Nursing Management of Preschool Children with Poisoning: A Review Article

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Abstract

Background: Poisoning may occur intentionally or unintentionally but the majority of poisoning cases occur unintentionally in children. Acute childhood poisoning aged 0–5 years old is a major health problem worldwide and is deemed one of the leading causes of unintended deaths. Also, it is still a serious issue in developing countries where it represents a common cause of emergency department presentation and admission poison center. Nurses are frequently the first healthcare professionals to come in contact with patients with acute poisoning. In case of insufficient knowledge, they could be trained enough to manage any case of acute poisoning for life-saving purposes..

Keywords: Poisoning, children, Nurses.

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Introduction

Poisoning is considered the fourth leading cause of death in Egypt after road traffic accidents, burns and drowning. The developmental characteristics of young children predispose them to poisoning by ingestion. Toddlers and preschoolers are developing autonomy and initiative, which increases their curiosity to explore and investigate their surroundings. As nurses use their knowledge of growth and development in teaching anticipatory guidance, they must focus the attention of the parent on the dangers of each age **(Middleton et al., 2021).**

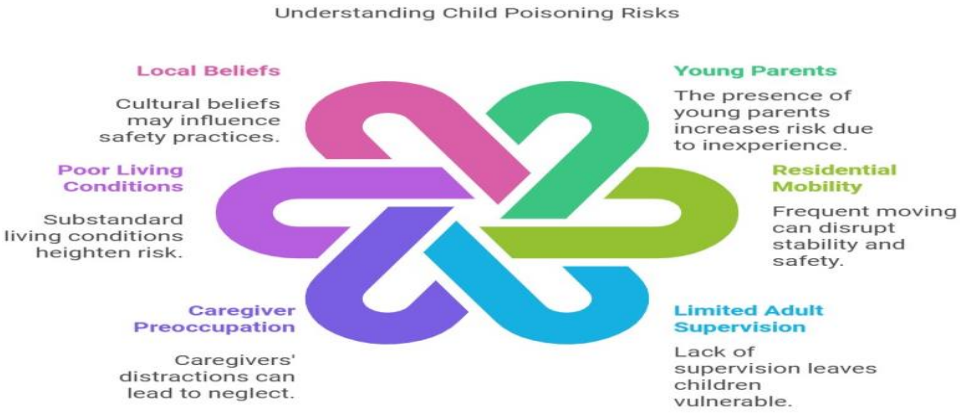
Poisoning occurs when any substance interferes with normal body functions after it is swallowed, inhaled, injected, or absorbed, causes injury or death. The branch of medicine that deals with the detection and treatment of poisons is known as toxicology. Maximum children exposed to these poisonous substances in home in which poisonous substances are unintentionally ingested only few

children exposed outside. Most of the poisons are in reach of preschoolers and mishap happened in a fraction of minutes. It can cause a serious threat to life, depending on the amount, type and concentration of the poisonous substance, and also the immediate nursing intervention **(Marano et al., 2021).**

The incidence of childhood poisoning in various studies ranges from 0.33% to 7.6%. Poisoning is most commonly observed at 1-5 years of age and these children constitute 80% of all poisoning cases. Worldwide, 44.2 percent of children under the age of five and 32.6 percent of children under the age of three suffer from acute poisoning. 304 acutely poisoned children, ages 1 to 18 years of both sexes, were admitted to the Poison Control Center of Ain Shams University Hospitals between June 2020 and November 2020. **(Abu El-Naga et al., 2022).**Moreover, 2294 poisoned patients presented to ZUPTU, emergency department, and intensive care unit from January 2023 till December 2023, 970 patients of them were admitted to the Poisoning Treatment Unit and the majority of cases were under 18 years **(Khayal et al., (2024).**

Risk factors

Child is rushed into the emergency department (ED) by anxious parents after the witnessed ingestion of a household product or medication. Such a scenario unfolds many times, yet it remains a uniquely compelling event for all the actors involved: patient, family, and medical staff. As with other injuries, the risk of a child being poisoned is affected by factors related to the child, the agent and the environment. These factors are interrelated and are highly dependent on the context **(Alhaboob, 2021).**



Routes of exposure for poisoning

There are four routes by which a substance can enter the body, including ingestion, inhalation, absorption, and injection. Each route of exposure can have different signs and symptoms, and different treatment approaches may be needed. Ingestion of a harmful substance is among the most common causes of injury to children less than six years of age **(Oztoprak & Energin, 2020).**

Classification of poisoning

I- Food poisoning: Food poisoning is illness that is passed along in food. It usually occurs 1 to 24 hours after eating food that has spoiled. Because their immune systems are still developing, making it harder for their bodies to fight off germs. Children younger than 5 years are at a higher risk of food poisoning than the general population **(Gupta & Chaudharyb, 2022)**.

