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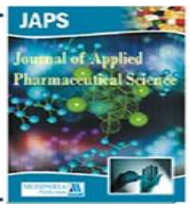

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PEDIATRIC POISONING IN EGYPT

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ABSTRACT

Poisoning exposures are a widespread public health problem for children and represents one of the most common medical emergencies encountered in young children, and accounts for a significant proportion of emergency room visits for the adolescent population. The aim of this work is to collect data for management of the most common pediatric poisoning in Egypt as a guideline for physicians and toxicologists. Most common childhood ingestions involve nontoxic substances or nontoxic doses of potentially toxic drugs or products, although a few ingestions can be very dangerous and require treatment. There are three things that typically put children at risk for toxic ingestion: improper storage of substances in the home, children spending more time in other people's homes, and caregiver distraction. The majority of exposures is accidental and occurs in children under the six years of age. The pediatric population is a very dynamic group because the physiologic processes that determine drug disposition undergo rapid changes as children grow, these pharmacokinetic properties, change as children mature with the most dramatic changes occurring in the first year of life. Most common pediatric poisoning in Egypt include insecticides, corrosives, hydrocarbons, food poisoning, analgesics, antihistamines, carbamazepines, phenol and oral contraceptive pills. Assessment of an acutely poisoned child involves the taking of an appropriate history, assessment of the level of consciousness, ventilation and circulation, a physical examination, and requesting appropriate toxicological and non-toxicological investigations. When a child presents with suspected poisoning, begin with an assessment of the airway, breathing and circulation. Activated charcoal is a universal antidote for the majority of poisons. Antidotes are playing an increasing role in therapy for pediatric poisonings. Poison prevention should continue as an integral part of anticipatory guidance activities of infant and child health care providers.

Keywords: Poison center; infant and child; poisoning; assessment.

INTRODUCTION

Poisoning ‘An individual's medical or social unacceptable condition as a consequence of being under influence of an exogenous substance in a dose too high for the person concerned’ (Uges, 2001). Poisoning represents one of the most common medical emergencies encountered in young children, and accounts for a significant proportion of emergency room visits for the adolescent population (Madden, 2005).

EPIDEMIOLOGY OF POISONING

The epidemiology of poisoning can be studied from different perspectives. These include overall mortality, hospital admission rates, and enquiries to Poisons Information Services (Bateman, 2007). The total cases of acute poisoning among children admitted at Tanta University Hospital and El-Menshawy General Hospital during the year 1998 was 434 (Maklad and El-Saleet, 1999), While 490 children admitted during the year 1994 (Gado, 1994). Food poisoning was the commonest cause of poisoning in Tanta University Hospital and El-Menshawy General Hospital followed by drug poisoning, unknown substances and household poisons respectively (Gado, 1994 and Maklad & El-Saleet, 1999), While the leading cause of acute poisoning among children in Alexandria Poison Center during the year 1992 was household agents followed by food poisoning then drug poisoning respectively (Abd El-Megid and Salem, 1995). Maklad and El-Saleet found in Tanta University Hospital and El-Menshawy General Hospital during the year 1998 that drug poisoned children in the age group 1-13 years were accidentally poisoned by: Antibiotics, antihypertensives, antirheumatics, oral contraceptives, bellacid and tonics (Maklad and El-Saleet, 1999). A total of 121 parents/caregivers were surveyed. In 117 cases (97%), information was sought prior to presentation. The Poisons Information Centre (PIC) was the initial source of information in 39 cases (32%), the emergency department in 25 cases (21%) and the family doctor (by telephone or consultation) in 21 cases (17%). Poisons Information Centers, emergency departments and family doctors were the sole sources of information for 18%, 15% and 12% of cases, respectively (Rush and Reith, 2003). While, the American Association of Poison Control Centers reports approximately 1.6 million potentially toxic exposures for children and adolescents ages 0 to 19 years during the year 2007, and these pediatric exposures represent 64.7 % of the reported exposures for all age groups during this year (Bronstein *et al.,* 2008). The total cases of acute poisoning among children admitted at Ain Shams University in Cairo (poison control center) during the year 2008 were 8841(Ain -Shams Poison Control Center, 2008) while the total cases of acute poisoning among children admitted during the year 2004 were 12018 cases (Aglan, 2007).

