevention of use in early stages provides for the reduction in substance addiction and increase in lifetime (Collins, Cuddy, & Martin, 2017).

Substance use disorders (SUDs) are highly prevalent psychiatric clinical conditions with lifetime prevalence in community samples of about 2–3% in the United States and 30–75% in clinical samples worldwide (Verheul et al., 2000). In Italy, about 1% of the general population is diagnosed with SUDs, whereas 16% of youths aged 15–24 years use drugs in Europe (Di Blasi, Pavia, Cavani, Lo Verso, & Schimmenti, 2015). Substance use disorders in youth have become an increasingly worrying issue; drug users younger than 25 years of age are estimated to represent 27% of the whole addicted population (EMCDDA, 2017).

National Institute of Mental Health (NIMH), Dhaka in collaboration with World Health Organization (WHO) conducted a multi-centric community-based study during 2003-2005 which revealed that 0.63% of the adult population (18 years and above) in Bangladesh had substance dependence (WHO, 2006).

According to a non-government organization “Green Sylhet” there are more than 5,000 men and women drug addicts in the district including in the city. There are more than 10 rehabilitation centers in Sylhet region. Maximum patients who are taking the treatment in these rehabilitation centers are16 to 40 years age (Hasin et al., 2013).

The major illicit substances available in Bangladesh are-

* Opium (Heroin, Pethedine, Cocaine) Cannabis (Ganja, Chorosh, Bhang, Hashish)
* Stimulant (Yaba, Ectasy, Viagra)
* Sleeping pill (Tranquilizer, Diazepam) and
* Cough syrup (Phensidyl, Dexpotent) etc. (Ahad, Chowdhury, Kundu, Tanny, & Rahman, 2017)

In Sylhet, highest 95.24% are addicted to cannabis as a principal drug and second highest (61.90 %) involved in yaba addiction. Around 50% of the drug addicts involved in heroin addiction, 47.62% addicted in alcohol, 42.33% addicted in phensedyl, 19.05% drug addicts regularly take pethidine/morphine injection. Cocaine and opium were taken by 7.14% and 2.38% of the drug addicts respectively (Ahad, Chowdhury, Islam, & Alam, 2017).

An estimated around 5 percent of the global adult population aged 15-64 years, used drugs at least once in 2015. Even more worrisome is the fact that about 0.6 percent of the global adult population, suffer from drug use disorders (Degenhardt et al., 2013).

Estimates regarding the prevalence of cognitive impairment in patients with SUDs vary widely and range from about 30%to 80% (Gupta, Murthy, & Rao, 2018). These deficits may range from the relatively subtle temporary effects of cannabis use (Shrivastava, Johnston, & Tsuang, 2011) to the moderate executive control deficits observed in chronic cocaine users even after several months of abstinence (Cadet & Bisagno, 2016).

Some studies have shown that cognitively impaired patients with SUDs cannot be adequately identified by drug counselors via clinical impression or through self-report (Kelly & Daley, 2013). If accounting for and addressing the presence of cognitive deficits among substance-abusing patients involves, as a first step, identifying those with neuropsychological impairment, treatment providers and researchers alike need a practical neurocognitive assessment approach for patients with SUDs that is both accurate and comparatively less labor intensive (Copersino et al., 2009).

More specifically, an association has been reported between cognitive deficits and low treatment adherence (Rohde et al., 2017), poor attendance at outpatient therapy sessions (Milward, Lynskey, & Strang, 2014), low willingness to change, reduced self-insight, denial of substance abuse, increased impulsivity, and less abstinence from the substance of abuse following treatment termination (Rinn, 2002). Impaired executive function has also been linked to medical and legal problems among this patient group (Bickel, Jarmolowicz, Mueller, Gatchalian, & McClure, 2012).

With neurocognitive deficits recognized as an adverse variable affecting recovery and treatment adherence in SUD patients, a thorough examination of cognitive functioning, including assessment of executive function, is of paramount importance with regard to formulation of an effective and clear individual treatment plan, and by this to facilitate improved everyday coping and functioning in this patient population (Hagen et al., 2016).

Following instruments are mostly used for assessment of cognitions:

* Mini Mental State Examination (MMSE).
* The Montreal Cognitive Assessment (MoCA).
* The Addenbrookes’ Cognitive Examination –iii.

