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Review Article

A Review on Household Poisoning and its Management

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Abbreviations: World Health Organization (WHO), Health Resources and Services Administration (HRSA).

INTRODUCTION

Harmful materials have become a customary home item in many developing countries in past few decades. It has become a considerable health problem worldwide and that is due to their effortless availability, marketing, accessibility, and people's lack of knowledge regarding the harmful effects of such products.¹ The larger number of poisonings that is about 79% occur in low- and middle-income nations like India, with oral intake of dangerous substances being the most common mode of poisoning.² WHO appraised that, in 2016, unintentional poisoning caused 106 683 deaths and a loss of about 6.3 million years of healthy life (disability-adjusted life year)³. The worldwide occurrence of poisoning is unknown. It may be hypothesized that up to half a million people die each year as a result of wide variety of poison exposures, including poisoning by natural toxins.⁴ WHO cautiously estimates that during the past 10 years the incidence of pesticide poisoning, which is high in developing countries, has doubled; however, a total sum up of cases that occur each year across the globe, and the severity of reported cases, are not known. In 1982 it was estimated in that developing countries accounted for only 15% of the worldwide use of pesticides. In that 50% of cases of pesticide poisoning occurred were largely avoidable in these countries as they were mainly due to misuse of the chemicals.⁴

In many nations, poisoning is one of the main culprits of emergency attention at hospitals. "Poisoning is a time-dependent emergency and, like infectious diseases, may require a specialist for appropriate diagnosis and treatment" -

Abstract

Background: Hazardous materials have become a popular home item in many developing countries over the last few decades. It has become a huge global health problem due to their simple availability, marketing, accessibility, and lack of knowledge. According to current figures, unintentional and domestic poisoning is the 13th biggest cause of mortality in India in an urban setting in India; Patil et al. (2014) identified home items to be the most common poisoning agents.

Data sources Study selection: This is a review paper. All the content in this article is taken from several reviews and guidelines published by WHO, HSRA etc.

Conclusion: To lower the prevalence of poisoning in urban settings, it is crucial to educate and raise awareness among the general public about chemical poisoning from home chemicals. Early diagnosis of suspected poisoning symptoms, implementing effective preventive measures and providing fast, focused treatment will help you win the war against poisoning in India.

Keywords: Household poisoning, WHO, Antidotes, Poison, Toxicity.

says WHO.³ Unintentional and intentional exposures continue to be a substantial cause of morbidity and mortality in the US.⁵ NPDS 2000-2020 Data on encounter volume clearly show a general downward trend in exposure cases. This drop, which has been seen since the middle of 2007, is due to fewer people using PCs for exposures that are less dangerous. Exposures with more significant outcomes (death, major, moderate) and HCF instances, however, have remained marginally up during this time.⁵ Poison is defined as any substance, when it comes into contact with any part of it, causes harm or death by local or systemic action, or both.³ A chemical is considered poisonous if it causes harm or death through local, systemic, or both effects when it is ingested by a living being or comes into contact with any part of it.³ Household poisoning is described as the hazardous effect induced owing to the exposure to household products and chemicals such as cosmetics, pesticides, detergents, sanitizers, cleansers etc... Because many household toxins cannot be felt, seen, smelled, or tasted when they come into contact with us, it is vital to be aware of the most frequent household poisons and to take proactive efforts to minimize or reduce our exposure to them.⁶

According to current statistics, unintentional and domestic poisoning is the 13th biggest cause of mortality in India (45.5%) among adults (>18 years) and children (1 to 18 years).⁷ Males outnumbered females by a margin of 62.4% to 37.5%. Unintentional poisoning was the most common mode of poisoning (66.8%), followed by intentional poisoning (33.2%). Oral exposure was the most common method of infection (95.6%). Household pesticides were the most frequently implicated (43.7%), followed by household

cleansers (21.8%), thermometer mercury (5.2%), naphthalene balls (5%), antiseptics (3%), kerosene (2%), and paint thinner (2%). Poisoning was also caused by a variety of goods such as camphor, silica gel, cosmetics, and adhesives (17.1%).^{8,9} The most commonly used household poisonous substances are listed in Table: 1.