RISK FACTORS

There are three things that typically put children at risk for toxic ingestion: improper storage of substances in the home, children spending more time in other people's homes, and caregiver distraction (Bryant and Singer, 2003). Poisonings fall into two broad types: accidental and intentional. Accidental poisonings usually involve toddlers and young children who ingest a small amount of a toxic substance usually result from oral exploration; typically they are taken by a family member for medical care soon after ingestion (Maureen, 2008). Consider the possibility of intentional administration by an older child or adult. In school-age children, suspect abuse or neglect as a reason for the ingestion. In adolescents and young adults, overdoses are usually suicidal but may also result from drug abuse or experimentation (Olson, 2007). Unintentional poisoning in childhood continues to be a major public health problem. Although the mortality rate is low and has declined significantly over the last 50 years (Uziel, 2005). It is generally recognized that most unintentional exposures usually result in mild symptoms or no symptoms and that less than 10% of unintentional exposures involving toddlers result in significant symptoms (Robin and Thomas, 2006). This has led to the one pill rule, which postulates that a single adult therapeutic dose would not be expected to produce significant toxicity in a child (Michael and Sztajnkrycer, 2005) also, most common childhood ingestions involve nontoxic substances or nontoxic doses of potentially toxic drugs or products (Dempsey, 2007).

The Association of American Poison Control Centers estimates that Children younger than age 6 years account for 79% of all reported pediatric exposures, children between 6 and 12 years of age account for 10% and adolescents 13 to 19 years of age account for 11% of reported pediatric exposures. Children younger than age 6 years account for 53% of all reported pediatric and adult poisoning exposures. Girls represent 47% of the reported poisoning exposures among young children and 56% of the reported exposures among adolescents (Fine, 2006).

There is a male predominance for ingestion in children younger than 13, and a female predominance in teenagers and adults (Bronstein *et al.*, 2007). Girls represent 47% of the reported poisoning exposures among young children and 56% of the reported exposures among adolescents (Fine, 2006). Boys are more likely than girls to be hospitalized for poisonings under age 13 years. Boys may be as mush as four times more likely to experience multiple incidents of an accidental poisoning then girls (Kivisto *et al.*, 2008). According to the American Poison Control Centers, approximately 56% of pediatric exposures are to xenobiotics that are commonly found around the house, such as cleaning products, cosmetics, plants, hydrocarbons, and insecticides, whereas approximately 44% are to pharmaceutical agents (Fine, 2006).

Table. 1: Average Annual Xenobiotic Exposures Reported to the American Poison Control Centers (1999-2003).

Age < 6 years		Age 6 -19 years	
Category	**Number of exposures**	**Category**	**Number of exposures**
Cosmetics	157,834	Analgesics	51,943
Cleaning substances	119,752	Cough/cold preparations	21,069
Analgesics	88,086	Antidepressants	18,007
Topical agents	78,419	Cleaning substances	17,795
Plants	69,655	Cosmetics/ personal products	17,703
Cough/cold preparations	63,107	Stimulant/street drugs	15,151
Insecticides/pesticides/ Rodenticides	47,618	Sedative-hypnotic drugs	13.297
Vitamins	41,918	Antihistamines	12,637
Gastrointestinal preparation	35,357	Art/craft supplies	12,399
Antimicrobial	33,847	Plants	11,833

(Fine, 2006)

AGENTS INVOLVED

According to American Poison Control Centers , approximately 55% of reported pediatric exposures and children are to non-pharmaceutics' agents, substances that are commonly found around the house such as cleaning agents, cosmetics, hydrocarbons, and insecticides; whereas approximately 45% are to Pharmaceutics' agents (Watson *et al.*, 2005).

