EDITORIAL

POISONINGS IN CHILDREN

A.P. Dubey, K. Rajeshwari
Department of Pediatrics, Maulana Azad Medical College, New Delhi 110002, India

Abstract: *Accidental poisoning is a world wide problem in children in the age group -5 years. Most pediatric poisoning is accidental and less than 1% is clinically serious. Majority of accidental poisoning is due to ingestion of non-toxic substances and only reassurance is needed. Only minority of poisoning in children are clinically serious requiring prompt attention. An effort has been made here to present an overview of pediatric poisoning including various management modalities. The best way to avoid accidental poisoning is education of parents and to prevent easy access of children to the toxic substances.*

INTRODUCTION

Accidental poisoning in children is a global problem. The relative importance of poisoning as a cause of childhood morbidity and mortality increases when malnutrition and infections are brought under control. Most pediatric poisoning is accidental in nature and occurs between the ages of 1-5 years. Less than 1% of pediatric and poisoning is clinically serious and death is rare. However some drugs including methadone, TCAs, iron, theophylline, antihistamines, methyl salicylate, phenothiazines, quinine, chloroquine and calcium channel blockers can cause severe toxicity after very small ingestions.

POISONINGS IN INDIAN CHILDREN

Accidental poisoning is the twelfth leading cause of admissions in pediatrics wards in India and accounts for about one percent of the hospitalized patients. Most cases of accidental poisoning are preventable. The exact incidence of poisoning in Indian children is not known. In a study of 250 cases over a period of 2 years admitted to Dr. R.N. Cooper hospital, Mumbai for various poisonings, over all incidence of poisoning was 11.9% among hospital admissions. Of these 58.4% were seen in the age group of 1- 4 years. Male to female ratio was 1:7:1. Incidence of food poisoning was 48.8%, followed by that of kerosene (24%), pesticides (9.6%), chemicals and medicaments (8.4%), plants (3.6%) and animal bites (3.2%). Overall mortality was 0.8%. In another prospective study of 120 Indian children who were brought to hospital with history of acute poisoning, accidental poisoning was seen in 116 cases (96.7%). Most 78 (65%) children were in the age range 1 -4 years. Medical aid was sought earliest in case of children with animal bites and in infants. Kerosene and medications accounted for 72 (60%) of poisonings. None of the care takers of children received any instruction regarding prevention of accidents and poisonings prior to the episode inspite of multiple contacts with healthcare providers. In another perspective study from Punjab, published in this issue, poisonings constituted 0.6% of total pediatric admissions. Accidental poisoning occurred at home in 94% of cases. Kerosene oil followed by organophosphorus compounds were the commonest causes of poisoning. The National Poisoning Information Centre (NPIC) was set up in the Department of Pharmacology in 1995 at All India Institute of Medical Sciences (AIIMS), New Delhi. The center functions round the clock, 365 days in a year and provides information on various poisoning and treatment protocols on telephone, fax, e-mail and in person. The NPIC has the back -up of latest literature on poisoning due to a variety of products that include household items, agricultural and industrial chemicals, drugs, environmental toxins including plants, animals bites, stings and other miscellaneous products.

Correspondence : Professor A.P. Dubey
E-mail : apdubey52@rediffmail.com

ECOLOGY OF POISONING

Interaction between the host and the environment (including easy access to the poisoning become very active and try to explore unfamiliar objects by putting these into their mouth and tasting these.

Large families and small accommodation: In large families living in small houses, there is little storage facility and therefore children living in small overcrowded houses are exposed to greater risk of poisoning.

Environment: Lead poisoning is common in children living in areas where there are workshops for repair of old automobile lead storage batteries or for manufacture of lead typesets for printings presses. Caustic soda poisoning used to be observed frequently in children of families which prepared washing soap for domestic or commercial purposes in their own houses. Insecticides, medicines, naphthalene balls and kerosene are common household things which are potential hazards.

Rural or urban areas: The pattern of poisoning varies in rural and urban areas due to exposures to different types of potential poisons. Snakebites are more common in those wandering in fields.

HOUSEHOLD POISONING

The household poisoning could either be a *non toxic* ingestion or *a toxic* ingestion. A non toxic ingestion is defined as that occurring after an individual consumes a non - edible product that usually does not produces symptoms, such as abrasives, adhesives, air fresheners, aluminum foils, antacids, baby products cosmetics, candles, chalk, erasers, ball point pen ink, lipsticks and lubricants etc. Household toxic ingestion consists of consumption of either of the following: soaps and detergents, shampoos, bleaches, disinfectants and deodorizers, acids and alkalis, boron compounds, cosmetics, nail polish remover (gamma butyrolactone), disk batteries, naphthalene moth balls, tobacco products, pica, insecticides, pharmaceuticals and paints. Nearly 75 percent of poisoning episodes are due to ingestion of non -toxic substances -which requires reassurance to the children and their parents. About 20 percent of poisoning episodes require urgent measures to remove the poison and approximately 5 percent of poisoning need intensive treatment.