All address cognitive functions of the patients but ACE-iii is superior to MMSE and there is no bangle validated MoCA Scale. The Addenbrooke’s Cognitive Examination-III (ACE-III) is a brief cognitive test that assesses five cognitive domains: attention, memory, verbal fluency, language and visuospatial abilities. The total score is 100 with higher scores indicating better cognitive functioning. Administration of the ACE-III takes, on average, 15 minutes and scoring takes about 5 minutes. The diagnostic accuracy of ACE as a brief ‘bedside’ cognitive screening instrument led to its widespread adoption. The original ACE included the mini-mental state examination (MMSE) or Folstein test, along with front-executive and extra visuospatial items (Senda et al., 2019).

The original 26 components were combined to produce five sub scores, each representing a specific cognitive domain: attention/orientation (18 points), memory (26 points), fluency (14 points), language (26 points) and visuospatial function (16 points)—100 in Total. It gives a cut-off score for the five sub domains against controls and takes between12 and 20 min (average 16. Testing shows that ACE-III cognitive domains correlate significantly with standardized neuropsychological tests used in the assessment of attention, language, verbal memory and visuospatial function. It also compared very favorably with its predecessor, the ACER, with similar levels of sensitivity and specificity and the two tests correlated significantly (r = 0.99, P < 0.01). The ACE-III also continues to show high sensitivity and specificity at cut-offs previously recommended: (I) 88 (sensitivity = 1.0; specificity = 0.96) and (ii) 82 (sensitivity = 0.93; specificity = 1.0). Internal reliability of the ACE-III, measured by Cronbach’s α Coefficient was 0.88. The assessment focuses on five cognitive domains:

* Attention
* Memory
* Verbal fluency
* Language
* Visuospatial abilities (Velayudhan et al., 2014).
* **Major illicit substances**

Several studies have shown that drug abuse has a neurotoxic effect on brain circuitries, leading to structural and functional modifications, particularly in the dopaminergic mesolimbic system of reward (Tomkins & Sellers, 2001). Many drugs produce cognition-related symptoms. These include:

* Cocaine deficits in cognitive flexibility (Kelley, Yeager, Pepper, & Beversdorf, 2005);
* Amphetamine deficits in attention and impulse control (Dalley et al., 2005);
* opioids—deficits in cognitive flexibility (Lyvers & Yakimoff, 2003);
* Alcohol deficits in working memory and attention (Moriyama, Muramatsu, Kato, Mimura, & Kashima, 2006);
* cannabis—deficits in cognitive flexibility and attention (Pope, Gruber, & Yurgelun-Todd, 2001); and
* Nicotine deficits in working memory and declarative learning (Kenney & Gould, 2008)
* This section provides information on major illicit substances in Bangladesh and their effects on physical and mental health.

According to the Diagnostic and statistical Manual of Mental Disorder, fifth edition (DSM-5), the abuseable drugs are divided into following categories; Alcohol, Cannabis, Hallucinogens, Inhalant, Opioid, Sedatives/Hypnotic/Anxiolytic, Stimulants, Tobacco and Others (Bedrick, 2008).

The major illicit substances available in Bangladesh are-

* + **Opium (Heroin, Pethidine, Cocaine)**

Opium is the name of the liquid produced inside the seed pods of the opium poppy plant. The opium liquid is comprised of morphine (about 12% in some poppy plant varieties), codeine (about 2%), thebaine, and other alkaloids. These chemicals as well as the seeds and other parts of the plant can be processed to produce powerful pain medication drugs. The morphine can also be processed into heroin (Haber, Pergolizzi, & LeQuang, 2019).

In 2014, approximately 0.4% of the global adult population used illicit opiates (e.g. opium, heroin). Ninety five percent of these drugs were supplied by three global production networks chains: the Afghanistan network, the Golden Triangle network, and the Mexico-Columbia network (Miltenburg, 2018).

In the United States, it has since become associated with opioids, commonly morphine and heroin and their derivatives, such as hydrocodone. The term is, today, imprecisely defined and typically has negative connotations. When used in a legal context in the U.S., a narcotic drug is simply one that is totally prohibited, or one that is used in violation of strict governmental regulation, such as heroin or morphine. From a pharmacological standpoint, it is not a useful term, as it is given by the fact that spirit and wine are classified differently due to their intoxicating power; while the narcotic principle to opium and tobacco imparts commensurate properties (Islam & Faruque Hossain, 2017).

