

**A STUDY ON KETAMINE ABUSERS IN
GEORGETOWN, KUALA LUMPUR AND JOHOR
BAHRU**

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**A STUDY ON KETAMINE ABUSERS IN
GEORGETOWN, KUALA LUMPUR AND JOHOR
BAHRU**

by

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LIST OF ABBREVIATION

AIDS	Acquired Immunodeficiency Syndrome
ATS	Amphetamine-Type-Stimulant
BMT	Buprenorphine Maintenance Treatment
CBT	Cognitive Behavioural Therapy
CCRC	Cure & Care Rehabilitation Centre
CNS	Central Nervous System
CT Scan	Computerized Tomography Scan
DBT	Dialectical Behavioural Therapy
DST	Drug Substitution Therapy
FDA	Food and Drug Administration
FGDs	Focus Group Discussions
GPs	General Practitioners
HIV	Human Immunodeficiency Virus
HPLC	High-Performance Liquid Chromatography
ICD-10	International Classification of Diseases
IDUs	Injecting Drug Users
KPT	Ketamine Psychedelic Therapy
LSD	Lysergic Acid Diethylamide
LUTs	Lower Urinary Tract Symptoms
MAT	Medically Assisted Treatment
MDMA	3,4-Methylenedioxy-Methamphetamine
MMT	Methadone Maintenance Treatment
MOH	Ministry of Health Malaysia

MRI	Magnetic Resonance Imaging
NADA	National Anti-Drug Agency
NADI	National Anti-Drug Information System
NGOs	Non-Governmental Organizations
NMDA	N-Methyl-D-Aspartate
NPSs	New Psychoactive Substances
NSEP	Needle Syringe Exchange Program
OST	Opiate Substitution Treatment
PCP	Phencyclidine
PWID	People Who Inject Drugs
RMP	Royal Malaysia Police
UNODC	United Nations Office on Drugs and Crime
USA	United States of America
WHO	World Health Organization

SATU KAJIAN BERSAMA PENYALAHGUNA KETAMINE DI GEORGETOWN, KUALA LUMPUR DAN JOHOR BAHRU

ABSTRAK

Ketamine *N-methyl-D-aspartat* (NMDA) merupakan agen anestetik, digunakan secara luas sebagai 'club-drug'. Sehingga kini, tiada data mengenai demografi sosio pengguna ketamine di Malaysia. Kajian ini bertujuan untuk mengkaji demografi sosio dan masalah kesihatan berkaitan dengan penggunaan ketamine dalam kalangan pengguna ketamine. Sejumlah $n=150$ pengguna ketamine menyertai kajian keratan-rentas ini. Responden telah direkrut melalui teknik persampelan purposif dan 'snowball' dari tiga negeri (Pulau Pinang, Kuala Lumpur dan Johor) di mana penggunaan ketamine dilaporkan berleluasa. Semua soal-selidik dilakukan secara temubual oleh seorang pembantu penyelidik yang terlatih. Responden telah dibahagikan kepada dua kumpulan berdasarkan tempoh penggunaan ketamine (<2 tahun sebagai jangka pendek dan ≥ 2 tahun sebagai jangka panjang). Analisis kajian dibahagikan kepada dua bahagian iaitu; (i) jumlah sampel $n=150$ dan (ii) sampel lelaki $n=127$ (pengguna ketamine sahaja $n=36$ dan pengguna ketamine 'poly-drug' $n=91$). Kebanyakan adalah lelaki, terutamanya etnik Cina. Min umur responden dalam kajian ini ialah 28.7 tahun (SD=8.46). Sejumlah besar mengaku menggunakan ketamine bersama dadah lain (pengguna ketamine 'poly-drug') ($n=107$). Pengguna ketamine jangka panjang ($n=150$) mempunyai kemungkinan yang tinggi untuk mengalami masalah urologi seperti peningkatan kekerapan kencing (OR: 2.89: 1.36-6.15: $p<0.004$), kerap kencing di waktu malam (OR: 2.23: 1.115-4.32: $p<0.013$), kesukaran mengawal kencing (OR: 3.10: 1.57-6.13: $p<0.001$), tiba-tiba rasa

hendak kencing (OR: 2.28: 1.12-4.65: $p<0.017$), sakit dibahagian bawah perut semasa kencing (OR: 4.47: 2.23-8.96: $p<0.000$) dan sakit semasa kencing (OR: 3.14: 1.57-6.27: $p<0.001$), berbanding dengan pengguna ketamine jangka pendek. Manakala, bagi responden lelaki $n=127$, responden yang menggunakan ketamine sahaja ($n=36$) untuk jangka panjang mempunyai kemungkinan yang tinggi untuk mengalami masalah urologi seperti kerap kencing di waktu malam (OR: 16: 2.7-93.6: $p<0.001$) dan tiba-tiba rasa hendak kencing (OR: 6: 1.1-33.3: $p<0.030$), berbanding dengan pengguna ketamine jangka pendek. Sebaliknya, pengguna ketamine 'poly-drug' ($n=91$) jangka panjang mempunyai kemungkinan yang tinggi untuk mengalami lebih banyak masalah urologi seperti peningkatan kekerapan kencing (OR: 3.7: 1.42-9.44: $p<0.006$), sukar mengawal kencing (OR: 6.2: 2.5-15.4: $p<0.000$), sakit dibahagian bawah perut semasa kencing (OR: 7.6: 2.9-19.53: $p<0.000$) dan sakit semasa kencing (OR: 4.6: 1.9-11.42: $p<0.001$), berbanding dengan pengguna ketamine 'poly-drug' jangka pendek. Terutama sekali, pengguna jangka panjang iaitu pengguna ketamine sahaja (OR: 6.1: 1.4-26.9: $p<0.013$) dan ketamine poly-drug (OR: 5.8: 2.3-14.45: $p<0.000$) mempunyai risiko yang tinggi untuk mengalami masalah mati pucuk, berbanding dengan pengguna jangka pendek. Masalah kesihatan berkaitan dengan penggunaan ketamine di Malaysia perlu diberi perhatian. Kajian ini menyokong kajian semasa bahawa penggunaan ketamine boleh menyebabkan masalah urologi. Ini merupakan kajian pertama yang telah mengenal pasti masalah mati pucuk di kalangan pengguna ketamine lelaki.

