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Quantitative Dissertation

Relationship between drug abuse and history of crime in Emirati population who are treated in a center of rehabilitation in the UAE

Submitted by

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# **Table of Contents**

Acknowledgements	2
List of Figures	
Glossary of Abbreviations	9
Abstract	
Chapter 1 – Introduction	
1.1 Drug Abuse, Crime and Education Status	
1.1.1 Drugs, Crime and Educational Status Among Students	
1.2 Epidemiology and Statistics in Western Countries and the UAE	
1.2.1 Epidemiology and Statistics in Western Nations	
1.2.2 Epidemiology and Statistics in the UAE	
1.3 Developing Addiction & Risk Factors	
1.4 Gabapentinoids as Drugs of Abuse	
1.5 Rationale for the Study	
1.7 Research Aims and Objectives	
1.8 Research Hypotheses	
Chapter 2: Literature Review	
2.1 Search Strategy	
2.2 Historical and Theoretical Background	
2.2.1 Lombroso's Criminal Man Theory	
2.2.2 Neurofeedback & The Psychointervention Model	
2.3 Drug Use and Delinquency in Students and Young Adults	
2.3.1 Drug Use and Delinquency in Students	
2.3.2 Drug Use and Delinquency Among Young Adults	
2.4 Drug Use in Offender Populations	
2.5 Crime in Drug Using Populations	
Chapter 3: Methodology	
3.1 Study Design	
3.2 Sampling	
3.2.1 Sampling Strategy	
3.2.2 Sample Size	40
3.2.3 Inclusion Criteria	

3.2.4 Exclusion Criteria	41
3.3 Data Collection	42
3.3.1 Variables	42
3.3.2 Data Collection Tool	42
3.4 Data Analysis	42
3.5 Ethical Considerations	42
3.5.1 Ethical approval and consent	42
3.5.2 Data Protection, Confidentiality and Anonymity	43
Chapter 4: Results	
4.1 Descriptive Statistics	45
4.1.2 Number of Previous Incarcerations	46
4.1.3 Age of the study population	47
4.1.4 Age of First Encounter with Drugs	48
4.1.5 Educational Status	51
4.1.6 Drugs of Abuse	54
4.1.7 Criminal History & Crimes Committed	58
4.2 Inferential Statistics	59
4.2.1 Chi-Square Analysis for Educational Status versus Committing Crimes	59
4.2.2 Chi Square for Substances Abused Versus Committing Crimes	62
4.2.4 T-test for Group 1 (Did Not Commit Crime) (Age * Drug Abused)	64
4.2.5 T-Test for Group That Committed Crime (Group 2) (Age * Drug Abused)	67
4.2.6 Age At First Encounter with Drugs of Abuse	70
Chapter 5: Discussion	72
5.1 Introduction	72
5.2 Main Findings	72
5.3 Study Limitations	77
5.3.1 Retrospective Design, Missing Data	77
5.3.2 Sampling Strategy	77
5.3.3 Social Desirability	
5.3.4 Limited Application and Scope	
5.4 Possible Implications	
Chapter 6: Recommendations and conclusion	80
6.1 Recommendations	80
6.2 Conclusion	83

Chapter 7: Reflections and Critique	
References	
Appendix 1: Data Abstraction Sheet in SPSS.	
Appendix 2: Coding Manual	100
Appendix 3: Research Ethics Committee Approval	105
Appendix 4: Approval letter	106
Appendix 5: General consent to treatment and account settlement	107

# List of Tables

Table 1:
Table 1:Number and age of included/excluded study population and the age of first encounter      with drugs: values are expressed as numbers, mean, or median
Table 2:
Table 2: Summary statistics of Previous Incarceration
Table 3:
Table 3: Summary statistics for the Age of the study population
Table 4
Summary of first encounter with drugs
Table 5:
Provisional Diagnosis for Crime Committed or Not In Emirati Male Population
Table 6 59
Educational status (university education completed or did not) versus committing crimes (yes or no) 2x2 Contingency Table
Table 7 Non-completion versus completion of high school and Crimes Committed or Not Chi      Square Test.      61
Table 8 Drugs Associated with Crimes Committing 62
Table 9 Drugs not Associated with Crimes Committing 63
Table 10. T-test for examining the statistical significance of mean age of opioid users as compared to non-opioid users in the study population who did not commit crimes. Statistically significance difference was observed, $p = .050$
Table 11. T-test for examining the statistical significance of difference of the mean for those who
take alcohol as compared to those who do not. No statistically significant difference was observed, $p = 0.953$ ,

Table 12. T-test for examining the statistical significance of difference of the mean age for those who take gabapentinoid as compared to those who do not, p = 0.017, as gabapentinoid users tended to be younger (mean = 16.9 years) as compared to mean age of (19.1 years) for non-users.

# List of Figures

Figure 1. Cannabis use over 12 months in 15-34 year olds in 2018
Figure 2. Cocaine use over 12 months in individual's aged 15 to 34, 2018
Figure 3. Literature Search Strategy
Figure 4. Bar chart showing age at the first encounter of drugs for those who committed crime (n=170)
Figure 5. Bar chart showing age at the first encounter of drug for those who did not communication for the second
Figure 6. Pie Chart showing educational status of research participants ( $n = 255$ )
Figure 7. Pie Chart showing percent and number of individuals in terms of educational status or research participants who did not commit crime ( $n = 82$ )
Figure 8. Pie chart showing the percentage and number of individuals in terms of educational status among those who committed crimes ( $n = 173$ )
Figure 9. Bar chart showing most common abused drugs in Emirati male population
Figure 10. Pie chart showing number of individuals who did not commit crime and commonly abused substances- percentage and number of cases
Figure 11. Pie chart showing number of individuals who committed crime and percent and number of individual cases for commonly abused substances.
Figure 12. Bar chart showing crime frequency in individuals who abused drugs ( $n = 173$ ) 5
Figure 13. Distribution of the age at first encounter with drugs of abuse

# **Glossary of Abbreviations**

EMCDDA: European Monitoring Centre for Drugs and Drug Addiction

- CNS: Central Nervous System
- DUI: Driving Under Influence
- EU: European Union
- GABA: Gamma Aminobutyric Acid
- GCC: Gulf Cooperation Council
- GDP: Gross Domestic Product
- NRC: National Rehabilitation Council
- MO-A: Monoamine Oxidase
- OECD: Organization for Economic Co-operation and Development
- PET: Positron Emission Tomography
- SUD: Substance Use Disorder
- UAE: United Arab Emirates
- UK: United Kingdom
- UNODC: United Nations Office on Drugs and Crime
- VGCC: Voltgate Gated Calcium Channel

## <u>Abstract</u>

**Introduction:** The association between criminal behavior and drug abuse has been widely studied, yet the precise nature of the relationship remains complex and relatively unexplored, in light of educational status. Researchers have examined the incidence and prevalence of drug abuse and its interrelationship with crime. However, studies that explore the association between drug abuse, criminal history and educational status in the UAE context are limited.

**Aim:** To examine the possible relationship between the type and gravity of crimes committed and the types and age at which problem of drug abuse started, in relation to education status of individuals.

**Methodology:** A retrospective study was conducted using a quantitative research design. A sample of male patients between 18 and 65 years who attended a rehabilitation center for treatment from 1<sup>st</sup> July 2020 to 28<sup>th</sup> February 2021 were selected. The sample size was 255. Retrospective data collected by the center for clinical reasons were utilized for the study. Utilizing the electronic database, which collected data such as employment and legal status, demographic data, provisional diagnosis and type of drugs. The research study examined the role of drug abuse in criminal history among male Emirati research participants. The primary outcome variable of the study was the criminal history of the patient, measured in terms of common crimes, number of crimes committed, and types of crimes committed. A secondary outcome variable was educational status, measured at three levels from University education to completion of high school, and no completion. Analysis included descriptive and inferential statistics.

**Results:** The results suggest an association between age at which drugs were first abused and educational status, as per  $\text{Chi}^2$  analysis (p= 0.001). An independent samples t-test revealed no difference between those who committed crime and those who did not regarding age at first encounter with the drugs (p= 0.606). Gabapentinoids were the most commonly abused drugs in the UAE population, while the most common drug-related crime committed was traffic offences.

**Conclusion:** It may be concluded on the basis of research findings that prescription drug abuse could be a potential reason for rising drug abuse rates in the UAE, due to misuse of drugs such as gabapentinoid. In addition, the crime committed and drug used are directly linked to educational status. Therefore, school drug abuse prevention programs and awareness and advocacy initiatives for UAE teens and young adults, who are at risk, such as school dropouts, must be formulated to curb the menace of drug use and crime among Emirati population.

Keywords: Crime, Criminal behavior, Drug abuse, Educational status.

# <u>Chapter 1 – Introduction</u>

The association between drug abuse and criminal behavior is a significant concern for researchers, policymakers, and communities alike (Pierce et al., 2017). While policymakers have assumed drug abuse and crime are connected, the precise nature of the relationship is being actively researched (Pierce et al., 2017). Scientific literature and popular media have identified the interrelationship between drug abuse and crime (Webster, Rice and Sud, 2020). Public perception of the relationship between drug abuse and crime is straightforward, in that a causal association is assumed. However, critical research and analysis suggests the relationship is empirically and conceptually complex (Brochu, Brunelle and Plourde, 2018). Drug abuse and criminal activity entail a broader set of integrated deviant behaviors, according to existing research (Brochu, Brunelle and Plourde, 2018). Once illegal drug use has been initiated, it exerts a dramatic effect on the extent of criminal activity. The drug abuse-crime nexus seems to be interactive, with a large number of offenders in criminal justice agencies emerging as regular drug users (Manhica et al., 2021; Pierce et al., 2017). The nature of the drug abuse-crime relationship varies depending on the nature of crime and the deviant subgroup (Bjerrgaard, 2010; Brochu, Brunelle and Plourde, 2018).

This chapter will present an analysis of the extant literature reviewed focusing on the relationship between drug abuse, criminal history and education status. It will also trace the epidemiology and enumerate statistics regarding drug abuse and crime in the UAE, the Western nations and worldwide. Developing drug addiction and risk factors therein are also discussed. The chapter will conclude with the study rationale, research objectives and aims, and research hypothesis.

# 1.1 Drug Abuse, Crime and Education Status

Drug abuse remains a critical social problem in modern times, threatening collective and individual wellbeing. The complex problem of substance abuse serves as a compelling topic of research, impacting crime rates influenced by a broad spectrum of political, social and economic forces (Nyabadza and Coetzee, 2017). Drugs are increasingly available as types and methods of distribution have changed (Murah et al., 2020a). Societies which promote drugs are fragmented in nature, as drug abuse is a multifaceted problem with social, security, economic, health,

religious, psychological, educational and cultural implications (Murah et al., 2020a: 67). Consequently, considerable efforts have been made to initiate drug abuse prevention strategies in schools in the UAE (Murah et al., 2020c). According to Emirati officials and specialists, the need to tighten the net and catch drug traffickers while imposing legal penalties on them is critical. The reason is that the number of addiction cases among school students in the UAE is rapidly rising, although it is still low compared to number of addiction cases among youth globally (Murah et al., 2020c: 2). Drugs can serve to marginalize and stigmatize youth. The health and safety of students attending educational institutions are at risk due to drug abuse (Murah et al., 2020c: 2).

Among populations receiving mandatory detoxification and treatment, the nature of the link between drug use disorders and crime is complex (Li et al., 2021, Evans et al., 2020). Research consistently shows the overall health of the user is negatively impacted and the behaviors linked to drug abuse increase the chances of the abuser turning to crime (Dave et al., 2021; Kim et al., 2019; Okafor, 2020; Salas-Wright et al., 2017). Empirical evidence shows that drug abuse is associated with poverty, crime, child neglect, trauma, social pressure and other social problems (Ayodele et al., 2018). Drugs are used and abused by youth and adults across socio-economic and ethnic backgrounds worldwide (Ayodele et al., 2018).

#### 1.1.1 Drugs, Crime and Educational Status Among Students

Preexisting individual and family characteristics, educational status also impacts drug use (Ersche et al., 2020: 15254). Drug abuse varies by educational status and attainment among adults and adolescents alike, as per research (McCabe et al., 2018; Schepis et al., 2018). Lifetime and past year adolescents and young adult drug abuse has also been linked to risky behavior and lack of effective academic performance (Schepis et al., 2018: 172). Research has also demonstrated drug abuse revolving around opioid and sedative misuse is common among young adults not in college, especially high school dropouts, while more college graduates and full-time students engaged in stimulant abuse (McCabe et al., 2018).

#### **1.2 Epidemiology and Statistics in Western Countries and the UAE**

#### **1.2.1 Epidemiology and Statistics in Western Nations**

According to UNODC's World Drug Report (2017), more than 37 million people worldwide are taking stimulants and sedatives, and a large proportion is for non-medical or recreational purpose. The number of cocaine and opioid users is high, despite a decline in drug smuggling as new synthetic drugs are being increasingly produced (UNODC, 2017). Although heroin and cocaine production has fallen worldwide recently, the global production levels are still high (UNODC, 2017). UNODC (2017), estimated yearly prevalence of illicit drug abuse worldwide was highest for cannabis (3.8%) for adults aged 15-64 years. This was followed by (0.77%) of the users opting for amphetamines, while (0.37%) abused opioids and (0.35%) abused cocaine (UNODC, 2017). According to the Surgeon-General's Report on Alcohol, Drugs and Health issued in 2016, drug abuse is associated with increased self-harm, as well (Kelly et al., 2017).

In South Africa, prevalence of past 3 months drug use was (3.7%) compared to (10.1%) in the US population (Peltzer and Phasana-Mafuya, 2018). In 2018, it was estimated 35.5 million people were drug abusers worldwide, with the UK topping drug induces deaths in European Union (EU), with 76 deaths per one million of the population affected (Stewart, 2021). Cannabis is the most widely used drug in the UK followed by powdered cocaine, MDMA and Ketamine (Stewart, 2021). In 2019-2020, the UK reported 225.6 thousand drug related offenses, and over 130 thousand arrests of cannabis by the police and border control force in Wales and England (Stewart, 2021).

The use of illegal drugs in EU remains a big issue. Close to one-third of adults aged between 15 and 64 have used illegal drugs at some point (OECD, 2021). OECD (2021), estimates that the most commonly abused drug is cannabis followed by other drugs such as amphetamines, ecstasy and cocaine, and use of this drug is highest among young adults in the EU (EMCDDA, 2020). Close to (15%) of those between 15 and 34 years of age in EU countries reported using cannabis in 2018 (Figure and table 1)



Figure 1. Cannabis use over 12 months in 15-34 year olds in 2018.

Table 1

Cannabis Use over 12 month period (in percent), 2018

Country	%
Belgium	13.6
Bulgaria	10.3
Czech	16.6
Denmark	15.4
Germany	16.9
Estonia	16.6
Ireland	13.8
Greece	4.5
Spain	18.3
France	21.7
Croatia	16.0
Italy	20.9
Cyprus	4.3
Latvia	10.0
Lithuania	6.0
Luxembourg	9.8
Hungary	3.5
Netherlands	17.1
Austria	14.1

Poland	7.8
Portugal	8.0
Romania	5.8
Slovenia	12.3
Slovakia	9.3
Finland	15.5
Sweden	7.9
$C_{1} = EMCDD A (2020)$	

Source: EMCDDA (2020)

Cannabis use was highest in Italy or France, with (20%) or more of individuals aged between 15 and 34 reporting the consumption of cannabis in 2018 alone (EMCDDA, 2020). Approximately (1%) of Europeans abuse cannabis daily or nearly almost each day, on average. Individuals abuse drug for 20 or more days within a single month (EMCDDA, 2020). A major percentage of these (58%) are older drug users, between 35 and 64 and around three-fourth of the drug users were men (EMCDDA, 2020). Cannabis use rose among young adults in Nordic countries such as Finland and Denmark, while rising in Western European nations such as France and Germany as well (EMCDDA, 2020). Around (2.4%) of young European adults reported using cocaine (Figure and table 2).



Figure 2. Cocaine use over 12 months in individual's aged 15 to 34, 2018.

