PATTERNS OF USE AND HARMS ASSOCIATED WITH NON-MEDICAL KETAMINE USE

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EXECUTIVE SUMMARY

This study interviewed 100 people who had ever used ketamine for non-medical reasons. Four topics were addressed: (1) what are the characteristics of the people who use ketamine?; (2) what motivates people to use ketamine?; (3) how is ketamine being used?; and, (4) what are the consequences of using ketamine? Specifically the aims of this project were 1) to identify current patterns of illicit ketamine use; 2) to identify potential harms associated with illicit ketamine use; and 3) to determine the need for interventions and identify appropriate harm reduction strategies for illicit ketamine users in particular community subgroups.

The ketamine users in this sample are a unique sub-group of the illicit drug using population in Australia. They appear to be a part of the growing 'party drug' culture in Australia with almost three quarters (73%) of them usually using the drug either at a rave/dance party or a club. Ecstasy and speed are among the most widely used drugs of this population. However, when compared with a previous study of ecstasy users, ketamine users differ in demographic profile and injecting behaviour. In common with other illicit drug users, however, in addition to the reasons for their drug use, they experience a range of negative health and psychological effects of their ketamine use.

In this sample of ketamine users, ketamine appeared to be a drug that had been added to an already extensive drug use repertoire. The three drugs reported as most widely used with ketamine were most closely linked to the party drug scene – ecstasy (ever used with ketamine by 71% of the sample), MDA (62%) and amphetamines (50%). This was supported by the sample's choice of drugs preferred to use with ketamine, once again ecstasy (74%) and MDA (37%) were the top choices.

Compared to a sample of regular ecstasy users surveyed in 1997, this sample of ketamine users was more likely to be older, male, in full-time employment and living in the inner city. They were a well-educated group of people, many of whom had high incomes.

Many ketamine users had had only a limited use history. Despite this, many had experienced negative side effects, which had meant they had either reduced their dose or stopped use. Nevertheless, significant proportions of this sample reported that their reasons for use related to side effects that might place them at risk of physical injury. Many of the sample reported having injected ketamine at some time, as well as a variety of other drugs. Many of the sample had

injected drugs, and while the survey reveals that they were not necessarily placing themselves at risk of HIV infection, they may be susceptible to other blood borne viruses such as Hepatitis C, as well as other injecting risks, such as vein damage.

Efforts to develop harm minimisation messages for this group will need to take into consideration the possibility that a large proportion of the group are well-educated and well-informed in their approach to drug use. This appears to be a risk-taking sample and any efforts to warn users or potential users of the negative side effects of this drug may simply promote future use of ketamine by persons who find these 'negative' side effects desirable.

1.0 INTRODUCTION

Ketamine hydrochloride is marketed as a short-acting, general anaesthetic for human and veterinary use (Parke-Davis, 1999-2000). Reports have indicated that ketamine, or 'Special K' as it is also known, is being used in social rather than medical and scientific settings in many parts of the world (Curran & Morgan, 2000; Weiner et al, 2000; New York State Office of Alcoholism & Substance Abuse Services, 1997; White & Ryan, 1996; Skovmand, 1996; Brown, 1995; Dotson et al, 1995). The medline data base contains over 6000 reports about ketamine's use in a medical and scientific context that provide some useful information, but there are very few formal studies of non-medical use. The drug has been increasingly mentioned in literature read by the general public (e.g. Russell, 2000).

1.1 Pharmaceutical Development

In 1956 the Parke Davis Company synthesized phencyclidine (PCP). Up to this time many anaesthetics were lethal at concentrations only slightly above that which is required for anaesthesia. However, PCP was found to have a very high margin of safety and was subsequently subjected to a human clinical trial in the following year.

Although proven to be an effective anaesthetic, problems arose with psychiatric sequelae during the recovery stage when the patient 'comes out' of the anaesthetised state, often referred to as the 'emergence' period. A wide range of mental experiences has been studied, reported and grouped as emergence phenomena (Obiaya et al, 1981). During this period participants may experience confusion, vivid dreams, and hallucinations (Seigel, 1978). Given the medical potential for this compound, Parke Davis attempted to develop a similar compound with fewer undesirable effects and less toxicity.

Ketamine hydrochloride or 2-orthochlorophenyl, 2-methylamino cyclohexanone hydrochloride was first synthesized by Calvin Stevens in 1962. Early clinical studies on ketamine with human volunteers found it to be more effective and shorter acting than PCP (Domino et al, 1965). Ketamine still produced emergence symptoms, but for a much shorter period than PCP, and with less physical toxicity.

The drug was first manufactured in the United States in the 1960s as Ketalar. It was described as a 'dissociative anaesthetic' with analgesic and amnesic actions. Use of ketamine as a surgical anaesthetic escalated when it gained popularity on the battlefields of Vietnam (Tori, 1996). It was promoted as a dissociative anaesthetic because of its ability to induce a lack of responsive awareness, not only to pain but also to the general environment. It is believed that the drug selectively interrupts association pathways of the brain before producing somesthetic (the consciousness of having a body) sensory blockade (Sparks et al, 1973; Weingarten, 1972; Winters, 1975).

The emergence phenomena have led to less medical use than was originally anticipated, but ketamine is still to be found in many general hospitals in most countries (Green et al, 1998). It is also currently widely used in veterinary medicine.

1.2 Medical Uses of Ketamine

Ketamine has broad areas of application and is a rapidly acting, relatively safe parenteral analgesic and anaesthetic agent that has been in clinical use since 1970. The function of the cardiovascular system is usually well maintained. Although the respiratory and pharyngeal reflexes are sometimes momentarily depressed after injection of substantial quantities (Maduska, 1978), they are usually maintained during the period of unconsciousness. The drug is therefore suitable for short anaesthetic and surgical procedures especially in the absence of a trained anaesthetist, although the latest Parke-Davis data sheet stresses that a trained professional should be present, together with resuscitation equipment (Parke-Davis, 1999-2000). It is particularly useful in developing countries and remote country areas, such as those found in Australia, where a doctor may be working alone. Minimal anaesthetic equipment is usually required and the unconscious patient usually requires little attention for maintenance of the airway.

The major concern is the emergence phenomena. Psychic disturbances after ketamine anaesthesia have been reported to occur in about 15% to 40% of adult cases, depending, to some extent, on how these terms are defined (Silvay, 1983; Khorramzedeh & Lofty, 1976; Hejja & Galloon, 1975; Abajian, Page & Morgan, 1973; Hefez & Lanyi, 1972; Corssen, Oget & Reed, 1971). Other drugs, such as diazepam, lorazepam and propofol, have been given together with ketamine in an attempt to reduce or abolish these phenomena, with some success. Psychological techniques are also effective in reducing complaints (Sklar, Zukin & Reilley, 1981).

Silvay (1983) suggested a number of clinical uses of ketamine. These are listed in Table 1.1.

Table 1.1: Clinical uses for ketamine

Paediatric anaesthesia

- Induction: intramuscular-route patients not properly sedated with premedication; unpremedicated outpatients prior to insertion of an intravenous catheter
- Induction and maintenance: any surgical procedure; widely used for diagnostic procedures – endoscopy, radiology, cardiac catheterisation, oral surgery

Geriatric anaesthesia

Critically ill and poor-risk patients

- shock or cardiogenic shock
- severe anaemia, dehydration
- constructive pericarditis and cardiac tamponade
- respiratory dysfunctions
- burn trauma
- short procedures: surgical, dressing changes, drainage

Supplement to local and regional anaesthesia

- when surgical procedure is prolonged
- when block is not sufficient

Special indications

- bronchial asthma
- intermittent porphyria
- malignant hyperpyrexia

Obstetrical anaesthesia

Outpatient anaesthesia

One-lung anaesthesia

Ketamine appears to be best used in the young (less than 10 years old) and the old (over 60 years) as these groups have reported fewer emergence reactions (Radford, 1996).