Common household products were to blame for more than 540,000 pediatric ingestions reported in 2002**.** These substances, which include everything from bubbles and dish detergent to nail polish and perfume, are not necessarily the most dangerous, but they are often the most accessible (Watson *et al.*, 2003). More than 20,000 children drank laundry bleach in 2002, often mistaking it for water or juice because it was stored in a glass or cup. That same year, automatic dishwasher detergent accounted for some 7,000 cases, as children grabbed a mouthful while the machine was being loaded. Fortunately, because of the bad taste, children usually stop eating or drinking such substances immediately and end up with only minor gastrointestinal distress. Other poisons can be very appealing, however, like antifreeze, with its sweet smell and taste (Watson *et al.*, 2003). The garage is a particularly dangerous place for kids, with gasoline and pesticides among the most toxic substances. More than 5,000 children swallowed gasoline in 2002; in some cases, the fuel was stored in a soda container. Gasoline and other agents that contain hydrocarbons can easily be inhaled, causing chemical pneumonia (Watson *et al.*, 2003). Still other household products, such as oven and toilet-bowl cleaners, drain openers, and rust removers, are so potent that serious burns can result from swallowing just a mouthful, which amounts to a little more than 9 ml for a toddler (Ratnapalan et al. (2003).

Medications are high on the list of pediatric toxins and are to blame for hundreds of thousands of incidents each year. Part of the problem is that parents may not be aware that child-resistant packaging isn't childproof, and that even young children have the dexterity to eventually open these containers (Lembersk *et al.*, 1996).There are certain common medications and substances that may place a child at greater risk for fatality, such as antidepressants, prenatal iron supplements, and salicylates, all of which have been reported to cause severe toxicity in toddlers (Watson *et al.*, 2005).

Maklad and El-Saleet found in Tanta University Hospital and El-Menshawy General Hospital during the year 1998 that drug poisoned children in the age group 1-13 years were accidentally poisoned by: Antibiotics, antihypertensives, antirheumatics, oral contraceptives, bellacid and tonics (Maklad and El-Saleet, 1999). Paralleling national and regional poison control data, cardiovascular, analgesic, and psychotropic medications were the source of the majority of pediatric pharmaceutical exposures in our study (Watson *et al.*, 2005).

Many studies from the developed countries show that common household products, rather than pharmaceuticals, are now implicated in the majority of pediatric poisonings. The most common pediatric poisoning (<18 year) admitted to Ain -Shams Poison Control Center during the year 2008 were food poisoning (1095), corrosives (866), organophosrus (792), hydrocarbons (744), Tegretol (carbamazapine) (231), insecticides (227), phenol (156), oral contraceptive pills (137), brufen (73) and aspocid (69) (figure 1): (Ain -Shams Poison Control Center, 2008).

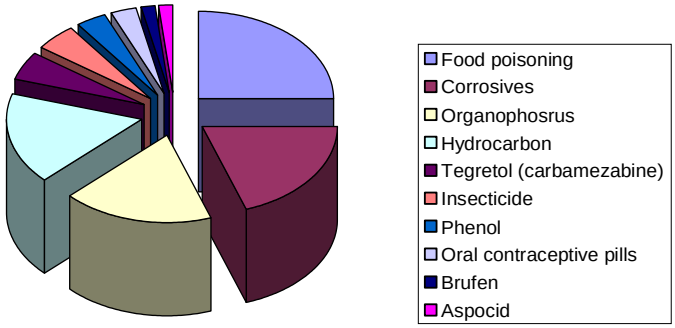

Fig. 1: Examples Of The Most Common Pediatric Poisoning Addmitted To Ain-Shams Poison Control Center During The Year 2008.

Among the total cases of acute poisoning in children admitted at Ain Shams University in Cairo (poison control center) during the year 2004, chemical and household products represent the highest percentage of poisoning (43.0%). Most of them were Insecticide (29.53%), Corrosives (29.4%) and Hydrocarbons (20.54%). In other hand medicinal products represent the second highest percentage of poisoning (36.0%). The most common medicinal products involved in poisoning were analgesics (10.48%). Food poisoning came the 3rd one (13.3%) and represent one of problem among children, While other group (Venomous animals (1.8%), Toxic plants (0.3%), Environmental toxins (2.3%) and unknown (2.5%) not represent a problem among children (figure 2): (Aglan, 2007).