**A STUDY ON KETAMINE ABUSERS IN GEORGETOWN, KUALA LUMPUR
AND JOHOR BAHRU**

ABSTRACT

Ketamine an *N-methyl-D-aspartate* (NMDA) is an anaesthetic agent, widely used as a club-drug. To date, there is no data on the socio-demographic characteristics of ketamine users in Malaysia. This study aims to investigate the socio-demographic characteristics and health problems associated with ketamine use among regular ketamine users. A total of $n=150$ ketamine users participated in this cross-sectional study. Respondents were recruited through purposive and snowball sampling from three states (Penang, Kuala Lumpur and Johor) where ketamine use was reported to be widespread. All the surveys were conducted through face-to-face interviews by one trained research assistants. Respondents were divided into two groups based on their duration of ketamine use (short-term <2 and long-term users ≥ 2 years). The study analysis is divided into two parts; (i) total sample $n=150$, and (ii) male sample $n=127$ (those who reported ketamine use only $n=36$ and ketamine poly-drug use $n=91$). Most were males, predominantly of Chinese ethnicity. The respondents mean age in this study was 28.7 years-old (SD=8.46). A substantial number reported to use ketamine with other drugs (ketamine poly-drug use) ($n=107$). Long-term ketamine users $n=150$, have higher odds of experiencing urological problems such as frequent urination (OR: 2.89: 1.36-6.15: $p<0.004$), nocturia (OR: 2.23: 1.115-4.32: $p<0.013$), incontinence (OR: 3.10: 1.57-6.13: $p<0.001$), urgency (OR: 2.28: 1.12-4.65: $p<0.017$), interstitial cystitis (OR: 4.47: 2.23-8.96: $p<0.000$) and dysuria (OR: 3.14: 1.57-6.27: $p<0.001$), compared to short-term

ketamine users. While for male respondents $n=127$, long-term ketamine users who reported ketamine use only were more likely to experience urological problems such as nocturia (OR: 16: 2.7-93.6: $p<0.001$) and urgency (OR: 6: 1.1-33.3: $p<0.030$) than short-term ketamine users. Conversely, long-term ketamine poly-drug users had higher odds of reporting more urological problems such as frequent urination (OR: 3.7: 1.42-9.44: $p<0.006$), incontinence (OR: 6.2: 2.5-15.4: $p<0.000$), interstitial cystitis (OR: 7.6: 2.9-19.53: $p<0.000$) and dysuria (OR: 4.6: 1.9-11.42: $p<0.001$) compared to short-term ketamine poly-drug users. Both long-term users who reported ketamine use only (OR: 6.1: 1.4-26.9: $p<0.013$) and ketamine poly-drug use (OR: 5.8: 2.3-14.45: $p<0.000$) were more likely to report erectile-dysfunction than short-term users. There is a need to address the health problems associated with ketamine use in Malaysia. This study supports the current literature that ketamine use can cause urological problems. This is the first study to identify erectile-dysfunction problem in regular male ketamine users.

CHAPTER 1

INTRODUCTION

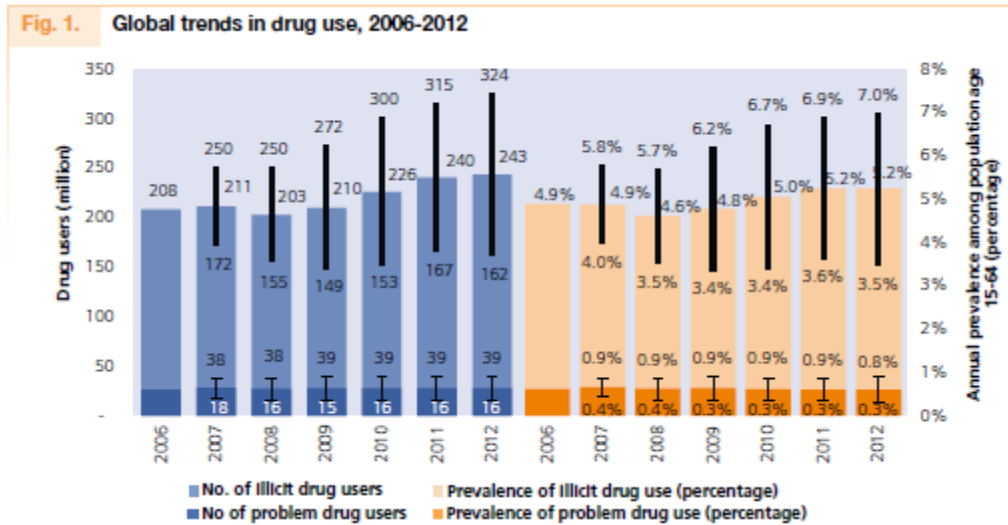
1.0 Introduction

This chapter introduces the first topic of the thesis. The world drug problem and Malaysia drug abuse problems are discussed in this chapter. The scope of study, research questions, research objectives, and study limitations are also described in this chapter.

1.1 World Drug Problem

Based on the 2014 World Drug Report from United Nations Office on Drugs and Crime (UNODC) indicated a total of 243 million people (scope 162-324 million) corresponding to some 5.2% (scope 3.5-7.0%) of the world population aged between 15 to 64 years had used an illicit drug, primarily cannabis, opioid, cocaine or Amphetamine-Type-Stimulant (ATS) at least once in the previous year (UNODC, 2014). In contrast, men are two to three times more likely than women to have used an illicit substance. Overall, the global prevalence of illicit drug use and problem drug use (those with substance use disorders) remains stable, as shown in Figure 1.1. A marked increase is also reported in opioid and cannabis use since 2009, whereas the use of opiates, cocaine and ATS (excluding ecstasy) has remained stable.

Figure 1.1 Global trends in drug use 2006 to 2012



Source: UNODC, 2014: pp.1.

‘Poly-drug’ use (multidrug use) is another emerging problem that has recently received significant attention from treatment providers. The problem of multidrug use could undermine drug users’ recovery program. UNODC reported that the emergence of poly-drug use among illicit drug users mainly occurs where a different substance is being taken together 1) to obtain complementary effects, 2) to ease the adverse effects of another drug, and 3) when a drug is gradually replaced or being substituted with another drug due to changes in price and drug availability, otherwise the drug is used because of fashion (UNODC, 2014:pp.1). The abuse of ketamine may lead to serious health problems. Despite the growing abuse of non-medical ketamine use in various parts of the world (Ng et al., 2012; Huang et al., 2008; Chu et al., 2008; Shahani et al., 2007; Garcia-Larrosa et al., 2012; Pal et al., 2013; Winstock et al., 2012), ketamine is also reported to be used in Malaysia among ‘club goers’ in entertainment settings (Robson et al., 2010). There are still limited data on ketamine use among ketamine users in

Malaysia, and this warrants further investigation as a result of its deleterious side-effects on lower urinary tract (Pal et al., 2013; Shahani et al., 2007; Mak et al., 2011; Chen et al., 2011).