In countries such as Mexico and Guatemala, no cases of opium misuse had been reported by the 1990s, despite the existence of opium poppy crops in those countries (Negrete, 1978). In turn, the National Survey on Psychoactive Drugs, conducted in Argentina in 2017 with the population ages 12–65 years, reported a lifetime prevalence of 0.1% for use of heroin, opium, and morphine. A somewhat similar result was obtained in Colombia in 2013, where only 1.07% of the population had ever used opiates and no differences were found in use by gender. Those ages 18–34 years reported the most use. In that study, 0.14% of the respondents had used heroin at least once, and 0.03% reported use during the prior year (Bagley, 2013).

In the United States, an advertising strategy that focused on cancer patients and on physicians with the highest indices of analgesic prescriptions led to a 402% increase in the prescription of oxycodone, which is recommended as a less addictive alternative to morphine. After the 2017 declaration of the opioid crisis as the worst drug epidemic in the country and a national emergency in the United States, the pharmaceutical industry used the same strategies to target Latin America as its potentially strongest market (Pacurucu-Castillo, Ordóñez-Mancheno, Hernández-Cruz, & Alarcón, 2019).

In India total number of registered addicts of opium were 1,10,866 in 2001. Opium dependence is gradually increasing in certain states of India, especially Rajasthan, Punjab, Haryana, M.P. etc. In rural areas of Western Rajasthan opium has also being used as ceremonial drink during the vital events, festivals and social functions. Opium dependence is widely prevalent in rural areas of western Rajasthan where crude opium is consumed with a social acceptance by a notable proportion (8.0%) of adult male population. Later on, they become addicted to it (Pawan, Choudhary, Mathur, Choudhary, & Kamla, 2011).

In terms of geographical location Bangladesh is situated in the central point of the world's biggest growing narcotics zone: the 'golden crescent' (Afghanistan, Pakistan, and Iran) and the 'golden triangle' (Myanmar, Laos, and Thailand). So, the country has become a major transit point for drug dealers. They are routing their shipments through this country to the markets of other parts of the world including Europe, Africa and America. Besides this, India, which is an important producer of opium and other substances located around Bangladesh. Though there was no available exact estimation of substance abusers in Bangladesh, on the basis of different and statistics, it can be estimated that the number may be more than 6 million and these people spend over 70 million BDT every day on illegal narcotics (Mohit, Maruf, Ahmed, & Alam, 2011). The major illicit drugs available in Bangladesh are opium derivatives (heroin, pethidine), cannabis (marijuana, ganja, chorosh, bhang, hashish), stimulants (yaba, cocaine), sleeping pills, cough syrup (phensidyl, dexpotent etc.) and few others (Ahad, Chowdhury, Islam, et al., 2017).

Kms et al (2018) reported that most commonly used category of drugs was heroin were 55.1% and second most abused drug was cannabis (ganja) were 43.2% and methamphetamines (Yabba) were 30.5% among the respondents.

* + **Cannabis (Ganja, Chorosh, Bhang, Hashish)**

Cannabis is the most widely used illicit substance across the world, and its main psychoactive ingredient, Δ9-tetrahydrocannabinol (THC), has been associated with memory impairments (Broyd, Van Hell, Beale, Yücel, & Solowij, 2016). As a potential factor impacting memory, cannabis intoxication is an issue of particular interest from a legal perspective. That is, testimonies by eyewitnesses or suspects are oftentimes the only piece of evidence that triers of fact can use for legal decision making, and, thus, gathering reliable testimony is crucial. However, memory performance is imperfect, resulting sometimes in false memories (Otgaar, Howe, Brackmann, & Smeets, 2016), and such false memories can have disastrous consequences in legal cases (e.g., wrongful convictions or false accusations). This phenomenon of false memory, combined with the fact that cannabis-intoxicated eyewitnesses and suspects are common (Evans, Schreiber Compo, & Russano, 2009), stresses the need to examine whether cannabis might facilitate false-memory production.

Cannabis has been tried by many European young adults and by most young adults in the USA and Australia. Most cannabis use is intermittent and time-limited: most users stop in their mid to late 20s, and very few engage in daily cannabis use over a period of years. In the USA and Australia, about 10% of those who ever use cannabis become daily users, and another 20–30% use the drug weekly. Because of uncertainties about THC content, heavy cannabis use is generally defined as daily or near daily use. This pattern of use over years places users at greatest risk of adverse health and psychological consequences. Daily cannabis users are more likely to be male, to be less well educated, to use alcohol and tobacco regularly, and to use amphetamines, hallucinogens, psychostimulants, sedatives, and opioids.