Some of the mental effects of ketamine resemble a schizophrenia-like psychosis (Adler et al, 1999). This may be due to blockade of N-methyl-D-asparate (NDMA) receptors and the release of dopamine, amongst other neurochemical effects, indicating that some aspects of schizophrenia are associated with decreased NMDA-glutamatergic function. As a result, much research has been carried out in recent years investigating the ketamine model of schizophrenia,

to increase our understanding of the illness and develop new treatments (Carpenter, 1999; Adler et al, 1999; Tsai et al, 1998).

Studies conducted in the 1950s and 1960s suggested that psychedelic drug-assisted psychotherapy might be an effective treatment for alcohol dependence (Grinspoon & Bakalar, 1979). In the 1990s, these findings were used as a partial basis for ketamine-assisted treatment of alcohol dependence. This is known as Ketamine Psychedelic Therapy (KPT) (Krupitsky & Ginenko, 1997). This is a controversial treatment which has yet to be used outside of Russia.

1.3 Non-Medical Use of Ketamine

Jansen (2000c) reported that ketamine was being used illicitly as early as 1967-68, with the drug being distributed by those who made it under names such as 'rockmesc'. Several other observers warned about the drug's potential for abuse (Reier, 1971; Collier, 1972) as ketamine appeared more widely on the illicit drug market in the USA in the early 1970s (Dotson et al, 1995). Street use of ketamine solutions was first noted in 1971 in San Francisco and Los Angeles, while other forms such as powder and tablets were identified in 1974 (Siegel, 1978). Some observers (Young et al, 1977) believed that the increased recreational use of ketamine could be attributed to experiences gained among patients in Vietnam and elsewhere during the late 1960s. Clinicians and researchers noted that some non-medical users sought dissociative, hallucinatory experiences (Ashley, 1978; Siegel, 1978). There are detailed published accounts of such experiences written by users (e.g. Turner, 1994; Lilly, 1978).

By the end of the 1970s, the United States Food and Drug Administration (FDA) had begun to become concerned about the sale of ketamine on the 'street' (FDA, 1979).

By the early 1980s a wide range of unauthorised preparations were available in the US including capsules, powder, crystals, tablets and solutions, in addition to the authorised injectable forms (Tori, 1996). Solutions sold on the street in the USA have gone by many names such as K, Kay, Jet, Super Acid, 1980 Acid, with powders known as Green, Purple, Mauve, Special LA Coke, Super C, and K (Siegel, 1978). Other street names have included Vitamin K and most recently, Special K (Tori, 1996).

Over the past decade there have been a growing number of reports on the non-medical, unauthorised use of ketamine in the United Kingdom (Dalgarno & Shewan, 1996). At the present time, ketamine is not a controlled drug in the UK, although selling ketamine as ecstasy has resulted in serious sentences (over 10 years in prison) for conspiracy to offer to supply a class A drug (ecstasy). Ketamine misuse has also been reported in Sweden (Skovmand, 1996) and Australia (White & Ryan, 1996) as well as the USA (Drug Enforcement Agency, 1997). In 1999 ketamine became a Schedule III drug at the federal level across the United States.

Both popular and research accounts indicate that the recreational use of ketamine has widened in the context of nightclubs, dance parties and 'raves' (Curran & Morgan, 2000; Crysell, 1998; Kent, 1996). This has caused concern as ketamine is an anaesthetic. Dalgarno and Shewan's (1996)

study concluded that it was 'totally inappropriate' to use ketamine as a 'dance drug'. The reasons for this were factors such as set and setting, the rapid onset of the drug and the intensity of the experience as a whole. The respondents believed that using ketamine in a noisy, busy, or crowded environment was potentially dangerous and that use should be confined to a familiar and secure place, such as one's home. All users had been unprepared for the intensity and nature of the effects when they first used the drug.

Ketmine has been sold in the 'rave' scene in the UK as a key component in fake MDMA (ecstasy) tablets (Shewan & King, 1996), but was also present in the 'free party' scene, from quite an early stage, in its pure form imported from India where partygoers in Goa had first encountered the drug (Jansen, 2000c; Shapiro, 1992). There are also reports of ketamine being sold as ecstasy in Australia, or used as a cutting agent in other drugs such as cocaine, amphetamines and heroin (ABCI, 1997). Western Australia law enforcement have had two seizures which proved to be ketamine. In November 1996, Sydney police seized LSD 'tabs' which were impregnated with ketamine (ABCI, 1997).

1.4 Patterns of Use

The information available in the peer-reviewed literature is currently limited as little research has been carried out into patterns of non-medical ketamine use in populations, as distinct from case studies. However, there are several anecdotal accounts (Jansen 2000a; 2000b; Kent, 1996). In the 1978 survey of 23 recreational users (10 intranasal users and 13 injectors), ketamine use was primarily for experimental or social reasons (Siegel, 1978). Participants used the drug in the form of capsules, powder, crystals, tablets, or solutions. None of the intranasal users had experimented with other routes of ketamine administration. However, a variety of routes of administration had been displayed by the injectors, who had all employed the intra-muscular route of self-administration, with some experimenting with intravenous injection as well as smoking the drug. Doses taken intranasally typically ranged from 60-100 mg per episode. Ketamine injectors (both intra-muscular and intravenous) employed dosages of between 1 to 2 mg/kg, repeating injections once per hour until a desired level of intoxication was achieved.

In a survey of 20 illicit ketamine users in Scotland (Dalgarno & Shewan, 1996), the participants' lifetime use ranged from 1 to 100 times. Seventeen described their use as occasional, with the remainder indicating more frequent use. The participants were unsure as to the actual amount of ketamine they used, but described it as being comparable in length to a line of amphetamine or cocaine. Half of the sample reported that they typically used 1/8 g, which the authors believed would provide the desired psychedelic experience. The most common route of use was intranasal. Eighteen participants had used the drug in this way. Nine participants had smoked the drug, seven had swallowed it, and two had used ketamine in a nasal spray. Injection was rare, with only two participants injecting intramuscularly.

1.5 The Australian Experience

There has been little research carried out in Australia with respect to the non-medical,

unauthorized use of ketamine. The drug is presently marketed under a number of brand names, which are used in both human and veterinary practice (see Table 1.2).

Table1.2 Brands of Ketamine Currently Available in Australia

Type	Trade Name	Manufacturer
Human	Ketalar	Parke Davis Pty Ltd
Veterinary	Ketamil	Ilium Veterinary Products
Veterinary	Ketapex	Apex Laboratories Pty Ltd
Veterinary	Ketavet	Delvet Pty Ltd
Veterinary	Ketamav 100	Mavlab Pty Ltd
Veterinary	Ketamine Injection	Parnell Laboratories (Aust.)