Home products were shown to be the most frequent poisoning agents in an urban area in India, according to Patil et al. (2014).¹⁰ In recent years, not only in India but all throughout the world, poisoning has increased as a subject of worry. Due to a lack of comprehensive scientific data on home poisoning and its variation with age and region, preventive, therapeutic, and rehabilitation interventions are not applied to their full potential in India. Different regions of the nation experience

poisoning in various ways. Finding risk factors depends on being aware of a nation's geographic pattern of poisoning.¹¹

A home accident could involve a staggering number of chemicals. As a result, there was no attempt to finish the topic.^[12] The remarks were restricted to some of the more general aspects of the situation, as well as illustrations of some of the most frequent and notable incidents. The numerous texts on general toxicology, industrial toxicology, pharmacology, and specialized articles in the medical literature contain a wealth of information about poisons, but they frequently fall short of offering solutions to the particular issues that a doctor faces in the event of a household accident. Despite the abundance of local evidence, a global meta-analysis of data on household poisoning is still missing.¹²

Table 1: Commonly used Harmful Household Ingredients

S.NO	HARMFUL INGREDIENT	AVAILABLE IN	AVAILABLE FORMS	LD50	ROUTE OF EXPOSURE	TOXIC EFFECTS
01	Ammonia	Window cleaners, Toilet cleaners, multi-surface cleaners, Oven cleaners, Glass/Mirror cleaners	Gaseous Ammonia (dry ammonia gas) Liquid ammonia, Liquor ammonia fortis, Laboratory bench reagent	350mg/kg	Inhalation, Dermal, Eye contact, Oral	Wheezing, Increased respiratory rate, Pulmonary edema, Lung damage, Skin irritation, Burns, Pain, Lacrimation, Rhinorrhea, Eye irritation, Eye damage, Corrosive damage to mouth, Throat and stomach, Methemoglobinemia syndrome.
02	Bleach (sodium hypochlorite)	Caustic drain cleaners, laundry cleaners, Household disinfecting products	Liquid, Powder (chlorinated lime), Gas (chlorine gas)	5800mg/kg	Inhalation, Ingestion, Dermal and Eye absorption, Injection	Bronchospasm, Asthma, Reddened eye, Vision may be blurry, Irritation in eyes, mouth, throat, skin and lungs, Vomiting, Hyperpigmentation
03	Dichlorobenzenes	Dyes, Pesticides, Auto part degreasers, plastic products, deodorant, In mothballs, camphor, Air-freshener	Liquid, Gas	500mg/kg	Oral, Inhalation	Irritating in eyes and nose, burning and tearing of the eyes, coughing, difficult breathing, and stomach upset. Dizziness, headaches, and liver problem
04	Ethanol	Hand sanitizers, Cosmetics, Mouthwashes, Perfumes, Deodorants, Food additives, Fuels, Medicine	Liquid, Gas	7060mg/kg	Ingestion, Dermal, Inhalation	Headache, drowsiness, nausea and vomiting, and unconsciousness, hepatic and gastrointestinal injuries. Coma, stupor, respiratory depression, hypothermia, vision loss, affect nervous system
05	Formaldehyde	Glues, Preservatives used in some medicines, cosmetics, dishwashing liquids and fabric softeners, Fertilizers and pesticides, Emissions from unvented, fuel burning appliances, like gas stoves or kerosene	Gas (natural state), Solid, Aqueous solution.	800mg/kg	Inhalation, Ingestion, Dermal, Eyes.	Asthma, COPD, Breathing difficulties, Epistaxis. Nausea, Vomiting, Burning and aching stomach, Sore throat. Skin irritation, Skin rashes, Dermatitis, rarely skin cancer. Lacrimation, Scratchy eyes.