Nursing Diagnosis, Goal, and Outcome Criterion: The primary nursing diagnosis for the child with food poisoning is risk for Injury related to poisoning. The specific type of injury depends on the action of the contaminant. In general, the treatment of food poisoning involves identifying the poison and decreasing the symptoms. The goal of nursing care for the child with food poisoning is the absence or reduction of ill effects from the poison. The criterion for evaluating the effects of intervention for food poisoning is diminished symptoms **(Patel et al., 2023).**

Interventions: Medical care is necessary if symptoms are severe or persistent, especially in children and older adults. The main danger from this illness is dehydration. This is the loss of too much water and minerals from the body. When this occurs, the child's body fluids must be replaced. Although the physician may order anti- emetics and anti-diarrheal, vomiting and diarrhea are sometimes allowed to continue within limits to eliminate the offending substances. Intravenous fluids may be prescribed with severe vomiting and diarrhea. Patients with botulism may require ventilator support **(Linton, 2016)**.

II- Hydrocarbon Toxicity (Petroleum poisoning): Hydrocarbons are compounds containing hydrogen and carbon. These are typically the chief components in many types of fuels. They can come in the form of a gas, liquid, solid, or polymers. Exposure to hydrocarbons is common because these substances are readily found in products like kerosene, gasoline, household cleansers, furniture polish, turpentine and many paint products. All hydrocarbons can be toxic, but aromatic (ring-shaped) and halogenated hydrocarbons typically have more severe toxicity **(Sinhamar & Meena, 2022)**.

Management and nursing role: The management of children with hydrocarbon toxicity is with an inter professional team that also includes nurses. All children presenting with suspicion or symptoms of hydrocarbon exposure should immediately be placed on a cardiac monitor as well as pulse oximetry. There are no specific quantitative tests for hydrocarbons, but identification of the specific hydrocarbon substance may help guide management and anticipate adverse events. Treatment is mainly supportive and symptomatic. It includes close monitoring of the child, supportive care, and monitoring for complications and managing them appropriately. Monitoring is central to the management of children with hydrocarbon ingestion **(Gummin et al., 2019)**.

Evacuation of the stomach by gastric lavage or induction of emesis is not recommended because of the increased risk of aspiration. Activated charcoal does not adsorb hydrocarbons and may increase the risk of vomiting and aspiration. Steroids have been found to be ineffective in cases of hydrocarbon poisoning and hence not recommended. There is no role for prophylactic antibiotics in children with

hydrocarbon poisoning unless they develop superadded pneumonia. Cardiac dysrhythmias due to myocardial sensitization should be treated with beta blockers (e.g., esmolol) and/or class Ib antidysrhythmics (lidocaine) **(Corlade-Andrei et al., 2023)**.

III-Drug toxicity: Pharmaceutical products are the leading cause of accidental poisoning in middle- and high-income countries. Patterns of poisoning with medicinal drugs change across different geographic regions and over decades. Drug toxicity is formally defined as "a diverse array of adverse effects which are brought about through drug use at either therapeutic or non-therapeutic doses. Drug toxicity occurs when a person has accumulated too much of a prescription drug in their bloodstream, leading to negative effects **(Mottla et al., 2023).**

Treatment and nursing role in drug toxicity: There are several ways drug toxicity may be treated. Treatment in hospitals may involve resuscitation, oral administration of activated charcoal or irrigation of the bowel to reduce the absorption of the drug from the intestine into the bloodstream. Antidotes are available only for specific drugs **(Demirbuga et al., 2020).**

Nursing implications of activated charcoal: Administer orally to conscious child orally. Give charcoal as soon as possible after poisoning. Store it in a closed container, because it absorbs gases from the air and is activated. Know that the solution feels gritty and tastes disagreeable. Caution child or parent that stool will be black for several days after administration **(Fitch, 2023).**

Chacko & Peter, (2019) reported that antidotes are agents that negate the effect of a poison or toxin. Antidotes mediate its effect either by preventing the absorption of the toxin, by binding and neutralizing the poison, antagonizing its end-organ effect, or by inhibiting the conversion of the toxin to more toxic metabolites. Antidote medications are typically administered through an intravenous (IV) line that is inserted into the arm. Not all toxins have antidotes.