In 1980 non-medical, unauthorized experimentation with ketamine was first reported in Australia (Ahmed & Petchovsky, 1980). The authors believed that use of the drug was largely confined to medical circles. Since that time, anecdotal evidence indicates that the nature of users has become much more varied. Ketamine is not identified in the National Drug Household Survey, which examines prevalence of drug use, nor are there any records of the drug in the New South Wales (NSW) Bureau of Crime Statistics. However, in 1994 ketamine was listed in the Australian Illicit Drug Report for the first time, with jurisdictions being urged to keep the matter under review during 1995 (ABCI, 1995).

As in other countries, most of the recreational use of the drug appeared to be linked with the nightclub/dance party scene, although it is likely that use in medical and paramedical groups continued. In a survey of 329 Australian ecstasy users conducted in 1997, ketamine was identified as one of the other drugs used (Topp et al, 1998). Although the number of ecstasy users who knew that they had ever used ketamine was small (18%), it does indicate that the drug is now more available and appears to be becoming more popular.

In Australia, ketamine is often marketed in small glass vials with small spoons to measure 'accurate' doses. The spoon is contained in the cap of the bottle, much like a snuff spoon. Other bottles have a self-contained 'measurer' in the cap which when turned over leaves a measured amount, which can then be snorted.

Drugs used intranasally (particularly amphetamines and cocaine) are normally snorted by the 'line'. These lines vary in length and thickness, according to the user's tolerance and experience. Very few ketamine users snort the drug in lines, instead they use 'bumps'. These have been defined as 'small snorts usually measured by a tiny spoon provided with the container in which it is purchased' (Topp et al, 1998). According to Jansen (2000c) a club 'bump' for snorting is 200 mg.

Ketamine is a relatively expensive drug at the present time in Australia, comparable to cocaine, with a street price of $200 per gram (Topp et al, 1998, unpublished data). Users, questioned on

their ketamine use in a recent survey of ecstasy users, believed that the price was relatively stable and that the drug was pure. Most of the respondents still believed the drug to be difficult to obtain. They used an average of 3 bumps per occasion, with the heaviest use being 5 bumps (Topp et al, 1998, unpublished data). Long-term users have indicated that these prices have risen dramatically over the past few years (anecdotal evidence suggests that the price in 1993 was $150 per gram), due to increased demand.

There have been no reports that ketamine is being manufactured illegally in Australia (ABCI, 1997). This may be due to the complicated multi-step synthesis process and the fact that the necessary precursor ingredients are not readily available. It appears to be obtained from the diversion of legitimate supplies (veterinarians and pharmaceutical companies) or is imported from overseas (ABCI, 1997). Ketamine can be bought over the counter in some Asian countries. Reports suggest that some veterinarians are selling ketamine in Sydney and Tasmanian police have reported an instance of ketamine being stolen from a veterinary surgery (ABCI, 1997).

Ketamine sold illicitly is often converted from a liquid form to a powder utilizing a simple evaporation process. The liquid ketamine is dried in a variety of ways (microwave, oven or sun-dried) until a residue remains. This crystal residue is ground into a powder, leaving a fine powdery material similar to cocaine and heroin. As ketamine is a highly lipophilic compound, the intranasal route offers a rapid onset of action. In this form it is far more convenient and more marketable than the injectable drug.

Evidence from the USA indicates that, up until 1996, ketamine was usually not adulterated ('cut') with other substances. Of all the ketamine submissions to the USA DEA regional laboratories, in that period, there was only one instance of this type of dilution recorded (Tori, 1996). However, this situation may well have changed when price and demand rose sufficiently to make such practices profitable.

In 1999 one Australian state, Victoria, introduced amendments to the Drugs, Poisons and Controlled Substances Act 1981, listing ketamine in Schedule II as a drug of dependence requiring a stricter enforcement regime (ABCI, 2000). The drug had previously been in Schedule IV, restricting it to medical, dental or veterinary prescription or supply. Specific offences now exist for using, possessing and trafficking ketamine. Traffickable quantities are 20 grams or more.

1.6 Key Psychoactive Effects of Ketamine

Jansen (2000c) reported that at 10-25% of an anaesthetic dose, effects begin about 30 seconds after an intravenous injection, 2-4 minutes after an intramuscular injection and 10-20 minutes after taking the drug orally. The length of the experience varies from 10 minutes (intravenous), to an hour (intramuscularly) to 4 hours (orally). Experiences can be much shorter than this in persons with a high tolerance.

Siegel (1978) reported that the drug was viewed by most of the users in his study as a safe, potent hallucinogen with a short duration of action and an equal balance between positive and negative effects. Self-administration was titrated to achieve the desired amount of dissociative sensations, hallucinations and transcendental experiences. Respondents reported ataxia (inability to co-ordinate muscular movement), slurring of speech, dizziness, mental confusion, blurred vision, anxiety, hyperexciteability and insomnia, amongst other effects.

In a study that examined the subjective effects of ketamine, Hansen et al (1988) gave seven male volunteers between five and 12 doses of ketamine intermittently over a period of 18 months. They used approximately 10-25% of the anaesthetic dose, believing this to reflect the dose level that occurs during the emergence period.

The authors describe a series of phenomena experienced by most of the participants:

- A sensation of light throughout the body
- Novel experiences concerning 'body consistency' (e.g. feeling as though they are made from wood or plastic)
- Grotesquely distorted shape or size of body parts
- Sensation of being weightless and floating or hovering
- Colourful visions (including geometrical patterns and figures)
- Absence of sense of time
- Sudden insights into the nature of the existence or the self
- Strong feelings of association with others in the environment
- Out-of-body experiences

Ketamine has sometimes been described using derogatory expressions such as 'horse tranquilliser', probably due to its link with veterinary medicine. Anecdotal evidence indicates that many users of other club drugs have hesitated to use it, due either to bad personal experiences or 'horror stories' relayed to them by others. Some users may describe visits to the 'K-hole', a place referring to 'where users are' when under the influence of ketamine (Tori, 1996). The K-hole experience appears to vary with the individual, but Stafford (1992) identified six main categories of mental effects produced by ketamine:

- The perception of contact with aliens
- The perception of entry into information networks
- Access into alternative realities
- Personal and creative problem-solving
- Out-of-body-near-death states
- Tantra-like enhancement of sexual activity

Ketamine can sometimes reproduce the features of a 'near-death experience' (NDE), including buzzing/ringing/whistling sounds at the beginning, travel through a dark tunnel into light at a high speed, the conviction that one is dead, apparent telepathic communion with God, intense visions and out-of-body experiences (Jansen, 2000c). An NDE induced by ketamine does not mean that the person is physically near death as the drug does not impair cardiac function.

1.7 Some Harms Associated with Ketamine Use

There are very few deaths by pure ketamine overdose recorded (i.e. not also involving a drug such as alcohol). Of 87 ketamine-linked deaths in New York City, none was purely due to the use of ketamine (Gill &Stajic, 2000). Parke-Davis have reported that there are cases of accidental injections with ten times the amount required for surgery, with no obvious, lasting effects (Parke-Davis, 1999-2000). The principal physical dangers of most non-medical use are currently believed to arise mainly from the setting, or an interaction between the user and the setting of use (Jansen, 1993), as ketamine can leave the user in a confused state. This can, for example, result in burns, falls (sometimes fatal), drowning, death by hypothermia from lying outside in winter, traffic accidents and becoming a crime victim (e.g. 'sedate rape').

There are two reports in the literature of deaths by pure ketamine overdose. One described as 'a homicide for homosexual ends' (Licata et al, 1994). The other describes a middle-aged woman who took the drug daily for seven months (Jansen, 2000c).