## Table 2

Cocaine Use over	r last 12	months	among	individuals	aged	15 t	o 34
------------------	-----------	--------	-------	-------------	------	------	------

Country	%
Belgium	2.9
Bulgaria	0.5
Czech	0.2
Denmark	3.9
Germany	2.4
Estonia	2.8
Ireland	2.9
Greece	0.6
Spain	2.8
France	3.1
Croatia	1.6
Italy	1.7
Cyprus	0.4
Latvia	1.2
Lithuania	0.3
Luxembourg	0.6
Hungary	0.9
Netherlands	3.9
Austria	0.4
Poland	0.5
Portugal	0.3
Romania	0.2
Slovenia	1.8
Slovakia	0.3
Finland	1.5
Sweden	2.5
EU	1.5

Source: EMCDDA, 2020.

In Denmark, France, the UK, as well as the Netherlands, a major percentage of young adults used cocaine. Around (3%) or more youths in these countries have used cocaine. Following years of low cocaine use, the numbers have been rapidly rising in these countries (EMCDDA, 2020). Ecstasy or MDMA abuse is lower than cocaine, with an estimated (1.9%) of European adults addicted to this drug in 2018 (EMCDDA, 2020). Use of ecstasy for 2018 was highest in the Netherlands, followed by Ireland, the UK, Bulgaria and Germany. Given the decline of ecstasy

use following the rise in early and middle of the 2000s, recent research suggests the use of this hallucinogenic drug is rising (EMCDDA, 2020). The primary opioid used in the EU is heroin. Synthetic opioids such as methadone, tramadol, and fentanyl are also sold in the EU (OECD, 2021). EMCDDA (2020), found prevalence of high-risk utilization of opioid equaled (0.4%) of the population in the EU, constituting 1.3 million high-risk users in 2018 among individuals aged between 15 and 64 years (Table 3).

Country	Year	Males	Total
Austria	2015	27	24.6
Belgium	2018	31.8	26.2
Bulgaria	2016	15.7	11.2
Croatia	2019	30.5	24.5
Cyprus	2019	21.7	14.2
Czech	2019	40.1	31.9
Denmark	2017	46.7	39.0
Estonia	2018	31.7	25.4
Finland	2018	30.3	26.1
France	2017	52.9	45.0
Germany	2018	33.5	28.9
Greece	2015	16	11.2
Hungary	2019	11.4	7.9
Ireland	2015	38.8	30.7
Italy	2017	39.5	33.3
Latvia	2015	17.9	11.3
Lithuania	2016	18	11.5
Luxembourg	2019	28.4	23.7
Malta	2013	2.1	1.4
Netherlands	2019	35.4	29.8
Norway	2019	28	23.5
Poland	2018	21.9	16.1
Portugal	2016	16.4	11.7
Romania	2019	15.6	11.9
Slovakia	2019	39.7	27.1
Slovenia	2018	25.1	21.2
Spain	2020	47.9	38.9
Sweden	2018	21.5	17.3
Turkey	2017	6.1	3.1
United Kingdom	2018	39.1	33.1

Lifetime prevalence of illicit drugs among adults aged 15-64 in the EU.

Source: EMCDDA (2020).

#### 1.2.2 Epidemiology and Statistics in the UAE

Drug abuse and addiction are steadily rising among UAE youth (AlAmeri, 2018). The number of deaths due to drug abuse is currently rising steadily (Al Ghaferi et al., 2017). Illegal drug consumption is a criminal offense with a 4-year prison sentence, yet drug abuse is rampant, although treatment and rehabilitation clauses were introduced in UAE laws between 1995 and 2005 (Al Ghaferi et al., 2017). Doran (2016: 749), estimated substance abuse is linked to costs, crime, and lost productivity in the UAE. The researcher indicates from an estimated 8.26 million people, about 1.47 million utilized tobacco, amounting to (20.50%) of adults in the UAE (Doran, 2016: 749). Another 3,80,085 people in the UAE used cannabis and this constituted more than (5%) of the UAE population (Doran, 2016: 749). A total of 14077 UAE individuals used alcohol in a manner that was harmful and the remaining (0.2%) or 1408 individuals used opiates of around (0.02%) (Doran, 2016: 749). Common substances abused by youth and older adults include alcohol and illicit drugs. According to the National Rehabilitation Council (NRC), (41.3%) abused alcohol, followed by (16.30%) using heroin, and these drugs were the most common substances used by the patients (Alblooshi et al., 2016).

Cost of addiction was measured at 5.47 billion USD in the year 2012 equaling (1.4 %) of UAE's GDP with loss of productivity adding up to 4.79 billion USD at (88%), and criminal behavior at 0.65 billion USD or (12%) (Doran, 2016: 749). Therefore, the economic implications of addiction in the UAE are severe (Doran, 2016). Factors found to initiate substance abuse among UAE youth include absence of parental supervision (Alhyas et al., 2015: 2). Studies suggest a definite connection between conduct disorder and drug abuse among Emirati youth (Al Banna et al., 2008).

According to UNODC 2014 World Drug Report, the UAE remains the key transit nation for the global aerial trafficking of illicit drugs, and the distribution channel for narcotics (Alblooshi et al., 2016: 2). Increasing population growth, rising number of youths and social drift has also affected the spread of drug abuse (Alblooshi et al., 2016:2). Alblooshi also found in a cohort study on UAE adults, substance use disorder correlated with marital status and smoking patterns. Multiple substance users amounting to (84%) formed the majority of the cohort. Numerous substances were combined in different patterns across various age groups with alcohol and

opioid was among the most common substances abused. About (67.2%) of opioid addicts in the UAE were Tramadol users, with the youngest age group less than 30 years old more prone to use of this illicit drug (Alblooshi et al., 2016:1). Older opioid users used heroin, while illicit use of prescription drugs such as Pregabalin, Procyclidin and Carisoprodol were most likely to be used by younger age groups below 30 (Alblooshi et al., 2016: 1).

#### **1.3 Developing Addiction & Risk Factors**

A family history of addiction confers an 8x times increase in possibility of developing addiction, combined with genetic and environmental risk factors (Ersche et al. 2020: 15253). Less is known about protective factors that prevent individuals from developing drug addiction, including personality traits and attitudes, supportive environments and neural systems compensating for adverse exposure (Ersche et al., 2020: 15253). Resilience in teens is an important factor that implicates drug addiction in later adulthood, as it is a period of heightened risk and vulnerability (Ersche et al., 2020; 15253). Research suggests that development and implementation of resilience operates in vulnerable adults in the form of compensatory mechanisms. Research shows cognitive deficits among those with family risk of addiction, as opposed to those without such a risk (Ersche et al., 2020: 15253).

Several neurobiological risk factors suggest criminal behavior predispose individuals to engage in drug use and crime. Genetic studies show heritability estimates for criminal behavior, while molecular genetics research has identified candidates for antisocial, drug use behaviors and geneenvironment interactions. Further, functional and structural neuroimaging studies found deficits in subcortical, frontal and temporal brain regions in criminal and antisocial individuals. Criminals and drug users, as per neuropsychological research, show criminals have deficits in executive, verbal and spatial abilities. Similarly, psychophysiological research shows autonomic arousal and hypo-responsivity are predictors of later drug offences and crimes. Research on endocrinological factors provides support for hormonal roots of aggressive behavior. Hormones triggering fear, stress, reward seeking as dominant behaviors lead to deviant behavior. Studies in early health factors prove prenatal substance abuse is not the only factor leading to drug and crime, as birth complications and physical anomalies can also increase the risk of antisocial and criminal behavior across life.

### **1.4 Gabapentinoids as Drugs of Abuse**

It was decided to include this section on gabapentinoids specifically as it was the most commonly abused drug among those who committed crimes. The epidemic of chronic pain and misuse of opioids has triggered the widespread use and abuse of gabapentinoids for users (Goins, Patel and Alles, 2021). Abusers may ingest the drugs for achieving euphoria and dissociation associated with conventional recreational drugs (Chiappini and Schifano, 2016). According to Chiappini and Schifano (2016), gabapentinoid drugs bind selectively to  $\alpha$ 2-3 subunits of voltgate-gated channels of calcium in the central nervous system neuron tissues. Consequently, GABA levels rise in parallel with the inhibition of release of excitatory neurotransmitters, that may lead to dopamine reward pathway activation and consequent drug abuse (Badgaiyan, 2013; Nagakura et al., 2009). According to Hagg, Jonsson and Ahlner (2020), gabapentinoids activate moderate dose-dependent increases in extracellular GABA levels in the brain, mimicking GABA features such as euphoria and relaxation. This feature of the drug serves to increase its potential abuse liability (Bura, Cabanero and Maldonado, 2018; Rutten et al., 2011). Another study by Al-Husseini, Wazaify and Van Hout (2021) showed that in Middle Eastern countries like Jordan and UAE, the abundance of community pharmacies and open access to drugs such as pregabalin are believed to be contributing to greater levels of misuse and drug abuse. Additionally, as opposed to alcohol, which is a forbidden substance in Islam, drugs such as pregabalin may prove to be an acceptable alternative for drug abusers (Personal Communication, 2020). Some studies have shown increased gabapentinoid abuse among UAE users (Evoy, Morrison and Saklad, 2017). The researchers found from those with SUD in UAE, (68%) used pregabalin (Evoy, Morrison and Saklad, 2017).

Gabapentinoid may induce lack of inhibition and sexual behavior. Alcohol consumption exerts similar disinhibiting effects on drug users in Western nations. However, there are cultural reasons why individuals in the UAE may prefer gabapentinoid to alcohol, as such a prescription

drug may produce the same effect while eliminating the need for imbibing alcohol forbidden in Islam (Sattari, Mashayekhi and Mashyekhi, 2019). Different GABA derivatives such as Lyrica, which are well absorbed through oral administrations, may be even more suitable for those with religious objections to alcohol, although research previously demonstrated alcohol use to be rampant in the UAE (Elkashef et al., 2013: 68-69).

Brain mechanisms underlying the way these drugs impact the user differ, but the end result is a similar disinhibiting effect for both. Gabapentinoids exhibit increased in vivo GABA concentration in the brain inhibiting the GABA catabolizing enzyme, GABA transaminase, at high levels of concentration (Cai et al., 2012). Research also found the drug raised GABA turnover in 11 of 12 regions in the brain, yet the temporal effect of the drug remained different for different regions of the brain. Other possible ways gabapentinoids impact the brain include inhibition of neuronal calcium influx, binding to the  $\alpha 23$  calcium channel subunits and increasing glutamate dehydrogenase in the brain (Cai et al., 2012).

On the other hand, alcohol alters reward related neural regions such as the ventral striatum and the medial prefrontal cortex, linked with consistent alcohol abuse (Swartz et al. 2020). The ventral striatum is the region of the brain associated with processing reward anticipation and receipt while being connected to the medial prefrontal cortex, which regulated reward responses. Alcohol impacts reward anticipation and reward feedback, according to findings from neuroimaging studies, leading to the potential for drug abuse (Swartz et al., 2020). Therefore, each of these two drugs are linked to abuse, dependence and death as well as life threatening intoxication due to activation of certain reward centers of the brain.

#### **1.5 Rationale for the Study**

In regards to the study, the researcher had undertaken a literature research and throughout all researches, the researcher came across literature and research studies primarily from the western world more specifically the United States. Despite extensive searches, the researcher was not able to locate many local studies in the Arab world or in the UAE, so this study will fill the gap in human knowledge. Further, there are no studies that investigate Emirati population and the problem of drug abuse in relation to education status of individuals. In addition, there is no study that has looked at drug abuse in relation to education and criminal history. Therefore, it is vitally important to gather data about this vulnerable group since we lack such information especially when it comes to sensitive topics, which is usually hidden by the society because of the stigma.

While evidence strongly supports the interrelationship between drugs and crime, the association is not merely a causal one. Challenges in ascertaining the nature of the association have also prompted the present research study. Considerable research exists regarding the association between drug abuse and criminal history among rehabilitation patients in Western nations such as the United States (Bernard et al., 2020, Winkelman et al., 2020). However, in the UAE context, research on this particular area remains underdeveloped and unexplored. National studies in the Arab countries, Gulf region or Emirati centers will also yield important insights regarding intervention, treatment planning and integration of the drug offenders within the community. The study will also lay the ground for effective penal policymaking and implementation in light of substance abuse and crime.

# **1.7 Research Aims and Objectives**

The aim of the study is to examine the possible relationship between the type and gravity of crimes committed and the types and age at which problem of drug abuse started, in relation to education status of individuals. Specifically, the following objectives will be explored:

-To identify common drugs of abuse among patients who have/have not committed punishable crimes.

- To explore the age at which drug abuse started and the possible relationship with educational status.

-To assess possible association between educational status, drug abused, and criminal gravity.

-To explore the association between types of crime and types of drug abused.

-To assess the association between primary drug of abuse and whether crime was committed.

-To explore common crimes that were committed.

# **1.8 Research Hypotheses**

There is a relationship between type and age of start of drug abuse and level of education and each of crime committed by patients.

## **Chapter 2: Literature Review**

The aim of this chapter is to provide a scholarly and comprehensive overview and literature critique associated with the relationship between drug abuse and history of crime. First the search strategy will be discussed. Second, coverage of drug abuse, its link with crime, the historical and theoretical background of research on drug abuse, crime and education status will be explored. Furthermore, modern or contemporary theoretical approaches to the study of drug abuse will be covered. The chapter's next section will detail research on drug abuse and delinquency among students and young adults, drug use in offender populations, crime in drug-using populations, and history of drugs and crime in America, EU and other Western nations, on the one hand, and the UAE, on the other. Finally, the literature review will cover empirical studies that examine the hypothesis in detail.

# 2.1 Search Strategy

An electronic database search was conducted utilizing MEDLINE, Cochrane Database for Systematic Reviews, PUBMED, and Science Direct. Initial search involving terms such as drug abuse and crime elicited irrelevant articles; hence a more refined search strategy was needed. Figure 2.1 highlights the inclusion/exclusion criteria, screening practices and data parameters.



Figure 3. Literature Search Strategy

This literature review will follow the subheadings focused on the particular search terms.

# 2.2 Historical and Theoretical Background

# 2.2.1 Lombroso's Criminal Man Theory

Ceasare Lombroso undoubtedly laid the foundation for a theory of criminal behavior that was based on his studies on brain anatomy, and physiology, culminating in his anthropometric analysis of criminals (Delisi, 2013). Lombroso founded criminal anthropology through his book entitled *The Criminal Man* (Gkotsi and Benaroyo, 2012). The researcher and criminologist de-

veloped his theory of criminality. He believed in the genetic role of criminal behavior and the emergence of a distinct hereditary class of criminally oriented individuals, drawing on evolutionary theories (Gkotsi and Benaroyo, 2012: 2). Lombroso proceeded to reiterate that criminals display mental and physical anomalies known as "physical stigmata" (Gkotsi and Benaroyo, 2012:2).

The theory proposed by Lombroso classified criminals into two categories, further subdivided into three categories. The first category of criminals included (i) Born Criminal (ii) Insane Criminal, and (iii) Epileptic Criminal. According to Lombroso, such criminals were aligned physically, emotionally, as well as behaviorally with primitive races. Lombroso furthermore reiterated insane criminals are not born criminals, but the victims of brain alternations that predispose them to crime.

The second category of criminals included (i) Occasional Criminal (ii) Criminaloids, and the (iii). Habituals. None of which possessed the peculiar phrenological features and evolutionary drawbacks of the first category. In describing the criminals, Lombroso held that the first category of criminals should not be held liable for their actions, as they were not exercising free will (Gkotsi and Benaroyo, 2012: 2). According to the theory Lombroso proposed, punishment should only be imposed on those who were committing crimes on the basis of choice and could be deterred via punishment (Gkotsi and Benaroyo, 2012:2). On the basis of the theory, the penal systems in Italy and worldwide were encouraged to adopt a more humane view of criminals arguing in favor of rehabilitation, not capital punishment for crime (Gkotsi and Benaroyo, 2012: 2).

The theory was once criticized as pseudoscience (Gkotsi and Benaroyo, 2012:2). However, Lombroso's theory has recently been examined, as a result of advances in biological psychiatry (Rafter et al., 2016). Researchers have argued that his biological theories of delinquency add value for medical science, in examining the neuro-circuitry underlying the criminal behaviors. Lombroso's principal theory is based on the link between anomalies and crime for explaining

criminal behavior (Gatti and Verde, 2012). Recent developments in the field of criminology and psychiatry have been anticipated by Lombroso's theory. New neuroimaging technologies have sought to establish the connection between alterations in brains due to drug use and antisocial or criminal behavior. PET (positron emission tomography) studies have led to the identification of cortical and subcortical processes predisposing murderers to commit homicide, and the role of damaged frontal and temporal lobes therein (Gatti and Verde, 2012: 23). Advances in the field of genetics have also supported the theory, paving the way for biological criminology (Gatti and Verde, 2012).