IV-Iron poisoning occurs when a child swallows a large number of iron-containing pills, most often vitamins. Iron toxicity can be acute, resulting from ingestion of a single large dose at one time, or chronic, due to the accumulation of iron in the body over time. Acute iron intoxication usually occurs in children under 5-year-old who swallow pediatric or adult vitamins containing iron. Iron salt is available in multiple preparations. For instance, ferrous sulphate is available as drops, syrup, elixir, capsules, and tablets **(Yuen & Becker, 2023).**

Management of children with iron toxicity is usually done with an inter professional team that includes the emergency department physician, poison control specialist, internist, intensivist, nurse practitioner, and a hematologist. Treatment for iron poisoning depends on the severity of the symptoms and the amount of iron ingested **(Rahimzadeh et al., 2023).** Gastrointestinal decontamination, fluid resuscitation, and close monitoring of vital signs are the mainstay of treatment for children with mild to moderate iron toxicity. Severe poisonings will require IV (intravenous) chelation therapy with deferoxamine (Desferal), a chemical that binds to iron in the blood and is then

excreted in urine. Changes in urine color to a red-orange and low blood pressure are common side effects with deferoxamine treatment **(Karakoc, 2020).**

Children that remain asymptomatic six hours after iron ingestion are unlikely to develop symptoms later on and may be discharged home. The nurse instructs parents to use an iron supplement for themselves or their children, stressing that overdoses can be fatal to small children. Teach them to think of iron as they would any other medicine and keep it out of the reach of small children **(Murrell & Roland, 2021).**

V- Corrosive (caustic) poisoning: Acute corrosive poisoning is considered a major problem in clinical toxicology all over the world including Egypt as a result of their availability and easy accessibility. Corrosives are defined as any substances that can cause chemical destruction once they come in contact with body tissues like the eye, skin, GIT or respiratory system. Storage of corrosive chemical substances in water or soft drink containers in the home is a risk factor for accidental corrosive ingestion in children, particularly those less than 5 years of age **(Nem & Abo Elwafa, 2020).**

Management of corrosive poisons: Children suspected of swallowing corrosive poisons should be assessed for severe pain and burning sensations in the mouth and throat, pain in swallowing or an inability to swallow, destruction of oral mucosa, vomiting and drooling. Education programs for storage of corrosive chemical substances in their original child-resistant containers might prevent some ingestion corrosive injuries **(Mahmoud, et al., 2024).**

The first intervention and management of the child who applied to the emergency room due to corrosive ingestion varies according to the chemical and physical properties of the substance, its amount, concentration, contact time in the tissues, and the patient's signs and symptoms. Management of acute corrosive ingestion is focused on initial resuscitation, evaluation of the grade of injury, treatment of early complications, maintenance of nutrition, and prevention of stricture formation **(Yaradilmis et al., 2022).**

VI- Carbon monoxide (CO) poisoning is a gaseous byproduct of incomplete fuel combustion and is present where there is aflame in a confined space with improper ventilation or air exchange. Levels of carbon monoxide can accumulate rapidly, and the gas is dangerous as it is colourless, odourless, tasteless and non-irritating. Sources of carbon monoxide are faulty radiant heaters, kerosene lamps, cooking stoves, engine exhausts and fireplaces **(Alfora et al., 2023).**

Management of CO poisoning: It is important for emergency nurses to recognize patients with unintentional CO exposure so that treatment is provided and measures taken to prevent further exposure. As CO is an inhaled toxin, the patient should be removed from the contaminated environment to prevent further absorption and allowed to breathe fresh air **(Cappelletto & Jarman, 2021).** Also **Miller et al., (2022)** mentioned that treatment of the CO- poisoned child begins with supplemental oxygen and aggressive supportive care, including airway management and stabilization

of the cardiovascular and respiratory systems. High- flow oxygen therapy should be administered immediately to accelerate elimination of CO from the body