In addition, UNODC estimated that approximately 1 in 6 problem drug users access treatment each year (UNODC, 2014). UNODC also estimated that there were around 183,000 drug-related deaths in 2012, corresponding to a mortality rate of 40% deaths per million persons aged 15 to 64 years. Drug overdose is the main contributor to the global number of drug-related deaths. In fact, opioids (heroin and non-medical use of prescription opioids) are the main type of drug that has led to accidental deaths among opiate users. Unsafe injecting practices could also pose significant health consequences. The United Nations Joint Programme on HIV/AIDS claimed that the number of new cases of HIV among injecting drug users are still high. UNODC estimated that there are about 12.7 million injecting drug users around the world (UNODC, 2014). While HIV prevalence among people who inject drugs is 22 times higher than the general population. It is estimated that there are around 6,190,000 injecting drug users in Asia (UNODC, 2014). About 1.7 million IDUs are reported to be infected with HIV in 2012, of this percentage 52% (850,000 people) are living with Hepatitis C. Hence, addressing HIV among people who inject drugs still remains a major challenge in most countries despite the implementation of various evidence-based harm reduction programs.

Apart from the health burden created by illicit drug use, production and trafficking of illicit drugs continues to escalate. Traditional drugs such as opiates/opioids are still widely used in most countries. UNODC reported that the opium cultivation area in Afghanistan has increased from 154,000 hectares in 2012 to 209,000 hectares in 2013 (UNODC, 2014). While, the global area for illicit opium cultivation in 2013 stood at 296,720 hectares, and the production of opium in 2013 is estimated to be at 6,883 tons, and heroin (of different purity) has increased to 560 tons (UNODC, 2014). Conversely, global seizure for heroin and illicit morphine fall to 19% in 2012. On the other hand, clandestine ATS manufacturing laboratories has increased from 12,571 labs in 2011 to 14,322 labs in 2012 (UNODC, 2014). In fact, over the past five years, seizures for methamphetamine have almost quadrupled from 24 tons in 2008 to 114 tons in 2012. UNODC (2014) report also indicated a marked increased in the number of people seeking treatment for ketamine use in the United Kingdom over the last six years.

1.2 Malaysia Drug Abuse Problem

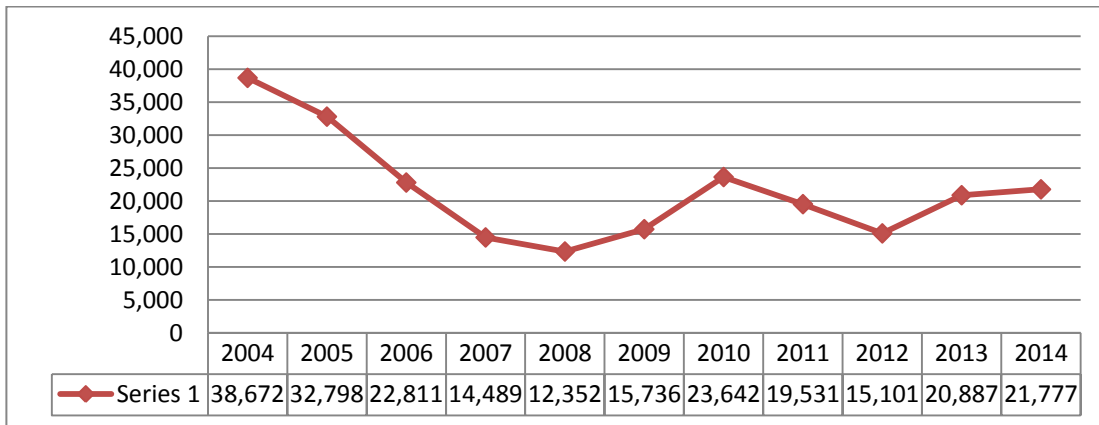
Malaysia is not spared from the global drug abuse problem. The history of substance abuse in Malaysia is largely influenced by the pre and post independent period. Before independence, opium was largely consumed by immigrants from China and India who were brought by the British to work in tin mines and rubber plantations in Malaya. In fact, migrant workers commonly used opium as a remedy to treat common medical problems, as well as to enhance work performance to laborious work (Adilah, 1985). In fact, after independence era many young adults were strongly influenced by the 'hippy' subculture. This hippy culture was introduced by the American soldiers (deployed to fight the Vietnam War) who usually visited Malaysia to spend their

holidays. Since then morphine popularity began to attract wider appeal particularly in adolescents. Most of the opium smoking ports in Malaya were slowly criminalized by the British under the Dangerous Drug Ordinance 1952. This restriction was mainly imposed to control the growing abuse and illegal distribution of opium among the Chinese triads in Malaya (Adilah, 1985). Hence, during the same period of time marijuana consumption became popular among the Malays compared to other ethnic groups (Navaratnam, 1988). In fact, the substance abuse problem escalated vastly in the 70's and 80's in Malaya. However, since 1996 other challenging issues surfaced with the increasing transmission of HIV among opiate IDUs who engaged in risky injecting and needle sharing behaviours (Chawarski et al., 2006). Receptive injecting and sexual risk behaviours have been acknowledged to be the primary risk factors for HIV transmission among opiate users in Malaysia (Vicknasingam et al., 2009).