Influence of heredity and genetic factors were earlier associated with twin studies and adoption studies. However, with advances in molecular biology, the link between genetics and antisocial behavior has been directly explored. Genetic polymorphisms have been actively linked to violent behavior (Gatti and Verde, 2012:23). The discovery that polymorphism of genetic encoding involving Monoamine Oxidase A (MO-A), an enzyme for neurotransmitter metabolization, is linked to antisocial behaviors in maltreated minors (Gatti and Verde, 2012: 23). Epigenetic data has also provided support for the theory, holding that gene expression at the phenotype level and not the transmission of the genotype are equally important. According to Gatti and Verde (2012:23), physical anomalies have also been noted as a result of lack of effective neural development during the third month of pregnancy and mark anomalous brain development.

Critics had argued that presence of aggressive models and learnt behavior was at the heart of the association between low educational status, increased drug use and crime. Research has systematically argued against this, as recent investigations have focused on how aggressive teens were also aggressive children (Gatti and Verde, 2012: 23). Recent research has also held that certain environmental factors or exposure to drugs could trigger delinquency in an individual (Gatti and Verde, 2012:23). Longitudinal studies have amply demonstrated that children of mothers who engage in substance abuse during pregnancy are likelier to display antisocial behavior (Harp and Oser, 2018). Neonatal or fetal exposure to drugs also triggers crime in children (Kennedy et al., 2017, Feder et al., 2020). Maternal substance abuse and offspring conduct problems point to the deep interlinkages between drugs and crime (Ruisch et al., 2018). Genetic studies have also examined how parental substance misuse is associated with offspring substance misuse and criminality (Latvala et al., 2020). In addition, Lombroso opposed prevailing stereotypical view of criminals and challenged the current ways of thinking by proposing a theory of criminal behavior that referred directly to the unlawful conduct of those in power (Gatti and Verde, 2012:24)). The modern concept of differential immunity owes its origin to Lombroso's work.

#### 2.2.2 Neurofeedback & The Psychointervention Model

During the twentieth century, an alternative to Lombroso's view of criminals was proposed through the use of neurofeedback in rehabilitation and correctional facilities (Gkotsi and Benaroyo, 2012:3). Neurofeedback reduces criminal behavior, "prevent violence and lower recidivism" (Gkotsi and Benaroyo, 2012:23). Based on the psycho-intervention model, the researchers proposed new non-invasive methods for training and adjusting the brainwave speed at varied frequencies called neurofeedback or neurotherapy (Marzbani et al., 2016). Clinical efficacy and potential mechanisms of neurofeedback are being actively researched (Niv, 2013). The science of neurofeedback rests on online feedback of neural activation provided to participants for self-regulation and learning control over these neural substrates could change certain behaviors (Sitaram et al., 2017).

This approach is based on an intervention model wherein overabundance or deficiency in frequencies is believed to correlate with emotional disturbances (Gkotsi and Benaroyo, 2012: 4). The conceptual framework associated with this advanced biological intervention is that it can enhance the therapeutic benefits of intervention for drug addicts (Dehghani-Arani et al., 2013). Neurotherapy could have benefits for offenders suffering from neurological damage due to stress and trauma, especially juvenile offenders. Researchers have utilized neurotherapy on juvenile offenders and it serves as an effective adjunctive treatment for the offenders in correctional facilities (Rostami and Dehghani-Arani, 2015). Alpha conditioning programs and EEG (electroencephalogram) biofeedback are at the core of neurofeedback (Rostami and Dehghani-Arani, 2015). The benefits of intensive neurofeedback therapy for criminal offenders are well established. Research in this field has also examined the ability of forensic psychiatric patients who are drug abusers to learn and utilize neurofeedback (Fielenbach et al., 2018, Fielenbach et al., 2019, Konicar et al., 2015). Neurofeeback has been successfully employed for improvement of craving among opiate addicts (Dehghani-Arani et al., 2013). Thus, it is primarily through the application of modern medical scientific theory that there are cogent, comprehensive interventions and therapies designed for building on rehabilitation and care of drug offenders.

#### **2.3 Drug Use and Delinquency in Students and Young Adults**

#### 2.3.1 Drug Use and Delinquency in Students

Drug use and delinquency co-occur across research studies, indicating a robust relationship between the two (Brook and Cohen, 2017). Some of the explanations for this relationship include the (i) common cause model: which emphasizes drug use and delinquency emerges due to common, underlying cause, either intrapersonal or interpersonal, (ii) a syndrome that reflects an underlying conduct disorder, (iii) a deviant lifestyle, or even (iv) common developmental processes (Brook and Cohen, 2017). According to Gasper (2012), drug use and delinquency lead to school dropouts, while alternative views hold that delinquency, dropping out and drug use are indicative of larger issues in a student's life. Various factors moderate the drug-delinquency relationship such as level of risk and protective factors, and the influence of social reputation and moral disengagement (Oesterele et al., 2012; Passini, 2012). Odds of marijuana and other drug use are higher in the United States, as compared to Scandinavian countries like Netherland. Marijuana use was noted among Dutch students in the 12-15 age group half of the US sample. Twothirds between 16 and 17 year old in the Netherlands used hard drugs, as compared to a higher percentage of US students (Oesterle et al., 2012). Dutch students in the 2 age groups had fewer delinquent behaviors as compared to US students (Oesterle et al., 2012). Risk and protective factors were correlated with drug use and delinquency outcomes in both nations (Oesterle et al., 2012).

In a study by Passini (2012), it was also found delinquency-drug relationship is mediated by the incidence of variables such as moral disengagement and social reputation, besides the type of

31

drug used. Social reputation and moral disengagement were found to predict heavy drug use, as well as light drug use and delinquency (Passini, 2012). Heavy drug use predicted delinquency such as vandalism, threatening someone with a weapon, smashing or damaging property and fighting (Passini, 2012). Therefore, substance use is a problem that triggers delinquent behaviors.

For teens, middle or secondary high school is considered a high risk period for substance abuse (Carney et al., 2013). Common risk factors for substance abuse and delinquent type behaviors include poor supervision, truancy and negative role models (Carney et al., 2013). Such factors can cause students to engage in aggression, bullying, carrying weapons, dealing in drugs, gang involvement and disobeying home rules (Carney et al., 2013). Factors that influence delinquency and drug use also include exposure to violence such as homicide (Carney et al., 2013). While drug use and delinquency are interlinked, individual differences also influence the developmental trajectory of such behaviors (Carney et al., 2013).

Across time, the relationship between drug abuse and delinquency changes, with first-time substance abuse and delinquency suggesting students are at risk for later offences and future problems as they grow older (Hunter et al., 2014). Arrested teens are at risk to use drugs than nonarrested ones, and studies indicate nearly two-third of imprisoned adolescents have at least one substance use disorder (Hunter et al., 2014). Thus, adverse experiences in childhood and adolescence can impair development and contribute to drug use and delinquency, such as abuse, neglect, imprisonment or domestic violence (Brown and Shillington, 2017). Teens sent by child welfare agencies to foster homes at greater risk of substance use and delinquency (Fettes, Aarons and Green, 2013; Goldstein et al., 2012; Siegel, Benbenishty, and Astor, 2016; Yampolska, Chuang and Walker, 2019). Prior research has even conceived of drug use and delinquency as a form of maladaptive coping, through which youth take drugs to manage trauma and stress, also called the "self-medication" hypothesis (Brown and Shillington, 2017: 212).

Research by DeLisi and Vaughn (2011) found the strongest correlate of later delinquency and drug use is cognitive or neuropsychological deficits. These deficits include selective attention,

lack of organizational skills, poor cognitive-set maintenance and inhibitory control (Rocque, Welsh and Raine, 2012). Students with these deficits may lack conformity to social expectations and lack of ability to delay gratification, scoring low on tests of working memory, verbal skills, intelligence, executive functions and attention (Rocque, Welsh and Raine, 2012). The frontal lobe of the brain, for example, is found damaged in children of mothers who took alcohol or drugs during pregnancy, while other studies show cognitive deficits can be due to abuse, trauma, disorders like phenylketonuria and even genetic or biological factors (Rocque, Welsh and Raine, 2012). Therefore, early exposure to trauma can trigger later drug use and delinquency, too.

#### 2.3.2 Drug Use and Delinquency Among Young Adults

Close to 230 million individuals among the adult population of the world use an illegal drug once a year minimum. Moreover, approximately 27 billion young adults use drugs regularly, engaging in crime and delinquency (Haug et al, 2014). Life-course persistent offenders, according to Nedelec, Park and Silver (2016: 84) exhibit a pattern of antisocial behavior that begins early in life and continues through teens all the way to adulthood.

Research shows such offenders have adverse developmental environments coupled with neuropsychological deficits (Nedelec, Park and Silver, 2016: 84). A positive relationship between criminal activity and alcohol use has also been documented in young adults (Popovici et al., 2012). Studies show alcohol use, delinquency and criminal activity are clearly more prevalent for young adults in a large number of arrests, with the US Department of Justice reporting (44.4 %) of all adults arrested for criminal offences in the US in 2006 were below 24 years of age (Popovici et al., 2012).

Most young adults do not begin as poly-drug users or serious delinquents. Research studies also show if an individual never uses alcohol, the individual will not use marijuana 97 to 98% of the time, or hard-core drugs 99-100% of the time (Elliott, Huizinga, and Menard, 2012). Additionally, if an individual does not engage in minor delinquent act, the individual will probably not use

33

an illegal drug other than marijuana 92-93% of the time (Elliott, Huizinga and Menard, 2012). Among young adults, alcohol use is a necessary precipitating factor of illicit drug use such as marijuana and poly-drug use (Elliott, Huizinga, and Menard, 2012). Minor offenses are a trigger for serious crimes and are a predictor for marijuana or poly-drug use (Elliott, Huizinga, and Menard, 2012).

Age is one of the most frequently correlated demographic factors in relation to drug use and delinquency. Data supports a curvilinear relationship between age and delinquency, with many studies showing delinquency peaking during mid-adolescence (Elliott, Huizinga and Menard, 2012). Leveling off or reversing of the drug-delinquency relationship is noted during young adulthood (Elliott, Huizinga and Menard, 2012).

Young adulthood is also full of challenges such as leaving school, and home, or new responsibilities, which may increase stress and lead to drug use and delinquency. However, if the individual is a heavy user, drug use remains high across time. New legal adult status creates more opportunities for drug use and offences than during high school. Abuse and low self-esteem may also be at the root of problematic drug use, impaired judgment and cognitive abilities and increased delinquency (Affifi et al., 2014; Cudmore, Cuevas and Sabina, 2015; Gao, Wong and Yu, 2016; Hadland et al., 2015; Marshall et al., 2013, Markowitz et al., 2011; Mills et al., 2013).

#### 2.4 Drug Use in Offender Populations

In the UAE, according to Al-Nuami (2014), multiple risks factors and negative exposures predict criminal behavior in UAE offenders. Drug use remains a significant factor in barriers to recovery from addiction among young offenders in the UAE (Alsuwadi, 2019). Risk factors for young offenders in the UAE include trauma and exposure to violence and physical abuse (Al-Nuami, 2014). According to Al Marrri, Oei and Amir (2009: 3), in a sample of 107 inmates at Dubai Central Prison, volume and frequency of alcohol intake predicted absolute annual alcohol

intake among the prisoners. The various forms of offences included antisocial behavior and financial fraud and drug offences (Almarri, Oei and Amir, 2009: 3).

In the US, on the other hand, dramatic rise in drug-related arrests have been noted in recent times (Rowell et al., 2012). US jails filled with critically serious poly-drug abusers are extremely risky environments (Rowell et al., 2012). Drug use in prison increases health problems and lengthens the stay of the incarceration (Rowell et al., 2012). Inmates can readily access drugs, although many prisons worldwide, including GCC countries lack a formal reporting system to collect information on drug use in prisons. Given that drug use among offender populations is considered a violation or misconduct of institutional rules, correctional officers often lack the will to address such drug use in the facilities (Rowell et al., 2012). In one study on a US prison's drug abuse problem, nearly (20%) of the inmates reported access to drugs (Rowell et al., 2012).

Moreover, inmates with more chronic drug use histories and longer time in prison were more prone to use drugs in jail (Rowell et al., 2012). Participants with cannabis use and polydrug use were unable to procure hard drugs within the prison system. The researchers also found participants on probation or parole were prone to using less drugs in prison, in exchange for favors or early release from the parole board. Offenders with history of drug use were prone to misconduct within institutional settings (Rowell et al., 2012).

In the EU, on the other hand, the prison population incarcerated for drug offenses varies from as low as (2.5%) to as high as (45%) and as many as 15 EU nations report drug and crime as a serious source of custodial crimes (Carpentier et al., 2012). The EU Monitoring Center for Drugs and Drug Addiction has collected data on illicit drug use among European prison inmates for more than 10 years. Studies in the EU show experience of drug use is more widespread in prison populations than general population (Carpentier et al., 2012). Drug use in prison involves drug injections and sharing of injecting syringes, raising concerns about Hepatitis C and other communicable diseases (Carpentier et al., 2012). Assessing the needs of offender populations in

terms of drug use in prison and planning appropriate interventions is critical in this context (Carpentier et al., 2012).

The subsection of the offender population released face significant challenges to rehabilitation with histories of crime and drug abuse (Western and Simes, 2019). Illegal drug use after release from prison is an indicator of continued criminal involvement, relapse to addiction, and elevated mortality risk (Mowen and Visher, 2015). Correlations between drug use and length of imprisonment prove those with poor health and history of crime and drug offenses are more prone to experience mental illness or chronic pain for which they may use drugs (Western and Simes, 2019).

Rafaiee, Olyaee and Sargolzaiee (2013) also examined the relationship between the type of crime and drug used in Zahedan Central Prison, using a cross-sectional, descriptive analytical study. The prison had over 923 addicted males under methadone maintenance. The information collected included the demographic factors of addiction history, as well as type of crime among prisoners. Although the average age of prisoners was 33.84 years, the average addiction age was 20.77 years and involvement duration was 11.94 years (Rafaiee, Olyaee and Sargolzaiee, 2013). Among drug abusers who abused opiates, opium syrup, heroin and Iranian crack, those who engaged in drug related crimes constituted (63.7%) for crack, (52.4%) for heroin, (43.8%) for opium and (40.5%) for opium syrup. Similarly, for the crime of robbery, crack users amounted to (63.3%), while heroin users were (52.4%), and (22%) were opium syrup while (26%) were opium users (Rafaiee, Olyaee and Sargolzaiee, 2013). Another (21.6%) of opium users, (18.30%) of crack users, (14.5%) of opium syrup users and (9.7%) of heroin users were associated with the crime of murder.

Around (25%) of heroin users,( 22%) of opium syrup, (21.1%) of crack, and (12.4%) of opium committed armed robberies (Rafaiee, Olyaee and Sargolzaiee, 2013). From those engaging in kidnapping, (4.3%) were opium users, (4.2%) were opium syrup users, and another (2.6%) used crack and (2.4%) heroin (Rafaiee, Olyaee and Sargolzaiee, 2013). The researchers also examined

the crimes of hallucinogenic drugs such as hashish, glass or methamphetamine and psychotropic pills. Among the research participants, (53.2%) glass abusers, (36.6%) pill abusers, (33.3%) hashish users, (5.4%) glass users, and (9.1%) pill users conducted armed robbery. Finally, concerning the crime of murder, hashish users amounted to (16.7%), psychotropic pill abusers to (18.2%) and glass users at (8.8%) (Rafaiee, Olyaee and Sargolzaiee, 2013).

The researchers found a direct relationship between drug abuse levels and type of drug abused and committed crimes. Increased drug abuse was characterized by higher rates of delinquency and intensity of the crime rose too. Addicts engaged in criminal activities to secure money for their drugs and were forced to commit crimes to acquire drugs. These addicts were unemployed and consequently, lacked an income to meet their needs. Consequently, they turned to activities such as drug trafficking and dealing, smuggling, prostitution and fall into a cycle of poverty, addiction and crime (Rafaiee, Olyaee and Sargolzaiee, 2013).

