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SUBSTANCE ABUSE DEPARTMENT

Volatile Solvents Abuse

A global overview

SOCIAL CHANGE AND MENTAL HEALTH
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ABSTRACT

This report provides an overview of current views about the problem of the use of volatile substances to achieve intoxication in a variety of settings.

Volatile solvent (VS) use is a world-wide phenomenon, mainly (but not exclusively) occurring among young people. The associated health risks – even with experimental use – are considerable but are generally under-rated and under-researched. Polysubstance use (especially VS use combined with alcohol and tobacco) is common among VS users. They also frequently have other health problems. Among young people, it is often the first psychoactive substance they experiment.

Controlling the supply of volatile solvents may have some marginal effect on the public health impact of the problem, but on its own is not an answer. Many countries have some legal controls on supply, but few have sought to make possession or 'misuse' of volatile solvents a legal offence. Education for retailers helps to raise awareness of the problem.

Attempts to limit demand have largely been by educational means. However, educational programmes often exclude or marginalise education about VS use. While there are doubts about the effectiveness of education, 'life skills' approaches show the most promise. Education has more chance of success when it involves the whole community as compared to an isolated measure in the school setting. Other demand reduction approaches, such as the addition of compounds to alter the taste or smell of the products containing volatile solvents have very limited value, given the wide variety of products which contain solvents and are used for commercial purposes.

Reducing the harm of VS use among those who are using is sometimes controversial, but there are certain clear messages that may help to reduce VS-related mortality and morbidity. These must be tailored to the local situation, taking into account the substances used, methods and manners of use and the characteristics of the groups using them.

Treatment appropriate for VS users will depend partly on the extent of their use and related problems. Very little has been evaluated in the area of treatment for chronic VS use and dependence, therefore being difficult to recommend the most effective approaches. Detoxification is often not necessary for dependent users, but a period of 'time out' from everyday difficulties may assist the user in reducing or stopping use, but this depends on the local conditions and resources. Support from peers is important, and self-help approaches show great promise. Treatment methods devised for older users of other drugs will need adaptation if they are to work with this client group. New methods of working are still required. It is important to deal not just with the VS use, but also with the multitude of problems that a VS user may have, including marginalization and limited access to health care. Treatment should not focus only on the individual, but needs to address group and community issues as well. Group work and community-based approaches should therefore be further developed and evaluated.

Evaluation of treatment and prevention approaches is a neglected area, but given its complexities, this is not surprising. The multiple and evolving aims of projects make evaluation difficult, and identifying change requires measures that go beyond simple calculation of a reduction in, or abstention from, substance use. Evaluation needs to be built in from the start of a programme and used to inform the intervention throughout. Evaluation is part of the process of intervention, helping to make it more effective.

CONTENTS

INTRODUCTION

This report provides an overview of the intentional use of volatile solvents (VS), often to achieve intoxication, which are commonly found in the home and workplace. In preparing this report, other reviews of the problem have been drawn on (e.g. Flanagan & Ives, 1994; Ives, 1990, 1995), as well as original research and case materials. The objective is to provide the basis for a comprehensive strategy, presented in part II of the report, to be tested in various countries, aimed not only to better understand the extent of the problems related to VS use but also to evaluate the effectiveness of a variety of approaches to reduce them at the national and local levels.

Compared to the use of other psychoactive substances, VS use has been relatively neglected, yet it is dangerous, with particular risks of death associated with acute intoxication. While most use is experimental and short-term, there are some people who use these products over a long period of time and in large quantities. VS use is particularly associated with young people, and in certain countries, with particular groups of young people such as street children and indigenous populations. Because there are many products that can be used to achieve intoxication which is readily available in the home and in a range of shops inexpensively, VS is often the first substance used by young people.

The WHO Substance Abuse Department (SAB)[1] has carried out several projects in which the problems related to volatile solvents have been tackled. In 1992, SAB convened an international consultation on solvent abuse in Geneva. Representatives from seven countries, Bangladesh, Guatemala, Ivory Coast, Morocco, New Zealand, and Phillippines attended. Current knowledge on the use of solvents in various countries and the national and local responses to the problem were reviewed, then a general framework for a comprehensive programme was proposed (WHO/PSA/93.8). However, due to lack of funds, no progress was made towards the implementation of the framework.

In 1992, SAB also started the Street Children Project. Phase I (WHO/PSA/93.7) studied the nature of substance use among 550 street children in 10 cities worldwide, indicating that volatile solvent use is very common and it is related to several health and social problems, including stigmatization and marginalization of users. In Phase II, which began in 1994, particular sites were chosen to assess the model for planning services and programmes for street children, as well as to develop a training manual for street educators, which included topics on volatile solvents. Phase III aims to take the project to scale, which may include the identification of model programmes, a strategy to provide training at a regional level, research and evaluation (WHO/PSA/96.12).