The most common unpleasant side-effects of occasional cannabis use are anxiety and panic reactions. These effects may be reported by naïve users, and they are a common reason for discontinuation of use; more experienced users may occasionally report these effects after receiving a much larger than usual dose of THC. Cannabis smoking or ingestion of THC increases heart rate by 20–50% within a few minutes to a quarter of an hour; this effect lasts for up to 3 h. Blood pressure is increased while the person is sitting, and decreased while standing. These effects are of negligible clinical significance in healthy young users because tolerance develops to them.2 The acute toxicity of cannabinoids is very low. There are no confirmed published cases worldwide of human deaths from cannabis poisoning, and the dose of THC required to produce 50% mortality in rodents is extremely high compared with other commonly used drugs.

Chronic heavy cannabis smoking is associated with increased symptoms of chronic bronchitis, such as coughing, production of sputum, and wheezing. Lung function is significantly poorer and there are significantly greater abnormalities in the large airways of marijuana smokers than in non-smokers. Tashkin and colleagues have reported evidence of an additive effect of marijuana and tobacco smoking on histopathological abnormalities in lung tissue.

Bloom and colleagues reported similar additive effects on bronchitic symptoms in an epidemiological study of the respiratory effects of smoking “non-tobacco” cigarettes in 990 individuals aged under 40 years in Tucson, Arizona, USA. Non-tobacco smokers reported more coughing, phlegm production, and wheeze than non-smokers, irrespective of whether they also smoked tobacco. Those who had never smoked any substance had the best respiratory functioning, followed in order of decreasing function by current tobacco smokers, current non-tobacco smokers, and current smokers of both tobacco and non-tobacco cigarettes. Non-tobacco smoking alone had a larger effect on respiratory function

Cannabis is the world’s most widely used illicit drug. Globally, its use appears to be increasing, with an estimated 162 million (4%) of the world’s adults using it in 2004, a 10% increase on use in the mid-1990s. Cannabis is used in every region, with the percentage of adults estimated to have used cannabis in the past year at 13% each in North America and Oceania, 6% in Western Europe, 6% in Africa, 3% in South and Eastern Europe, and 2% each in Central and South America. Because of their larger populations Asia and Africa each account for 23% of estimated global use, followed by Europe and North America (18% each), and South America and Oceania with 5% and 2% respectively (UNODC, 2008). The best data on the prevalence of cannabis use and its correlates come from Anglophone countries such as the United States, Canada and Australia, and from Europe, where rates of use among young people have been higher for longer than in most other developed countries (Shi, Lenzi, & An, 2015). In the United States in 2005, 40% of the adult population reported trying cannabis at some time in their life and 13% of adolescents reported use in the past year. In Australia in 2004, 34% of adults aged 15 and older reported using cannabis at some time in their lives. In the late 1990s and early 2000s, the median rate of lifetime cannabis use among European adults aged between 18 and 64 years was 15%, with a high of 31% in the Czech Republic and a low of 2% in Romania.

* + **Stimulant (Yaba, Ecstasy, Viagra, Methamphetamine)**

As the name implies, these drugs stimulate the user. Stimulants are a class of psychoactive drug that increase activity in the brain whereby these drugs can temporarily elevate alertness, mood and awareness. Some stimulant drugs are legal widely used however; many stimulants can also be addicting. Stimulants share many commonalities, but each has unique properties and mechanisms of action.

Yaba is typically produced in a round pill form. There are many different versions of yaba, and the most common are red, orange, or lime green in color and carry logos such as "R" or "WY". They are small and round, roughly 6 millimeters (0.24 in) in diameter, which means they can be packed inside a plastic soda straw for easy transportation or in a reusable "mint" container. Ya ba tablets typically are consumed orally. Users also place the yaba tablet on aluminum foil and heat it from below. As the tablet melts, vapors rise and are inhaled ("chasing the dragon"). The drug also may be administered by crushing the tablets into powder, which is then snorted or mixed with a solvent and injected (National Drug Intelligence Center, 2006). When swallowed in pill form the duration of the drug's effect is between 8–16 hours, as compared to 1–3 hours when smoked, while the intensity is considerably reduced. The peak of the drug's effect is followed by a comedown period lasting 6–10 hours, during which the user may have difficulty sleeping or eating. Many users report that it takes them up to 24 hours after consumption to be able to fall asleep. Yaba is not commonly injected as many intravenous users prefer the pure product instead (methamphetamine, called "ice" in Southeast Asia). This illegal drug is especially popular in Thailand, where it is imported from Burma or Laos even though it is sometimes manufactured locally in Thailand. Typical yaba users are working males, aged 16–40 years old, and its use is not uncommon among both female and male sex workers in Thailand and Cambodia.