A report showing that ketamine could cause toxic changes in the rat brain (Olney et al, 1989; Olney et al, 1991) caused concern, but to date there are still no published studies which show that these changes occur in the monkey or human brain, and there are metabolic and neurochemical reasons why they are unlikely to do so (Auer, 1996).

There is an extensive list of possible physical effects of ketamine that may be seen as adverse by the user, or that may be directly harmful. A review of all of these is beyond the scope of the present report. Some of those of principal concern in a non-medical use context are difficulty with walking and balance resulting in falls, numbness, slurred speech, dizziness, visual problems, nausea, headaches, spasms, and twitches.

The use of ketamine has been linked with a range of unpleasant mental effects including anxiety, panic attacks, flashbacks, post-traumatic stress disorder, persistent perceptual changes, mania, depression, suicide, insomnia, nightmares, night terrors, an unpleasant feeling of being unreal or that the world is unreal, paranoid delusions, persistent hallucinations, automatic behaviour, fragmentation of the personality and aggression (Jansen, 2000c).

Siegel's study of 23 recreational users noted a high incidence of flashbacks and attentional dysfunction, but exactly what was meant by 'flashbacks' is not defined (Siegel, 1978). Large anaesthetic studies do not confirm the finding and generally conclude that ketamine is usually devoid of significant persistent effects once the drug and its metabolites have cleared the body

(Schorn & Whitwam, 1980; Modvig & Nielsen, 1977). For example, in a study of 1400 patients given ketamine as an anaesthetic for surgical procedures three had prolonged hallucinations, none lasting beyond three weeks. In no case did hallucinations begin after a period of normality, which is integral to the World health Organisation (1992) definition of flashbacks (Fine & Finestone, 1973).

There is a substantial amount of popular literature describing ketamine as having a marked potential for giving rise to non-physical dependence (e.g. Turner, 1994; Sputz, 1989; Lilly, 1978) and case studies in the medical literature are accumulating (Moore & Bostwick, 1999; Hurt & Ritchie, 1994; Soyka, Kripinsky & Volki, 1993; Jansen, 1990; Kamaya & Krishna, 1987; Ahmed & Petchkovsky, 1980). There is evidence from animal studies to support the view that ketamine can give rise to a dependence syndrome without physical withdrawal phenomena (Beardsley & Balster, 1987). This resembles cocaine dependence without the 'crash' after use.

There may also be problems with relationships, employment, finances, education and involvement in crime.

Therefore the aims of this study are to address the following four topics: (1) what are the characteristics of the people who use ketamine?; (2) what motivates people to use ketamine?; (3) how is ketamine being used?; and, (4) what are the consequences of using ketamine? Specifically the aims of this project were 1) to identify current patterns of illicit ketamine use; 2) to identify potential harms associated with illicit ketamine use; and 3) to determine the need for interventions and identify appropriate harm reduction strategies for illicit ketamine users in particular community subgroups.

2.0 METHOD

2.1 Procedure

In order to maximise the number of participants in the study, a variety of recruitment alternatives were employed, with an expectation that 'snowballing' would result in additional users. The recruitment of ketamine users was sought via:

- personal contacts with ketamine users;
- needle and syringe exchanges;
- radio interview(s); &
- an advertisement and article in a free street newspaper.

The majority of the sample were recruited to the study by direct approach from the first author (39%), 38% heard of the study from a friend, 15% heard a story about the study on the radio and 8% responded to an advertisement in the print media. Participants contacted the researcher by telephone. In the case of personal contacts, they were approached by the researcher personally. To be eligible for the study, the individual had to have used ketamine intentionally at least once in their lifetime. Those who had been administered the drug as part of a medical procedure were ineligible. All participants were volunteers and were offered up to $20 reimbursement of travel costs and out-of-pocket expenses. The questionnaire constructed for this study (see Appendix I) was carried out as either a structured interview, or, by self-completion and returned by mail to the researcher (8%).

Each face-to-face interview was conducted in a location determined by the participant in an attempt to minimise any hesitation they might have about participating. Consequently, interview sites included coffee shops, shopping centres, participant's homes and the researchers' workplace (National Drug and Alcohol Research Centre). All participants were guaranteed, both at the time of screening and interview, that any information they provided would be kept strictly confidential and anonymous and they signed the participant's consent form. The project protocol was passed by the University of New South Wales Committee for Experimental Procedures Involving Humans as consistent with the Declaration of Helsinki (1989) and the National Health and Medical Research Council's Statement on Human Experimentation (1992). All interviews were conducted by the first author and took between 30 minutes and one and a half-hours to complete.

Where self-completion was preferred by the participant, they made initial contact with the researcher and a suitable place where the questionnaire could be handed over was determined or an address for mailing was provided. Accompanying the questionnaire was an information sheet clearly explaining what they were required to do; they were also asked to call the researcher a week after mailing back the questionnaire so that he could clarify any responses that were unclear.

2.2 Structured Interview

A questionnaire was constructed specifically for this project based on information contained in various reports, and the scientific literature. The questionnaire was constructed so that it could be used in a structured interview or by self-report and was divided into six separate sections, described below.

2.2.1. *Demographics*

The demographic details obtained included: the participant's gender, age, height, weight, nationality, primary spoken language, sexual preference, relationship status, living arrangements, level of education achieved and employment status.

2.2.2 *Patterns of use*

This section sought to gain as much information about the participant's ketamine use history as possible, ranging from general issues to specific patterns used. Areas covered included age of first intentional and unintentional use, number of occasions used and whether or not they considered themselves a regular ketamine user. Information was gathered on sources of ketamine, both primary and secondary, the price of the drug, and the usual method of administration. Questions on price, purity and availability of the drug were also asked. Health related questions were asked concerning injecting practices (sharing, reusing, etc.) and concurrent use of other drugs.

2.2.3 *Reasons for using*

In addition to asking for their main reasons for using ketamine, this section sought to examine what the users believed were the benefits and harms of the drug. A list of commonly reported expectations from the literature was provided, with space for additional items. This section also examined what activities the user participated in whilst using the drug, who they used with and how many people they knew who used ketamine.

2.2.4 *Effects of Ketamine*

Checklists based on previous research were provided for the individual to identify both the physical and psychological/behavioural effects they had experienced; for each they were asked to indicate whether they believed it to be a positive or negative effect. The Severity of Dependence Scale (Gossop et al., 1991) was also included. This scale examines loss of control and concern over use and has validated for opiates, amphetamines and cannabis. This scale, however, has never been used in the context of ketamine use so the meaning of the total score is difficult to interpret. Participants were asked about a range of problems associated with ketamine use including tolerance and recovery from the effects.

2.2.5 *Lifestyle*

An overview of the ketamine users drug use history was investigated looking at current alcohol and cigarette use, lifetime experience with other drugs (ecstasy, amphetamines, cocaine, LSD,

cannabis, amyl nitrate, benzodiazepines, heroin, methadone, anabolic steroids, GBH, MDA and nitrous oxide), and injecting drug use history.

2.2.6 *Deterrents*

The final section asked the user to identify the extent to which a number of factors (covering financial, legal, health and social issues) might deter them from using ketamine.