Finally, SAB initiated the Indigenous Peoples and Substance Use Project, with case study reports from 12 different indigenous communities (Berbers of Morocco; Canadian First Nations; Greenlanders of Greenland; Maoris of New Zealand; Mayas of Guatemala; Ogonis of Nigeria; Potiguara Indians from Brazil, Tongans of Tonga; Torres Strait Islanders of Australia; a Vietnamese hill tribe community and Yuracares of Bolivia). These described the nature, extent and context of substance use and problems of these communities and some of the responses which have been used. Phase II of the project was initiated in 1995 with a project planning meeting and the development of a comprehensive community-based action to prevent and manage substance use (WHO/PSA/96.12). Particularly among the Canadian First Nations, support given for interventions on volatile solvent use problems allowed the development and implementation of culturally appropriate treatment programmes in several indigenous communities across Canada.

[1] The WHO Programme on Substance Abuse (PSA) was renamed as WHO Substance Abuse Department (SAB) by the end of year 1998.

Terminology

In this report the term VS use is adopted to describe the intentional inhalations of a variety of volatile substances (most of them being organic solvents), for mind altering and recreational purposes. The term 'inhalants' has come to encompass a group of psychoactive chemicals that are defined by the route of administration rather than by their experienced effects on the central nervous system (CNS) action. Thus, such diverse substances as toluene, ether, and nitrites have been included under the rubric of inhalants because they are all taken in through the nose and mouth by inhalation. Their effects are rapid but of short duration, because the substances quickly enter the bloodstream via the lungs, from where they easily pass to the brain to act in several areas, producing their effects. Recovery is also relatively rapid as substances rest on the neuronal membrane only for a short period and go back to the blood stream and from there are finally metabolized in the liver. Thus one can get 'high' (intoxicated) several times over a short period of time. The effects of acute intoxication with volatile inhalants are similar to being drunk on alcohol, but some experience hallucinations or pseudo hallucinations as well.

Under certain circumstances of use, VS can cause symptoms that meet the criteria for a diagnosable mental health disorder. According to the ICD-10 terminology (International Statistical Classification of Diseases, 10th edition, WHO 1992), these include intoxication, harmful use, dependence and withdrawal. Without going into many details, below are brief definitions of key terms:

intoxication - an acute condition that follows the administration of a psychoactive substance and results in disturbances in the level of consciousness, cognition, perception, judgement, affect, or behaviour, or other psychophysiological functions and responses. Intoxication is highly dependent on the type and dose of substance and is influenced by the individual's level of tolerance and other factors. The disturbances resolve with time, with complete recovery, except where tissue damage or other complications have arisen.

harmful use - a pattern of psychoactive substance use which is causing damage to health. Such damage may be physical (e.g. neuropathy, hepatitis), or mental (e.g. depressive episodes). Adverse social consequences often accompany harmful use, but are not required to be present. Nor are social consequences in themselves sufficient to result in a diagnosis of harmful use.

tolerance - a decrease in response to a psychoactive substance dose that occurs with continued use. Increased doses are required to achieve the effects originally produced by lower doses. Both physiological and psychosocial factors may contribute to the development of tolerance, which may be physical, behavioural or psychological.

dependence - repeated use with a cluster of behavioural, cognitive and physiological phenomena, including a strong desire to take the substance, impaired control over its use, persistent use despite harmful consequences, a higher priority given to drug use than to other activities and obligations, increased tolerance, and sometimes a withdrawal syndrome when the substance is discontinued.

withdrawal - a group of symptoms of variable clustering and degree of severity which occur on cessation or reduction of use of a psychoactive substance that has been taken repeatedly, usually for a prolonged period and/or high dose. The onset and course of the withdrawal syndrome are time-limited and are related to the type of substance and dose being taken immediately before cessation or reduction of use. Typically, the features of a withdrawal syndrome are the opposites of those of acute intoxication.

However, other terms related to the pattern and manner of using psychoactive substances are in common use in the literature related to volatile solvents, such as 'solvent abuse/misuse', functional/dysfunctional use, experimental/ recreational/chronic use. In several countries, the practice is often referred to as 'inhalant abuse'. Some terms refer to the use of particular products, such as 'glue sniffing', 'gas sniffing', 'petrol sniffing'. (The English term 'petrol', rather than 'gasoline', is used in this paper.) There are also many slang terms in English, such as 'huffing'. For convenience, the practice will be described as 'VS use' or 'inhalation'; the products used

as 'inhalable products'; and the people who engage in it as 'inhalers' (this is a better term than 'sniffing' as the products are inhaled through both the nose and mouth).