Ecstasy is often used in combination with other drugs, and the increase in use and abuse of the drug is demonstrated in the increases in the numbers of clients seeking treatment who report a primary, secondary, or tertiary problem with ecstasy (exhibit 24). The most common combination was use with marijuana.

* **Sleeping pill (Midazolam, Diazepam)**

Around the world, sleeping pills are prescribed to decrease or eliminate anxiety, produce sedation, control certain types of seizures, induce and maintain sleep, and relax skeletal muscles. Benzodiazepines are present in most sleeping tablets (hypnotics), and can also be used as sedatives before surgical operations, as light anesthetics during operations, and to lessen muscle spasms, such as occur with sports injuries. Some benzodiazepines can be used to treat some forms of epilepsy.

The neurobiology of sleep and substance abuse interconnects, such that alterations in one process have consequences for the other. Acute exposure to drugs of abuse disrupts sleep by affecting sleep latency, duration, and quality (Angarita, Emadi, Hodges, & Morgan, 2016). With chronic administration, sleep disruption becomes more severe, and during abstinence, insomnia with a negative effect prevails, which drives drug craving and contributes to impulsivity and relapse. Sleep impairments associated with drug abuse also contribute to cognitive dysfunction in addicted individuals.

Further, because sleep is important in memory consolidation and the process of extinction, sleep dysfunction might interfere with the learning of non-reinforced drug associations needed for recovery. Notably, current medication therapies for opioid, alcohol, or nicotine addiction do not reverse sleep dysfunctions, and this may be an obstacle to recovery (Dunn, Finan, Andrew Tompkins, & Strain, 2018). Whereas exposure to drugs of abuse is causal to sleep dysfunctions that further promote chronic use, sleep disorders in turn are risk factors for substance abuse and their severity can predict the prognosis of substance use disorders (SUD) (Dolsen & Harvey, 2017). Sleep disruption results in a cumulation of risk factors that drive drug abuse, including increasing the sensitivity to pain, acting as a stressor, and biasing toward a negative effect.

* + **Cough syrup (Phensydil, Dexpotent)**

Phensydil is the combination of codeine, pseudoephedrine and chlorpheniramine. Phensydil is a cough prevention medicine which contains codin phosphate originated from Opium. Though it is illegal in Bangladesh; but it comes in Bangladesh through Golden Crescent route. Its looks like syrup and smell very acute. It creates feelings like heroin. When heroin is unavailable and costly, heroin abusers take phencydil as an alternative drug.

Phensydil and other cough syrups are illegally brought into the State with forged documents and at times are hidden under other commodities like in trucks and buses. Once inside, they find their way to Bangladesh, with which Tripura shares two thirds of its border. The drug is generally sent in its original packaging. Since liquor is banned in Bangladesh, the drug became a popular alternative for alcohol. Phensydil used to contain codeine phosphate along with hydrochloride ephedrine and promethazine, a unique combination for addiction. This is what made it a popular drug of abuse and unfortunately the trend still continues even after the chemical formulation was changed.

* **Routes of substance use**
* **Smoking**

Smoking is one of the most common routes of drug administration, encapsulating tobacco, marijuana, opium, heroin, cocaine and various other substances. Whenever someone draws in on a cigarette, the smoke goes to the lungs and is then rapidly absorbed into the bloodstream. This makes it one of the fastest ways for someone to experience a high as the chemicals are transferred to the necessary bodily receptors in seconds. There are several side effects to smoking which can pose significant risks to the smoker’s health, regardless of the drug involved. An individual who smokes tobacco, marijuana, opium or heroin has a higher chance of experiencing the following: Heart disease, mouth, throat and lung cancer, heart attacks and strokes, chronic obstructive pulmonary disease (including emphysema and chronic bronchitis), high blood pressure (hypertension), bacterial pneumonia and other lung infections Drugs, such as cannabis and crack, pose greater risks than tobacco to a smoker primarily because they are designed to be inhaled in order for a high to be experienced. In standard cigarettes, the smoke does not necessarily need to enter the lungs and the majority of the above effects can be eliminated.

