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An Uprising Health Concern of Inhalant Abuse among Adolescents: A Mini Review

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Abstract

Inhalant abuse is an emerging problem of the decade. Of late, it is reported that inhalants are being abused by adolescents. Some studies have help out to describe the epidemiology of volatile substance abuse in the worldwide. Many parents disregard the hazards posed to their children and adolescents from collective products used in home that contain volatile substances. Products such as nail polish remover, glues, spray paints, air fresheners, Hair spray, Varnishes, lacquers, resins, lacquer thinners are widely available for human needs. Adolescents inhale vapours from these causes in search of intoxication devoid of being aware of severe health consequences. Severe effects include impulsive sniffing death syndrome, asphyxia and serious harms. Long-term abuse affect neurologic, cardiac, hepatic, and renal systems. Through scientific research and report of researchers we have reviewed about the nature and level of inhalant abuse, its pharmacology and its consequences. By this review, it is need of the hour to enlighten the abuse and harmful effects of volatile liquids in commonly available in household and cosmetic products to the scientific community.

Keywords: Inhalants, Substance abuse, acute exposure, chronic exposure.

INTRODUCTION

Inhalant abuse is an emerging problem worldwide. It is also an often unnoticed form of substance abuse in adolescents. The major problem is with prevention and treatment of inhalant drug abuse. The prevalence and consequences of inhalant use appear to be high among children's and adolescents. Annually, the United Nations Office on Drugs and Crime (UNODC) announces the World Drug Report for pretension to advice the understanding of the world drug abuse problem and countering its impact on health, supremacy and security. The reports contains the data on World Population Prospects on abuse, facets of inhalant misuse, highlighting novel information collected and data pertaining to adolescents and provides recommendations for management of inhalant abuse (1). In Indian scenario, reports states that 78% of patients are admitted at a hospital to treatment for inhalant abuse signs of withdrawal indicated by anxiety, fatigue, and irritability, craving, and reduced concentration (2). In addition, previous reports are also concurrent with current information that the peak age of inhalant abuse was 12 to 18 years. Hence, all these reports suggest that there is a lack of knowledge in adolescents abusing such chemicals and volatile substance (3). The type, incidence and method of volatile substance abuse diverge generally related to age of the abuser and geographical area. Epidemiological studies piloted an era ago in the country had no queries about this abuse. There is inadequate existing collected works on the problem from India. Lastly, Indian National Household Survey on 2019 drug use conducted among surveyed in children's aged 12–18 years failed to classify the inhalant use (4). The awareness of inhalants as 'kid's drugs' has been defined. This awareness may explain the epidemiological trends of inhalant abuse and justifies attention by health care professionals (5). Inhalant abuse seems to be further prevalent among rural or urban societies with high rates of unemployment, poverty and violence (6). Due to the above environmental conditions, such abuse of inhaled chemicals by these individuals was to produce self-intoxication and/or altered mental state to overcome their personal issues (7). Complete evidence-based prevention and intervention strategies are needed to report inhalant use and its effects (8).

TOXIC EFFECTS OF INHALANTS

The different methods by which chemicals are inhaled through the nose and the mouth are: sniffing or exhaling fumes from containers, spraying aerosols, Bag sniffing or inhaling fumes from materials inside a bag (9). Inhaled substances get absorbed directly into the circulation through the lungs and are rapidly distributed to the different organs (10). Within a few seconds of inhalation, the abuser would experience intoxication (11). The produced effects may vary from garbled speech, the incapability to coordinate movements, hallucinations, euphoria and dizziness, light-headedness and delusions (12). Due to short term action due to inhalation route, users frequently seek to get intoxicated by inhaling repeatedly for several hours, which is a very dangerous repetition that can lead to prolonged loss of consciousness and maybe death occur in us(13). Such chemicals that are abused are listed under aliphatic, aromatic and halogenated hydrocarbons in inhalants known to produce severe effects. The chemical properties of the inhalants determine the definite toxicity, while the doses and method of ingestion affect which organs are exposed to the toxicity (14) (15).

Inhalant abuse can produce devastating medical consequences. The reported neurotoxic effects of continuous inhalant abuse contain neurological conditions that reproduce injury to brain involved in cognition, movement, vision, and hearing. Prolonged exposure can produce major damage to the heart, lungs, liver, and kidneys. Many conditions caused by recurring and prolonged abuse are irremediable. Inhalant abuse also can cause death by Suffocation, Convulsions or seizures,

Asphyxiation, Coma, choking, fatal injury. Animal models allow methodological control and capability to investigate the effects of withdrawal from toluene without potential confounds (37) (38). Withdrawal symptoms include tremors, seizures, irritability, insomnia, anxiety, delirium, tingling sensations and muscle cramps. Afflicted patients exist with sleep disturbance, tremor, nausea, petulance, and abdominal pain. In Table 1, we list and summarise certain commonly available chemicals that have been reported to be abused by the adolescents along with their toxic effects produced on exposure.