		space heaters.				
06	Lead	Deteriorating lead-based household paint, Household Dust, Canned Food, Toys, Eyeliner and Lipstick, Vehicle Batteries.	Solid, Liquid forms	4556mg/kg	Dermal, Ingestion.	Skin rashes, As lead is not absorbed through skin ,it doesn't cause any systemic effects Abdominal pain and Cramps, Constipation, Loss of appetite.
07	Naphthalene	Household chemical in the form of moth repellent and disinfectant, Wood smoke, fuel oil and gasoline also contain naphthalene.	Solid	1760mg/kg	Ingestion, Inhalation	Eating a mothball containing naphthalene, they might develop hemolytic anemia, also develop diarrhea, fever, abdominal pain, and painful urination with discolored urine. Develop headaches, nausea, dizziness, and/or vomiting after being exposed to naphthalene vapors.
08	Organophosphate	Agriculture, homes, gardens and veterinary practices	esters of phosphoric acid	500 mg/kg	Inhalation, dermal, oral	Muscle weakness and numbness and tingling of the hands and feet (neuropathy). Long-term exposure to organophosphates can cause confusion, anxiety, loss of memory, loss of appetite, disorientation, depression, and personality changes.
09	Oxalic Acid	Antirust, bleaches, toilet bowl cleaners, furniture cleaners.	Transparent prismatic crystals	ORAL :375mg/kg DERMAL: 20000mg/kg	Inhalation, Oral, Dermal	Dyspnea, severe burning pain , vomiting , excessive thirst , irritation , numbness etc.
10	Parabens	Shampoo, soaps, scrubs, face wash, beverages, processed foods, sauces, jams etc...	white powder form	1200-5500 mg/kg	Dermal, Oral	Face-acne, endocrine disruption, neurological disease, cancer, skin irritation, harm fertility etc...
11	Pthalates	Cosmetics, plastics. dairy products, food additives, fragrances etc...	Colorless odorless liquids	ORAL: 3474-10000mg/kg DERMAL: 20000mg/kg	Oral , inhalation	Face acne, endocrine disruption, neurological disease, cancer, kidney toxicity, liver toxicity, harm fertility, cognitive dysfunction etc....
12	Phosphate	Laundry/ dishwashing detergent, hard water treating agent	waxy, white, yellow, red, violet, black metallic looking	3.03-3.76mg/kg	Inhalation, oral	kidney damage, osteoporosis, apoptosis, muscle weakness, constipation, nausea, vomiting
13	Silica	Glass, hand soaps, cosmetics, concrete and cements and paints.	Crystalline or non-crystalline (amorphous) form and Synthetic amorphous silica.	ORAL:3160 mg/kg DERMAL: 5 g/kg	Inhalation, Dermal, Ingestion.	Silicosis, Lung cancer, Tuberculosis, COPD, Renal diseases and other cancers.
14	Sulphates	Liquid soaps, shampoos, laundry detergents, dish detergents,	Salts, acids derivatives, peroxides of sulphate.	1,200 mg/kg.	Inhalation, Eye contact, Skin contact.	URT irritation, conjunctivitis, corneal ulceration, and allergic contact dermatitis.

		toothpaste, various beauty and cleaning products.				
15	Toluene	Paint, glues, cleaners, nail polishes, inks and stain removers.	Colorless, water insoluble liquid.	5000mg/kg.	Inhalation and Ingestion.	CNS depression, blurred vision, muscle fatigue, memory loss and unconsciousness.
16	Xylene	Cleaning agents, a thinner for paints and in varnishes.	Colorless, flammable, slightly greasy liquids.	3608 mg/kg.	Dermal and Inhalation.	Ventricular arrhythmias, dizziness, respiratory depression, acute pulmonary edema and reversible hepatic impairment.

