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Review Article

Inhalant Abuse: A Curse to the New Generation Adolescents

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Abstract: Inhalant Abuse or commonly known as "Glue Sniffing", has emerged as one of the important form of Drug Addiction in the present world particularly Asian countries. The mind-blowing fact remains that the children and adolescents are the common victims to it resulting in severe brain damage and behavioural abnormalities, liver and kidney failure, suffocation and even death in some cases. The inhalants are easily available in the market in the form of many domestic household products making its easy accessibility to teenagers. Government should take strict law enforcement measures to regulate the sale of such chemicals amongst the teenagers. The parents, friends and social agencies are also to take active part in its prevention and necessary care-giving to an addict.
Keywords: Inhalant abuse, Glue sniffing, Adolescents, Neurotoxicity.

INTRODUCTION

Inhalants include chemicals found in such household products as aerosol sprays, cleaning fluids, glue, paint, paint thinner, nail polish remover, amyl nitrite and lighter fuel that are sniffed or "huffed" [1].

Inhalations of substance or fumes are through the nose or mouth, can cause permanent physical and mental damage. Inhalants affect the brain. They starve the body of oxygen and force the heart to beat irregularly and rapidly. Inhalants can kill a person by heart attack or suffocation as the inhaled fumes take the place of oxygen in the lungs and central nervous system. People can loss their sense of smell, suffer nausea and nose bleeds and may develop liver, lungs and kidney problems. Continuous use of inhalants can cause diminished muscle mass, tone and strength. Even can make people unable to walk, talk and think normally. Much damage is caused to the brain tissue, when the toxic fumes are sniffed into the sinuses [1].

Easily available in plenty, a gum or an adhesive is common inhalants used as means of addiction. Commercially the most commonly available as Dendrite but the nick name to the addicts is "Dandy". Dandy is basically made in India but used in all the Asian countries. It is usually used by the shoemakers for gluing shoes, leather and leather products and by the carpenters for joining wood materials. Also it is used to repair tubes of bicycles, motor vehicles, synthetic leather, plastic, Formica, foam, wood, rubber and fabric [2].

The inhalant abuse is highest in the 7^{th} and 9^{th} grade population, although use may start at much younger age [3]. The addiction process is interesting. Groups of street children are usually seen usually near the city slum areas huddled together, blowing into seemingly empty polythene bags, milk or chips packets at several spots. A little bit of inhalant like dendrite is taken inside the bag and the pungent smell of the adhesive is sniffed from inside the bag and become addicted [2].

Dandy, being an adhesive, is not yet categorized as a drug. As a result, the law enforcement authorities cannot prevent the children and adolescents from using this. Furthermore, no restriction is there of selling [2].

One of the common causes of increase in inhalant abuse is the high costs of the hard drugs like Heroin,

phensedyl, cannabis etc. whereas the dendrite or other common household inhalants are cheap and easily available.

A study in Bangladesh [4] shows that out of 1.5 million children in the country, 1.3 million in Dhaka city itself is addicted to Dandy.

The estimated number of street children in Nepal ranges from 3100 to 5000, increasing at the rate of 1000 children taking to the streets every year. Drug addiction and glue sniffing are a relatively new phenomenon among them. The low and easy availability causes a dramatic increase in their damaging behavior. Some reports that 95% of them sniff Dendrite [5].

The adhesive glue contains toluene and other hydrocarbons which are sweet smelling substances that are highly neurotoxic. It dissolves the membrane of the brain cells and causes hallucinations, affects mental health, causes kidney and liver failure, paralysis and even death [6].

COMMON INHALANTS

- Volatile solvents such as shoe polish, paint, paint thinner, glue and gasoline.
- Office supplies such as felt tip markers, correcting fluids, computer dust-off sprays.
- Butane, propane and nitrous oxide gases. Butane is found in hair sprays, air freshners, spray deodorants and spray paints.

TOXIC SOLVENTS

Chemistry and properties

Toluene, formerly known as toluol is a clear, water insoluble liquid with the typical smell of paint thinners. It is a mono-substituted benzene derivative i.e., substituted by a methyl group and its systematic name is methyl benzene. It is an aromatic hydrocarbon that is widely used as industrial feedstock and as a solvent. Like other solvents, toluene is also used as an inhalant drug for its intoxicating properties. It can also cause neurological harm [7].

Toluene reacts as a normal aromatic hydrocarbon towards electrophilic aromatic substitution [8]. The methyl group makes it around 25 times more potent than benzene. It undergoes smooth sulfonation to give p-toluene sulfonic acid and chlorinate in presence of $FeCl_2$ to give ortho and para isomers of chlorotoluene.

Toluene occurs naturally at low levels in crude oil and is usually produced in the process of making gasoline via a catalytic reformer, in an ethylene cracker or making coke from coal [9]. Final separation, either via distillation or solvent extraction, takes place in one of the many available processes for the extraction of BTX aromatics (benzene, toluene and xylene isomers) [10].

Toluene is used as a common solvent, able to dissolve paints, paint thinners, silicone sealants and many chemicals reactants, rubber, adhesives, printing ink, leather tanners, lacquers disinfectants. It acts as a solvent for carbon nanomaterials. It is used to break open red blood cells in biochemistry experiments [11, 12].

Inhalation of toluene in low to moderate levels can cause tiredness, confusion, weakness, drunkenness type of reactions, loss of appetite, memory loss, nausea, loss of hearing and colour vision. Symptoms usually disappear when exposure is stopped. Inhalation of high levels of toluene in a short time may cause light headedness, nausea or sleepiness, can cause unconsciousness or even death [13].