# 2.5 Crime in Drug Using Populations

Illicit drug abuse contributes to the global disease burden at (0.8%), estimated prevalence of illegal drug use being (53%) in 2014 (Peltzer and Phaswana-Mafuya, 2018). Among the South African provinces, harmful drug use was associated with being of mixed race and higher alcohol use besides being a victim of a violent crime (Peltzer and Phaswana-Mafuya, 2018).

Individuals dependent on drugs engage in acquisitive offending for financial gains (Pierce et al., 2017). Drugs-crime association explanations fall into the following three categories: (a). Forward causation: Crime is due to drug use, because of the need to (i) finance the drug through economic necessity (Pierce et al., 2015) or (ii), on account of psychopharmacological changes caused by taking the drugs, (b). Reverse causation: crime is due to involvement with drug use and opportunities for drug use rise due to involvement in criminal behavior (c). Crime and drug are linked to a common cause, and while there is no direct causal relationship, drug use and crime occur on account of common causes (Pierce et al., 2017).
However, Pierce et al. (2017) explained such simple cause-effect mechanisms cannot explain the nature of the drug-crime association without examining longitudinal data to gain knowledge on what separates criminals who use drugs, from those who do not. Complex interventions targeting users must focus on identification of substance use through early life delinquency and offending behavior (MacLeod et al., 2013). In their study, Pierce et al. (2017) reported that opiate positive users had higher number of offenses as compared to negative controls. The researchers also found increase in opiate use caused number of offenses to rise still further. Effect of opiate use initiation on criminal history differs by crime type and gender (Pierce et al., 2017).

According to Walters (2017), rate of serious drug involvement in adult offenders is between (45% and 55%), irrespective of whether drug use is identified by self-report, victim-report or laboratory analysis. Meta analyses of drug-crime connections show higher rates of offending, 2.8 to 3.8 times, than non-drug users (Walters, 2017). Walters (2017), in a study, found the relationship between drug use and crime is mediated by age, with the relationship interactive during formative years, but additive or cumulative at the time of early adulthood. Predictors for drug crime offenses included weekly use of stimulants, moderate to high nicotine use, theft, distant relationship with parents among hospitalized psychiatric inpatients from 13-17 years in a study from Finland (Kontu et al., 2021).

Different scholars have identified drug-crime pathways. Parent and Brochu (2017) described the criminal trajectory taken by regular cocaine users, in a set of three stages (i) onset stage: drug use remains a function of contact with cash available and degree of contact with other users, wherein onset could be linked to opportunity or petty crime (ii) mutual reinforcement: at this stage, the association between crime and consumption of illicit drugs become bidirectional (iii), economic compulsive: this stage of the drug-crime relationship only takes place in light of an advanced drug trajectory (Parent and Brochu, 2017). Furthermore, the neurophysiological factors involved in drug crime relationships are also conclusive.

At each stage, the neurophysiological pathways respond to the pleasure or reward generated by drug use. Dopamine rich mesolimbic system from the ventral tegmental region of the midbrain to the major limbic structure such as nucleus accumbens, amygdala and hypothalamus play a major role in the effect drugs have on the body (Walters, 2014). Drug abuse stimulates 2 to 10 times the dopamine release compared to regular rewards and reinforcements wherein stimulants and opiates are known for their dopamine enhancing effects. Drugs like cocaine and amphetamine block the dopamine reuptake within the presynaptic terminal exerting a sustained effect on postsynaptic receptor sites (Walters, 2014). Drugs such as opiates also enhance dopamine activity by interacting with neurotransmitters that limit dopamine and diminish the inhibition of dopamine resulting in its potentiation (Walters, 2014). Pursuing rewards regardless of costs characteristic of criminality can be traced to mesolimbic dopamine are critical in motivating crime, as well, explaining the neurophysiological basis of the drug crime connection (Walters, 2014).

There are three classes of drug-crime offenses namely (i) drug defined offenses such as violation of laws holding it is illegal to procure, use, distribute or possess illicit drugs, which can range from marijuana cultivation to methamphetamine production (ii) drug related offenses: where the drugs pharmacological action contributes to offenses needed to finance drugs, and distribute the illegal substances to other addicts and (iii) drug using lifestyle: this category of drug use and crime reflects a deviant lifestyle and the possibility that drug users may be encouraged to commit crimes, through skills learned from other drug offenders (Armiyau et al., 2017: 132). A range of crimes can be due to SUDs, from violence to property crimes, DUI charges or dealing in drugs (Armiyau et al., 2017: 132).

Offenders may commit violent crimes to support drug habits and disputes may occur in illegal markets, where traffickers are prone to use violence and street drug markets have low levels of social and legal control (Armiyau et al., 2017: 132). Although drug users may commit more crimes than nonusers, arrestees and inmates come under drug influence and become violent (Rivera-Saldana et al., 2021). Assessing the extent and nature of drugs' influence on crimes requires reliable data about offense and offender to be present (Rivera-Saldana et al., 2021).

#### **Chapter 3: Methodology**

#### 3.1 Study Design

A quantitative research design will be utilized for the present study. The research will entail a deductive approach. Quantitative research design supports statistically significant conclusions about a population by selecting a representative sample of the population (Lowhorn, 2007). The quantitative research design establishes causality due to precise measurement and controlled research environment (Lowhorn, 2007). Quantitative research design applied in the research study is based on deductive reasoning or deduction, making use of quantitative analysis techniques to establish statistical associations between variables through statistical tests and models (Khalid, Abdullah and Kumar, 2012). A research design is a plan providing the underlying structure for integrating quantitative study elements so results as credible, free from bias and objective, holding the research project together (Dannels, 2018).

Quantitative research calls for describing, explaining and predicting phenomena. Such research design uses probability sampling and relies on large, representative samples to draw out and quantify relationships between different variables. Quantitative designs involve studying the relationship between the independent or predictor variable and the dependent or outcome variable (Khalid, Abdullah, and Kumar, 2012). The research methodology used for quantitative research design, deals with utilization and analysis of numbers using specific statistical tests and definitions to refute or support the research claim (Apuke, 2017: 41). The benefit of a quantitative research design for this study is the capacity of this method to test hypothesis, cause and effect to make predictions. Quantitative research designs are based on numerical data, precise measurement and structured data collection tools, wherein objectivity is assured (Apuke, 2017: 42). Specific variables are studied and findings can be easily generalizable to the wider population, even as the statistical report yields correlations, comparisons of means and obtains the statistical significance of findings (Apuke, 2017: 42). The research design for this study is aligned with the hypothesis to be tested and the wider research aims and objectives.

#### 3.2 Sampling

#### **3.2.1 Sampling Strategy**

The sampling strategy used will be convenience sampling, a non-probability sampling method that is time and cost-effective. It eliminates many drawbacks of random sampling. Etikan, Musa and AlKassim (2016:2) define a convenience sampling (also called accidental or haphazard sampling) as "a type of nonprobability or nonrandom sampling where members of the target population that meet certain practical criteria such as easy accessibility, geographical proximity" are available and willing to participate in the study at a given time. According to Etikan, Musa and Alkassim (2016: 2), the rationale behind using this sampling technique is that it is impossible to include the whole population or every subject because a population is almost finite. Convenience sampling assures elements selected as sample just happen to be situated where the research is being conducted and the population is accessible for the study (Etikan, Musa, and Alkassim, 2016: 2). However, the main drawback of this sampling approach is the problem of outliers, along with the possibility of selection bias. Convenience sampling may not be representative of the wider population, as there is possibility of high self-selection. Nonetheless, given the large sample size and the composition of treatment groups not changing unduly post randomization, convenience sampling is effective, and acceptable in the present research study (Sedgwick, 2013).

#### 3.2.2 Sample Size

The targeted participants of this study are male patients aged from 18 to 65 years who attended a rehabilitation center for treatment from 1<sup>st</sup> July 2020 to 28<sup>th</sup> February 2021. The total number of participants in this study was 255 participants.

# **3.2.3 Inclusion Criteria**

Age	18 - 65 years	
Gender	Male	
Nationality	Emirati	
Language	Arabic and English	
Location and Time Span	Patients who attended rehabilitation center	
	between July 1 <sup>st</sup> , 2020 and February 2021	

# 3.2.4 Exclusion Criteria

Original Sample				
349 individuals – 35 females and 314 males				
Exclusion	Reason(s)			
Females	<ul> <li>Lack of availability of accurate data</li> <li>Small sample size</li> <li>Lower percentage of female drug offenders</li> <li>Limited research on male offenders in UAE</li> </ul>			
Foreigners	<ul> <li>No study about Emirati population addresses drug abuse and history of crime.</li> <li>Sample size of foreigners was smaller compared to the Emirati population</li> </ul>			
10 Other Individuals	<ul> <li>2 individuals excluded because they were intoxicated; medical team unable to conduct assessment.</li> <li>7 individuals attended initial sessions, opened a file yet refused to conduct assessment after that.</li> <li>1 patient was diagnosed with a psychiatric condition not SUD and admitted to a psychiatric hospital</li> </ul>			

#### **3.3 Data Collection**

#### 3.3.1 Variables

Independent Variable: Drug Abuse is the independent or predictor variable, measured in terms of common drugs of abuse. Other predictor variables included previous incarceration, age, educational status and age at which drug first encountered. Dependent Variables: Criminal history of the patients will be the dependent or outcome variable measured through common crimes, number of crimes committed, and types of crimes committed. The present study will seek to ascertain the types of crimes in relation to the type of drugs and educational status.

#### **3.3.2 Data Collection Tool**

Retrospective data was obtained from a center of rehabilitation collected for clinical reasons over a period from July 2020 to February 2021. An electronic database was used in collecting data such as demographic data, employment status, legal status, types of drugs and provisional diagnosis. Legal status involved whether the research participant was imprisoned and the type of crime committed.

#### **3.4 Data Analysis**

Research data will be analyzed with SPSS software Version 26 using descriptive indicators of statistical analysis. Descriptive statistics in the form of numbers, percent values, means, median and range values will be presented as script, tables and graphs. Associations between categorical values will be assessed using inferential statistics Chi<sup>2</sup> test. Differences between mean values in different groups will be assessed by independent samples t-test. Chi<sup>2</sup> test will be used to assess the statistical significance of the association between two categorical data.

## **3.5 Ethical Considerations**

#### **3.5.1 Ethical approval and Consent**

In order to use the data for research purposes, the researcher obtained two ethical approvals. First ethical approval was obtained from the ethics committee from Dubai Medical

College. Second ethical approval was obtained from head of medical department in the rehabilitation center. Further, obtaining informed consent from participants is critical for securing the ethical rights of the potential participants (Biros, 2018: 72). Informed consent remains the primary standard of ethical consent concerning ethical and legal aspects of research involving human beings as research subjects (Ibrahim, 2019: 27). It is associated with the voluntary nature of participation, indicating subject awareness of procedures, consequences and study objectives. Informed consent is derived from the ethical principles of respect for the autonomy of subjects in a study (Ibrahim et al., 2019:27).

For this study, no consent will be required, as the research involves retrospective analysis of data obtained for clinical indications. However, the rehabilitation center has obtained detailed consent from patients in relation to use of data for clinical and research purposes. As patients will never be encountered and only data will be analyzed for objective indicated, the principle of informed consent is not applicable to the present study.

#### 3.5.2 Data Protection, Confidentiality and Anonymity

The ethical duty of protecting the confidentiality and anonymity refers to researcher obligations to protect and safeguard entrusted data (Turcotte-Tremblay and Sween Cadieux, 2018: 6). Turcotte-Tremblay and Sween-Cadieux (2018: 6) reiterate that breaching confidentiality can affect research participants negatively, subjecting them to stigma within the community in the form of prejudice and marginalization in biomedical research. Additionally, the enactment of data protection laws necessitates protection of personal details from public disclosure (Rumbold and Pierscionek, 2017). As data privacy laws are being harmonized to protect and empower the citizen's rights to data privacy, anonymity and confidentiality must be guaranteed (Chico, 2018: 109). Therefore, steps were taken to ensure no information that could identify an individual is released. Necessary measures were taken to keep data secure and inaccessible to third parties who lack authorization to access to it. All sensitive details such as names and dates of birth were removed from the coded data. Data was kept on a password protected desktop computer in a room locked after business hours. Files were encrypted and protected with specific passwords.

In terms of the subject's right to safety and privacy, the principle investigator took steps to protect the data confidentiality regarding patient-identifying information through numerous measures. Primarily, due to the high degree of sensitivity of the population, names and dates of birth were removed and replaced by codes or recruitment numbers and codes were destroyed once data analysis was completed, while data was initially secured with passwords and encryption. Sensitive, confidential data were confidential to assure the protection of privacy and confidentiality of the patients, while personal information or any data not relevant to research were not obtained or removed from selected, coded anonymous data.

Once the research study is completed, the data will be permanently destroyed, as per the rules and regulations of the organization within 5 years of having obtained the data.

#### **Chapter 4: Results**

The chapter will outline research results based on descriptive and inferential statistics, presenting the findings utilizing measures of central tendency and variability, and percentages. Following the presentation of key descriptive statistics, results of the independent samples t-test and cross tabulation and Chi<sup>2</sup> will be described.

# **4.1 Descriptive Statistics**

# 4.1.1 Number and age of included/excluded study population and the age of first encounter with drugs: values are expressed as numbers, mean, or median.

Total number of individuals (Males and Females)	349
Number of females who were excluded	35
Number of non-Emirati males who were excluded	47
Number of individuals who did not fit the inclusion criteria/refused to share	12
Number of Emirati males who were included in the study	255
Minimum age	18 years
Maximum age	63 years
Mean age	29.5 years
Median age	28 years
Mean age at 1 <sup>st</sup> encounter with drug	<b>18.6</b> years
Median age at 1 <sup>st</sup> encounter with drug	17 years

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The number and average age of the study population and age of first encounter with drugs displays the minimum age of respondents as 18 years and the maximum age as 63 years. The table also shows the average or means age of the respondents (n = 255) was 28 years. The average age at first encounter with the drug was 18.6 years, while the median age at first encounter with the drugs was 17 years (Table 1).

#### 4.1.2 Number of Previous Incarcerations

#### Table 2:

#### **Summary statistics of Previous Incarceration**

#### Most individuals had no previous incarceration as the mode = 0n = 251\*

Statistics		Value
Mean number of incar	rcerations	2.6
95% Confidence In-	Lower Bound	2.1
terval for the above	Upper Bound	3.1
Median		1.0
Variance		17.3
Std. Deviation		4.1
Maximum number of incarcerations		42.0
Range		42.0
Interquartile Range		3.0

\*Data was missing for 4 individuals

The (mean) = 2.6 and (median) = 1.0 were different by more than 61.5%. This variable is not normally distributed as the distribution has heavy positive skewness distribution. The SD was high at 4.1, indicating that the numbers were widely spread around the mean while the range was wide from 0 to 42. Interquartile range was 3.0 indicating that the distance between first and third quartile of data fell within this narrow value. Seventy-four of the subjects (29.5%) were not previously incarcerated, while fifty-eight (23.1%) of the subjects were incarcerated at least once. Another thirty-five (13.9%) of the subjects were incarcerated twice. Twenty-six (10.2%) of the respondents were incarcerated at least three times. Furthermore, fifty-eight (23.1%) of the subjects were incarcerated four times or more.

#### 4.1.3 Age of the study population

#### Table 3:

#### Summary statistics for the Age of the study population

Statistics		Value
Mean		29.5
95% Confidence Interval for	Lower Bound	28.5
the above	Upper Bound	30.5
Median		28.0
Std. Deviation		8.2
Mode		25.0
Minimum		18.0
Maximum		63.0
Range		45.0
Interquartile Range		9.0

#### n = 255

The (mean) = 29.5 differed from the (median) 28 by 5.1%. The distribution was not normal and the heavier tails signaled a leptokurtic distribution. SD at 8.1 was relatively large as the coefficient of variability was  $(8.1/29.5) \times 100 = 27.5\%$ , suggesting the spread of age values were somewhat centered around the mean. With a minimum age of 18 years and a maximum age of 63 years, the range for the age values was 45. Interquartile range was 9.0, as 25% of the subjects were 24 years or below and 50% of the participants were 28 years or below. Most participants were young or middle-aged adults, with 75% of the sample aged 33 years or below.