POISONING MECHANISM

Both local and systemic effects can be caused by poisons. They work by affecting the body's secretions or bodily activities, such as urine, lacrimation, salivation, and perspiration. Additionally, poison alters the biochemistry of cells, which in turn alters the physiology. Certain neurotoxic poisons, such as lead, ethanol, nitric oxide, botulinum toxin, tetanus toxin, etc., cause damage to neurons. The majority of toxins alter the oxygen route, which eventually leads to respiratory issues

- The inspiratory oxygen fraction is decreased by asphyxiant gases (carbon dioxide, methane, butane, and nitrogen).
- Cyanide and hydrogen sulphide interfere with the cytochrome enzyme chain, impairing oxidative metabolism and lowering tissue oxygen consumption.
- Organophosphates, strychnine, and the botulinus toxin all produce respiratory syndrome by paralyzing or spasming the respiratory muscles. Both local and systemic effects can be caused by poisons. They work by affecting the body's secretions or bodily activities, such as urine, lacrimation, salivation, and perspiration. Additionally, poison alters the biochemistry of cells, which in turn alters the physiology. This lowers the arterial oxygen tension.
- By lowering alveolar oxygen tension and impairing breathing, opioid, sedative-hypnotic, and barbiturate use leads to respiratory depression.
- Hemolysis is brought on by carbon monoxide, nitrites, arsine, and stibine. As a result, hemoglobin function declines.
- Beta-blockers and tricyclic antidepressants decrease the amount of oxygen that gets to the heart, which causes myocardial depression.¹³

TOXICOKINETICS

Since the body tends to get rid of the wrong things when poison is consumed, the majority of it is lost through vomiting and diarrhea. The liver performs a biotransformation on any toxicity that is still present in the body. Urine can get rid of poisons or their byproducts. Bile, perspiration, saliva, mucus, and exhaled air are other means of excretion. The epidermis, nails, and hair hold onto poisons like arsenic, much as bone can hold onto substances like lead or radioactive metal.¹³

HOUSEHOLD POISONING ACROSS THE GLOBE

Poisoning is one of the most common reasons for illness and death in children. According to WHO data from 2008, unintentional poisoning is a global health risk for the paediatric population, with a death rate of roughly 45000 per

year and an incidence rate of 1.8/100,000 inhabitants. Children under the age of five are involved in most accidents; factors contributing to this are kids' inherent curiosity, their inability to recognise danger ahead, and toddlers' propensity for mouthing. Around 2 million kids under the age of 6 reportedly have a history of poisoning and visit emergency rooms every year. While intentional poisoning is fairly common in the adolescent age group, the vast majority of cases, particularly those involving children, were unintentional.¹⁴

According to World Health Organization (WHO) estimates, three million severe pesticide poisoning episodes occur globally each year, with at least 300,000 people dying as a result, with low- and middle-income countries accounting for 99 percent of cases. Long-term pesticide exposure has yet to be precisely estimated in terms of health effects. One of the most pressing global public health issues is how to protect people from the harmful effects of pesticides while also ensuring local agricultural production and food security in low- and middle-income countries.¹⁵

HOUSEHOLD POISONING IN INDIA

Pesticides, household cleaners, mercury for thermometers, antiseptics, kerosene, paint thinners, and other various household items are frequently utilized for domestic purposes. Any of these products, if overused or mismanaged can cause poisoning. In India, the National Poisons Centre (NPIC) at the All-India Institute of Medical Sciences, New Delhi, provides information on management of poisoning to treating physicians. A significant prevalence of poisoning from home items, followed by medications, agricultural pesticides, and industrial chemicals, has been identified by analysis of data based on telephone calls received by the NPIC (April 2006–March 2016). Because not all poisoning calls are reported to the Center, the trend and pattern of poisoning differs across the nation. Therefore, the data as a whole could not accurately reflect the situation in India. However, the results do reveal a rising prevalence of poisoning owing to home chemicals notably among children.¹⁶

Also Pooled analysis of studies revealed that pesticides were the main cause of poisoning in adults, with an incidence of 63%, while miscellaneous agents were the main cause of poisoning in children, with an incidence of 45.0%, among those presenting to hospitals. Pesticide poisoning was the most prevalent in North India (79.1%), followed by South (65.9%), Central (59.2%), West (53.1%), North East (46.9%) and East (38.5%). The second most common cause of poisoning was miscellaneous agents (18%, %), followed by drugs (10%), venoms (6%) and corrosives (2%).¹⁷