2.3 Statistical Analysis

The majority of the analyses were descriptive in nature and only these data are included in this report. Percentages are reported for categorical variables; means and medians are reported for normally distributed and skewed continuous variables, respectively. A number of univariate comparisons of major variables of interest will be reported elsewhere: unadjusted odds ratios (OR) and their corresponding 95% confidence intervals (95% CI) for categorical data, and t-test or the non-parametric equivalent for skewed data for continuous variables. The data analysis was carried out using SPSS for Windows (Version 10.0).

3.0 RESULTS

3.1 Characteristics of the Sample

A total of 100 lifetime ketamine users were recruited over a 22 month period from January 1998 to October 1999 in Sydney, Australia. The majority of the sample were male (70%). The participants ranged in age from 19 to 42 years with a mean of 29.7 years (SD 5.2 years).

3.1.1 *Sexual preference, relationship status & living arrangements*

Forty per cent of the sample were homosexual, with a further 1% indicating that they were bisexual. Almost two thirds (63%) described themselves as single, 28% lived with a sexual partner, with 4% currently married and 5% divorced. Around half (49%) described themselves as currently in a relationship with a median duration of 33 months. Only 10% of the participants had dependent children.

The most common living arrangement was with friends (36%), followed by living with a partner (32%), living alone (20%), with parents (7%) or in a group house (5%). It was a highly urban sample with around two thirds of the participants living in inner city Sydney (67%) with a further 16% in the inner western suburbs.

3.1.2 *Citizenship and background*

The vast majority of the sample (95%) were Australian citizens with 3 participants being of Aboriginal and/or Torres Strait Islander descent. Table 3.1 describes the 10 most common countries of birth of both parents for the sample. Unsurprisingly 97% of the sample spoke English and 2% spoke Italian and one person spoke Portuguese at home.

Table 3.1 – 10 most common parental birthplaces of Ketamine users in the sample

Country of Birth	Percentage Mother	Percentage Father
Australia	66	60
U.K.	17	20
Italy	4	2
New Zealand	2	1
Ireland	0	3
Canada	0	2
South Africa	1	1
India	1	1
Portugal	1	1
Croatia	1	1

3.1.3 *Education and employment*

The median number of years of education was 13 (mean 12.6; SD 1) with a range of 8 to 13 years. Almost one half of the sample had completed university (46%) with a further (19%) either currently attending or having attended at some time. Fourteen percent had earned diplomas or trade certificates. The lowest level of education was completion of 10 years of schooling to age 16 years (8%) with the remainder completing no education beyond 12 years of high school (13%). The majority of the sample were employed, either full-time (72%) or part-time (14%). Only 9% described themselves as unemployed. Table 3.2 provides a breakdown of the present occupation of the participants. Fourteen of the participants would have had access to ketamine in their workplace (medical practitioners, nurses, veterinarians and a pharmacist).

The most common gross salary band was $AU40-50,000 pa (27%) with only 19% earning less that $AU30,000 pa and 25% earning more than $AU50,000 pa. Fourteen per cent declined to respond.

Table 3.2 The current occupation of the participant*

Occupation	Percentage
Teacher	6
Nurse	6
Medical practitioner	5
Accounting	4
Veterinarian	2
Pharmacist	1
Airline industry	4
Management/consulting	15
Service industry (retail sales, waiter, customer services, secretarial, sex worker)	22
Advertising industry	11
Other profession (engineer, scientific officer, town planner)	4
Trade (plumber, carpenter, make-up artist, glass artist)	4

* 16 missing cases

3.2 Ketamine Use History

The mean age of first intentional use of ketamine was 25.8 years (SD 4.8; range 16-41 years). Only 10% of the participants felt that they had previously used ketamine under a different name; either MDMA (4%), cocaine (3%) or MDA (1 person). On that occasion 4% had taken a tablet, 3% a powder and 1 a capsule that had been supplied by a dealer (3%) or friends/acquaintances (5%).

The majority of the sample (58%) had considerable experience with ketamine having used it more than 10 times. Only 3 people had used only once, 25% 2-5 times, 14% 6-10 times, 14% 10-15 times, 9% 16-20 times and 35% more than 20 times. Only 26%, however, considered themselves regular ketamine users. See Table 3.3 for frequency of ketamine use.

Table 3.3 Frequency of Ketamine use among the sample

Frequency of ketamine use	Percentage
More than once a week	2
Weekly	6
Couple of times per month	10
Monthly	16
5-10 times per year	29
Once a year	7
Less than once a year	7
Do not use anymore	23

3.3 The Ketamine Market

Almost two thirds of the sample (64%) had personally purchased ketamine. The usual source of supply was friends (39%), dealers (14%), acquaintances (5%), veterinary supplier (3%), and 1% each for workmates and overseas purchase. Of those who believed their supplier obtained his/her ketamine from another source and thought they knew its origin (31%), veterinary surgery (10%) was most commonly nominated followed by veterinary supplier (8%), hospital pharmacy (4%), and overseas (Bangkok or USA) (6%).

Participants who had never purchased their own ketamine (35% of the sample) reported that they most commonly obtained it from friends (29%), dealers (5%), and workmates (3%). Of the 16% of the sample who believed they knew the primary source of this ketamine, 11% reported hospitals, pharmaceutical company (2%), and 1 each nominated Bangkok, pharmacy and veterinarian. Table 3.4 shows the usual location for scoring ketamine among the sample.

The most common form of buying ketamine was per gram (65%) with a mean price of A$155.77 per gram (SD 31.3; range A$50-$250). Only 5 participants commented on the price per bump with a range of A$2-$15. A single person commented on price per millilitre as between A$400-$600. More than half of the sample (52%) could not comment on price stability over the previous 6 months and of the remainder 43% thought the price had been stable while 3% thought it had decreased and 2% that it had increased.

Table 3.4 Usual location for obtaining Ketamine

Location	Percentage
Friend's home	32
Nightclub	21
Dance party	16
Own home	12
Dealer's home	8
Gym	4
Pub	2
Hospital	2
Work	2
Dial-a dealer	1

Seventy percent of the sample felt able to comment on the purity of the ketamine they obtained, with 48% reporting that it was pure, 20% that it was reasonably pure, and 2% as not very pure. Of the minority who commented on the stability of the purity over the previous 6 months, 39% felt it was unchanged, 5 that it had reduced and 3 that it had improved over that time.

Of the seventy nine people who responded to the question on the availability of ketamine, only 2 felt ketamine was very difficult to obtain, 29% that it was difficult, while 28% thought it was easy and 20% very easy to obtain. The majority (40%) felt there had been no change in availability over the previous 6 months, with 14% believing it was easier to obtain and 5% that it was more difficult to obtain over that period.

3.4 Patterns of Ketamine Use

Concerning the preparation of the ketamine prior to use, 68% said they did not alter the constitution however 23% reported heating the liquid, 5% rehydrating with water, 2% melting a solid and 2% crushing a tablet and adding water.

Table 3.5 Usual form of Ketamine used

Form	Percentage
Powder with measuring spoon in lid	38
Powder in bag	32
Liquid in vial	18
Powder with measured puffs in lid	6
Tablets/capsules	5

1 missing data

Table 3.5 describes the form of ketamine usually used by the participants.

The usual amount of and the maximum amount of ketamine used on a single occasion is reported according to the preparation of ketamine used in table 3.6.