#### 4.1.4 Age of First Encounter with Drugs

#### Table 4

#### Summary statistics for age of first encounter with drugs

Statistics		Value
Mean		17.7
95% Confidence Interval for	Lower Bound	17.2
the above	Upper Bound	18.2
Median	17.0	
Std. Deviation		3.9
Mode		18.0
Minimum		8.0
Maximum	31.0	
Range	23.0	
Interquartile Range		5.0

```
n = 251*
```

\*Data missing for 4 individuals

The mean of first encounter with drug =17.7 was different from the median of 17 years by 3.4%. The SD at 3.9 was low as the coefficient of variability was  $(3.9/15.9) \times 100 = 24\%$ , and the range was 23, with minimum age of only 8 years and maximum age of 31 years. The interquartile range was 5. Most of the participants reported drug use first in their adolescence or adulthood.



Figure 4. Bar chart showing age at the first encounter of drugs for those who committed crimes (n=170)

The most dangerous age range for committing crimes in relation to drug abuse was 14-21 years. The highest risk of crime occurred between 17 and 19 years. The age range of 14-21 years contained 73.5% (n = 125) of 170 individuals among the participants.



Figure 5. Bar chart showing age at the first encounter of drug for those who did not commit crimes (n=81).

Figure 5 shows the age at the first encounter of drugs for those who did not commit crimes was 17 years (n = 12) followed by 18 years (n = 10), 15 years (n=10), and 19 years (n = 8). Most common age at the first encounter of drugs was in adolescence or young adulthood as well. 74.1% (n = 60) out of 81 participants were concentrated around the age range of 14 to 21 years. These results suggest that the age of first encounter with drugs is not different amongst those who commit drug related crimes as compared to those who do not.

#### 4.1.5 Educational Status





Percent of drug abuse is higher in those who either did not complete high school education (n = 114, 45%) or only completed high school (n = 82, 32%). In total low educational status expressed as none completion of high school or only high school (n = 196, 77.4%) was more associated with drug abuse as compared to university education which was associated with only 57 individuals representing 22% of total (Figure 6).

Those who did not complete high school were higher in number for the group that committed crime (n=91) than the group that did not (n=23). Among those who completed high school, more participants committed crime (n=54) as against the number that did not (n=28). Fewer participants committed crime (n=27) as opposed to those who did not (n=30) among university graduates. A higher number of participants committing crime did not complete high school as opposed to those who completed university education. Among those who did not commit crime, university graduates were higher in number than those who did not complete high school. Lack of educational qualifications were linked to crime among drug users.

Figure 7. Pie Chart showing percent and number of individuals in terms of educational status of research participants who did not commit crime (n = 82).





Figure 8. Pie chart showing the percentage and number of individuals in terms of educational status among those who committed crimes (n = 173).

The number and percent of individuals who did not complete high school (n = 91, 53%) were highest among those who committed crimes, as against those who completed high school (n = 54, 31%) and university graduates (n = 27, 16%).

Research participants who did not commit crime were lower in number among those who completed high school and university. In contrast, those who did not complete high school were less prone to committing crimes (Figure 7). The results indicate educational status was not as important in those who did not commit crime, than those who did. In Group 1, among those committing crimes, drug abuse was associated with low education, yet this finding was not observed in Group 2 that did not commit crime. Therefore, educational status was related to drug abuse particularly in those who committed crimes, as against those who did not.

#### 4.1.6 Drugs of Abuse

Among the research participants, common drugs of abuse were identified in number and percent terms. The most commonly abused drugs in Emirati male population are: Gabapentinoids and opioids, followed by alcohol, cannabinoids and stimulants



Figure 9. Bar chart showing most common abused drugs in Emirati male population.

Gabapentinoid (n = 201, 78.8%), followed by Opioids (n = 197, 77.2%) are the two most commonly abused drugs in the study population, followed by Alcohol (n = 177, 69.4%), Cannabinoids (n=155, 60.8%) and stimulants (n=151, 59.2%) were the most commonly abused drugs.

Figure 10. Pie chart showing number of individuals who did not commit crime and commonly abused substance- percentage and number of cases



Number of individuals who did not commit crime and the commonly abused substances and number of users

Alcohol (n = 55, 18%) followed by benzodiazepines (n = 50, 17%) and opioid (n = 49, 16%) gabapentinoids (n=48, 15%) and cannabinoids (n=43, 13%) were the most commonly abused drugs for those who did not commit crime.

Figure 9. Pie chart showing number of individuals who committed crime and percent and number of individual cases for commonly abused substances.



Number of individuals who committed crime and the commonly abused substances and number of users

Gabapentinoids (n = 152, 19%) opioids (n = 148, 18%) and alcohol (n = 122, 15%), followed by stimulants (n=118, 15%) and cannabinoids (n=112, 14%) were the commonly abused substance for group 1 who committed the crime. As the results show, there were similarities between the two groups regarding abused drugs such as alcohol, gabapentinoid, opioid and cannabinoids. However, in the no crime individuals, the benzodiazepines were abused (17%) which was not the case in the drug-committing group. Between the two groups, the individuals who committed crime were also commonly abusing stimulants (15%) while those individuals not committing crime did not abuse this drug frequently.

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Provisional Diagnosis	Crime Committed		
	Yes	No	
F10: Mental and behavioral disorders due to use of alcohol	8	14	
F11: Mental and behavioral disorders due to the use of opioid	28	11	
F12: Mental and behavioral disorders due to the use of cannabinoids	4	6	
F13: Mental and behavioral disorders due to the use of sedatives and anxiolytics	12	6	
F15: Mental and behavioral disorders due to the use of other stimulants	55	26	
F18: Mental and behavioral disorders due to the use of volatile solvents	0	2	
F19: Mental and behavioral disorders due to multiple drug use and use of other psychoactive substances	65	16	
Missing Information	1	1	
Total	173	82	

#### Provisional Diagnosis for Crime Committed or Not In Emirati Male Population

Among the group that committed crime, the highest number of primary drug abused was for polydrug users (n=65, 25%), followed by other stimulant users (n=55, 21%) and opioids (n=28, 10.3%). Among the group that did not commit crime, other stimulant users (n=26, 10.2%) were the highest in number, followed by poly drug users (n=16, 6.27%) and alcohol (n=14, 5.4%). Therefore, the clinical picture that emerged suggests the most common provisional diagnosis received was that of poly drug use.



Figure 12. Bar chart showing crime frequency in individuals who abused drugs (n = 173).

Traffic offence (n = 18, 10.23%) was the most common crime followed by assault (n = 17, 9.66%) and violence (n = 16, 9.09%). Assault is associated with individuals who are charged with sexual or physical abuse. Violence involves the act of breaking property and causing damage. The law in the United Arab Emirates criminalizes the possession or use of drugs and if these were taken as a stand-alone crime it would be the most common crime (n= 26, 14.1%). Altogether, the combined percentage for the 3 serious crimes of rape, attempted murder and drug dealing is extremely low (n=7, 4.04%).

# 4.2 Inferential Statistics

#### 4.2.1 Chi-Square Analysis for Educational Status versus Committing Crimes

#### Table 6

# Educational status (university education completed or did not) versus committing crimes (yes or no) 2x2 Contingency Table

Educational status (completed university or not)* Crimes Committed (Yes or no) Cross tabulation				
Educational Status	Crimes C	ommitted	Total	
	No	Yes	-	
Did Not Complete University	51	145	196	
Completed University	30	27	57	
Total	81	172	253	

As presented in the above table, individuals who did not complete their education at university level had higher rates of drug charges, as compared to those who completed their education or were university graduates. Those who completed their university education had lower drug charges.

Chi-Square Tests					
	Chi <sup>2</sup>	df	p-value		
	Value				
Pearson Chi-	14.6	2	.001		
Square					
Likelihood Ratio	13.9	2	.001		
N of Valid Cases	255				
a. 2 cells (33.3%) have expected count less than 5. The minimum ex-					
pected count is .62.					

 $\text{Chi}^2$  value was 14.6 at p<0.01 suggesting a significant association between educational status (completed university or did not complete university) and crimes committed (yes or no). From 196 participants who did not complete university (either completed or did not complete school), a majority (n=145) committed crimes as against those who did not commit crime (n=51). In contrast, among 57 individuals who completed university education, the difference between those who committed crime (n=27) and those who did not (n=30) was not very large.

Chi<sup>2</sup> analysis was conducted to compare crime (Group 1) and no crime (Group 2) versus completion of high school and non-school completion.

# Table 7 Non-completion versus completion of high school and Crimes Committed or Not Chi<sup>2</sup> Test

Did not complete or completed high school * Crime Committed or not				
Did not complete or	Completed high school	0	Crime Committed	Total
completed high school	Comproved ingh sensor	No	Yes	
		28	54	82
	Did not complete	23	91	114
	Total	51	145	196

Chi-Square Tests						
			Asymptotic Significance (2-			
	Value	df	sided)			
Pearson Chi-Square	4.836 <sup>a</sup>	1	.028			
Likelihood Ratio	4.790	1	.042			
N of Valid Cases	196					
a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 16.14.						

Crimes committed and completion of high school or non-completion of school were associated as P value = 0.028, and Pearson Chi<sup>2</sup> value was = 4.8. Therefore, there was an association that completing or not completing high school was linked to crime. Participants were more likely to engage in crime if they did not complete school. A clear difference emerged between those completing school and those not completing school with respect to crimes. As presented in the above table, individuals who did not complete their education at secondary level had higher rates of drug related crimes and charges, as compared to those who completed their high school. Those who completed their high school education had lower drug related crimes and charges.

#### 4.2.2 Chi Square for Substances Abused Versus Committing Crimes

The association between individual substances abused and committing crimes were tested using the Chi<sup>2</sup> test and the summaries of the results are presented in tables 8 (for drugs showing significant associations) and table 9 (for drugs showing no significant association). For each of the drugs, opioids, cannabinoids, alcohol, benzodiazepine, anticholinergic, muscle relaxants, gabapentinoids, cocaine, stimulants, volatile solvents and hallucinogens, Chi<sup>2</sup> tests were performed to assess the association between primary substance abused (yes/no) and crime committed (yes/no). While there was an association between crimes committed and opioid use, hallucinogen, cannabinoid, gabapentinoids, and stimulants, other drugs did not show an association with crimes committed. We looked into introducing the association between each of the drugs and whether patients committed crime or not using the Chi<sup>2</sup> to assess the association and we found that that all of the primary substances/drugs abused listed in Table 8 were very strongly associated, although the Chi<sup>2</sup> statistic gradually decreasing from the largest value for gabapentinoids to the smallest value for cocaine and all values were statistically significant. By contrast, we found no association between all of these drugs, alcohol, cannabinoids, hallucinogens, muscle relaxants, and volatile solvents where p value was higher than 0.05, as seen in Table 9.

Drug Abused	Chi Square Value	P-Value (≤0.05)
Gabapentinoids	30.8	.000
Opioids	23.6	.000
Stimulants	25.1	.000
Benzodiazepine	15.7	.000
Anticholinergic	7.4	.024
Cocaine	7.3	.026

Table 8 Drugs	Associated	with	Crimes	Committing

Drug Abused	Chi Square Value	P-Value (>0.05)
Cannabinoids	5.7	.126
Alcohol	1.2	.519
Muscle Relaxants	1.0	.605
Volatile Solvents	.58	.749
Hallucinogens	.47	.788
-		

**Table 9 Drugs not Associated with Crimes Committing** 

There is an association between having opioids dependence and committing crimes, Pearson Chi 2 = 23.6 and P value = 0.000. There was no significant association between abuse of cannabinoids and committing crimes, Pearson  $Chi^2 = 5.7$  and P value 0.126. There is association between intake of Benzodiazepines and committing crimes, Pearson  $Chi^2 = 15.7$  and P = 0.000. No association between abuse of Volatile Solvents abuse and committing crimes was noted, with Pearson  $Chi^2 = 0.68$  and P value= 0.407. There is no statistically significance association between the use of Anticholinergic and committing crimes, Pearson  $Chi^2 = 2.1$  and P value = 0.333. There is a strong association between the use of Gabapentinoids and committing crimes with a Pearson  $\text{Chi}^2 = 30.8$ , P value = 0.000. No association between abuse of Muscle relaxants and committing crimes, Pearson  $Chi^2 = 1.0$ , P value= 0.605 was observed. There is a strong association between the use of Stimulants and committing crimes, Pearson  $Chi^2 = 25.1$ , P value = 0.000. There is no association between use of alcohol and drug charges as Pearson  $Chi^2 = 1.2$  and P value is 0.519. Despite alcohol being the third most commonly abused drug in the group that committed crime, it was also the most commonly abused drug among those who did not commit crime, thus explaining the lack of association between alcohol and drug charges. There is no association between cocaine and charged with drug charges as Pearson  $Chi^2 = 7.4$  and P value is 0.026. There is no significant association between abuse of hallucinogens and being charged with drug charges as Pearson  $Chi^2 = 0.47$  and P value = 0.788.

## 4.2.4 T-test for Group 1 (Did Not Commit Crime) (Age \* Drug Abused)

4.2.4.1 Age and Opioid use among those who did not commit crime

Table 10. T-test for examining the statistical significance of mean age of opioid users as compared to non-opioid users in the study population who did not commit crimes. Statistically significance difference was observed, p = .050

Group Statistics*								
	<b>Opioid Consumption</b>	Std. Error						
			Age		wiean			
Age at which drug taken	Ν	35	18.9	4.3	.73			
	Yes	46	17.2	3.6	.51			

\*Data missing for 1 individual

Independent Samples Test								
		Le Equa	vene's Test for llity of Variances	t-test for Equality of Means				
		F	Sig.	Τ	Df	Sig. (2-tailed)		
Age at which drug taken	Equal variances assumes	1.4	.235	1.991	79	.050		

At p=0.05, the t-test value is 1.99 indicating the mean age at which opioid was first taken for the group that did not commit crime is statistically significant from those who did not take opioid.

# Table 11. T-test for examining the statistical significance of difference of the mean for those who take alcohol as compared to those who do not. No statistically significant difference was observed, p = 0.953.

Group Statistics*								
	Alcohol	N	Mean	Std. Deviation	Std. Error Mean			
First time used drugs	No	27	18.0	4.1	0.80			
	Yes	54	17.9	3.9	0.53			

\*Data missing for 1 individual

Independent Samples Test								
		Levene's Test for Equality of Variances		t-test for Equality of Means				
		F	Sig.	Τ	Df	Sig. (2-tailed)		
Age at which drug taken	Equal variances assumed	0.35	.555	0.059	79	0.953		

The t-test shows t-value is 0.059 with p= 0.953, indicating the mean age at which alcohol was taken or not among those who did not commit crimes was not statistically significantly. However, it was noted that it was lower in those who took alcohol (17.9 years) as compared to those who did not (18.0 years), p = 0.588

Table 12. T-test for examining the statistical significance of difference of the mean age for those who take gabapentinoid as compared to those who do not, p = 0.017, as gabapentinoid users tended to be younger (mean = 16.9 years) as compared to mean age of (19.1 years) for non-users.

Group Statistics*								
	Gabapentinoid consumption	Ν	Mean	Std. Deviation	Std. Error			
			Age		Mean			
Age at which drug taken	No	33	19.2	4.2	.72			
	Yes	46	17.1	3.6	.53			

\*Data of 3 individuals missing

Independent Samples Test								
		Levene's Equality of	Test for Variances	t-test for Equality of Means				
		F	Sig.	T	Df	Sig. (2-tailed)		
Age at which drug taken	Equal variances assumes	0.997	.321	2.35	77	.022		

The t-test indicates the t value is 2.4 and p=0.022, therefore the difference in mean age of people who take gabapentinoid is statistically significantly lower at (17.1 years) as compared to the mean age of those who do not take gabapentinoind at (19.2 years)

## 4.2.5 T-Test for Group That Committed Crime (Group 2) (Age \* Drug Abused)

4.2.5.1 Age and Alcohol use among those who committed crime

Table 13. T-test for examining the statistical significance of difference of the mean age for those who take alcohol and committed crimes as compared to those who do not, as alcohol users tended to be younger (mean = 17.6 years) as compared to mean age of for nonusers (17.9 years), p = 0.737

Group Statistics*								
AlcoholNMeanStd. DeviationStd. ErrorAgeAgeMean								
Age at which	No	51	17.6	3.8	0.53			
drug taken	Yes	119	17.7	4.1	0.37			

\*Data missing for 2 individuals

Independent Samples Test								
		Levene's Test for Equality of Variances		t-test for Equality of Means				
		F	Sig.	Т	Df	Sig. (2-tailed)		
Age at which drug taken	Equal variances assumed	1.2	0.278	0.25	167	0.796		

Findings show the age at which drugs taken was not statistically significant among those who committed crimes, among stimulant users and nonusers with t-value at 0.25 and the p value at 0.796.