HOUSEHOLD POISONING ACROSS SOUTH INDIA

According to the World Health Organization and the Centers for Disease Control and Prevention in the United States, accidental poisoning is one of the leading causes of morbidity and mortality worldwide, accounting for 18-19% of total poisoning cases in India. According to available statistics, accidental poisoning was the 13th leading cause of death in India from 2001 to 2003, with accidental pesticide intake ranging from 8695 (2001), 7777 (2002), and 8064 (2003).¹⁸

From October 2018 to October 2019, a 12-month prospective observational study was conducted in a teaching hospital on 278 cases of acute poisoning reported to the emergency department. Data on patient demographics, poisoning agent type, hospital stay duration, and outcome were collected and analyzed. Organophosphate compounds (41%), drug overdose (36%), rodenticide (9%), house cleaning agents (6%), mosquito repellents (4%), corrosives (1%), and kerosene

were the most commonly consumed poisoning agents (1%). Sedatives were the most common drug overdose cause of poisoning (9%), followed by nonsteroidal anti-inflammatory agents (4%). Of the 278 patients, 87 (31%) were males under the age of 30. The majority of the patients were illiterate and worked as laborer's (27%) or farmers (17%). (36%). Suicide (79%) was discovered to be the leading cause of poisoning. Acute poisoning is a major public health concern, particularly among the younger and less educated populations.¹⁹

In our article, literature review was conducted on Pubmed, Google scholar, Dove press, Science direct etc., by using the search terms such as household poisoning, review article on household poisoning. Filters applied during the search was Year (Jan 2017- Dec 2021), Type of article (Full text review article) from which we obtained an overall of 32 full text review articles, in that 7 articles were found closely related to our review which is mentioned in Table: 2.

Table: 2 Studies conducted on household poisoning in India for the recent five years

AUTHOR	YEAR	TITLE	TYPE OF STUDY	DURATION OF STUDY	CONCLUSION
Mittal C et al.,	2021	An observational study on acute poisoning in a tertiary care hospital in West Bengal, India	Observational study	18 Months	This prospective observational study reveals that collected data is not only the incidence and nature of poisoning but also on management and mortality outcome.
Alka Bansal et al.,	2021	Probabilistic model to predict the outcome in acute suicidal chemical poisoning cases from age and gender of patient and type of chemical poison consumed.	Prospective observational study	January 2019 to February 2020	In this study, poisoning patients demographic and type of poison were collected which was used for identifying the probability of death and LAMA risk patients
Daniel Sundar Singh et al.,	2021	A review on Alcohol Based Hand Sanitizer (ABHS) poisoning during covid-19 pandemic among young children		NA	This study focused on poisoning due to alcohol-based hand sanitizer among children of 5 years or less. They targeted on the proper use and amount of sanitizer to be used and concluded that monitoring of children reduces the poisoning exposure ²⁸ .
Diganta Saikia et.al	2020	Clinical profile of poisoning due to various poisons in children of age 0-12 years	cross-sectional study	NA	Males were most commonly exposed to poisoning. Children had unintentional poisoning.
Roshan Mathew et al.,	2019	Profile of acute poisoning cases and their outcome in a teaching hospital of north India	Prospective study	15 months	There is a rise suicidal ingestion of corrosive agent and they should follow mental health management at primary level.
Ashutosh Baliram Potdar et al.,	2018	Awareness and attitude toward household poisons among medical and nonmedical students: A comparative study	cross-sectional study	3 months	They focused on health education to widen the change in approach towards household poisoning.
Mohammed Naseeruddin Nadeem et al.,	2017	A Prospective observational study on pattern of poisoning cases reported to emergency department of a teaching hospital in South India.	Observational Study	12 months	On analyzing poisoning tendency in South India, will assist people to make preventive measures by educating the interventions and also to establish the PCC.