MANAGEMENT OF POISONING

The basic elements of the medical management of poisoning are (1.) Support vital functions; (2.) Identify agent (when possible); (3.) Remove, neutralize or reverse toxic effects of poison; (4.) Hasten recovery; (5.) Treat damaged or poisoned organs systems and prevent further damaged whenever possible.

Initial Management

In a case of poisoning the immediate priority must be to maintain life. The general approach to evaluation and support of airways and cardio respiratory function remains same as taught in pediatric advanced life support course (PALS). During the initial evaluation and support of vital functions, a member of the emergency team should make effort to identify the poison. A constellation of signs and symptoms consistent with ingestion on exposure to a toxin is called toxidrome. (Table 1).

It is important to recognize toxidrome when an acutely ill patient does not have any obvious history of poisoning. For some of these toxidromes life saving therapies are available (table 2).

Immediate Care : The initial priority in treating seriously ill patient with poisoning is standard resuscitation, i.e. airway, breathing and circulation. Inadequate ventilation caused by airway compromise or reduced respiratory efforts may require oropharyngeal or nasopharyngeal airway and bag –mask ventilation with the provision of supplemental oxygen until a definite airway can be obtained through toxin reversal (for example, naloxone for opioids). Hypotension should be treated initially using intravenous fluids (an initial bolus of 10 -20 mI/kg of Crystalloid titrated to clinical effect). Hypotension produced by poison such as opioids, beta blockers or diogoxin can in addition be treated using the specific antidote (i.e naloxone, glucagon and diogoxin specific antibodies respectively). Hypotension resistant to treatment with IV fluid or appropriate antidotes is managed by measuring central venous pressure to ensure adequate circulatory filling and then cautions administration of an appropriate isotropic agent.

Arrhythmias associated with poisoning should generally not be treated with anti -arrhythmic drugs as a first line approach. Factors precipating or contributing to the arrhythmia such as acidosis, hypocalcaemia, hypomagnesaemia and hypoxia should be corrected. Correction of precipitating factors and the appropriate use of antidotal agents negates the need for anti arrhythmic agents in most cases. Sustained seizures should be treated using benzodiazepines (Iorazepam or diazepam). It is important that a bedside sugar is checked early in any patient with .seizures to exclude hypoglycemia as a cause. Patients with core temperatures of greater than 39°X should be aggressively treated with cool IV fluid and active cooling measures because prolonged hypothermia can result in significant complications such as rhabdomyolysis and disseminated intravascular coagulation.

Table 1: Examples of symptom Complexes/Toxidromes.

Pupils	Respiration	Consciousness	Possible agent	Other associations
Pinpoint	↑↓	Coma	Organophosphorus	Cholinergic: Bradycardia, Wheeze, Salivation,
	↓	Coma	Opioids	Hypotension, hypothermia
	↓	Coma	Phenothiazines	Cardiac arrhythmias
Dilated	↑	Agitation	Atropine	Anticholinergic: Fever, Dry mucous membranes, Flushing, urinary retention.
	↓	Coma	Tricyclic Antidepressants	Cardiac arrhythmia, seizures, hypotension.
	↓	Coma	Sedatives, Barbiturates	Hypotension, hypothermia, hyporeflexia.
	↑	Agitation	Theophylline, Amphetamines	Seizures, tachycardia, hypertension, acidosis.
Normal	↑	Coma	Uremia	Acidosis, hyperkalemia,
	↑	Semi coma	Salicylates	Tinnitus, agitation, Diaphoresis, alkalosis followed by acidosis.

Table 2 : Toxidromes for which life saving therapies are available

Toxidromes	Therapy
1. **Opioid**: Miosis, CNS depression, Respiratory depression.	Intravenous naloxone
2. **Cholinergic**: (caused by organophosphates And carbamates)	Atropine and pralidoxine
3. **Cyclical antidepressant** toxidrome (Altered sensorium, wide QRS complexes, arrhythmias)	Sodium bicarbonate
4. Hypoglycemia: it should be suspected in any child with altered sensorium or seizures.	Intravenous 25% glucose.
(Occurs due to **Oral Hypoglycemic, beta blockers, salicylates, ethanol)**	

Preventing Absorption : Most toxins are rapidly absorbed from the gastrointestinal tract or through inhalation. Many may also be well absorbed upon dermal contact. Prompt action to remove the toxin and minimize contact with the absorptive surface is crucial used to prevent absorption of a toxin from the stomach and gastrointestinal tract and each has limitations and risks. A decontamination procedure instituted after the drug is absorbed poses a risk to the patient with no potential for benefit. In general most liquid drug products are almost completely absorbed within 30 minutes of ingestion and most solid dosage forms within 1 -2 hours. Gastrointestinal decontamination beyond this time is of no value.