Table 14. T-test for examining the statistical significance of difference of the mean age for those who take opioids and committed crimes as compared to those who do not, as opioid users tended to be younger (mean = 17.1 years) as compared to mean age of for nonusers (21.3 years), p = 0.00

Group Statistics*							
	Opioid Use N Mean Std. Deviation						
			Age		Mean		
Age at which	No	25	21.3	4.48	.89		
drug taken	Yes	146	17.1	3.58	.31		

\*Data missing for 3 individuals

Independent Samples Test							
		Leveno Equality	e's Test for of Variances	t-test for Equality of Means			
		F Sig.		Т	Df	Sig. (2-tailed)	
Age at which	Equal variances	2.6	.108	5.3	169	.000	
drug taken	assumed						

T-value was 5.3 and p=0.00, therefore the mean age at which drugs were first taken did differed significantly among opioid users and non-users among those committing crimes, as opioid users tended to be younger (mean = 17.1 years) as compared to mean age of for nonusers (21.3 years), p = 0.000

Table 15. T-test for examining the statistical significance of difference of the mean age for those who take gabapentinoid and committed crimes as compared to those who do not, as gabapentinoid users tended to be younger (mean = 17.2 years) as compared to mean age of for nonusers (21.0 years), p = 0.000

Group Statistics*							
Gabapentinoid N Mean Std. Devia- Std.							
	Use		Age	tion	Mean		
Age at which	No	21	21.4	4.8	1.03		
ui ug taken	Yes	150	17.1	3.6	.295		

\*Data missing for 2 individuals

Independent Samples Test								
		Levene's Test for Equality of Vari- ances		t-test for Equality of Means				
		F	Sig.	Τ	Df	Sig. (2-tailed)		
Age at which drug taken	Equal vari- ances assumed	2.7	.097	4.9	169	.000		

T-value was 4.9 and p= 0.000 therefore the mean age at which individuals took drugs did differ significantly for gabapentinoid and non-gabapentinoid users among those who committed crimes. as gabapintinoid users tended to be younger (mean = 17.1 years) as compared to mean age of for nonusers (21.4 years), p = 0.000.

#### 4.2.6 Age At First Encounter with Drugs of Abuse





Distribution of the Age at first encounter with drugs of abuse (years)

People are at most risk for first encounter with drugs of abuse in the age range 14 - 18 (rectangle A). This range is flanked on the right and left by age range of less significantly increased risk that goes down on the left flank to 12 years of age (rectangle B) and goes up in the right flank to 21 years of age (rectangle C).

A t-test was carried out to assess age of start consuming drugs on those who committed crimes and those who did not.

# Table 16 T-Test for Age at First Encounter with Drugs on Those who Committed Crimesand Those who Did Not

The mean age for first encounter with drugs for those who committed drug related crimes (mean = 17.9) was slightly higher than the mean age of first encounter with drugs for those who did not commit crimes (mean=17.6). However, that difference failed to reach statistical significance as the p value =0.606.

Group Statistics*							
	Charged with drug charges	N*	Mean Age	Std. Deviation	Std. Error Mean		
Age at which	Yes	170	17.9	3.9	0.45		
arug taken	No	81	17.6	3.9	0.30		

Independent Samples Test								
		Levene's Test for Equality of Variances		t-test for Equality of Means				
		F Sig.		Т	Df	Sig. (2-tailed)		
Age at which	Equal variances	.006	.937	0.517	249	.606		
drug taken	assumed							

\*Missing data of 4 cases.

The result of the t-test suggest there is no significance difference between those who did or did not consumer drugs regarding the age at first encounter with drugs, as p= 0.606 and t-value is 0.517.

# **Chapter 5: Discussion**

#### **5.1 Introduction**

The aim of the present study was to examine the relationship between drug abuse and history of crime, in relation to educational status among Emirati population who are treated in a center of rehabilitation in the UAE. Given that the association between drug abuse and criminal behavior is widely debated, the present study is critical in establishing the complexity of the association between the two variables, moderated by educational status. Drug abuse is a multidimensional social, economic, and health problem with religious, cultural and psychological implications (Murah et al., 2020a). Therefore, the present study seeks to explore the role of educational variables in impacting this problem and proposing a multi-pronged solution.

#### 5.2 Main Findings

The research hypothesis stated that there is a relationship between type and age of start of drug abuse and level of education and each of the crime committed by patients. Research findings provided critical support for this hypothesis. Some studies reported results similar to the research findings, while others contradicted or showed different results. Primarily, the association between educational status and age of drug abuse was established, as Chi<sup>2</sup> analysis revealed more research participants who did not complete high school were charged with criminal activities following drug abuse, as opposed to those who completed university education. The association between age of start of drug abuse and criminal history or whether or not the individual committed the crime was not established. An independent-samples t-test revealed there was no statistically significant difference between those who did commit crime and those who did not among the rehabilitation center patients with respect to age at which first encounter with drugs took place. While educational status impacted the relationship between drug abuse and criminal history, the relationship was complex. Drug abuse rates are rapidly rising in GCC countries and strong evidence suggests the relationship is more than causal (Murah et al., 2020c; Van Amsterdam et al., 2021). Risk factors for developing addiction include activation and alternation of dopamine signaling within the basal ganglia of the brain (Ersche et
al., 2020: 15254). Chronic exposure to drugs can be habit-forming for the nervous system and Lombroso's "Criminal Man" theory, which argues for biological theories of drug abuse and delinquency is relevant in this regard. Researchers have examined the neuro-circuits underlying reward signaling in criminal behavior (Gatti and Verde, 2012:23). PET studies have also established antisocial or criminal behavior is widely reported due to subcortical and cortical damage in the frontal and temporal lobes of the brain (Gatti and Verde, 2012:23). Therefore, it may be argued that the role of neurofeedback and the implementation of the psychointervention model may prove useful in this regard (Fielenbach et al., 2018, 2019; Konicar et al., 2015).

Potentially significant differences were noted in the use of drugs, depending on whether these were prescription drugs that were being abused, or recreational and psychotropic drugs or even legal substances such as alcohol. Chi<sup>2</sup> analysis revealed drugs associated with crimes committed varied in terms of statistical significance by a wide margin. Gabapentinoids were associated with drug use among those who committed crimes most significantly. Other drugs associated with crime committing included opioids, stimulants, benzodiazepines, anticholinergic and cocaine. The association between stimulants and crime committed was possibly significant, on account of the high number of stimulant users who also committed crimes. Although the number of cocaine users was low, among these a sizable percentage committed crimes, as compared to those who did not, explaining the association between this drug use and crimes committed.

Among the drugs not associated with those committing crimes, were cannabinoids, muscle relaxants, volatile solvents, alcohol, and hallucinogens. Alcohol was not associated with crime, as it was counted as the most commonly abused drug among those who did not commit crime, despite being the third most commonly abused drug in the group that committed crime. Moreover, the commonly abused drug in terms of number and percent of users was also gabapentinoids, followed by opioids, alcohol, cannabinoids and stimulants for the entire group of research participants in the study. Among those who did not commit crime, alcohol, followed by benzodiazepines and opioid were the most commonly abused drugs along with gabapentinoids and cannabinoids. For those committing crimes, gabapentinoid was the most commonly abused substance followed by opioids and alcohol, stimulants and cannabinoids.

The results of the present study are in direct contrast to research findings from NRC which cite how common substances abused by UAE youth were alcohol (41.3%) followed by heroin (16.3%) (Alblooshi et al., 2016:1). Western studies also point to the growing use of drugs for addiction and abuse. UNODC's World Drug Report (2017) found heroin and cocaine as well as opioid were commonly abused drugs, while cannabis was the most frequently abused drug. EMCDDA (2020) also estimates most commonly abused drugs among young adults in EU include amphetamines, ecstasy and cocaine. In another study of UAE individuals, most commonly abused drugs included tobacco, cannabis, alcohol and opiates (Doran, 2016: 749). The finding of the present study that gabapentinoid was a common drug suggests abusers may be more oriented towards using drugs that are socially acceptable such as prescription pills like gabapentinoids, gabapentin and pregabalin (Chiappini and Schifano, 2016; Goins, Patel and Alles, 2021).

Hence, the rewarding effects and the availability of gabapentinoids could be a reason for the high number of gabapentinoid abusers. As gabapentinoid drugs bind selectively to  $\alpha 2$ -3 subunits of VGCC (volgate gated calcium channels) in the CNS (Central Nervous System) neuron tissues, the GABA levels increase along with inhibition of excitatory neurotransmitters (Badgaiyan, 2013). Therefore, gabapentinoid is associated with activation of dopamine reward pathways and it may trigger drug abuse because it is a GABA agonist (Hagg, Jonnson, and Ahlner, 2020; Nagakura et al., 2009). Besides the rewarding effects of gabapentinoid drugs such as pregabalin, the role of community pharmacies in promoting addiction to the medicine are also notable in countries such as UAE and Jordan (Al-Husseini, Wazaify and Van Hout, 2021; Bura, Cabanero and Maldonado, 2018: Ruttern et al., 2011). Moreover, the use of alcohol is forbidden in Islam and drugs like pregabalin might be more religiously and socially acceptable for drug users (Sattari, Mashayekhi and Mashayekhi, 2019). Additionally the mechanisms through which alcohol and gabapentinoid affect the human brain differ, but the effect is equally rewarding for both (Hagg, Johnson and Ahlner, 2020). Therefore, the use of prescription drugs such as gabapentin and pregabalin for drug abuse as opposed to alcohol can be the result of complex factors such as rewarding effects, easy availability in community pharmacies and cultural factors (Al Husseini, Wazaify, and Van Hout, 2021; Hagg, Johnson and Ahlner, 2020; Sattari, Mashayekhi and Mashayekhi, 2019).

The researcher examined drug use and delinquency as well as nature of crime committed. Results revealed traffic offences followed by assault and violence were the most common crimes committed by those who came to the rehabilitation center for treatment. Explanations for the relationship between drug use and crime are rooted in diverse explanations, such as the common cause model, deviant lifestyles, underlying conduct disorder, or common developmental processes (Brook and Cohen, 2017). It has also been established that school dropouts are likelier to use drugs and commit crime (Gasper, 2012). Therefore, the role played by educational status in influencing the association between drug abuse and criminality are also well established. The results of this study align with research findings and the proposed hypothesis in this context. The present research study found the likelihood of people who were not educated to commit crimes was nearly 14-fold as compared to those who completed their education. The results of the study indicate investing in education could be an effective means of preventing drug abuse and crime in society. Preventing school dropout rates from rising by focusing on promoting education could be a way to decrease drug abuse.

In a study by Valkov (2018), the relationship between school dropout and use of illicit drugs has been clearly established. The researcher (2018) explains how research holds that school dropout was a predictor of substance abuse, while epidemiological research has also revealed the relationship between educational failure and criminality including violence, assault and other crimes related to drugs. In another study by Tice, Lipari and Van Horn (2017), it was found 12<sup>th</sup> grade dropouts were more prone to engage in cigarette, alcohol and marijuana use, as well as prescription drug abuse as opposed to those in school. Similarly, the present study also found educational status directly impacted drug abuse and crimes committed.

An important finding of the study that traffic offenses were most common among the rehabilitation center patients with crime charges, followed by assault and violence, contradicted the studies in Western nations, which have found drug abuse is linked to severe and serious crimes. As opposed to crimes such as attempted murder and rape common in drug abuse offenders in Western nations, it is notable that Emirati drug abusers have committed far less serious crimes (Vaughn et al., 2018: 71). According to Lu et al. (2021: 571), cannabis addiction

that is widespread in US states like Colorado and Washington, where it triggers high rates of intimate partner assault, violent crimes and misdemeanors. Grave crimes such as drug dealing, drug promotion, attempted murder and rape were very low among the Emirati male population studied. In contrast, minor offenses can give way for serious crimes and serve as a basis for marijuana or poly drug abuse (Elliott, Huizinga and Menard, 2012). Research findings on the number of previous incarcerations showed the range to be wide and some research participants indicted on as many as 42 criminal charges, while others had no criminal charges. Increased drug abuse serves as an indicator of continued criminal involvement in relation to relapse and mortality risk (Mowen and Visher, 2015). This could explain repeated imprisonment and individual rates of relapse among the present study sample for those with higher criminal charges and conviction rates.

As per the provisional diagnosis, primary drug of abuse impacted the nature of crimes committed. Among the group committing crime, poly drug users were highest in number followed by other stimulant users and opioid users, while among the group that did not commit crime, other stimulant users were the highest in number, followed by poly drug users and alcohol abusers. Stimulant abuse is known to trigger increased criminality in the form of violent and nonviolent crimes (Armenian et al., 2019: 645). On the other hand, opiate use was linked to theft, fraud and drug offenses (Pierce et al., 2017). Marijuana use is generally limited in its effects on nonviolent and violent criminality (Zhai et al., 2020). However, in the sample studied, the male Emirati population showed lower incidence of violent crimes, as opposed to Western countries such as the United States (Maier et al., 2017; Salas-Wright et al., 2017).

Previous research has suggested stimulants were more associated with crimes such as assault (Ahmadpour et al., 2013; Singh et al., 2021). Opioid use was linked to less aggressive behaviors (Ahmadpour et al., 2013: 140). Additionally, among those seeking medical care post incarceration, self-reported substance use was lower than post incarceration, although having an alcohol or SUD was associated with higher levels of post incarceration possession and use of illicit drugs (Chamberlain et al., 2019: 1). The three most common drugs identified were gabapentinoid, opioids and alcohol.

Drug use at early ages was somewhat predictive of SUDs later. A majority of the individuals who abused drugs in the samples started using drugs before 18 years of age. The possibility of developing SUDs is greater for those beginning drug abuse in adolescence. Arrested teens are also more prone to drugs than non-arrested ones, with two-third of imprisoned adolescents having at least one substance use disorder (Hunter et al., 2014).

# 5.3 Study Limitations

The findings provide considerable support for the rejection of the null hypothesis and the conclusion that the association between drugs and crime is well substantiated and it is moderated by factors such as educational status, and age. However, despite efforts to secure a detailed and comprehensive dataset, some limitations are also noted in the sampling method, the issue of social desirability, and potential confounding variables.

# 5.3.1 Retrospective Design, Missing Data

The causal inference cannot be attributed based on retrospective data with the same confidence as a prospective study. Consequently, the research has limited application for professionals due to potential confounders. The study utilized a retrospective research design, so results were based on the premise that no errors or confounding had occurred and two groups, Crime and No Crime committed, were comparable. Causal links could not be established with certainty, as this was a retrospective study. In addition, missing data led to the possibility of skewed or biased results. Such a research study would be subject to a potential confounding bias.

# **5.3.2 Sampling Strategy**

As convenience sampling was used for the study, the results lack the generalizability assured by a prospective research design that implements random sampling strategies or matching to control for confounding variables. In addition, convenience sampling is associated with selection bias and the possibility of outliers and selection bias (Etikan, Musa and AlKassim, 2016).

# **5.3.3 Social Desirability**

Results of the study may have been impacted by social desirability concerns among research participants, leading to responses in the research setting being different from what they would have been in real-world settings. Using reliable procedures and valid measures of behavior cannot compensate for inherent bias due to change in the responses of participants because of their immersion in the research process.

# 5.3.4 Limited Application and Scope

The study can also be criticized on the grounds that it was not associated with any form of intervention to bring about a change in the attitudes and values of the rehabilitation patients regarding drug abuse. The study has limited applicability in different cultural surroundings. Also research on rehabilitation patients would provide a limited view of the drug users, which also constitutes offender populations in prisons and correctional facilities, besides patients in rehabilitation centers. Additionally, research by Rowell et al. (2012) has found inmates with chronic drug use histories spending more time in prison were more prone to drug use in jail. A limitation of this study was there was absence of information about whether the research participants used drugs in jail when imprisoned.

The relationship between drug abuse and crime has been well established, yet the present study made no attempt to examine educational status and the drug-crime nexus in the context of criminal gravity, as only primary substance of abuse was accessible and it was not known which drugs the individuals used when they were committing crimes or imprisoned or charged for criminal acts. This points to another limitation in relation to scope of the study, wherein the research could not examine the extent and exact nature of the relationship between serious crimes and drug abuse.