VII- Plant poisoning: Toxic plants are plants that have in their constitution chemical compounds or active principles, which through contact, inhalation or ingestion, are capable of causing injury, disease and even death in humans. Poisonous plants have a seed, root, leaf, stalk, fruit or juice where even a relatively small amount either taken or administered can harm the human body. Toxic (poisonous) plants can be the source of poisoning emergencies, especially in children **(Friday, 2019).**

It is critical to watch children when they are playing or otherwise have access to any poisonous plants in the home, garden, or other public areas where plants are grown (relatives' homes, parks, school yards, church, etc.). It is critical to teach children that plants are beautiful but should not be eaten, and some should not be touched **(Housman & Odum, 2015)**. Children should be told not to eat garden seeds, berries, mushrooms, or leaves from any plant. They should also not suck on the flowers, unless an adult verifies that the plant is not toxic. Do not assume a plant is nontoxic because birds or animals eat it without harmful effects. Eating a small amount of a poisonous plant may not be a problem, but large or repeated small doses could cause toxic symptoms **(Gul & Sari, 2020)**.

VIII-Lead poisoning occurs when lead builds up in the body, often over months or years. Children younger than 6 years are especially vulnerable to lead poisoning, which can severely affect mental and physical development. At very high levels, lead poisoning can be fatal. Lead- based paint and lead-contaminated dust in older building are common sources of lead poisoning in children. Lead can remain in household dust, in soil that children unintentionally ingest through normal hand- to- mouth behavior, or in water that is supplied through lead pipes. Other sources include old toys painted with lead-based paint, some imported ceramics, glazed dishes older, viny mini-blind and imported aluminum cans with soldered seams **(Swaringen et al., 2022)**.

Nursing Care Management of lead poisoning: Nurses play an important role in recognizing the signs and symptoms of lead poisoning, educating families on potential sources of lead exposure, and advocating for preventive measures to reduce risks. The primary nursing goal in lead poisoning is to prevent the child's initial or further exposure to lead. For children with low-level exposure, this requires identifying the sources of lead in the environment. Careful history taking is the most useful and valuable tool and should concentrate on the personal risk questions **(Marilyn &Wilson, 2021).**

For children who undergo chelation therapy, the nurse prepares them for the injections and makes all efforts to reduce injection pain. Chelating agents are administered deeply into a large muscle mass. To lessen the pain from EDTA, the local anesthetic procaine is injected with the drug. Rotation of sites is essential to prevent the formation of painful areas of fibrotic tissue. Because EDTA and lead are toxic to the kidneys, keep records of intake and output, and assess urinalysis to monitor renal functioning **(Wei et al., 2024)**.

Treatment of the poisoning

Berta et al, (2020) stated that the treatment for ingestion of poison will depend on the type of poison ingested. Treatment of poisoning includes prevention of absorption, enhancement of excretion of the poison from the body, maintenance of fluid and electrolyte balance, and cardiopulmonary stabilization. Gastrointestinal decontamination (GID) is used if necessary, depending on the potential toxicity of the poison and the risks versus benefits. GID with agents such as gastric lavage or activated charcoal or through whole-bowel irrigation.

Gastric lavage may be performed to empty the stomach of the toxic agent, however this procedure is associated with serious complications (Gastrointestinal (GI) perforation, hypoxia, aspiration). In addition, gastric lavage may be of little use if used beyond 1 hour of ingestion. Conditions that may be appropriate for performing gastric lavage include presentation within 1 hour of ingestion of a toxin, ingestion in a patient who has decreased Gl motility, the ingestion of a toxic amount of a sustained release medication, and a massive or life- threatening amount of poison lavage is used, the patient requires a protected away, possible sedation, and the largest diameter tube that can be inserted to facilitate passage of gastric contents **(Sandilands, 2023)**.

A commonly used method of GID is the use of activated charcoal (AC), an odorless, tasteless, fine black powder that adsorbs many compounds, creating a stable complex. AC has the best results when administered 30 to 60 minutes after poison ingestion. It binds with most poisonous compounds; exceptions are metals, ethanol, caustics, and many hydrocarbons **(Anderson, 2021)**.