* **Nasal**

The snorting of drugs (also called insufflation) is conducted mostly by users of tobacco, cocaine, heroin, ecstasy and amphetamines. Around 30 to 60% of the snorted chemicals will enter the bloodstream through the mucus membrane in the nose. The rest is then swallowed and moves down to the stomach where it finally reaches the blood. In general, the high is experienced within about 15 minutes from the time of snorting. There are several health risks associated with insufflating drugs. Most famously, drugs such as cocaine have been known to damage the inside lining of the nostrils, damaging the nasal cavity and even destroying the septum, the wall of cartilage between the two nostrils. As well as this, sharing bank notes, straws or pens to snort drugs can result in the spreading of infectious diseases such as hepatitis C and HIV. Other potential dangers also exist, but these vary depending on the drug being taken.

* **Swallowing/Oral Intake**

One of the simplest ways of taking drugs is through the mouth and allows the drugs to move onto the stomach where they are absorbed by the stomach lining and then enter the bloodstream. The most common drugs to be taken in this way are alcohol, marijuana, opium, amphetamines, ecstasy, LSD and magic mushrooms. Swallowing is one of the safest ways to take drugs for several reasons. Firstly, the substance will be slowly absorbed through the stomach lining resulting in effects which are less extreme and therefore less dangerous. Secondly, an individual’s digestive system is designed to induce vomiting if that person ingests anything risky. There have, however, been cases of people dying from swallowing cocaine, showing that there are still some dangers present with this particular route of administration.

* **Injections**

This route of administration is a recent development in the drug scene and involves a syringe full of an illicit substance being injected directly into the blood stream. This can be done in three different ways: subcutaneous Injections: Directly into the soft tissue just beneath the skin. Intravenous Injections: Directly into a vein found under the surface of the skin. Intramuscular Injections: Directly into a muscle found deeper in the body. This is one of the more popular methods of drug use as the full effects are felt almost immediately, typically within 3 to 5 seconds. It also bypasses many of the body’s defenses and delivers more of the drug to the brain. This is why injecting illicit substances is one of the more dangerous routes of administration as substances which would have normally been rejected by the stomach or blocked by the skin can enter into the bloodstream without any trouble. This can then lead to the following dangers: Increased chance of infection due to contaminated needles or drugs. Those who share syringes also run the risk of spreading blood-borne diseases, such as HIV and hepatitis. Scarring of the veins. This is caused by blunt syringes and can lead to the vein collapsing. Arterial damage at the injection site, which can lead to hemorrhaging, distal ischemia, gangrene, endarteritis and thrombosis. There is also an increased chance of addiction for those who take drugs via injections. This is because the heightened feelings that they experience may lead them to come back and repeat the action simply to relive the previous emotions.

However, among all the routes of substance, injection drug use (IDU) is proven to be of higher risk and had poorer health outcomes than non-IDUs. People who inject drugs (PWID) face some of the most severe health consequences associated with drug use. Almost 12 million people worldwide inject drugs, of whom one in eight (1.6 million) are living with HIV and more than half (6.1 million) are living with hepatitis C (WORLD DRUG REPORT, 2017).

* **Treatment options**

Addiction are now commonly accepted as diseases of the brain caused by the impact of the drug itself on the brain (direct effects and neuroadaptations) and modified by various environmental factors. These factors include epigenetic changes, addict mindset, and social influences, including peer pressure, family environment, and especially, response to stress and stressors (Kreek et al., 2012). Addiction was historically viewed as a disease of “weak personality” and was not systematically addressed by the scientific and medical communities until the latter half of the 20th century. Pioneering studies in the 1960s and 1970s led to the development of methadone, the first (and still effective and widely used) treatment for the long-term management of addictions to heroin and other opiates (KREEK, 2006). During the 1980s, efforts coalesced around the investigation and development of pharmacological treatments for other drugs of abuse, including alcohol and cocaine, though there are still no approved medications for the treatment of cocaine addiction.

Further, the presence of specific variants of multiple genes may enhance or decrease the vulnerability to developing specific addictions. These gene variants may function synergistically with genetic polymorphisms involved in common comorbid conditions, such as anxiety or depression, and stress responsivity. Addictions can also be comorbid with major infectious disorders, such as HIV/AIDS (Novick, Khan, & Kreek, 1986).