Table 3.6 Usual and maximum amount of Ketamine used in a single occasion

Quantity of ketamine	Dose usually used (%)	Maximum dose used (%)
1 bump	4	0
1-5 bumps	39	21
5-10 bumps	25	24
10-30 bumps	13	27
>1 gram	1	10
1-5 mls	12	10
5-10 mls	1	1
>10 mls	0	5
2-5 lines	3	0
½ tablet	2	0
1 tablet	0	1

The participants reported usually consuming ketamine at raves and dance parties (47%), clubs (26%), at home (16%), at a friend's place (10%) or at a pub (1%).

3.4.1 *Blood-borne virus risk-taking behaviour*

The vast majority of participants reported that their usual route of administration was snorting their ketamine (82%) with 11% reporting intravenous use, 4% intramuscular use and 3% swallowing. Only 29% reported ever having injected ketamine, with only 6 participants reporting having injected ketamine in the previous month (no one had injected more than once in the previous month). The median number of lifetime ketamine injections was 3.0 (SD21.9; range 1-60).

Of the 29 lifetime ketamine injectors, none reported ever using a needle previously used by someone else when injecting ketamine, however, 5 reported that someone else had used a needle after them. Only 4 participants reported that they re-used their needles and of these 2 reported that they always cleaned their needle prior to re-use and 2 did so sometimes.

With regard to other injecting drug use, 48% reported that they had ever injected another illicit drug. Over their lifetime use of other drugs, 4 reported that they had ever used a needle after someone else, 4 believed that someone else had used a needle after them, and 8 had re-used needles. Among those reporting re-use of a needle when using other drugs, 5 always cleaned the needle, 2 often and 1 rarely cleaned it. Only 2 people thought that they had problems obtaining needles.

Participants who had never injected ketamine were asked to state why they had not used this route of administration. These are set out in Table 3.7.

Table 3.7 Primary and secondary reasons for not injecting Ketamine

Reason	Number as primary	Number as secondary
Dislike needles	42	0
Satisfied with snort/swallow	12	41
Fear of health problems	11	11
Injecting inconvenient	3	3
Unknown dose	1	1
Don't know enough about it	1	0
Don't want to use ketamine again	1	0
Friends do not inject	0	4
Concerned about purity	0	1
No desire to inject	0	4

3.4.2 *Ketamine and other drug use*

Around one third (25%) of the sample reported that they preferred to use ketamine without any other drugs. Table 3.8 describes the drugs ever used with ketamine, preferred to be used with ketamine and those drugs not used with ketamine by the participants.

Table 3.8 Pattern of other drugs used with Ketamine*

Drug	Drugs ever used with ketamine (%)	Drugs preferred to use with ketamine (%)	Drugs not used with ketamine (%)
Ecstasy	71	74	2
MDA	62	37	1
Amphetamines (speed)	50	16	4
Cannabis	49	19	3
Alcohol	44	6	13
Cocaine	41	19	6
Tobacco	30	10	0
Amyl nitrate	26	0	4
LSD	20	6	23
Benzodiazepines	9	0	16
GHB	7	1	16
Ethyl alcohol	7	0	0
Nitrous oxide	7	0	12
Heroin	3	2	35
Antidepressants	3	0	12
Pethidine	1	0	1

*multiple option categories

3.4.3 *Reasons and circumstances of Ketamine use*

Table 3.9 reports the three main reasons that participants gave for using ketamine the first time. Table 3.10 reports on a multiple response question relating to the best things about ketamine use. The participants reported that the worst things about ketamine use were fear of the "K hole" (45%), health risks (35%), coming down (32%), limited availability (22%), impurities (15%), psychological problems (11%), nothing (10%), tolerance (8%), and physical responses (1%).

When asked to choose only two options, the participants noted that the two main things they did while on ketamine were dancing (78%), staying at home (27%), chilling out (25%), and listening to music (19%). The people they most commonly use ketamine with were a small group (59%), a large group (22%), his/her partner (10%), alone (4%), acquaintances (3%), and friends (2%).

The majority of the participants know more than 10 people that also use ketamine (75%) with 29% knowing more than 50 people who also use and only 3% not knowing anyone else that used ketamine. More than half of the sample (57%) had introduced ketamine to someone else for the first time with a median of 5.5 introductions (range of 1-50 introductions) per person.

Table 3.9 Three main reasons for first Ketamine use

Reason for use	1st reason (%)	2nd reason (%)	3rd reason (%)	Reasons for continued use (%)*
For the effect	62	0	0	74
Friends using	25	41	0	42
Curiosity	11	39	34	5
Boredom	2	1	0	1
Use other drugs	0	6	20	35
Couldn't get other drugs	0	3	1	0
Cheap	0	1	3	17
High tolerance to other drugs	0	2	3	9
Feels good	0	6	8	32
To party	0	0	24	61
Easily available	0	0	2	2
Self-exploration	0	0	3	0
To cope	0	0	1	1

*Multiple response option

Table 3.10 The best things about Ketamine use

Reason	Percentage endorsed
Altered senses	78
Out of body experience	52
Euphoric rush	50
Group experience	49
Bring on other drugs	42
Escape reality	38
Feeling of well-being	26
Dance all night	23
Creativity	20
Stress release	4
Nothing	1

3.4.4 *Effects of Ketamine*

Only 14% of the participants had ever used ketamine orally. Of those, 6 reported it took 20-30 minutes to take effect, 5 thought 15-20 minutes and 2 reported 5-10 minutes. The remaining individual estimated that it took 40-50 minutes to have an effect. The majority (n=9) reported that it lasted more than two hours, 2 each reported it lasted 60-90 minutes and 90-120 minutes and 1 person estimated it lasted 30-60 minutes.

Snorting ketamine was reported by 86% of the sample with 43% reporting it took 2-5 minutes for the drug to take effect, 21% less than 2 minutes, 17% 5-10 minutes and 5 people thought it took 10-15 minutes to take effect. They further reported that the effect of ketamine when snorted lasted 30-60 minutes (54%), 20% less than 30 minutes, 7% more than 2 hours, 4% for 60-90 minutes and 1 person reported 90-120 minutes duration.

Only 7 participants reported using ketamine intramuscularly with onset estimates varying from 2-5 minutes (n=4), 10-15 minutes (n=2), and one person thought less than 2 minutes. They reported that the effect lasted 90-120 minutes (n=3), 60-90 minutes (n=2), and 1 each thought 30-60 minutes or more than 2 hours.
Unsurprisingly the onset estimates of the 23% of the sample who had used ketamine intravenously was consistent at less than 2 minutes. Fourteen percent thought it lasted less than 30 minutes, 3% 30-60 minutes and 2% each for 60-90 minutes, 90-120 minutes and more than 2 hours.

The majority of the participants (86%) reported that they enjoyed the effects of ketamine and 81% thought that it heightened the experience of dance parties.