# **5.4 Possible Implications**

Arrested teens are at risk to use drugs than non-arrested ones, and studies indicate nearly two-third of imprisoned adolescents have at least one substance use disorder (Hunter et al., 2014). The implications of the research for practitioners and addiction science experts and

professionals in the field are multiple. Primarily, the research substantiated the need for examining educational status in light of drug use and criminal history to formulate an effective intervention program that can benefit the patient population. However, on account of its large sample size, despite limitations and biases, the study has generated valuable data for future researchers seeking to explore and establish a relationship between drug abuse, crime and educational status among rehabilitation patients in the UAE and other GCC countries. The study also generated insights into why drugs such as gabapentinoid which are prescription medication not commonly associated with drug abuse may be rising in the UAE due to the social and religious objection to substances such as alcohol typically associated with SUD (Sattari, Mashayekhi and Mashayekhi, 2019).

The main advantage of this study and an important implication it has for future research is that it has established a link between drug abuse and criminal history, documenting how educational status impacts the drug-crime nexus. This study can provide a basis for implementation of early warning and prevention programs to detect and eliminate drug use in vulnerable, at risk populations such as school dropouts, academic failures and unemployed young adults.

The implications of the study also include the need for understanding how neurofeedback and neurotherapy, besides other rehabilitation interventions, could help those with repeated criminal convictions or charges who are drug abusers at a criminal facility. Research suggests repeated convictions and higher drug abuse frequency leads to more serious criminal histories and higher risks of relapse and mortality. Therefore, jail may not prove to be an effective deterrent against continued drug use. Use of neurofeedback to enable drug users to use biofeedback effectively for self-management of their symptoms and complications can be an effective means of treatment (Dehghani Arani et al., 2013; Konicar et al., 2015; Rostami and Dehghani- Arani, 2015).

Other key psycho-interventions include neuromodulation of brain activation associated with addiction through the use of real-time functional magnetic resonance imaging neurofeedback (Martz et al., 2020). Evidence-based psychosocial interventions for substance abuse must also complement biological therapy, including cognitive behavioral therapy, relapse prevention, contingency management, motivational interviewing and brief interventions (Jhanjee, 2014).

Behavioral and pharmacological interventions grounded on neuroscientific evidence would also help in treating addiction and criminality among drug abusers (Potenza et al., 2011). New therapies such as deep brain stimulation (DBS) can target the nucleus accumbens, besides other brain areas associated with addiction such as the lateral habenula, insula and subthalamic nucleus (Wang et al., 2018). Results suggest support for such interventions as opposed to imprisonment or capital punishments for deterrence from drug abuse and associated crimes.

# **Chapter 6: Conclusion and Recommendations**

# **6.1 Recommendations**

The key recommendation based on the findings of this study is that early drug abuse prevention and awareness programs at school level could be critical for effectively eliminating drug abuse among UAE youth and associated criminal charges, as well. Drug awareness and advocacy programs are central to building a deeper resilience and attitude change in regard to drug misuse and abuse (Record et al., 2021). Another important recommendation is that drug abuse among prescription drugs should be accorded priority in drug abuse diagnosis and detection programs and policy formulation by practitioners and addiction sciences specialists (Grecu, Dave and Saffer, 2019:181). Utilization of prescriptions should be closely monitored by addiction, rehabilitation and mental health specialists to detect signs of prescription drug abuse among UAE patients.

It is hoped that the study will lead the way for future intervention-based research for identifying and eliminating drug abuse and addiction practices among offender populations. Research findings could translate into effective insights for rehabilitation professionals to understand the need for helping patients by overcoming habit-forming associative learning linked to drug abuse, through programs such as neurofeedback, in line with Lombroso's research (Gatti and Verde, 2012:23). Offender populations may be better served through biological interventions such as neurofeedback, as these can curb drug cravings and undo the damage caused by stress and repeated trauma, especially among juvenile drug offenders (Dehghani et al., 2013).

The research study also demonstrates a deeper understanding of how systemic issues in treatment services can harm the quality of addiction treatment (Bhui et al., 2019). To prevent relapse, it is critical to formulate interventions utilizing various forms of therapy such as neurotherapy for intensive and focused care of drug abusers who also have a criminal history (Corominas-Roso et al., 2020: 1275). Expanded availability of overdose antagonists and strengthening the data collection, integration and surveillance of drug abuse monitoring programs could help in containing the crisis at local and national levels. Scientific research also needs to focus on development of high potency antagonists and interventions such as neurofeedback therapy to even using wearable devices and apps for tracking drug use and monitoring the patient (Fielenbach et al., 2018; 2019).

Specialized treatment access is critical and for this, medical practitioners should be sensitized to refer and advocate treatment options for drug addiction (Mahmoud, 2020: 1124). Targeted interventions, rehabilitation efforts focused on skill building and reintegration into the community are recommended (Mahmoud, 2020:1124). The findings suggest the need for expanded access to evidence-based recovery and treatment services and addressing the needs of the vulnerable population such as young adults and repeat offenders (Han et al., 2017: 293).

Another critical recommendation is that research and development in the field of medications and drugs must focus on formulating drugs with limited abuse potential and habit-forming properties. Regulating and restricting production of such habit-forming drugs must also be a critical step, besides improving prescription monitoring and surveillance.

UAE policymakers must focus on national level programs for high-risk groups and mobile populations as well as other groups vulnerable to drug addiction (Murah et al., 2020a, 2020b, 2020c). Therefore, prevention programs must be targeted at multiple settings including schools and communities and incorporating multiple risk factor (Murah et al., 2020a). Parenting education should also be made available in schools, vocational training centers as well as communities to curb drug abuse among youth (Mwania and Njagi, 2017).

Secondary prevention or early detection and preventing progression of drug abuse should be utilized to prevent early onset habit-forming abuse and addiction (ElKazh and El Mahdy, 2017). Interventions should also focus on early and intermittent users so they do not fall prey to drug abuse (ElKazh and El Mehdy, 2017).

It is also recommended the future research in this area should focus on understanding the moderating influence of educational status, on the drug-abuse-crime nexus based on a careful examination of criminal gravity. Such a research orientation would be beneficial in advancing knowledge in the field of drug abuse and crime prevention, among repeat offenders or those with higher counts of criminal charges. Understanding how serious crimes can be the outcome of drug abuse under specific circumstances could lead researchers to a more profound comprehension of how to avert violent criminal acts and prevent offenders from repeating criminal acts under the influence of drugs. Antidrug campaigners would also benefit from understanding the relationship between patterns of drug addiction or abuse and the propensity for engaging in criminal behavior. While the research study reveals that despite drug abuse, less serious crimes are common among drug offenders and those charges with addiction and criminal actions, the importance of eradicating this dangerous social problem is of critical importance. The present study demonstrates how education can also be an effective deterrent to engaging in drug abuse and carrying out crimes.

Policy makers and key stakeholders must be made aware of the problem of substance abuse in the UAE for formulating suitable policies and action plans (Murah et al.. 2020a). Social welfare systems and rehabilitation centers must be developed for timely care (Mahmoud, 2020:1124). Policy makers can also formulate alternative approaches as opposed to imprisonment for drug use offences based on international best practices and standards (Alsuwaidi, 2019). Effective treatments can be implemented within prisoners and communities in the UAE, and critical penal policies can be formulated in relation to substance use and crime (Alsuwaidi, 2019).

# 6.2 Conclusion

The research study sought to examine if there was an association between educational status with crime committed or not. It also explored the extent of drug abuse and common drugs of abuse among those who did committed or did not commit crimes. Research findings delved into the association between drug abuse and crime committed, in light of age at first encounter with drugs. Research result showed the association between drug abuse and crime committed was positive and robust, in terms of magnitude and direction of the correlation. Primary drug abused among the research participants were gabaepnetinoid, opioids and alcohol. Other important research findings were that individuals who committed crimes were likelier to not complete high school as opposed to university graduates. Clear differences emerged regarding patterns of drug abuse, types of crimes committed by drug users, most commonly abused drugs, age at first encounter with drugs between the Emirati population studied and reports from Western research. The association between drug use and crime committed was established for certain drugs such as stimulants, gabapentinoids, opioids and alcohol. The findings also indicated the need for considering critical recommendations and future implications of the study. Although the age at first encounter with drugs was lower for the sample, the research findings showed no difference between the mean age at which drugs were first taken for those who committed crimes and those who did not. However, with respect to educational status and the drug abuse-crime nexus, the results were in line with the proposed hypothesis.

# **<u>Chapter 7: Reflections and Critique</u>**

Meeting this dissertation requirement has been challenging and a rewarding, enriching experience. Due to the research conducted, I became aware of how important theoretical knowledge was in terms of its application in practical, real world settings. As I advanced through the research project, I acquired a range of skills such as the ability to analyze effectively, engage with data and decode critical statistical principles, besides following ethical research procedures. I also learnt the importance of cultivating independent research skills.

I also acquired a deeper understanding of the value of time management and the importance of supervisory guidance and feedback. The importance of feedback was critical in this regard, as it enabled me to learn about my strengths and areas of personal and professional development and growth. Regarding the research design and methodology followed, data collection was the most challenging part of the study. The reason for this was because the sample size was large and obtaining data release approvals was lengthy, as it requires administrative clearances. Extracting the information from the system was also effortful and time consuming.

Obtaining approval for the research was a critical point for me. Another crucial area of learning was developing the ability to complete specific, measurable, attainable, reliable and timely goals and objectives I set for myself, while meeting the timelines for this research project. The completion of this dissertation added to my knowledge as a researcher, practitioner and professional. I learnt considerable knowledge and gained profound insights into drug abuse and the history of crime in the UAE and how it differed from Western nations.

The research dissertation also challenged me to delve into areas of personal and professional improvement. I acquired a better comprehension of the importance of not procrastinating and initiating timely completion of goals. I gained know-how about the offender population and the vital criticality of rehabilitation as opposed to imprisonment or capital punishment for helping the drug offenders in the Emirati correctional and rehabilitation systems and facilities. Finally, the research study was a valuable opportunity for me to grow my skills, advance my knowledge, and build on my competencies, to appreciate the essential importance of incorporating a scientific approach as an addiction science professional.

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# **Appendix 1: Data Abstraction Sheet in SPSS**

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	BeducationalStatus	💑 Employment	AgeFirstU sed	🚜 StartedTaking	💑 ProvisionalDiagnosis	🔗 OpiodUse	Cannabinoi dUse	🖗 AlcoholUse	Benzodiaz epineUse	🖋 AnticholinergicUse	
1	Did not	Unemployed	17.00	Opioids	F15Mental and behavioural disorders due to use of other stimulants	2	1	1	1		1
2	Complete	Employed	12.00	Gabapentinoids	F19Mental and behavioural disorders due to multiple drug use and use of other psychoactive substances	2	2	2	2		2
3	Complete	Unemployed	15.00	Opioids	F15Mental and behavioural disorders due to use of other stimulants	2	1	1	1		1
4	Did not	Unemployed	15.00	Opioids	F19Mental and behavioural disorders due to multiple drug use and use of other psychoactive substances	2	2	2	2		2
5	Did not	Unemployed	19.00	Opioids	F15Mental and behavioural disorders due to use of other stimulants	2	1	1	1		1
6	Did not	Unemployed	25.00	Cannabinoids	F19Mental and behavioural disorders due to multiple drug use and use of other psychoactive substances	2	2	2	2		1
7	Did not	Employed	17.00	Gabapentinoids	F19Mental and behavioural disorders due to multiple drug use and use of other psychoactive substances	2	1	2	2		1
8	University	Unemployed	25.00	Gabapentinoids	F13Mental and behavioural disorders due to use of sedatives or hypnotics	2	2	2	2		1
9	Complete	Employed	21.00	Cannabinoids	F15Mental and behavioural disorders due to use of other stimulants	1	2	2	2		1
10	Did not	Unemployed	14.00	Opioids	F19Mental and behavioural disorders due to multiple drug use and use of other psychoactive substances	2	1	2	2		1
11	Complete	Employed	20.00	Gabapentinoids	F19Mental and behavioural disorders due to multiple drug use and use of other psychoactive substances	1	2	2	2		2
12	Complete	Unemployed	22.00	Cannabinoids	F15Mental and behavioural disorders due to use of other stimulants	2	2	1	2		1
13	Complete	Employed	13.00	Opioids	F19Mental and behavioural disorders due to multiple drug use and use of other psychoactive substances	2	1	2	2		1
14	Did not	Unemployed	18.00	Cannabinoids	F15Mental and behavioural disorders due to use of other stimulants	1	2	1	2		2
15	Did not	Unemployed	14.00	Alcohol	F11Mental and behavioural disorders due to use of opioids	2	2	2	1		1
16	Complete	Unemployed	24.00	Cannabinoids	F12Mental and behavioural disorders due to use of cannabinoids	1	2	2	1		1
17	Complete	Unemployed	18.00	Gabapentinoids	F19Mental and behavioural disorders due to multiple drug use and use of other psychoactive substances	1	2	2	2		1
18	Did not	Unemployed	15.00	Anticholinergics	F15Mental and behavioural disorders due to use of other stimulants	2	2	2	2		2
19	Complete	Unemployed	15.00	Cannabinoids	F19Mental and behavioural disorders due to multiple drug use and use of other psychoactive substances	2	2	1	1		1
20	Complete	Unemployed	22.00	Cannabinoids	F12Mental and behavioural disorders due to use of cannabinoids	1	2	2	1		1
21	Complete	Employed	17.00	Stimulants	F15Mental and behavioural disorders due to use of other stimulants	1	1	1	1		1
22	Did not	Unemployed	18.00	Opioids	F19Mental and behavioural disorders due to multiple drug use and use of other psychoactive substances	2	2	2	2		1
23	University	Unemployed	17.00	Alcohol	F12Wental and behavioural disorders due to use of cannabinoids	1	2	2	1		1
24	Complete	Unemployed				2	2	2	2		1
25	Did not	Unemployed	16.00	Gabapentinoids	F15Mental and behavioural disorders due to use of other stimulants	2	1	2	2		2
26	Did not	Unemployed	12.00	Cannabinoids	F19Mental and behavioural disorders due to multiple drug use and use of other psychoactive substances	2	2	2	2		1
27	Complete	Unemployed	14.00	Alcohol	F13Mental and behavioural disorders due to use of sedatives or hypnotics	2	2	2	2		2
28	Did not	Unemployed	15.00	Alcohol	F18Mental and behavioural disorders due to use of volatile solvents	1	1	2	1		1
29	Did not	Unemployed	18.00	Alcohol	F15Mental and behavioural disorders due to use of other stimulants	2	1	2	1		1
30	Did not	Unemployed	10.00	Anticholinergics	F11Mental and behavioural disorders due to use of opioids	2	2	2	2		2

	OpiodUse	Cannabinoi dUse	NcoholUse 🖗	Benzodiaz epineUse	🖋 AnticholinergicUse	🖋 GabapnetinoidsUse	Musclerelax antsUse	: 🛷 CocaineUse	VolatileSolve ntsUse	Hallucinoge nsUse	StimulantsU se	💑 DrugCharges	💑 DrugUse	Possessio a nofillegalsu bstances
1	2	1	1	1	1	2	2 1	1	1	1	2	1	1	No
2	2	2	2	2	2	2	2 1	1	1	1	1	2	2	No
3	2	1	1	1	1	2	2 1	1	1	1	2	2	2	No
4	2	2	2	2	2	2	2 1	1	1	1	2	1	1	No
5	2	1	1	1	1	2	2 1	1	1	1	2	2	2	No
6	2	2	2	2	1	2	2 2	2 1	1	1	2	2	2	No
7	2	1	2	2	1	2	2 1	1	1	1	2	2	2	No
8	2	2	2	2	1	2	2 2	2 1	1	1	1	2	2	No
9	1	2	2	2	1	2	2 1	1	1	1	2	2	2	No
10	2	1	2	2	1	2	2 1	1	1	1	2	1	1	No
11	1	2	2	2	2	•	1 1	1	1	1	2	: 1	1	No
12	2	2	1	2	1	2	2 1	1	1 1	1	2	2	2	No
13	2	1	2	2 2	1	2	2 2	2 1	1	1	2	2	2	No
14	1	2	1	2	2	2	2 1	1	1 1	1	2	2	2	No
15	2	2	2	! 1	1	2	2 1	1	1	1	2	2	2	No
16	1	2	2	! 1	1	ſ	1 1	1	1 1	1	2	2	2	No
17	1	2	2	2 2	1	2	2 2	2 1	1	1	2	2	2	No
18	2	2	2	2	2	2	2 1	1	1	1	2	1	1	No
19	2	2	1	1	1	2	2 1	1	1 1	1	2	1	1	No
20	1	2	2	2 1	1	2	2 1	1	1	1	1	2	2	No
21	1	1	1	1	1	f	1 1	1	1	1	2	2	2	No
22	2	2	2	2	1	2	2 2	? 1	1	1	2	1	1	No
23	1	2	2	! 1	1	2	2 1	1	1	1	1	2	2	No
24	2	2	2	2 2	1	1	1 2	2 1	1	1	2	2	2	No
25	2	1	2	2 2	2	2	2 1	1	1	1	2	1	1	No
26	2	2	2	2	1	2	2 1	1	1	1	2	2	2	No
27	2	2	2	2	2	2	2 1	1	1	1	2	2	2	No
28	1	1	2	! 1	1	1	1 1	1	2	1	1	1	1	No
29	2	1	2	! 1	1	2	2 1	1	1	1	2	2	2	No
30	2	2	2	2	2	2	2 1	1	2	1	2	1	1	No
1 A A														1