Investigations : All poisoned patients should have their heart rate, blood pressure, respiratory rate and temperatures recorded. Patients should undergo formal weight measurement as part of routine clinical care. An ECG may detect occult cardiac conduction abnormalities of diagnostic and prognostic significance. All unconscious patients and those with features of severe toxicity (seizures, hypotension, cardiac arrhythmias or respiratory depression) should have measurement of electrolytes, renal function, paracetamol concentration and determination of acid base status. Measurement of plasma drug concentration is not routinely helpful in treating poisoned patients and should not be part of clinical care. Exceptions include paracetamol, salicylates, iron, lithium, theophylline, ethylene glycol, ethanol, methanol, and to a lesser extent diogoxin, phenobarbitone, sodium valproate and cabamazepine. Most poisoning should be treated on the basis of observed clinical toxicity rather than drug concentration.

Gut Decontamination : The role of gut decontamination procedures is outlined in a series of consensus statements " published by the American Academy of Clinical Toxicologists (ACCT) and European ,[Association of Poison Centers and Clinical Toxicologists (EAPCCT). Activated charcoal is a ; safe and probably effective agent used to decrease the amount of drug absorbed from the gastrointestinal (Gl) tract into the blood stream. There is paucity of well controlled data from clinical studies. Activated charcoal (lg/kg) orally should be considered for patients who have ingested a potentially toxic overdose within the previous hour. It can be given to unconscious patients after intubation through a large bore nasogastric tube. Gastric lavage has no role in -routine GI decontamination

of actually poisoned patients. There is no evidence that gastric lavage improves patient outcome. Gastric lavage should only be considered in a patient presenting within one hour of ingestion of a potentially life threatening overdose. Vagal stimulation and hypoxia during gastric lavage potentially increases risk of cardiac arrhythmias. Administration of syrup of ipecac to incidence vomiting after acute overdose is not part of accepted clinical care.

Whole bowel irrigation is a newer method of gut decontamination that entails administrating nolvethvlene Qlvcol (25-40 ml /k{!/hour either orallv or bv wav of nasogastric tube for 4 -6 calcium channel blockers) Contra indications to its use include obstructed bowel, ileus or G I hemorrhage.

Antidotes: Antidotes are available for a limited number of drugs and poisons. Prompt administration of antidote can be life saving.

Enhancing Elimination: Enhancing excretion is useful for only a few toxins.

Diuresis: For most toxins, renal clearance is not proportionate to urine voluine; thus diuresis alone does not increase elimination. Increasing the Ph of the urine with intravenously administered bicarbonate increases the elimination of weak acids, such as salicylates and phenobarbital.

Dialysis: Few drugs or toxins are removed by dialysis in amounts sufficient to justify the risks and difficulty of dialysis. Examples of toxins for which dialysis may be useful include methanol, ethylene glycol and large symptomatic ingestions of salicylate or theophylline.

HemoDerfusion: It is rarely used in children because of the risks associated with its use.

PREVENTION

Poison prevention education should be an integral part of all well child visits, even before a child is mobile. Counseling parents and other caregivers about potential poisoning risks, how to make "poison proof' a child's environment and what to do if a poisoning occurs diminishes the likelihood of serious morbidity or mortality from an exposure. Poisoning exposures in children 6 -12 years of age are much less common (4% of exposures). Toxic exposures in adolescents are primarily intentional (suicide or abuse) or occupational. Pediatrician should be aware of the signs of drugs abuse or suicidal ideation in this population and should aggressively intervene. Future directions: Creation of centers in major cities and towns similar to the NPIC at AIIMS will facilitate early referral of poisoned patients to appropriate centers and institution of prompt treatment. Making life saving antidotes and anti snake venous widely available across the country will decrease morbidity and mortality .Dissemination of information to parents regarding prevention of poisoning by health care providers is easily feasible and requires only motivation. Only parent information can reduce the problem of poisonings in children in the long run.

SUGGESTED READING

1. Khare M, Bhide M, Ranade A, Jay Kar A, Panicker L, Patnekar PN, Poisoning in children analysis of 250 cases. J Postgrad Med 1990; 36: 203 -206.
2. Mehta A, Kalsa KR, Bavdekar SB, Hathi as, Joshi sY. Acute poisoning in children. J Indian Med Assoc 1996; 94 (6): 219- 220.
3. Greene SL, Dargan PI, Jones AL. Acute poisoning: understanding 90% of cases in a nutshell. Postgrad Med J 2005; 81: 204-216.
4. American Academy of Clinical Toxicology and European Association of Poisons Control Centres and Clinical Toxicologists. Position statement: gastric lavage. J Toxicol Clin Toxicol1997; 35: 711- 719.
5. American Academy of Clinical Toxicology and European Association of Poison Control Centres and Clinical Toxicologists. Position statement: whole bowel irrigation. J Toxicol Clin Toxicol1997; 35: 753 -762.
6. Watson W A, Litovitz TL, Rodgers ac et al. 2002 Annual Report of the American Association of Poison Control Centres Toxic Exposure Surveillance System Am J Emerg Med 2003; 21: 353-421.
7. CG Wilson. Accidents and Poisonings in children. In: IAP Textbook of Pediatrics. 3rd Ed. 2005 New Delhi: Jaypee Brothers Medical Publishers (P) Ltd; PP 971 -982.