The two main sources of data on the number of drug users in the country are documented by the National Anti-drugs Agency (NADA) and the Royal Malaysia Police (RMP). Figures from National Drug Report 2014, showed fluctuating trends in the number of people detected for illicit drug use from year 2004 to 2014, Figure 1.2. While there has been a decrease from year 2004 (38,672) to 2007 (14,489), a slight increase is observed from year 2008 (12,352) to 2010 (23,642) again followed by a decrease from 2010 (23,642) to 2012 (15,101) and an increase from year 2013 (20,887) to 2014 (21,777). These fluctuating trends do not really describe the situation of drug use in the country. On the other hand, RMP data related to drug use arrests is also shown in Figure 1.3. Similarly, a fluctuating trend is observed for opiate and cannabis users arrests where there was a decrease from year 2006 (45,451) to 2008 (41,363). An increase is observed

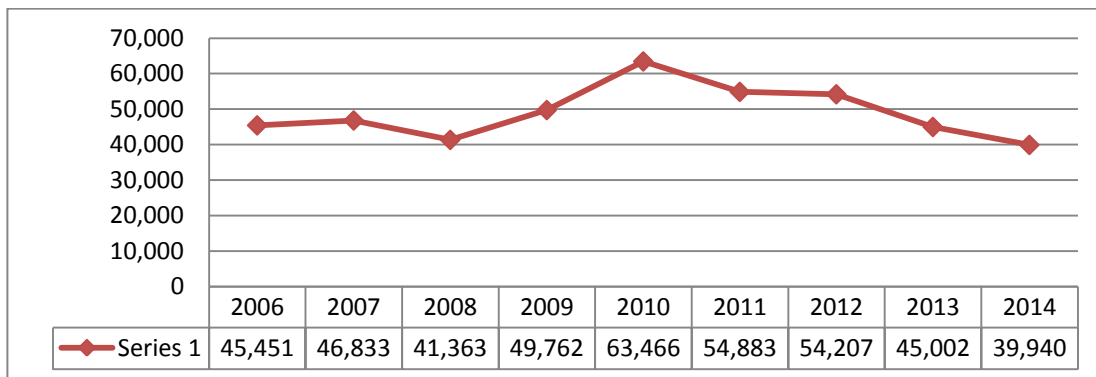
between years 2008 (41, 363) and 2010 (63,466). This is followed by a decrease since year 2010 (63,466) to 2014 (39,940).

Figure 1.2 Number of drug addicts detected from year 2004 to 2014.



Source: National Drug Report, 2014.

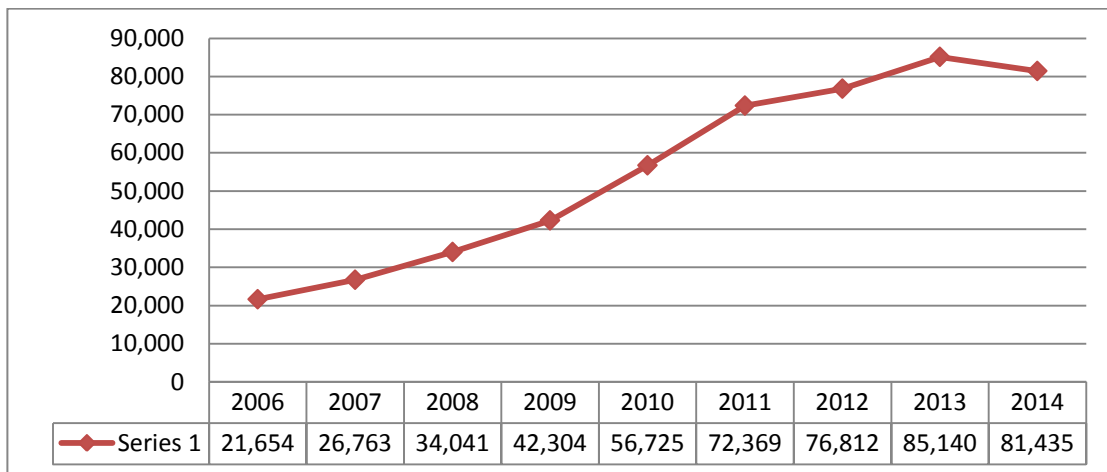
Figure 1.3 Total arrest under section 3(1) Drug Dependents Act (Treatment and Rehabilitation) 1983 related to opiate and cannabis drug use from 2006 to 2014.



Source: Royal Malaysia Police, 2014.

While the number of opiate and cannabis users showed a fluctuating trend in the country, the latest figures from RMP (2014) showed the number of people arrested for ATS use has increased exponentially from 21,654 in 2006 to 81,435 in 2014, as shown in Figure 1.4.

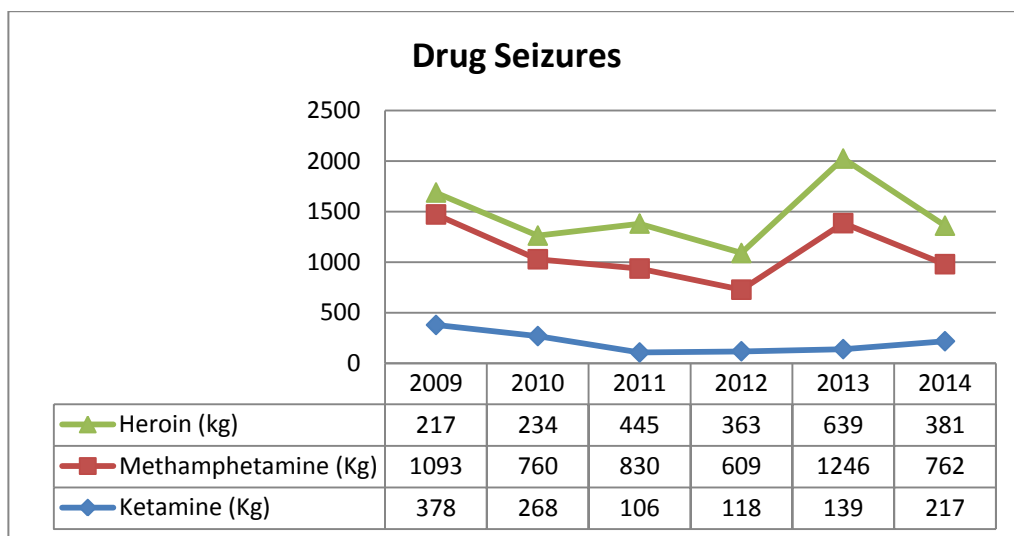
Figure 1.4 Total arrest under section 15 (1) (a) Dangerous Drugs Act 1952 for party drugs from 2006 to 2014.



Source: Royal Malaysia Police, 2014.