Such terms are used in the literature with less precision and therefore it is difficult to know whether a chronic solvent user is dependent or not, or has developed harmful consequences from such use. An experimental user may die from sudden sniffing death while dependent users may not show other physical harm related to solvent use. As it can be seen, these patterns may overlap or the same individual may have several patterns over time, therefore, they should not be viewed in a rank of severity in terms of impact on the individual's health. The health consequences of VS use are difficult to relate to the dose, as dose is very difficult to quantify for an inhalable substance (except in laboratory-controlled conditions where dose can also be related to blood levels). Whenever possible, the most precise terminology was used in this report; however, when discussing the literature available, the terminology used in the original work has been maintained because of the difficulty in finding out the precise meaning of the term employed.

Products used

For products to be used as inhalant, they must contain a suitably volatile compound (or compounds) which is accessible in sufficient quantity free from particularly toxic components. These products include the following:

volatile hydrocarbons such as those found in cigarette lighter refills, normally butane gas
aerosol sprays (these formerly contained volatile CFCs, now the propellant is most often butane gas almost any aerosol may be used; hair-sprays and pain-relieving sprays are common)
solvent-based contact adhesives (glues), especially those containing toluene
correcting fluids and thinners (until recently mostly containing 1,1,1-trichloroethane)
dry-cleaning fluids
the contents of some types of halocarbon fire extinguishers
petrol (gasoline)
liquefied petroleum gas (LPG), most often butane
inhalational anaesthetics such as enflurane and nitrous oxide
other halogenated solvents

See tables 1 and 2 for more detail of the chemicals involved.

Many aerosols formerly contained CFCs (chloro-fluoro carbons). Today, because of concerns about their effect on the ozone in the upper atmosphere with its implications for global warming, CFCs are used in only a few aerosols. Instead, butane gas is often used as the propellant. CFCs had the advantage of being nonflammable so the use of butane as a propellant poses additional dangers for unwary inhalers, particularly if they smoke while inhaling.

Petroleum distillates such as white spirit and paraffin (kerosene), and also alcohols and diols such as ethanol, 2-propanol, 2-methoxyethanol (methyl cellosolve) and ethylene glycol, are not sufficiently volatile to be used by inhalation.

However, amyl (pentyl) and isobutyl nitrites may be used by inhalation. The pharmacological effects (vasodilation), make them attractive to some male homosexuals, although there is some anecdotal evidence from the UK dance scene of more widespread use. Since their use is different from most other volatile substances, nitrites are not further discussed in this paper. For further details, see the review by Haverkos and Dougherty (1988).

Table 1 Volatile substances with potential for intoxication by inhalation[†]

Hydrocarbons:	
Aliphatic	Acetylene
	Butane[1]
	Isobutane (2-Methylpropane)[1]
	Hexane[2]
	Propane[1]
Alicyclic/aromatic	Cyclopropane (trimethylene)
	Toluene (toluol, methylbenzene, phenylmethane)
	Xylene (xylol, dimethylbenzene)[3]
Mixed	Petrol (gasoline)[4]
	Petroleum ethers[5]
Halogenated	Bromochlorodifluoromethane (BCF, FC 12B1)
	Carbon tetrachloride (tetrachloromethane)
	Chlorodifluoromethane (FC 22, Freon 22)
	Chloroform (trichloromethane)
	Dichlorodifluoromethane (FC 12, Freon 12)
	Dichloromethane (methylene chloride)
	1,2-Dichloropropane (propylene dichloride)
	Ethyl chloride (monochloroethane)
	Halothane (2-bromo-2-chloro-1,1,1-trifluoroethane)
	Tetrachloroethylene (perchloroethylene)
	1,1,1-Trichloroethane (methylchloroform, Genklene)
	1,1,2-Trichlorotrifluoroethane (FC 113)
	Trichloroethylene ('trike', Trilene)
	Trichlorofluoromethane (FC 11, Freon 11)
Oxygenated compounds	Acetone (dimethyl ketone, propanone)
	Butanone (2-butanone, methyl ethyl ketone, MEK)
	Butyl nitrite[6]
	Enflurane (2-chloro-1,1,2-trifluoroethyl difluoromethyl ether)
	Ethyl acetate
	Diethyl ether (ethoxyethane)
	Dimethyl ether (DME, methoxymethane)
	Isobutyl nitrite ('butyl nitrite')[6]
	Isoflurane (1-chloro-2,2,2-trifluoroethyl difluoromethyl ether)
	Isopentyl nitrite (3-methyl-1-butanol, isoamyl nitrite, 'amyl nitrite')[6,7]
	Methyl acetate
	Methyl isobutyl ketone (MIBK, isopropyl acetone)