GRADING SYSTEM

WHO categorized poisoning severity as grading system (Table:3), based on clinical presentation upon exposure towards household poisoning. A standardized and universally applicable classification scheme for the severity of poisoning allows a qualitative assessment of incidence and facilitates comparability of data.²⁰

Table: 3 Poison severity scale

Poisoning Severity Score (Grades)	Clinical Presentation
NONE (0)	No symptoms or signs related to poisoning
MINOR (1)	Mild, transient and spontaneously resolving symptoms
MODERATE (2)	Pronounced or prolonged symptoms
SEVERE (3)	Severe or life-threatening symptoms
FATAL (4)	Death

(Available from: <https://www.who.int/ipcs/poisons/pss.pdf>)

TOXICITY/POISONING MANAGEMENT

Poisoning is treated by stabilizing the patient, evaluating them, removing the poison, and administering an antidote. During patient stabilization, the patient's condition is thoroughly assessed, and vital signs are kept track of. Convulsions, electrolyte imbalances, acid-base disorders, hyperthermia, hypothermia, and movement problems are identified during the patient's evaluation. There are several strategies used in decontamination to lessen the effects of toxins. When a poison needs to be eliminated, methods such as forced diuresis, hemodialysis, hemoperfusion, and hemofiltration are used. When an antidote needs to be supplied to a patient, the right agent is given to them to block the poison's effects.¹³

Pre -Hospital care

First Aid

Monitoring is done for respiration, airway, and circulation, and manual cardiopulmonary resuscitation is initiated.

If required, promptly. If cardiac arrest occurs, this stops it and restores blood flow while protecting brain function. Early breakdown of the toxin is crucial to preventing the spread of serious intoxication. When the patient arrives at the hospital, the emergency department is contacted right away, and the patient is positioned on their left side for easier airway clearance and slower poison absorption. As first aid, the following procedures are used.

When a toxin is inhaled, the patient needs to be transported to a room with fresh air, the windows and doors need to be opened, and if the patient isn't breathing, artificial respiration needs to be given.

- For the immediate effects on skin, contaminated garments should be taken off, and the affected region should be covered with fresh water. With soap and water, the polluted area is cleaned.
- For poisoning in the eye, rinse the open eyes with cold, fresh water many times over the course of 15 minutes. Remove your contact lenses.
- If a poison was ingested, further therapy and water are administered unless the patient is unconscious or convulsing.¹³

Hospital care

Depending on the clinical status and symptoms of the patient when they arrive at the hospital, supportive and symptomatic care is crucial. It is crucial to pay close attention to the body's vital indicators, including the heart rate, blood pressure, respiration, oxygenation, circulation, blood sugar, ECG, and other cardiac activities. If any of these are improper, appropriate medical care must be given, such as mechanical ventilation, oxygenation, orotracheal or nasotracheal intubation. Pressor agents, cardiac stimulants, defibrillation, and pacing are used to keep blood pressure and heart functions in check. Infusions of dextrose solution are used to keep blood sugar levels in check. Similar to this, further supportive care is provided to address seizures, acid-base and electrolyte abnormalities, and fluid imbalances. In order to assure fluid supplementation and urine output, IV and urinary catheters are installed.¹³

Emesis & gastric lavage

Ipecac syrup, a non-prescription drug, has been used to cause vomiting for centuries. However, because of the lack of a toxic consequence and the difficulties in diagnosing it, its usage is no longer advised. There is no need to induce if beneficial emesis has already happened on its own. If he feels better using the appropriate procedure, a toxicologist will induce emesis. Gastric lavage is the procedure of removing the ingested poisons by delivery and aspiration of fluid through a gastric tube. When a harmful substance has been consumed, this treatment is used. The fluid contains 2-4 liters of heated (370 C) saline. But there are specific consequences of gastric lavage that include laryngospasm, hypothermia, electrolyte and fluid imbalance, aspiration pneumonitis, and mechanical injury.¹³