In an attempt to get a better understanding on the substance abuse situation in the country, drug seizure data is also reviewed. Figures from RMP (2014), showed seizure for methamphetamine have increased from 609kg in 2012 to 1246kg in 2013, and decreased in 2014 to 762kg as shown in Figure 1.5. Heroin seizure also increased from 445kg in 2011 to 639kg in 2013, and decreased in 2014 to 381kg. During this same period, a decreasing trend was observed for the arrests of opiate users as shown in Figure 1.3. Ketamine seizures show a decreasing trend from year 2009 (378kg) to 2011 (106kg) followed by an increasing trend from 2012 (118kg) to 2014 (217kg).

Figure 1.5 Drug Seizures from 2009 to 2014



Source: Royal Malaysia Police, 2014.

Other sources of data show a higher estimate of drug users in the country, The Malaysian Psychiatric Association (2006) estimates that there are about 1 million people who use illicit drugs in Malaysia. It is also estimated that there is about 170,000 IDUs in Malaysia, and the HIV prevalence in IDU population is estimated to be around 15.9%-19.0% (Ministry of Health Malaysia, 2010).

The varying trends in opiate users detected and arrested may be due to various factors. One of the main reasons could be due to the implementation of harm reduction programs in the country, where opiate drug users are encouraged to enter treatment programs (methadone treatment program). The shift from an enforcement approach to a public health approach may have contributed to the decline in drug related arrests in the country.

1.3 Ketamine Use Histories in Malaysia

Ketamine was first invented in 1962 by Calvin Stevens at the Parke-Davis laboratories in Michigan (Jansen, 2000). Ketamine effects were related to PCP (phencyclidine). It was reported to have shorter acting and less toxic effects and produces trance-like ‘dissociative anesthesia’ (Domino et al., 1965). Psychedelic drugs such as LSD, as well as psilocybin are emotionally exhausting and can elicit unpleasant effects when used frequently (Jansen and Cankovic, 2001). Some individuals claimed that it is easier to use ketamine, since it creates a state of unemotional “high indifference” (Lilly, 1978). With prolonged use, ketamine effects resemble aspects of cocaine, opium, cannabis and alcohol. Noteworthy, tolerance to ketamine can also develop rapidly, after one large dose of use (Meliska & Trevort, 1978). Ketamine has both direct and indirect effects on opioid receptors (Hirota et al., 1999). Despite giving rise to a rapid tolerance for itself, ketamine can block the development of tolerance and physical addiction to many other drugs, including heroin, alcohol and benzodiazepines (Khanna et al., 1998). In addition, ketamine can also suppress withdrawal symptoms in heroin addicts (Shimoyama, 1996).

In 1970, the Food and Drug Administration (FDA) approved ketamine for medical use in human. However, since 1980s ketamine popularity increased and ketamine was mainly used in dance culture, parties and raves among adolescents (Curran & Morgan, 2000). Pharmacologically, ketamine is an *N-methyl-D-aspartate* (NMDA) receptor antagonist. It is commonly used as a short-acting ‘dissociative anesthetic’ agent for medical purposes. Historically, ketamine gained notoriety during the Vietnam War where it was used by soldiers to suppress pain caused by physical trauma. Ketamine is a psychoactive drug and is commonly snorted (snapped) via the nostril to obtain a ‘hallucinatory effect’. Ketamine is also popularly known as *K* among ketamine users for non-medical use. Ketamine users often report that ketamine could induce dissociative-disorder commonly referred to as *k-hole* or out-of-body experience (Muetzelfeldt et al., 2008).

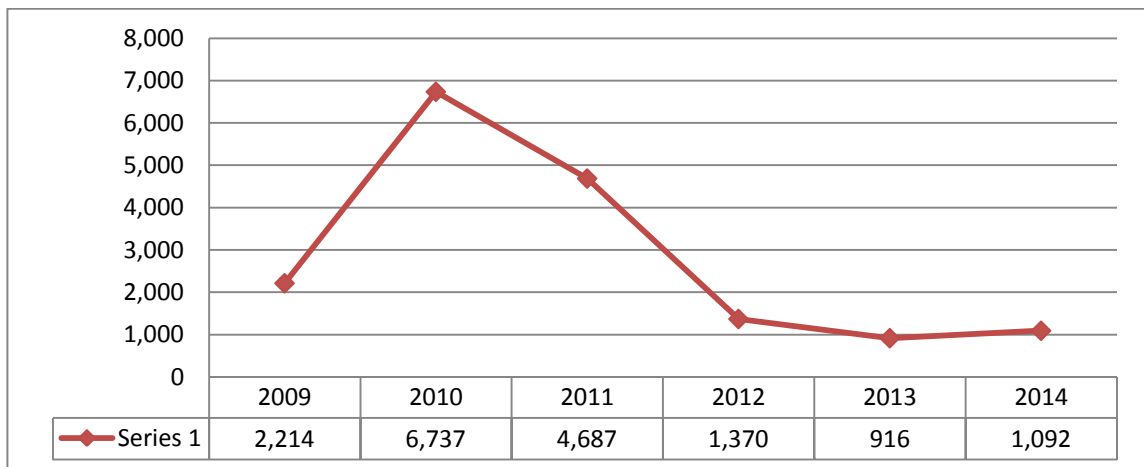
Ketamine acts as a stimulant at lower doses (White & Ryan, 1996), and as a psychedelic drug because it can reveal aspects of how the mind constructs reality, personality, and a sense of meaning and sacredness, without necessarily inducing a toxic delirium (Jansen, 2000). Ketamine effects can be felt about 30 seconds after an intravenous injection, two to three minutes after an intramuscular injection, five to ten minutes after intranasal use, and 10 to 30 minutes after oral intake. Moreover, the use of ketamine has been linked with a wide range of mental health problems including anxiety, panic attacks, flashbacks, posttraumatic stress disorder, persistent perceptual changes, depression and unpleasant feeling of being unreal or that the world is unreal to ketamine users (Jansen, 2000). Nevertheless, ketamine could also induce cognitive impairments (Curran & Morgan, 2000). In addition, ketamine users may also

experienced difficulty with balance, numbness, muscle weakness and impaired vision, often resulting in lethal falls. In fact, *K cramps* are also known as severe abdominal pains commencing after high dose or daily ketamine use (Jansen & Cankovic, 2001).