Activated charcoal is mixed with water or a saline cathartic to form a slurry. Slurries are neither gritty nor distasteful but resemble black mud. To increase the child's acceptance of AC, the nurse should mix it with small amounts of chocolate milk, fruit syrup, or cola drinks and serve it through a straw in an opaque container with a cover (e.g., a disposable coffee cup and lid) or an ordinary cup covered with aluminum foil. For small children, a nasogastric tube may be required to administer AC **(Bhimani et al., 2023)**.

In whole-bowel irrigation, toxins are “flushed” from the gastrointestinal tract with an electrolyte solution. A child may be able to drink the solution or a tube may be inserted through the nose or mouth and into the stomach. Flushing helps to push the contents of the gastrointestinal tract out of the body. Fluid is passed through the tube until clear fluid exits the rectum **(Deguigne et al., 2023)**. Also **Marc & Darren, (2023)** reported about administration of Antidotes that certain poisons have specific antidotes, which are available and should be administered without delay once confirmation of poisoning is obtained. Antidotes are not available for many poisons. They should be administered in appropriate doses immediately.

Role of the nurse

Assessment: The first and most important principle in dealing with a poisoning is to treat the child first, not the poison. Accurate and rapid assessment of the poisoned child can mean the difference

between life and death. The nurse starts by assessing the airway, breathing, circulation, disability, exposure (ABCDE) and taking frequent vital signs. Initiate respiratory or circulatory support as needed. Because shock is a result of ingestion of many toxic substances, blood pressure, tissue perfusion, and urine output are carefully monitored. Also, measures to reduce the effects of shock, beginning with the CAB (circulation, airway, and breathing) of resuscitation, are important. Observe and document the child's mental status frequently to determine any changes in level of consciousness. Assess changes in pupil size or reactivity, as well as the occurrence of seizures **(Ornillo & Harbord, 2020)**.

The nurse's responsibility is to be prepared for immediate intervention with all of the necessary equipment. Because time and speed are critical factors in recovery from serious poisonings, anticipation of potential difficulties and complications may mean the difference between life and death. Exposure to the poison is terminated next, such as emptying the mouth of pills or other materials or flushing the skin or other body area. Then, the poison is identified by questioning the parents or witnesses of the event to determine the appropriate treatment **(Doudareva & Carter, 2022)**.

Nursing diagnoses that apply to the child and family include: Risk for injury related to insufficient parental knowledge about first aid for toxic ingestion and accidental poisoning, ineffective breathing pattern related to effects of toxic substances and risk of deficient fluid volume related to effects of ingested substances, treatment modalities, or decreased fluid intake. Also include risk for poisoning related to insufficient parental knowledge about poisoning prevention **(Leifer, G., 2022)**.

Interventions

Stabilizing the child is the nurse's priority in caring for the child who has ingested a poisonous substance. Nursing care also includes reducing the child's and the family's fear and anxiety, providing preventive teaching concerning the storage of poisons and supervision of children, and removing of the poison from the child's skin and mucous membranes to reduce further injury. The nurse administers the antidote or takes other measures as prescribed by the health care provider, such as administering activated charcoal. The nurse documents the occurrence, assessment findings, poison ingested, treatment measures and the child's response **(Adal et al., 2023)**.

The nurse should give special attention to the family. The parents may feel guilty and blame themselves for the child's condition. The nurse must not reinforce this belief through either verbal or nonverbal communication. The parents should be kept informed about their child's condition, allowed to be with the child if at all possible, and given a chance to vent their feelings. The nurse should listen and support them through this difficult period. Preventive teaching should not be done until the acute stage has passed **(Connor et al., 2022)**.

Nurses play a major role in the prevention of poisoning in children. As nurses use their knowledge of growth and development in teaching anticipatory guidance. Children are naturally curious, and as

they become mobile, they can climb and reach any hiding place and open almost any bottle. The use of safety caps has been effective in reducing the number of ingestions. Parents are encouraged to not give emetic or other substance at home without consultation with a poison control center (PCC) or health care provider **(Babic et al., 2021)**..

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