Table 3.11 Experiences and attitudes towards the physical effects of Ketamine

Effect	Ever experienced (%)	Usually experienced (%)	Positive (%)	Negative (%)
Increased heart rate	38	17	34	20
Increased breathing	17	11	8	18
Difficulty breathing	21	2	0	18
Nausea	27	9	0	38
Vomiting	27	3	0	30
Convulsions	3	0	0	3
Pyrexia	41	17	22	27
Lack of co-ordination	77	14	51	40
Temporary paralysis	23	16	22	17
Inability to move	22	39	38	22
Blurred vision	61	21	54	26
Inability to speak	39	30	39	44
Feeling no pain	49	7	49	7
Muscle spasms	4	3	1	6

Table 3.12 Experiences and attitudes towards the psychological/behavioural effects of Ketamine

Effect	Ever experienced (%)	Usually experienced (%)	Positive (%)	Negative (%)
Insomnia	16	16	7	25
Anorexia	11	6	9	8
Dizziness	26	22	11	37
Separated from environment	53	27	65	17
Separated from body	57	25	68	16
Auditory hallucinations	46	21	57	10
Visual hallucinations	49	23	63	8
Confusion	45	25	29	41
Excitement	46	20	69	0
Irrational behaviour	18	16	19	15
Paranoia	22	12	0	35
Loose associations	30	26	45	8
Unusual thought content	60	16	68	8
Impaired memory	32	12	19	23
Euphoria	55	12	67	0
Enhanced colour vision	40	18	52	4
Aggression	2	0	0	2
Novel bodily sensations	42	20	57	6
Weightlessness	47	18	63	2
Altered body perceptions	53	21	64	9
Perseveration	12	6	6	13
Anxiety	24	9	5	31
Absence of time	74	14	61	24
Agitation	11	1	0	12

The majority (56%) of the participants reported having experienced the "K-hole".
Despite the reports in Tables 3.11 and 3.12, only 20% reported ever having experienced severe side effects as a result of their ketamine use.

3.4.5 *Problems Associated with Ketamine Use*

Twenty percent of the participants reported severe side effects as a result of ketamine use. More than a third (38%), however, reported having to deal with someone else who has suffered badly following ketamine use. Table 3.13 sets out the proportion endorsing ketamine ever having caused them problems in these areas. The problems reported with employment included vagueness affecting work performance and lesser volume of work being produced.

Table 3.13 Types of problems ever experienced as a result of Ketamine use

Nature of problem	Percentage
Relationships	5
Legal	1
Financial	5
Employment	20

Of the five participants reporting relationship problems none also reported financial problems but 3 of 5 also reported work-related problems. Twenty two participants reported at least one problem, 5 reported 2 problem areas and one reported 3 problems.

The participants also completed the Severity of Dependence Scale (SDS) (Gossop et al., 1992;1995). The mean SDS score was 1.07 (SD 1.49) with a range of 0-7. More than half (56%) of the participants scored zero, 7 scored 1, 21 scored 2, 10 scored 3, 1 scored 4, 2 scored 5 and 1 each scored 6 and 7. The cut-off score for diagnosis of cannabis dependence using this measure is 3 (Swift et al., 1998) and 4 for amphetamines (Topp & Mattick, 1997). Examining each question individually, when asked if they every thought their ketamine use was out of control: 86% reported never, 12 sometimes and 1 often. The next question was whether the prospect of not being able to get any ketamine made them worried or anxious. 68% reported never, 29 sometimes, and 2 often. When asked how much did they worry about their ketamine use, 78% said not at all, 20 a little, and 1 person reported they often worried about their ketamine use. The vast majority (91%) said they never or almost never wished they could stop using ketamine, 6 sometimes, and 1 each worried about it often or always. Three quarters (76%) thought it would not be at all difficult to stop or go without ketamine, 20 thought it would be quite difficult, and 3 very difficult.

Table 3.14 Symptoms experienced more than 12 hours after use

Symptom	Percentage
Vivid dreams	43
None	35
Visual hallucinations	23
Insomnia	23
Confusion	20
Auditory hallucinations	16
Anxiety	13
Delirium	8
Irrational behaviour	8
Excitement	7

Around one in five participants (22%) reported that they needed more ketamine to get the same effect. When asked how long it took to fully recover from the effects of ketamine use 28% thought 1-2 hours, 26% were OK the next day, 17% less than 2 hours, 16% 2-3 hours, and 12% a day or two.

3.5 Use of Other Drugs and Alcohol

Two thirds (67%) of the participants had a drink containing alcohol at least weekly, with 8% being daily drinkers. The mean number of drinks per typical drinking day was 3.1 drinks (SD 1.9; range 1-7). More than a third of the participants (39%) classed themselves as cigarette smokers, smoking a median of 10 cigarettes per day (range 1-50 cigarettes per day). Table 3.15 sets out the percentage of participants who had used other illicit drugs, age of first use and frequency of use in the previous 12 months.

Daily use of other illicit drugs was reported by 2% of cocaine users, 11% of cannabis users, and 1% of methadone users.

Table 3.15 Pattern of other illicit drug use

Drug	% ever used	Mean/median (range of age of 1st use)	% used at least monthly
Ecstasy	99	22.5 (15-39)	68
Amphetamines (speed)	97	20.9 (14-34)	34
Cocaine	96	23.6 (16-38)	41
LSD	88	20.2 (14-35)	4
Cannabis	96	16.0 (12-34)	62
Amyl nitrate	84	20.3 (14-32)	28
Benzodiazepines	58	22.6 (14-34)	29
Heroin	31	11.9 (16-35)	2
Methadone	13	24.2 (20-28)	1
Anabolic-androgenic steroids (AAS)	18	26.7 (19-39)	8
GBH/fantasy	25	27.4 (18-39)	4
MDA	89	23.4 (16-35)	29
Nitrous oxide	35	19.0 (14-38)	2

Almost half (49%) of the participants had ever injected a drug other than ketamine. Table 3.16 describes the proportion of participants that had ever injected a range of drugs and the frequency of use.

Table 3.16 Frequency of injecting illicit drugs other than Ketamine

Drug	% ever injected	% used once only	% used 2-5 times	% used 6-10 times	% used 20+ times
Ecstasy	24	4	18	2	0
Speed	30	2	5	9	4
Cocaine	26	5	6	2	4
LSD	1	1	0	0	0
Benzodiazepines	7	2	5	0	0
Heroin	13	3	6	2	2
Methadone	0	0	0	0	0
AAS	10	0	1	1	8
GBH/fantasy	2	2	0	0	0
MDA	8	2	5	0	1

3.6 Deterrents to Ketamine Use

The majority of participants (69%) reported that they intended to use ketamine again. Table 3.17 sets out the likelihood of potential factors impacting on ketamine use deterring them from using ketamine again.

Table 3.17 Likelihood that participants will be deterred from using Ketamine by a change in this factor

Factor	% Likely/ extremely likely	% Don't know	%Unlikely/extremely unlikely
Cost doubling	31	10	58
Increased criminal penalties	8	5	86
Greater police enforcement	12	6	81
Deteriorating general health	91	1	3
Ketamine side effects	63	8	23
Lack of public acceptance of use	8	2	89
Information on the dangers of use	60	9	30

4.0 DISCUSSION

The ketamine users in this sample are a unique sub-group of the illicit drug using population in Australia. They appear to be a part of the growing 'party drug' culture in Australia with almost three quarters (73%) of them usually using the drug either at a rave/dance party or a club. Ecstasy and speed are among the most widely used drugs of this population. However, when compared with a previous study of ecstasy users (Topp et al, 1997), ketamine users differ in demographic profile and injecting behaviour. In common with other illicit drug users, however, in addition to the reasons for their drug use, they experience a range of negative health and psychological effects of their ketamine use.

4.1 Characteristics of the Sample

Compared to a sample of regular ecstasy users surveyed in 1997 (Topp et al, 1997), this sample of ketamine users was more likely to be older (30 years v 22 years), male (70% v 48%), in full-time employment (72% v 33%) and living in the inner city (67% v 44%).