Since 2006, cases related to ketamine urological problems begun to emerge in recreational ketamine users (Shahani et al., 2007; Tsai et al., 2009; Mak et al., 2011; Pal et al., 2013; Mason et al., 2010; Ng et al., 2013; Huang et al., 2008; Chu et al., 2008; Garcia-Larrosa et al., 2012; Winstock et al., 2012; Gray & Das, 2012; Chen et al., 2011; Middela & Pearce, 2011; Oxley et al., 2009). Among some of the commonly reported side-effects of ketamine use among recreational ketamine users include dysuria, urinal frequency, urgency, incontinence, nocturia and haematuria (Shahani et al., 2007; Tsai et al., 2009; Chan et al., 2013; Chen et al., 2013). Approximately, 20-30% of ketamine abusers suffer from lower urinary tract symptoms (Muetzelfeldt et al., 2008; Chu et al., 2008). Study conducted by Tsai et al, (2009) found ketamine users who used ketamine for about 1 to 4 years or for at least 1 month period have higher probability of experiencing lower urinary tract symptoms. Similarly, findings from Chao & Shai, (2010) also reported that ketamine users who use ketamine regularly for three years are more likely to develop depressive symptoms and lower urinary tract problems. While, a study conducted by Chen et al, (2011) also reported that those who use ketamine for 12 months period have higher odds of developing urinary tract problems. As illicit ketamine become more available, it's illegal use is anticipated to cause severe bladder problems (Tsai & Kuo, 2014). In fact, cessation from ketamine use has been reported to help reduce the deterioration of bladder symptoms in ketamine users (Winstock et al., 2012).

Figures from the Royal Malaysia Police 2014 showed, in 2009 and 2010 a total of 2,214 and 6,737 people were arrested for ketamine use. The number of people arrested for ketamine use has decreased significantly from 4,687 in 2011 to 1,092 in 2014, as shown in Figure 1.6. The drop in the number of ketamine arrests could be attributed to the decrease in police raids conducted on entertainment outlets and also the hidden nature of these users who often use ketamine as recreational drug in entertainment settings. On the other hand, as shown in figure 1.5, the seizure for ketamine has been increasing since 2011.

Figure 1.6 Ketamine users arrests from 2009 to 2014.



Source: Royal Malaysia Police 2014.

1.4 Problem Statement

At this juncture, there are limited studies on ketamine use and its health impact in Malaysia. Ketamine a *NMDA* receptor antagonist is an anesthetic agent commonly used in hospital settings for its sedative and analgesic properties (Tsai & Kuo, 2014). From its traditional medicinal use, ketamine is now popularly used for its narcotic properties mainly among young club goers in entertainment settings. Ketamine is known as a club-drug in Malaysia, as well as in China, Taiwan and Hong Kong. Ketamine begun to gain popularity in 1970s, and its widespread use was linked with club scenes and rave parties (Curran & Morgan, 2000). Recreational ketamine use is reported to cause adverse health problems such as lower urinary tract symptoms (LUTs) in regular ketamine users (Wood et al., 2011; Middela & Pearce, 2011; Chu et al., 2008; Tsai et al., 2009; Shahani et al., 2007; Pal et al., 2013; Mak et al., 2011; Mason et al., 2010; Meng et al., 2013).

Ketamine used was first reported in Malaysia in early 2001, where it was used recreationally in entertainment settings (Royal Malaysia Police, 2014). So far there are 3 published studies on ketamine use in Malaysia (Lee et al., 2009; Ho et al., 2010; Robson et al., 2010). These three single case reports mainly describe the health problems associated with frequent ketamine use. To date, no studies have described the socio-demographic characteristics and the contextual use of ketamine among ketamine users in Malaysia. The current data on ketamine arrests does not completely describe the socio-demographic characteristics of ketamine users and the side-effects of ketamine use. Ketamine users are still seen as a 'hidden population' in Malaysia, since ketamine is commonly used in entertainment setting unlike on illicit drugs which are used on the streets. There is a need to understand this clandestine nature of ketamine use and the

socio-demographic characteristics of ketamine users in Malaysia. It is evident that illicit ketamine use can cause various health problems. Hence, conducting a study to understand the effects caused by ketamine use is important to treatment providers. This emerging health problem may also be under-reported as health care professionals dealing with drug users or ketamine users may not be trained to detect the symptoms and effects of ketamine use. As a result of this research paucity, this study aims to describe the socio-demographic characteristics, contextual use and health problems associated with ketamine use in regular ketamine users in the states of Penang (Georgetown), Kuala Lumpur and Johor Bahru. It is hoped that the findings from this study can help provide the necessary information to guide healthcare professionals and policymakers designed proper prevention and treatment interventions for ketamine users in the country.

1.5 Research Questions

The research questions for the study are as follows;

1. What are the socio-demographic characteristics of ketamine users in Malaysia?

This question will elicit respondents' demographic characteristics such as ethnicity, gender, age, marital, income and education status, as well as employment and incarceration history.

2. What is the contextual use of ketamine in Malaysia?

The second question will collect information related to respondents' history of ketamine use, frequency and quantity of ketamine use, physical and psychological symptoms of ketamine use, reasons for ketamine initiation, risky sexual behaviours and history of poly-drug use.

3. To what extent do ketamine users develop ketamine induced health problems in Malaysia?

The third question of the study will focus on common health problems reported by ketamine users.

4. How does the duration of ketamine use affect ketamine induced health problems among users in Malaysia?

The fourth question of the study will try to determine the association between duration of ketamine use with several health symptoms in ketamine users in this study.

1.6 Study Objectives

The study objectives are as follows;

1. To described the socio-demographic characteristics of ketamine users in Malaysia.
2. To described the contextual use of ketamine in Malaysia.
3. To identify ketamine induced health problems among ketamine users in Malaysia.
4. To assess the association between duration of ketamine use and ketamine induced health problems among users in Malaysia.

1.7 Scope of Study

To have a better understanding on the socio-demographic characteristics, contextual use and health problems associated with ketamine use in Malaysia, a total of $n=150$ regular ketamine users were recruited for this cross-sectional study. The study was mainly conducted in three most economically advanced states (Penang, Kuala Lumpur and Johor Bahru) in the Malaysian Peninsular where most of the entertainment outlets are located. The study population mainly consists of ‘out-of-treatment’ regular ketamine users. The entire sample reported using ketamine recreationally in entertainment settings where ketamine is usually promoted as a club-drug.