NEUROTOXICITIES AND EFFECT ON BRAIN

Inhalant intoxication initially mimics drunkenness. There is usually a brief euphoric stage with dizziness and silly behavior followed by some loss of coordination, drowsiness, may have slurring speech, fell down and become lethargic. Agitation, confusion and loss of consciousness may occur [3].

Chronic inhalant abuse can lead to permanent loss of brain tissue volume and lasting abnormalities in brain structure. Inhaling solvents causes more cognitive impairment than cocaine abuse [3].

Some drugs work in the brain because they have a similar size and shape like neurotransmitters. In the brain, in right amount of dose and preparation, they lock to the receptors and start an un-natural chain reaction of electrical charges, causing neurons to release a large amount of neurotransmitters. Some drugs lock into the neuron and act like a pump, so the neuron releases more neurotransmitters. Other drugs block reabsorption, or uptake and cause flooding of neurotransmitters [14].

The first time someone uses a drug of abuse, he feels an intense experience of pleasure because they sense more than enough dopamine [15].

OTHER SHORT TERM AND LONG TERM EFFECTS

The immediate effects of dendrite can be nausea, coughing, sneezing, exhaustion, bleeding noses, bad breath, loss of appetite. Deep breathing of the dendrite or using a lot over a short period of time may cause losing touch with ones surroundings, violent behavior, loss of self control, unconsciousness and even death [5].

In addition inhalants can kill a person by heart attack or suffocation as the inhaled fumes take the place of oxygen in the lungs and central nervous system. Some individuals suddenly react with extreme violence [16].

Long term effects can lead to muscle wasting, reduced tone and strength of muscles and can permanently damage the body and brain.

Long term use of Dendrite can cause weight loss, muscle fatigue, exhaustion electrolyte imbalance, and later permanent damage to kidneys, liver, blood, bone marrow and nervous systems. The long term drug abuse can cause permanent damage to the child and can even lead to death [5].

THE DEVELOPMENT OF ADDICTION

Drug addiction basically is a complex brain disease. It is characterized by compulsive, at times uncontrollable, drug craving, seeking and use that persist even in the face of severe negative consequences. Drug seeking becomes compulsive, of the effects of prolonged use on brain functioning and on behavior. For many people, this drug abuse becomes chronic which returns even after long period of abstinence [17].

It is not certain to the fact that how many times a subject has to inhale to become an addict. A person's genetic make- up probably plays a role. After enough doses, an addicted teens' limbic system crave for the drug as it craves for food. Because of the down regulation drug craving is made worse. Without the dose of the drug, the dopamine level in the addict's brain is low and abuser feels lifeless and depressed. So, abuser wants to take the drug to make the dopamine back to the normal level. Larger amounts of drug are needed to achieve the same dopamine level resulting in development tolerance [18, 19].

SEVERE SYMPTOMS AND DEATH

Huffing can cause individuals to experience headache, nausea and vomiting, but the most dangerous side effect is asphyxiation and sudden sniffing death syndrome. Asphyxiation occurs when oxygen in the lungs is displaced by the chemicals inhaled, leading to convulsions, coma or loss of life. Sudden sniffing death syndrome refers to death caused by chemically triggered irregular heart rhythms [3].

TREATMENT

Treatment is directed at stopping inhalation. It is very difficult to identify the glue sniffing unless the odour can be detected or signs of intoxication are present. Tolerance to solvent inhalation can develop and it can take large amounts to achieve the initial effect [20].

PREVENTIVE STEPS THE PARENTS CAN TAKE

Inhalant abuse is not readily apparent. A child or an adolescent can sneak away to the basement or garage for 10 to 15 minutes, sniff the inhalant and quickly recover. The parents can watch the chemical odour in the body, breath or clothing or paint stains on the clothes. Red eyes and a running nose are signs of sniffing and huffing.

STREET CHILDREN PROJECT TO PREVENT DRUG ABUSE

Awareness programmes should be launched in order to raise awareness among shop owners and street children. The Government should make the sale of Dendrites to children illegal which is one of the ways to control glue sniffing and to prevent health hazards among street children. Already South-east Asia, Latin America and Africa have introduced laws against supplying harmful substances to children [2].

World vision India was able to serve 1000 children living in the slums, city suburbs and along the railway lines addicted of inhalants. The project is working alongside institutions in juvenile de-addiction programme. Children are also given importance to the education, personality development, life skills, talent development, behaviour changes. The project is also able to partner with social activists, journalists, local celebrities and other members of the society in order to provide a solution [21].

A doctor should be consulted if a child or adolescent is found to be abusing inhalants. A young teenager who is in the habit of glue sniffing needs careful psychological support and attempt should be made to find the reason for the habit and to explain the seriousness of the condition. Glue sniffing can be the first contact with drugs and may lead on to the use of illegal drugs like heroin.

Drug addiction can be effectively treated with behavioural based therapies and medications. Treatment may vary for each person depending on the type of drug being used and the individual's specific circumstances. In many cases multiple courses of treatment are needed to achieve success.

- Talking to parents or supportive adults or friends.
- Limitation of the time spent with drug or alcohol using friend.
- Start thinking about yourself, get out and participate in activities that may take off the mind off the situation.

FUTURE RESEARCH AREAS

- Solvent should be replaced by water soluble products in the domestic household, whenever possible.
- The solvents used in domestic household products should be denatured by certain chemicals having obnoxious non-toxic smell.

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