Activated charcoal

Administration of activated charcoal can lessen the absorption of toxins. It is carbon-based, dark in color, and blocks poison absorption by joining with the poison. Because of emesis and aspiration, it is typically less effective for substances like iron, lead, alcohol, lithium, and corrosives and is not recommended for substances like aliphatic hydrocarbons. It is administered within the first hour following toxin consumption. Adults should take 25-100 g of activated charcoal, while children up to 2 years old should take 25-50 g. It is delivered via a nasogastric tube after being slurry-fied with water. This treatment is utilized if a patient has consumed a dose of phenobarbital, carbamazepine, dapsone, theophylline, or quinine that poses a life-threatening risk. Additionally, this is employed in the treatment of cimetidine, digitalis, NSAIDs, Opiates, phenothiazines, strychnine, tetracycline, antidiabetic medications, as well as kerosene, paracetamol, phenol, alcohol, carbamates, heavy metals, hydrocarbons, cyanide, etc.¹³

Laxatives and purgatives

To remove the poison and the charcoal poison complex from the gastrointestinal tract, laxatives like sorbitol magnesium citrate and liquid paraffin are used right away after the delivery of charcoal. However, their value has not been established, and their usage is not usually recommended. They are only employed after their efficacy has been established, before doing a colonoscopy and undergoing intestinal surgery to eliminate toxins, whole bowel irritants like polyethylene glycol electrolyte solutions. They clean the digestive system.¹³

Diuresis

Using diuretics helps the body eliminate toxins even more effectively. The majority of the time, diuretics are used to push the urine's forced elimination of the toxin. The fluid balance, blood pressure, electrolyte balance, and acid base balance are

all closely watched while using diuretics. Commonly prescribed medications for this purpose include furosemide and mannitol. Due to several unfavourable effects, this method is not always advantageous.¹³

Hemodialysis and hemoperfusion

Hemodialysis is a procedure that eliminates toxins as well as waste products like urea and creatinine from your blood. Hemoperfusion is a technique for purifying blood outside the body to get rid of toxins. Only when there are serious poisoning instances and symptoms are getting worse are hemodialysis and hemoperfusion employed. It is also employed when the typical toxin removal pathway is jeopardized. Drugs that are to be eliminated must have a low molecular weight, be loosely linked to proteins, and be less dispersed throughout tissues in order for a suitable device called a dialyzer to be used. If poisoning with ethylene glycol, ethanol, theophylline, or salicylate is suspected, this approach is effective. The risks of thrombosis, blood element loss, fluid and electrolyte imbalances, air embolism, and infection are present with this approach, just like with other treatments. Additionally, a patient with unstable hemodynamics cannot tolerate this approach.¹³

Antidotes

Antidotes are substances that neutralize the toxin. These medicines or chemicals counteract the effects of poison and

their symptoms. Important antidotes often used are listed in table 4. They are created when a tiny amount of poison is given into animals and antibodies are drawn from the blood of the animals. Antivenom, for instance, is created from antibodies and used to combat venom secreted by specific snakes and spiders. Antidotes operate using the following mechanisms.

The production of inert complexes, such as those containing chelating agents for heavy metals, dicobalt edentate for cyanide, and Prussian blue for thallium

- Accelerated detoxification: For instance, thiosulfate hastened the transformation of poisonous cyanide into non-toxic thiocyanate, while acetylcysteine detoxifies paracetamol metabolites to lessen hepatotoxicity.
- Competition for receptor sites, such as when naloxone works at the opioid receptor site to counteract the effects of opiates.
- Receptor site blockade: Organophosphates are blocked by atropine at the muscarinic receptor site, for example.
- Reduced hazardous conversion: By competing with the same enzyme, ethanol prevents the metabolism of harmful metabolites from methanol (alcohol dehydrogenase)
- Bypassing toxic effects, such as oxygen in cyanide poisoning.¹³