1.8 Significance of Study

This study aims to determine the socio-demographic characteristics, contextual use of ketamine and ketamine health problems in ketamine users in Malaysia. At present, there are limited studies on ketamine use in Malaysia. In fact, the National Anti-Drug Agency (NADA) does not collect any information on ketamine users in the country though using ketamine was an offence in Malaysia. The only data on ketamine use was on ketamine related arrests and seizures which are provided by the Royal Malaysia Police. Previous studies on ketamine use were merely based on single case-reports and review article (Robson et al., 2010; Lee et al., 2009; Ho et al., 2010), which highlighted the adverse effects of ketamine consumption. It is hoped that the findings from this study will be able to describe the context of ketamine use and its associated health problems among a cohort of regular ketamine users who were recruited from an entertainment setting in Malaysia. Nevertheless, healthcare providers and policymakers

can also use the study findings to develop suitable evidence-based preventive and treatment interventions for illicit ketamine users in the country.

1.9 Terminology

Some of the common terminologies used in this text are elaborated below for the ease of understanding.

Ketamine.	Ketamine is a <i>NMDA</i> receptor antagonist commonly used as an anesthetic agent for clinical use.
Lower Urinary Tract Symptoms (LUTs).	Unpleasant symptoms associated with urinary tract problems.
Club-drugs.	Illicit synthetic substances that are popularly used in entertainment settings.
ATS.	Amphetamine-Type-Stimulants (methamphetamine/amphetamine) are psychostimulants, mainly use for its psychotropic effects.
Frequent urination.	Increase episodes of urination.
Nocturia.	An individual has to wake at night one or more times to urinate.
Incontinence.	Is also known as urinary incontinence where an individual experience the inability to hold its urine (leakage of urine).
Urgency.	Is also known as urinary urgency where an individual experience a sudden compelling urge to urinate.
Interstitial cystitis.	Is also known as bladder pain syndrome, where an individual experience chronic inflammatory condition of the submucosal and muscle layers of the bladder.
Dysuria.	Is also known as painful urination (burning or stinging sensation felt during urination).
Erectile-dysfunction.	Is also clinically known as impotence. It's a sexual dysfunction characterized by the inability to develop or maintain an erection of the penis during sexual activity in humans.
Poly-drug users.	Individuals who use more than one illicit drug or a combination of several different classes of illicit drugs.
Menstrual cycle.	Is also known as irregular menstruation cycle. Is a regular natural change that occurs in the female reproductive system, specifically the uterus and ovaries.

1.10 Study Limitation

This study has few limitations and has been clearly highlighted. Respondents were non-randomly recruited using snowball-sampling technique for this study, thus it is impossible to generalize the findings of the study because it does not represent the whole ketamine using population in the country. Respondents responses were based on their self-report, thus it is bound to social and recall biasness. Some of the reported health problems in this study may emerge or caused by other underlying medical conditions and not necessarily from ketamine use alone. Due to this limitation, it is certainly difficult to fairly conclude that ketamine use is harmful. Inevitably, there was also inconsistency in respondents self-reports, because few of the Chinese respondents were not able to clearly understand the research questions that were constructed in the Malay language. Ideally, a Chinese translated set of questionnaire could have been use among few Chinese respondents who have difficulty comprehending the questions in Malay. This could help increase the reliability of their self-report. Finally, there could be a discrepancy in respondents self-reports and the context of ketamine use, since the study was largely conducted among a group of ketamine users who regularly frequented entertainment outlets. Future studies must strive to recruit a more representative sample of ketamine users from varied settings.

1.11 Conclusion

This chapter provides the background to the world drug problem, the substance abuse scenario in Malaysia, pharmacological effects of ketamine, problem statement of study, study objectives and research questions, as well as the scope and limitations of the study. The next chapter describes the literature review. The global and local substance

abuse problem, drug treatment policy in Malaysia, problems associated with HIV infections, recent and previous publications on ketamine use in human, and the fundamental components of addiction (e.g. dependence, withdrawal, tolerance) are discussed in the second chapter of this thesis. There are six chapters altogether in this thesis and the summary of each chapter is shown below.

Chapter 1: In the first chapter, the global scenario on drug use, scenario on drug use in Asia and Malaysia, classification of party drugs for this study, research questions, study objectives, and study limitations are clearly elucidated.

Chapter 2: The second chapter covers the literature review. In this chapter, all the relevant and important literature relating to the study is delineated.

Chapter 3: The third chapter is the methodology chapter. In this chapter, all the methods undertaken in this study are discussed.

Chapter 4: The fourth chapter is the results chapter. All the results are described and presented in this chapter.

Chapter 5: The fifth chapter is the discussion chapter where the findings of this study are discussed with other previous studies.

Chapter 6: The sixth chapter is the final chapter of the thesis. In this chapter all the findings are summarized. The implication of this study is also discussed. It also provides some recommendations on how to improve and conduct future studies related to ketamine use in Malaysia. This final chapter also addresses some of the current gaps in the existing studies on ketamine use in Malaysia.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

In the second chapter of this thesis all relevant literatures on ketamine are discussed. The chapter starts by providing a background to the definition of drugs, followed by world and Malaysia drug abuse problems, drug policy in Malaysia, health consequences related to drug use, drug addiction theories, drug laws in the country and specifically all relevant literature related to ketamine are discussed in this chapter.

2.1 Drugs

Psychoactive drugs or narcotics are chemical compounds that can influence our subjective perceptions and behaviour (Muller and Homberg, 2015). Addiction, originates from a Latin word '*addicere*' (which means to sentence) is a chronic relapsing brain disorder (Milton and Everitt, 2012). In fact, drug addiction can be a chronic problem (McLellan et al., 2000; Hser et al., 2001). Drug users usually take drugs because psychotropic substances can produce potent effects on primary and secondary reinforcement mechanisms. Based on the incentive sensitisation theory of addiction (Robinson and Berridge, 1993) there may be dissociations in the neural systems underlying reward and reinforcement. A drug outcome could act as a strong reinforcer by activating the wanting system, without having any effect on the liking system and could probably elicit hedonic responses (Milton and Everitt, 2012).

The term illicit drugs are drugs under International Control, which have been produced, trafficked and consumed illegally (UNODC, 2015). Substance abuse refers to the harmful use of psychoactive substances, including alcohol and illicit drugs such as opiates, cannabis and amphetamine-type-stimulants (ATS). In fact, the abuse of narcotic substances can lead to dependence syndrome, a cluster of behavioural, cognitive and physiological manifestations that develop after repeated substance use, where drug users often experienced a strong desire to use drugs, difficulties in controlling its use, continuous use despite harmful consequences, more importance given to drug use activities, increased tolerance and a withdrawal state (www.who.com).