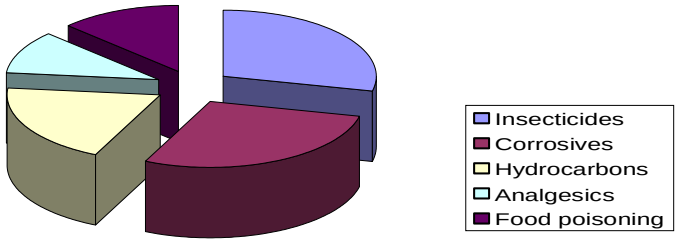

Fig. 1: cases of acute poisoning admitted to ain shams university (popison control center) during the year 2004.

Food poisoning was the commonest cause of poisoning in Tanta University Hospital and El-Menshawy General Hospital followed by drug poisoning, unknown substances and household poisons respectively (Gado, 1994 and Maklad & El-Saleet, 1999), While the leading cause of acute poisoning among children in Alexandria Poison Center during the year 1992 was household agents followed by food poisoning then drug poisoning respectively (Abd El-Megid and Salem, 1995). Drugs are the most common cause of exposure, and in most cases, the clinical course is benign. However, among the Arab children, who reside at rural surroundings, pesticides are the most common cause of poisoning, often resulting in a moderate to severe clinical course (Uziel, 2005).

Most children who ingest poisons suffer no harm; however, health care providers must recognize, assess, and manage those exposures that are most likely to cause serious injury, illness, or death and initiate appropriate management to minimize the physical injury that may occur (Madden, 2005).

Summer is the most vulnerable period for poisoning in children and kerosene is mostly consumed during this time. There was significant relation during this season with the kerosene (Rashid *et al.,* 2007). Summer was the dry season. Children became thirsty and took kerosene contained in the soft drink and mineral water unintentionally. In the study by Matityahu & Vladimir, most poisonings were observed to occur in summer and autumn as compared to other seasons (Matityahu and Vladimir, 2000). Household products are more commonly ingested than drugs by children and seasonal variability has been described. Pesticides and weed killers are more commonly ingested in the spring, berry poisoning occurs in the autumn, and cough and cold remedies are more commonly ingested in the winter (Jepsen and Ryan, 2005). Snake bite is seen more in rainy season (Rashid *et al*., 2007).

PHARMACOKINETICS & PHARMACODYNAMICS

The pediatric population is a very dynamic group because the physiologic processes that determine drug disposition undergo rapid changes as children grow, these pharmacokinetic properties, which can be very different in children as compared to adults, change as children mature with the most dramatic changes occurring in the first year of life. Pharmacokinetics immaturity in the perinatal period is a generalized phenomenon that can modulate the metabolism and clearance of numerous environmental toxicants. This could affect the removal of both parent compound and metabolites and alter the degree to which chemicals are converted to toxic metabolites (Renwick *et al.,* 2000). In general, clearance is inversely proportional to age in children. Premature babies often have slower drug clearance (and a longer half-life), due to the delayed metabolism and elimination associated with the immaturity of the hepatic and renal organ systems (Hendrick 1995). At later ages, when the immaturity of hepatic systems has been overcome, it is possible for children's metabolism and clearance of xenobiotics to supersede that in adults (Renwick *et al*.,, 2000).

In general, the rate of drug absorption is slower in neonates and young infants than in older children (Kearns *et al.,* 2003) and experience prolonged gastric emptying time, this enhanced absorption of medications increases the risk of adverse side effects and toxicities (Guthrie, 2005). The ratio of total body surface area to body mass in infants and young children far exceeds that in adults. Thus, the relative systemic exposure of infants and children to topically applied drugs may exceed that in adults, with consequent toxic effects in some instances (Kearns *et al.,* 2003). Age-related changes in the relative amounts of body water and fat composition can alter the volume of distribution of certain medications (Guthrie, 2005). Infants and young children will display less protein binding than adults, leaving more free drug available for distribution and interaction with protein receptors. The rate of oxidative metabolism (hydroxylation) and of glucuronidation is reduced in newborns and has played a part in tragic intoxications. Renal function is decreased in newborn and is not reached to the adult level until 6 months to 1 year of age (Viccellio *et al.,* 1998).