Table 4: List of Antidots Commonly Used

S.N.	Antidote	Main indication for	S.NO	Antidote	Main indication for
01	Acetylcysteine	Paracetamol	18	Flumazenil	Benzodiazepines
02	Amyl nitrate	Cyanide	19	Glucose	Insulin
03	Atropine	Cholinergic drugs	20	Guanidine	Botulism
04	Isoprenaline	Beta blockers	21	Ascorbic acid	Organic peroxides
05	Aurintricarboxylic acid	Beryllium	22	Calcium salts	Oxalate, Fluorides
06	Deferoxamine	Iron, Aluminum	23	Diazepam	Chloroquine
07	Deferoxamine Dimercaprol	Arsenic	24	Ethanol	Methanol, ethylene glycol
08	Methionine	Paracetamol	25	N-acetylpenicillamine	Mercury
09	Naloxone	Opiates	26	Oximes	Organophosphates
10	Oxygen (hyperbaric)	Carbon monoxides, cyanide	27	Penicillamine	Copper
11	Phentolamine	Alpha adrenergic	28	Prussian blue	Thallium
12	Propranolol	Beta adrenergic	29	Protamine sulphate	Heparin
13	Pyridoxine	Isoniazid	30	Sodium nitroprusside	Ergotism
14	Succimer	Lead mercury	31	Tocopherol	Carbon monoxide
15	Triethylene tetramine	Copper	32	Activated charcoal	Given above
16	Calcium chloride	Calcium channel blocker, spider bites	33	Cyproheptadine	Serotonin syndrome
17	Diphenhydramine HCl & Benztropine mesylate	Antipsychotics (Extrapyramidal reactions)	34	Calcium gluconate	Calcium channel blocker toxicity, hydrofluoric acid burns

PREVENTION

- Keep any medications and possibly hazardous items (laundry supplies, toiletries, cosmetics etc..) out of children's reach or in locked cabinets.²⁰
- Keep medications properly labelled and store them in their original containers, also discard them if they are expired or no longer in use.
- To ensure safe and efficient use, always adhere to the directions on the product label, for example: Bleach is particularly harmful and should only be combined with water.
- To safely dispose of spent button batteries (such as those found in watches), store any that are not in use out of the reach of children.²¹
- Please adhere to any specific storage directions (for example, keeping flammable liquids away from heat, keeping medicines in a cool place, and keeping acids away from alkaline products).²²
- To protect skin and eyes, put on gloves and safety goggles when using harsh cleaners like drain cleaner, bleach, and oven cleanser.²³ Regardless of whether you know what is inside, avoid sniffing chemical containers.²⁴
- Call the local poison control center or the emergency number if you or someone you are with has been exposed.²⁵

CONCLUSION

Pesticides and chemicals (phenol, bleaches, kerosene, and their derivatives) were the two most common agents of poisoning. Pesticides were the second most common cause of overall high mortality after chemical poisoning. In various investigations conducted in India, pesticides, particularly organophosphates and aluminum phosphide, were the most frequent causes of poisoning Fan et al (2013). found that home items were one of the main sources of poisoning in New Zealand among children and teenagers under the age of 19. Additionally, a study conducted in Brazil by Presgrave Rde et al (2015). discovered that ingesting pesticides, household cleaners, or caustic substances caused the majority of unintentional poisoning in youngsters. Researchers have rightly noted that the pattern of poisoning in a place depends on a number of factors, including the accessibility, and availability of poisonous substances, socioeconomic position, cultural aspects of the population, Age, the amount taken, early hospitalization, and proper therapy are only a few of the variables that affect poisoning-related mortality.²⁶

To lower the prevalence of poisoning in urban settings, it is crucial to educate and raise awareness among the general public about chemical poisoning from home chemicals. Early diagnosis of suspected poisoning symptoms, implementing effective preventive measures, counselling, creating standard management protocols, and providing fast, focused treatment will all help to win the war against poisoning in India.²⁷

CONFLICT OF INTEREST:

The Authors declare no conflicts of interest regarding the publication of this paper.

AUTHORS CONTRIBUTION:

All the authors contributed equally to prepare this article, read, and approved the final Manuscript.

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