2.2 Overview of Global Illicit Drug Use

In 2012 United Nations Office on Drugs and Crime (UNODC) estimated that there are around 162 and 324 million people (3.5% to 7% of the population) aged between 15 to 64 years who have used illicit substances. While the extent of problem drug use, range from 16 to 39 million people (equivalent to 0.3% to 0.9% of the population) aged 15-64 (UNODC, 2014). Table 2.1 shows the global categorisation of illicit drug use. Cannabis remains the most widely used illicit substance and the estimated number of cannabis users were around 125 and 227 million in 2012, equivalent to a prevalence rate of 2.7%-4.9% of the population aged 15-64 years old (UNODC, 2014). While, the second most widely used group of substances is ATS (including methamphetamine, amphetamine and ecstasy). There are between 24 and 84 million ATS users or equivalent to a prevalence rate ranging from 0.5%-1.8% of the population aged 15-64 in 2012. The broad ranges in the number of ATS users are mainly due to the uncertainties in ATS users in China, India and Africa (UNODC,

2014:pp.2). Nevertheless, Opiates remains the third most widely used group of substances with estimates ranging from 42 to 58 million people, equivalent to a prevalence rate of 0.9%-1.2% of the population aged 15-64 in 2012. In recent years, problem drug use has also been related to the non-medical use of various prescription Opioids. Cocaine appears to rank fourth in terms of global prevalence, with an estimated of 14 to 21 million people, equivalent to a prevalence rate that ranges from 0.3%-0.5% of the population aged 15-64 in 2012 (UNODC, 2014:pp.2).

Table 2.1 Global estimates of users of different drugs in 2012 (aged 15-64)

	Number of users (millions)		Prevalence (percentage)	
	Low	High	Low	High
Cannabis	125.30	227.27	2.7	4.9
Opiates	41.43	58.39	0.88	1.23
Cocaine	13.99	20.92	0.3	0.45
ATS	13.94	54.81	0.3	1.2
Ecstasy	9.4	28.24	0.2	0.6

Source: UNODC, 2014:pp.2.

The emergence of *New Psychoactive Substances* (NPSs) in the current drug market is not a new development. Recently, seizures of new psychoactive substances (NPS) have been expanding rapidly. NPSs are now commonly found and used in Europe and North America, Oceania, Asia, South America, and few African countries. Only 166 NPSs were reported between 1997 and 2009. Surprisingly, a total of 348 NPSs were identified in 2013. In fact, the prevalence of ketamine use fell from 2.1% to 0.8% in 2012 (UNODC, 2014).

2.3 Overview on Asia's Illicit Drug Use and Production

Opium is widely produced and used in Asia. Based on World Drug Report 2014 the two largest opium-producing countries are Afghanistan and Myanmar. In Afghanistan the opium cultivation area have increased by 36% in 2013. In fact, total opium production in Afghanistan accounts for 80% of the global opium production in 2013 (UNODC, 2014). Cannabis production remains widespread in most regions, where almost every country in the world produces it through personal cultivation or large-scale farming (UNODC, 2014). In addition, Asia has developed into a major production and trafficking hub for amphetamine-type-stimulants (ATS), accounting for 64% of worldwide ATS seizures in 2009 (UNODC, 2011:pp.42). A total of 144 tons of ATS was seized in 2012; approximately half were seized in North America and a quarter in East and South-East Asia (UNODC, 2014:pp.46). There are indications that large quantities of ATS are being manufactured chiefly in East and South-East Asia. Between 2008 and 2011, dismantle clandestine ATS labs increased from 300 in 2009 to 560 in 2011. Moreover, an increasing number of clandestine ATS laboratories have been discovered in New Zealand, Australia, Cambodia, Hong-Kong, China, India, Indonesia, Japan, North Korea, Malaysia, Myanmar, Philippines and Sri Lanka (Global Synthetic Drugs Assessment, 2014). In July 2006, Malaysian enforcement authorities busted the world's largest clandestine methamphetamine manufacturing laboratory in Malaysia (Kozel et al., 2006).

Ketamine is popularly used in most Asian countries, notably in East Asia. Figures from the Global Synthetic Drugs Assessment (2014) showed in 2012 ketamine was the second most used drug in Macau and China. Total ketamine seizures in China and Hong-Kong have accounted for almost 60% of global ketamine

seizures between 2008 and 2011. Relatively high levels of ketamine use have also been reported in Southern Asian regions like India, Myanmar, Brunei Darussalam, Japan, Singapore, Indonesia and Malaysia (Global Synthetic Drugs Assessment, 2014). In 2012, a total of 81 ketamine laboratories were discovered in China. Most of the world-wide ketamine seizures originate from China, India, Cambodia and Taiwan. Around 2.2 tons of ketamine have been seized in Malaysia from 2009 and 2011(Global Synthetic Drugs Assessment, 2014:pp.30). In 2012, ketamine has also been found in tablet form, and sold as methamphetamine in some countries, such as in Indonesia and Australia (Global Synthetic Drugs Assessment, 2014). In Asia, cannabis is the most commonly used illicit substance, with an annual prevalence use of 1.9% among those aged 15-64 years, followed by ATS at 1.1%, opiates at 0.35% and cocaine at 0.05% (UNODC, 2014). Notably, the use of methamphetamine continues to rise in East and South-East Asia countries, with accompanying seizures of methamphetamine in pills and crystalline forms.

2.4 Types of Illicit Drugs Used and Total Drug Users in Malaysia

Malaysia first began to experience with drug abuse problem during the British invasion in Malaya. During the British colonisation in Malaya, Chinese and Indian manual labourers were brought in by the British to work in tin mines, rubber plantations and pepper estates. The Chinese workers were the first people who introduced opium smoking, while the Indian workers particularly the dockworkers used cannabis. By 1929, the Federated Malay States had 52,313 registered opium users and in 1941, there were approximately 75,000 opium users in Malaya (Rani, 2007). The combination of ‘hippy culture’ and the consequences of the Vietnam War in the late 1960s saw a shift in the pattern of drug usage in Malaysia. Hence, drug