	🗞 DrugCharges	💑 DrugUse	Possessio a nofillegalsu bstances	🖧 DrugPromotion	💑 DrugDealing	🖧 Assault	🚜 Violence	🎝 Rape	💑 Robbery	a TrafficOffenc e	Attempted Murder	FinancialC ase	a Impersonating officer	otherlegalch arges	Numberof ReviousC harges
	1	1	1 No	No	No	No	No	No	No	No	No	No	No	No	.00
	2	2	2 No	No	No	No	No	No	No	Yes	No	No	No	No	1.00
	2	2	2 No	No	No	No	Yes	No	No	No	No	No	No	No	3.00
	1	1	1 No	No	No	No	No	No	No	No	No	No	No	No	7.00
	2	2	2 No	No	No	No	No	No	No	No	No	No	No	No	5.00
	2	2	2 No	No	No	No	No	No	No	No	No	No	No	No	4.00
	2	2	2 No	No	No	Yes	No	No	No	No	No	No	No	No	2.00
	2	2	2 No	No	No	No	No	No	No	No	No	No	No	No	1.00
	2	2	2 No	No	No	No	No	No	No	No	No	No	No	No	.00
	1	1	1 No	No	No	No	No	No	No	No	No	No	No	No	
	1	1	1 No	No	No	No	No	No	No	Yes	No	No	No	No	1.00
	2	2	2 No	No	No	No	No	No	No	No	No	No	No	No	1.00
	2	2	2 No	No	No	Yes	Yes	No	No	No	No	No	No	No	6.00
	2	2	2 No	No	No	No	Yes	No	No	No	No	No	No	No	6.00
	2	2	2 No	No	No	No	No	No	No	No	No	No	No	No	.00
	2	2	2 No	No	No	No	No	No	No	No	No	No	No	No	.00
	2	2	2 No	No	No	No	No	No	No	No	No	No	No	No	.00
	1	1	1 No	No	No	No	No	No	No	No	Yes	No	No	No	4.00
	1	1	1 No	No	No	No	No	No	No	No	No	No	No	No	1.00
	2	2	2 No	No	No	Yes	No	No	No	No	No	No	No	No	2.00
	2	2	2 No	No	No	No	No	No	No	No	No	No	No	No	.00
	1	1	1 No	No	No	No	No	No	No	No	No	No	No	No	10.00
	2	2	2 No	No	No	No	No	No	No	No	No	No	No	No	.00
	2	2	2 No	No	No										
	1	1	1 No	No	No	No	No	No	No	No	No	No	No	No	3.00
	2	2	2 No	No	No	No	No	No	No	No	No	No	No	No	8.00
	2	2	2 No	No	No	No	No	No	No	No	No	No	No	No	.00
	1	1	1 No	No	No	No	No	No	No	No	No	No	No	No	.00
	2	2	2 No	No	No	No	No	No	No	Yes	No	No	No	No	10.00
	1	1	1 No	No	No	No	Yes	No	No	No	No	No	No	No	10.00
ų,					14.4	14.4	14.4			14.4				14.4	

# Appendix 2: Coding Manual

Variable	Definition	How Recorded
Educational status	Defined at three levels:	Categorical
	1. Did not complete high school	
	2. Completed high school	
	3. Completed university	
Employment	Defined at two levels	Categorical
	1. Employed	
	2. Unemployed	
Age First Used	Age of first encounter with drugs	Continuous/Numeric
Started Taking Which	This is defined in terms of 11 drugs	Categorical
Drugs	1. Opioid	
	2. Hallucinogen	
	3. Stimulant	
	4. Anticholinergic	
	5. Benzodiazepine	
	6. Alcohol	
	7. Cannabinoids	
	8. Gabapentinoids	
	9. Muscle relaxant	
	10. Cocaine	

	11. Volatile solvents	
Provisional Diagnosis	Provision diagnosis as per ICD 10 from F10	Categorical
	to F19.	
Opioid Use	Defined in terms of	Categorical
	1. Yes- 2	
	2. No-1	
Hallucinogen use	Defined in terms of	Categorical
	1. Yes- 2	
	2. No-1	
Stimulants use	Defined in terms of	Categorical
	1. Yes- 2	
	2. No-1	
Volatile solvents use	Defined in terms of	Categorical
	1. Yes- 2	
	2. No-1	
Cocaine use	Defined in terms of	Categorical
	1. Yes- 2	
	2. No-1	
Alcohol Use	Defined in terms of	Categorical
	1. Yes- 2	
	2. No-1	
Cannabinoids use	Defined in terms of	Categorical
	1. Yes- 2	

	2. No-1	
Gabapentinoid use	Defined in terms of	Categorical
	1. Yes- 2	
	2. No-1	
Muscle relaxant	Defined in terms of	Categorical
	1. Yes- 2	
	2. No-1	
Anticholinergic	Defined in terms of	Categorical
	1. Yes- 2	
	2. No-1	
Benzodiazepine	Defined in terms of	Categorical
	1. Yes- 2	
	2. No-1	
Drug Charges	Defined in terms of	Categorical
	1. Yes- 2	
	2. No-1	
Drug use	Defined in terms of	Categorical
	1. Yes- 2	
	2. No-1	
	Defined in terms of	Categorical
Possession of illegal	1. Yes- 2	
substances	2. No-1	
Drug promotion	Defined in terms of	Categorical

	1. Yes- 2	
	2. No-1	
	Defined in terms of	Categorical
	1. Yes- 2	
Drug dealing	2. No-1	
	Defined in terms of	Categorical
	1. Yes- 2	
Assault	2. No-1	
	Defined in terms of	Categorical
	1. Yes- 2	
Violence	2. No-1	
	Defined in terms of	Categorical
	1. Yes- 2	
Rape	2. No-1	
	Defined in terms of	Categorical
	1. Yes- 2	
Robbery	2. No-1	
	Defined in terms of	Categorical
	1. Yes- 2	
Traffic offence	2. No-1	
	Defined in terms of	Categorical
	1. Yes- 2	
Attempted murder	2. No-1	

	Defined in terms of	Categorical
	1. Yes- 2	
Financial case	2. No-1	
	Defined in terms of	Categorical
Impersonating security	1. Yes- 2	
officer	2. No-1	
	Defined in terms of	Categorical
	1. Yes- 2	
Other legal charges	2. No-1	
Number of previous	Ranges from 0 to 42 counts/crime charges	Continuous/Numerical
incarcerations		

# **Appendix 3: Research Ethics Committee Approval**



December 24th, 2020 Alia Almarar,

MSc Addiction Sciences Batch 1 Candidate,

Dubai Medical College,

Dear Alia

Re: Drugs of abuse related crimes in an Emirati male population.

I am writing this letter to confirm that the Ethics Committee at Dubai Medical College has approved your submitted proposal entitled above, having accommodated the feed-back given in the previous response, including the clear illustration of the combined quantitative and qualitative nature of the study, and properly dealing with the other requested details. We take this opportunity to wish you all the best for the future with the study. Please inform the Ethics Committee at DMC of publications and oral presentations that might be achieved as a result of this research project. Let us know of any intended changes to the submitted protocol before implementation.

Sincerely,

fermes

Dr. Hafez Ahmed,

PhD, MSc, MB BCh, Dip-RCPath (London, Chemical Pathology),

HEA Member (UK), PG-Cert (HED., Kingston University, UK).

Professor of Biochemistry,

Director of Research Ethics Committee,

DMC, Dubai, UAE.

# **Appendix 4: Approval letter**

**GOVERNMENT OF DUBAI** 



ECTR-MED-GL-22032021-006

2021-03-22

### Subject: Letter of Approval to Conduct a Study

Dear Medical Education and Research Department (MERD),

Please note that **Alia Al Marar**, DMC Student ID number: **AMK20190304**, is conducting a research titled "**Drug related crimes in rehabilitation men**" for their Master's Degree in Addiction Science in Erada Center for Treatment and Rehab in Dubai, and we approve of this research pending DHA approval.

Sincerely, Prof. Hamdy Moselhy Medical Director – Erada Center for treatment and rehab in Dubai



 Email: info@erada.ae
 Tel: 800 Erada (37232)
 Fax: 04-3399340
 P.O. Box: 440100 Dubai, U.A.E.

# **Appendix 5: General consent to treatment and account settlement**

**GENERAL CONSENT** 

options, and alternative courses of treatment

Dubai and myself. On completion of this form,

**RELEASE OF PERSONAL AND MEDICAL INFORMATION** 

By signing below, I authorize to Erada Center for Treatment and Rehab in Dubai, and

their staff to conduct any diagnostic examinations, tests and procedures and to

provide any medications, treatment or therapy necessary to effectively assess and

maintain my health, and to assess, diagnose and treat my illness or injuries. I

understand that it is the responsibility of my healthcare providers to explain the

reasons for any particular diagnostic examination, test or procedure, the available treatment options, the common risks, anticipated benefits associated with these

I understand that the email address that I have provided on the registration form will be used as a communication tool between Erada Center for Treatment and Rehab in

I hereby authorize the Erada Center to provide any information of whatever nature concerning my treatment, including but not limited to current conditions/co-

morbidities to my insurance carrier or third-party payer, for the purpose of determining

honofit optitlement and to process navment. Therefore, taking responsibility for the



### وثيقة الموافقة على العلاج وتسديد الحساب - GENERAL CONSENT TO TREATMENT & ACCOUNT SETTLEMENT

أنا، المريض ------ الرعاية الصحية أدناه، أطلب الحصول على الرعاية الصحية I, the undersigned patient , request health care and والعلاج من مركز إرادة للعلاج والتأهيل في دبي. وأوافق وأصرح بما يلي treatment from Erada Center for Treatment and Rehab in Dubai. I consent to and authorize the following:

#### موافقة عامة

بالتوقيع أدناه، أصرح لمركز إرادة للعلاج والتأهيل في دبي وموظفيه بإجراء أية فحوصات واختبارات تشخيصية وتقديم أية أدوية أو علاج ضروري لتقييم صحتي والمحافظة عليها بفعالية ولتقييم وتشخيص ومعالجة مرضي أو الإصابَّات اللاحقة بيّ. كما أدرك بأنه من مسؤولية مقدمي الرعاية الصحية بيان أسباب أي فحص أو اختبار أو إجراء تشخيصي مُحدد وخيارات العلاج المتوفرة والمخاطر الشائعة والمنافع المتوقعة المرتبطة بهذه الخيارات ودورات العلاج البديلة.

### الإفصاح عن المعلومات الشخصية والطبية

أدرك بأن عنوان البريد الالكثروني الذي قدمته في نموذج التسجيل سيستخدم كوسيلة تصال بيني وبين مركز إرادة للعلاج والتأهيل في دبي عند تعبنة هذا النموذج،

الصال بيشي وبين مرغر برانة منحرج واسعين في يبي صحب عصوب علمي أصر لمركز إرادة بنقديم أية معلومات أيا كانت طبيعتها بخصوص علاجي ذلك لكن دون تحديد (لاوضاع)الامراض المصاحبة الحالية أشركة التأمير طرف آخر مسؤول عن الدفع لأغراض تحديد حق الاستفادة والدفع، وبالتّال المسؤولية عن التسوية المالية للفواتير الطبية الخاصة بي.

سرح لمركز إرادة بتقديم أية معلومات كانت طبيعتها بخصوص علاجي للشرطة كما أص أو الم

# الم

financial settlement of my medical bills.	لمحصه، إذا حلب محولاً عن طريقهم،دون إذن مسبق متي. مركز الرادة للعلاج و التأهيل في دبر ملا و يتقديه بعض المعلومات المتعلقة
In addition, I hereby authorize the Erada Center to provide any information about my treatment to the police or court if I was referred through them without prior authorization from me.	رضَى وَالوافق بموجّبة على اَستَخدَّام الْمُعلوماتُ الْخَاصَة بي حسبماً هو مطلوب ذا و اوافق أيضا على ان نستخدم معلوماتي (بدون نوصيف شخصي) لأغراض ث العلمي
Erada Center for Treatment and Rehab in Dubai is obliged by regulations to submit certain information and I hereby give consent for the use of my information as statutory required. I also acknowledge that this consent is subject to the laws and jurisdiction of the United Arab Emirates. I also authorize my anonymous information to be used for scientific research purposes.	
VALUABLES	تلكات الثمينية
I acknowledge that Erada Center for Treatment and Rehab is not liable for the loss or damage of any money, jewelry, documents or other articles of values	بان مرکز از ادة غیر مسؤول عن فقدان أو تلف أیة أموال أو مجوهر ات أو مستندات أو ایة ء اخری ذات قیمة
FINANCIAL AGREEMENT	إفقة المالية
Within the expected time frame during the visit or stay, I will take the responsibility and meet any financial obligation towards Erada Centre regardless of the mode and source of payment (i.e.: self-paying, insurance company, sponsoring company, other). In cases where an estimated charge has been given, the deposited amount is utilized against accrued charges or a proportion of same. I understood that the estimated charge might differ from the final account depending on the actual services rendered. I will be responsible for settlement of differential costs. In cases whereby, settlement of treatment cost has not been approved by an insurance agreement, sponsorship or third-party payer, I will take full responsibility and settle accounts. I have read and understood and accept the above terms and conditions, and agree to abide by said requirements herewith towards Erada Center for Treatment and Rehab in Dubai. I have read the details on my registration form and confirm that they are correct	يب على العملاء ضمن الإطار الزمني المتوقع أثناء زيارة العيادة أو الإقامة فيها لل المسؤولية الشخصية والوفاء بالي الترام مالي تجاه مركز إر ادة بغض النظر عن الحالات الذي ينم فيها تقدير رسم تقديرية، يستخدم المبلغ المودع مقابل الرسوم تتحقة أو نسبة منها يرجي الطم بان الرسوم المتوقعة قد تخلف عن الحساب النهاني عثماد على الخدمات الفعلية المقدمة ورائلالي، تتمل المحالاة الممونية عن متابل عثماد على الخدمات الفعلية المقدمة ورائلالي، تتمل المحالاة المونولية عن تسوية عثماد على الخدمات الفعلية المقدمة ورائلالي، تتمل المحالات المعرولية عن تسوية عثماد على الخدمات القعلية المقدمة ورائلالي، تتمل المحالاة المعرولية عن تسوية وفي التكاليف، في الحالات الذي لا نتم قيها الموافقة على تسوية تكلفة العلاج على تحمل المسؤولية النامة وتسوية الحسابات. عليك المذكورة طبه تجاه مركز إرادة العلاج والتأهيل في ديمي منيا المذكورة طبة تجاه مركز إرادة العلاج والتأهيل في ديمي منيا المذكورة طبة تجاه مركز إرادة العلاج والتها من على الموافق مين المينية في نموذج التسجيل الخاص بي واقر بانها صحيحة
Name (Patient / relative)	الاسم: (المريض/أحد الأقرباء)
التوقيع : Signature: : التوقيع الم	الناريخ : Date:
Relationship:	القرابة صلة :

**Consent Form** ECTR-PA-F-002 Rev.02/Oct 2019