This sample was also highly likely to be single (63%) and well educated. They also had a substantially higher disposable income than the general Australian community, with only 19% earning less than A$30,000 per annum.

Workers in the medical field have been identified as a key occupational group of ketamine users in the literature, particularly in terms of ketamine dependence. This sample reflects the unauthorized use within the medical and related professions with 14% possibly having ready access to a supply of ketamine in the course of their profession. When asked about supply, responses suggest that of those who know where their ketamine originated, there does appear to be some diversion from legitimate supply to the blackmarket, with hospitals, veterinary suppliers and pharmaceutical companies implicated.

Despite a range of recruitment strategies being implemented, recruitment in the early stages of the 22 months of study was primarily from within the homosexual dance party/clubbing scene. This supports anecdotal information that this population are often the first to experiment with new party drugs that appear on the scene. As a result 41% of the sample were identified as either homo/bisexual. However, in the last six months of recruitment it became increasingly easy to find heterosexual ketamine users. This could suggest that the drug had infiltrated a different market and was now becoming a more mainstream drug and was more widely available.
Users involved in the present study first experimented with ketamine comparatively late in their life (25.8 years), with only steroids and GBH first used at a later age. The sample appears to have added it to an already established list of party drugs. The late introduction to the drug could be due to the limited availability of the drug, which only recently appeared to become easier to obtain, or the negative image that ketamine continues to have among some party drug users (Crysell, 1998).

The three drugs reported as most widely used with ketamine were most closely linked to the party drug scene – ecstasy, MDA and amphetamines. This was supported by the sample's choice of drugs preferred to use with ketamine, once again ecstasy and MDA were the top choices. Over three quarters (78%) of the sample indicated that the main thing they do when using ketamine is dance, and even more (81%) believe that the drug heightens the effects of a dance party. This is in contrast to the findings of a small study in Glasgow which indicated that, in the sample studied, ketamine was not a dance drug (Dalgarno & Shewan, 1996). For many ketamine users, use was typically in a group setting, with half reporting that one of the best things about ketamine was the 'group experience' of use. Two thirds reported that they preferred to use ketamine with others; and 81% reported that they usually used ketamine in a group. This supports anecdotal evidence that the effects of ketamine are not only dissociative and isolating, but can also involve dissolution of boundaries resulting in feelings of bonding with others, and even identification with inanimate objects (Jansen, 2000c).

Although many of the negative effects described in Dalgarno & Shewan's (1996) paper were also identified by the present sample it appears that Australian ketamine users believed that the perceived positive benefits outweigh the negative effects as the vast majority (86%) enjoyed the effects of the drug. Australian users appear to take smaller doses than those in the Glasgow study. Dalgarno & Shewan (1996) reported that their sample snorted 'lines' of ketamine, equivalent to those used for drugs such as speed and cocaine. However, the present sample usually snorted 'bumps', smaller amounts of the drug, up to 30 times during a session, although the majority used far less frequently than this. This variation in dosage may contribute to the different beliefs held about the drug by the two samples.

These ketamine users were more likely to inject than party drug users previously studied. Twenty nine per cent of the present sample had injected ketamine, while 24% had injected ecstasy. This compares to the 1998 survey of ecstasy users where only 13% had ever injected ecstasy (Topp et al, 1997). Recent national surveys indicate that only 2.1% of the Australian population have ever injected illegal drugs (Australian Institute of Health & Welfare, 1999). This appears to be a risk-taking sample. According to this study, ketamine users appear to be a group who have used a wide variety of illicit drugs, with almost a half (48%) having injected another illicit drug at some time in their life. Furthermore, 12% of those who had never injected ketamine reported that one of the reasons they had not done so was because they were still satisfied with the intranasal route. It is possible that some of this group might experiment with injection if the intranasal route becomes unsatisfactory given the reported level of tolerance even among those who use relatively infrequently.

The injecting practices of the sample were not conducive to the transmission of HIV and other blood borne viruses. None of the ketamine injectors reported using a needle previously used by someone else. A possible hypothesis for the low incidence of needle sharing would be that the education strategies regarding safe injecting practices and free access to needles, syringes and other injecting equipment are effective in reducing risky injecting practices.

For a drug not used particularly regularly (less than 20% said that they used it more than a couple of times per month) it is interesting that so many users reported severe side effects as a consequence of ketamine use. In particular, many users reported regularly experiencing an inability to speak, blurred vision, lack of co-ordination, and increased body temperature. All of these symptoms have potentially serious implications for the safety of the user. However, for many of those who reported experiencing these symptoms, they were seen as *positive* effects of the drug. Previous research has shown that ketamine use has led to injuries as a result of burns, falls, and traffic accidents (for example) or even death (Gill & Stajic, 2000; Jansen, 2000c). This makes the development of harm minimisation messages particularly challenging given that some users appear to be actively seeking the effects that most place their health at risk.

Furthermore, although significant proportions of this sample had only used ketamine a few times, and only one third reported having used 20 or more times, 8% reported that 'tolerance' to ketamine's effects was a negative effect of use; and 22% reported that they had needed to take greater amounts of ketamine to achieve the effect they wanted. The development of tolerance has been studied by anaesthetists (Byer & Gould, 1981, Cumming, 1976), and noted in case reports of illicit use (Jansen, 1990), but has not been studied in recreational use populations. The parameters of tolerance in this context is an issue for future research. Tolerance may develop to some effects but not others, possibly placing users at increased risks of some of the side effects of ketamine use.

One in five of the sample reported that they had experienced a 'severe side effect' (self-defined by the respondents), which included vomiting and passing out. One third of the sample (38%) had assisted another person who was 'suffering badly' after using ketamine. Clearly, negative experiences from ketamine use appear to be a frequent occurrence, even among a group that did not appear to have had an extensive use history.

While the issue of duration was not explored, it seems likely from the problems described that some participants met the lifetime criteria for substance abuse disorder for ketamine, described in the DSM-IV as recurrent use resulting in failure to fulfil major role obligations at work, school or home or continued use despite persistent or recurrent social and interpersonal problems (American Psychiatric Association, 1994). There are some indications that more than one in five of the participants (22%) may have met criteria for a ketamine use disorder. This is particularly surprising given the frequency and amount of use reported by the sample.

Conclusions

In this sample of ketamine users, ketamine appeared to be a drug that had been added to an already extensive drug use repertoire. They were generally a well-educated group of people, few of whom were in relationships, and largely having high incomes. They appeared to be an older

group of 'party drug' users, in contrast with a sample of regular ecstasy users interviewed in a similar period.

Many ketamine users had had only a limited use history. Despite this, many had experienced negative side effects, which had meant they had either reduced their dose or stopped use. Nevertheless, significant proportions of this sample reported that their reasons for use related to the side effects that might place them at risk of physical injury. Many of the sample reported having injected ketamine at some time, as well as a variety of other drugs. Many of the sample had injected drugs, and while the survey reveals that they were not necessarily placing themselves at risk of HIV infection, they may be susceptible to other blood borne viruses such as Hepatitis C, as well as other injecting risks, such as vein damage.

Efforts to develop harm minimisation messages for this group will need to take into consideration the possibility that a large proportion of the group are well-educated and well-informed in their approach to drug use. Furthermore, efforts to warn users or potential users of the negative side effects of this drug may simply promote future use of ketamine by persons who find these 'negative' side effects desirable.

5.0 REFERENCES

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6.0 APPENDIX I (Structured interview)