CURRENT CLINICAL STRATEGIES FOR INHALANT EXPOSURE:

Most intoxicated inhalant abusers do not look for medical care and only when it intoxicate the abuser will get attention towards the treatment. In addition, documenting such detailed history of incidences and history of substances that have abused all can help predict an epidemiological model. The core principle of substance abuse treatment must address various facets of therapy. First and foremost is the clinical aspect of patient's stability. Suitable pharmacological treatment may be given to counter the effects produced by the identified inhalants. For example, if the patient is suicidal, delirious, gravely disabled; suitable administration of medications such as risperidone, haloperidol to relieve any psychosis associated to the chemicals inhaled.

Upon clinical recovery, the next aspect would be to counter the emotional aspect which is to prevent any further recurrence of abuse and prevent neurocognitive implications. This is achievable by rehabilitation. Counselling must be instigated, along with patient education to explain the dangers of inhalant abuse. Treatment approaches for inhalant abuse are similar to individuals used to treat addictive behaviour. These treatments contain cognitive behaviour therapy, 12-step facilitation, multisystem and family therapy, and motivational enhancement methods. For chronic abusers, prolonged detoxification is usually recommended. Any occurrence of psychiatric conditions or physical syndromes need to be taken into concern and treated. Cognitive-behavioural therapy benefits patients diagnose, avoid, and cope with the situations in which they are most probable to use drugs (39). Consequently at last, the social aspect of giving proper academic knowledge and improve the quality of an individual and his/her environment can altogether alleviate the root cause of such abuse (40).

Table 1: Summary of Volatile Chemicals, their product availability, Toxic effects produced on exposure.

Chemical Abused	Properties and Product Availability	Toxic Effects	References
Trichloroethane	A colourless and non-inflammable liquid. It has a sweet, chloroform-like odour. Cold cleaning and vapour degreasing agent. Found in aerosol sprays, spot cleaners, glues, and lubricants.	Reported Toxic effects include CNS depression, behavioural changes, hypotension, dysrhythmia, respiratory arrest, and pulmonary oedema, macro nodular cirrhosis, transient hepatitis, dermal burning sensation erythema, ocular irritation and transient conjunctivitis. Acute exposures suffer brain and cardiac damage due to hypoxia. Chronic exposures can cause impaired memory and balance and also dermatitis and it is being assessed for carcinogenic effects	(16) (17)
Trichloroethylene	A clear colourless volatile liquid and ethereal odour. Solvent to eliminate grease from metal portions. Ingredient of adhesives, pesticides, paints, varnishes, paint strippers, lubricants and cold metal cleaners.	Reported toxic effects include CNS depression, decreased appetite, headaches, skin irritation, eye defects, clonal atresia, hypospadias, hepatotoxicity, renal failure, cardiac arrhythmias, Reactive airway dysfunction syndrome (RADS). Acute exposures can cause drowsiness, mucous irritation, headaches, and liver damage. Chronic exposures cause ataxia, short term memory loss, vertigo, neurotoxicity and nephrotoxicity and it also being assessed for carcinogenic effects	(18) (19).
Toluene	A clear, colour less liquid with a distinctive odour. Used in manufacture of paints, lacquers, paint thinners, adhesives, fingernail polish and leather tanning processes.	Reported toxic effects include headache, dizziness, light-headedness, and confusion, nausea and blurred vision, loss of consciousness, coma and death. In solvent abusers, electrolyte and acid-base disturbances have resulted in renal tubular acidosis, deficiency of potassium and phosphate. Acute exposure effects are respiratory arrest, chemical pneumonitis, RADS, IIA, cardiac abnormalities, renal failure, bone marrow dysplasia and anaemia. Chronic exposures of toluene results in neuropsychiatric effects,	(20) (21)