CLINICAL EVALUATION OF PEDIATRIC POISONING

There are several unique aspects in the clinical assessment and management of suspected childhood poisoning that need to be considered. The emergency department management is primarily determined by the thorough history obtained from a parent or caregiver and observing for clinical signs indicative of poisoning. Appropriate initial decision-making in a poisoned child requires accurate identification of the substance (name, manufacturer ingredients, quantities, concentrations, production date), the amount ingested (dosage per kilogram body weight), and the time interval since ingestion. To facilitate the identification of the substance, it is crucial to perform a through physical examination, assessing mainly vital signs, temperature, and hydration of mucous memberanes, pupil response measurements, and neurological examinations. It must be remembered that laboratory studies play an important role in diagnosis of poisoning. Initial diagnostic studies must often be performed concomitantly with the primary survey and implementation of life-saving treatment (Riordan *et al.,* 2002).

Assessment of an acutely poisoned patient involves the taking of an appropriate history, assessment of the level of consciousness, ventilation and circulation, a physical examination, and requesting appropriate toxicological and non-toxicological investigations (Vale and Bradberry, 2007). It must be remembered that laboratory studies play an important role, but should never be followed blindly. Even some commonly used tests are not as conclusive as some clinicians may believe. It is imperative that the limitations of these studies be known to those that order them (Eldridge, 2008).

Initial diagnostic studies must often be performed concomitantly with the primary survey and implementation of life-saving treatment (Julius, 1996). The exact laboratory investigations depend on the specifics of each case as well as the overall severity. Not all toxins can be measured. Although blood and urine toxicologic screens are available, these can be expensive and rarely provide immediate results. Hence their use may be limited in the Emergency Department, but may have important medicolegal consequences (Ericson and Ahrens., 2005). Although routine toxicologic screens do not contribute to the immediate management of suspected poisoning, they may be indicated in specific circumstances, such as when it is denied or unreported and there is a clinical suspicion (Montague *et al.,* 2001).

The effectiveness of certain treatments depends upon how much time has elapsed since the poison was ingested (Bryant and Singer, 2003). Bear in mind that approximately 40% of children who present with poisoning have not been exposed to the suspected toxin. So it's crucial to look for clinical indicators of poisonous

ingestion before initiating treatment. A thorough history is critical, find out what was ingested, in what quantity, and at what time. Chart the patient's age, weight, medications, and any medical conditions he may have (Hawang *et al.,* 2003).

When a child presents with suspected poisoning, begin with an assessment of the airway, breathing and circulation (Hwang et al., 2003). Activated charcoal is a universal antidote for the majority of poisons (Michael, 2007). Antidotes are playing an increasing role in therapy for pediatric poisonings (White and Liebelt, 2006).

Newer antidotes have emerged in the last 10 years that target specific life-threatening poisonings. These newer therapies, including hormones, drug antagonists, enzyme inhibitors, and antibodies against drugs and venoms such as glucagon (β-blocker and calcium channel blocker toxicity), insulin/glucose (calcium-channel blocker toxicity), octreotide (sulfonylurea toxicity), new crotalid antivenom (crotalid snake bit envenomation), antibody therapy for tricyclic antidepressants, fomepizole (ethylene glycol toxicity), and nalmefene (opiod toxicity) (Liebelt, 2000). Supportive care continues to be the cornerstone in managing most poisoned children (Hwang *et al*., 2003).

Both the American Academy of Pediatrics and the American Academy of Family Physicians recommend that physicians include poison prevention anticipatory guidance as a part of routine well-child care. Current recommendations include reminding parents to keep medicines and other dangerous substances locked up and in child-resistant containers and to have the local poison center telephone number posted in a prominent place near the telephone (Gerard *et al.,* 2000).

The following messages should be part of anticipatory guidance during prenatal and well-infant visits:

- Keep potential poisons out of sight and out of reach.
- Always reengage child-resistant closures in the locked mode immediately after using a pharmaceutical or consumer product.
- Never transfer a substance from its original to an alternate container.
- Safely dispose of all unused and no longer needed medications.
- Do not refer to medicines as candy.
- Post the poison control center number near the telephone (Bull *et al.,* 2003).

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