Chemical Abused	Properties and Product Availability	Toxic Effects	References
		Disorders of the muscles, renal tubular damage, cardiovascular effects, and sudden death	
Acetone	A clear, colourless, characteristic odour of pungent or fruity liquid. Found in paints, varnishes and lacquers. Common nail polish remover component.	Acute exposure includes-CNS depression, confusion, headache, light-headedness, nausea, respiratory tract irritation, sinus tachycardia, and vomiting, hypothermia, inebriation, irritability, lethargy. Chronic exposure produce Cardiovascular collapse, loss of consciousness, restlessness, seizure, slurred speech, stupor, Burns, contact dermatitis, defatting effects, dry skin, erythema, irritation, Hyperglycaemia, ketosis, metabolic acidosis, polydipsia, premature menstrual periods, shortening of menstrual cycle, Oesophageal erosion, nausea, soft palate erosion, throat irritation, Leucocytosis, Gait disturbance, paraesthesia, rhabdomyolysis, weakness, Corneal erosion (rare), eye irritation, nystagmus Glycosuria, ketonuria, polyuria, renal failure.	(22) (23)
Methylene Chloride	A clear, colourless liquid with a pleasant odour. Found in paints, varnish strippers and in degreasing agents. Used in the manufacture of photographic films, pharmaceuticals, adhesives, inks, synthetic fibres, and printed circuit boards. Propellant for air fresheners, insecticides, and paints.	Acute effects include headache, drowsiness, slowed reaction times, light-headedness, decreased alertness, slurred speech, irritability, impaired gait, and stupor. Chronic severe effects include coronary disease, angina, myocardial infraction and cardiac failure, may suffer airway irritation, accumulation of fluid in the lungs, inflammation of the lungs, liver dysfunction, skin irritation and blistering, burning pain and inflammation of the eye surface and iris.	(24) (25).
Ethyl Acetate	A colourless liquid, with a characteristically sweet, pleasant odour. Because of its odour, it is one of the most potential abused substances. It is used in nail lacquers and nail polish remover, glues, paints and perfumes.	Ethyl acetate causes irritation when it comes into contact with the eyes and skin. Chronic exposure causes some severe effects such as damage to the following organs: blood, kidneys, liver, central nervous system (CNS), dermatitis, conjunctival irritation with corneal clouding. It causes many medical concerns in industrial workers.	(26) (27) (28).
Xylene	A clear, colourless, volatile liquid. It is used as a degreasing agent and as a thinner and solvent in paints, inks, adhesives.	Acute effects include CNS effects and more effects include tremors, rapid respiration, inflammation of the lungs and paralysis, loss of consciousness, coma, and death. Continuous contact to xylene due to solvent abuse can result in permanent neuropsychiatric manifestations. It may irritate the mucous membranes of the respiratory tract. With massive exposure, accumulation of fluid in the lungs and respiratory arrest may ensue. High-level xylene exposure may lead to acid-base imbalance and can irritate the stomach. Pulmonary aspiration of toxic vomitus xylene may cause inflammation of the lungs.	(29) (30).

Chemical Abused	Properties and Product Availability	Toxic Effects	References
Tetrachloroethylene	A colourless, volatile, non-flammable liquid with a sharp, sweet odour. Found in household products such as paint removers, water repellents, silicone lubricants, spot removers, adhesives, wood cleaners.	Tetrachloroethylene is absorbed if inhaled or ingested. Dermal exposure to the liquid can cause irritation and burns. Exposure by any route can cause systemic effects It causes CNS depression, dysrhythmogenic effects, Upper respiratory tract irritation, nausea and vomiting, hepatocellular damage manifested as icterus, hepatomegaly, and elevated serum levels of liver enzymes, Proteinuria, haematuria, and oliguric renal failure, ocular and dermal irritation. Chronic exposure can cause liver, kidney abnormalities, memory and concentration impairment, vision disturbances, ataxia, dizziness, irritability, sleep disturbances, and peripheral neuropathy. Chronic skin exposure can cause irritant contact dermatitis	(31)
Hydrocarbons	Hydrocarbons are organic mixtures present in many common household and industrial products in motor fuel, paint thinner, solvents, lotion, cleaning agents, and glues, paint, cleaning sprays.	Pulmonary toxicity is most common, though cardiovascular, nervous, and gastrointestinal systems can all be affected. Inhalation of halogenated hydrocarbons called huffing or bagging and it is common among adolescents. It can cause euphoria and mental position changes and can sensitize the heart to endogenous catecholamines. Fatal ventricular arrhythmias may cause because of high exposure. Chronic inhalation can cause long-term CNS toxicity, categorized by periventricular, occipital, and thalamic destruction. Serious toxicity and death can be related with hydrocarbon exposure through inhalation and aspiration.	(32) (33) (34) (35) (36).

CONCLUSION

This short review emphasise the toxicity, prevention and management of inhalant abuse which is arising in adolescents. Complete evidence-based prevention and intervention policies are needed to address inhalant abuse are explained. We the authors wish to expose the representation of inhalant abuse in the world. Above and beyond emphasises the evolving hazards of such abuse to parents, adolescents and clinicians. As per our understanding, the existing treatment strategies are still under development. This concise data will help readers to research more on this issue for better treatment regimen with specific antidotes.

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