

# Poisoning in Childhood and Adolescence: A Study of 111 Cases Admitted to a Military Hospital

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One hundred eleven cases of poisoning (over a 4<sup>1</sup>/<sub>2</sub>-year period) were retrospectively reviewed at a military medical center. Results of the review included the following: (1) two peak age ranges for poisoning were identified: the 1<sup>1</sup>/<sub>2</sub>- to 4-year-old child who accidentally ingests both drugs and non-drugs, and the female adolescent who ingests drugs as a suicide attempt or gesture; (2) hydrocarbons and aspirin were the most common agents ingested; however, if grouped, drugs with anticholinergic effects would replace aspirin as the second most common poison; (3) emergency treatment included emesis or lavage in four fifths of poisonings except in ingestions of hydrocarbons or caustics where its use is controversial; (4) incidence of recurrence of poison ingestion was three percent, and morbidity and mortality combined were less than one percent; and (5) two thirds of patients were asymptomatic on admission and hospitalized primarily for observation.

Poisoning, usually from toxic substances or drugs kept in the home, is one of the most serious sources of illness and death in childhood.<sup>1</sup> Despite widespread education of parents and physicians,<sup>2-4</sup> introduction of safety packaging, and reducing the number of doses of medication per container, more than one million children less than five years old ingest poisons, resulting in more than 100 deaths per year. The easy availability of aspirin and hydrocarbons in the child's environment has, in the past, caused these two agents to be the most common cause of morbidity and mortality from pediatric poisoning.<sup>5</sup> These somber statistics reflect the fact that poisoning is the most common pediatric emergency encountered by the primary care physician.

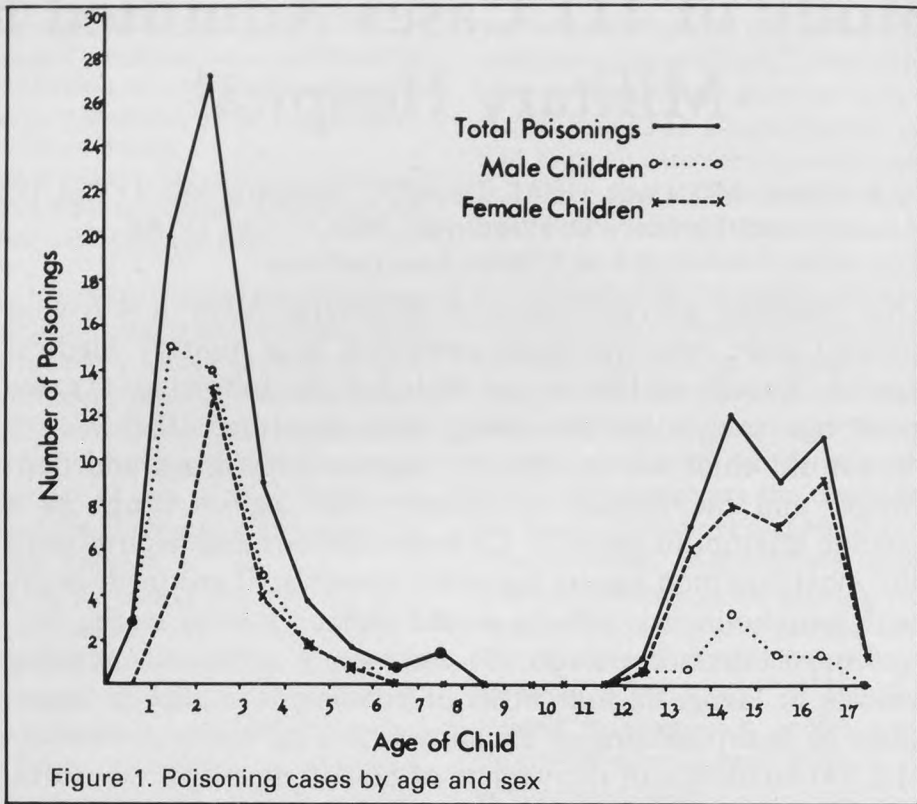
Because of seemingly frequent admissions for poisoning to David Grant Medical Center and a

seemingly high incidence of anticholinergic ingestions, a 4<sup>1</sup>/<sub>2</sub>-year retrospective inpatient review was undertaken to determine: (1) if the inpatient characteristics differed from those of previous studies of pediatric poisoning, (2) if substances ingested in a military setting are comparable to those reported from previous civilian studies, and (3) if methods of poison management could be improved at David Grant Medical Center.

## Methods

Records were reviewed of children through 18 years of age admitted to the pediatric ward of the medical center from November 1973 through May 1978 and discharged with the diagnosis of poisoning or overdosage of drugs and toxic agents. The 111 patients studied represent poisonings admitted over a four-year seven-month period. Discharge summary records were matched with hospital admission and inpatient medical records. The 111 patients represented 4.4 percent of the total pediatric admissions during the period reviewed.

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Data collected included time of occurrence, age and sex of the patient, type of agent involved, initial management, duration of hospitalization, and mortality or morbidity associated with the poisoning.

**Results**

The distribution of poisoning cases by age and sex is shown in Figure 1. There was no predominance of the time of day, day of week, or month of year, in any poison group, or age group, within the 111 patients. Male to female ratios were approximately equal for the total population of patients (48 percent male, 52 percent female), while poisonings below age two years (78 percent male, 22 percent female) and above age 13 years (22 percent male, 78 percent female) showed significant differences in sex ratios. Two "peak" age groups, ages 1½ to 4 years and ages 13 to 17 years, accounted for 80 percent of all poisonings. Only three cases of ingestion were noted between the ages of 6 and 12 years. All three were boys, ages 6 and 7; one child who ingested his mother's iron tablets was retarded (Trisomy 21), the other two (Haldol in-

gestion and a gasoline inhalation, respectively) were noted with familial psychosocial circumstances that prompted poor supervision. Twenty-five percent of cases were suicide attempts or gestures, all occurring in adolescents.

Table 1 lists the specific poison agents in order of frequency. Two categories of substances were represented: "Non-Drugs," physical agents used either as specific internal poisons, external cleansing agents, or fuels, which included hydrocarbons, caustics, arsenic, isopropyl alcohol, metaldehyde, and warfarin rat poison; and "Drugs," chemicals used medicinally and taken internally which were available either over-the-counter or by prescription. "Drugs" were involved in 71 percent of poisonings and were predominantly in children over four years of age, while "non-drug" ingestions were involved in 29 percent of poisonings and were almost exclusively (88 percent) in children four years old and younger. Multiple drug ingestions were divided into two categories: "Two drugs" or "more than two drugs"; all multiple drug cases involved suicide gestures or attempts in adolescents.

Table 1. Distribution of Substances Involved in Poisonings by Age Group and Sex					
	Total	Male		Female	
		<8 Years	>12 Years	<6 Years	>12 Years
<b>Non-Drugs</b>					
Hydrocarbon	17	11	1	4	1
Caustics	5	5	0	0	0
Arsenic	3	3	0	0	0
Isopropyl alcohol	2	1	0	1	0
Metaldehyde	2	1	0	1	0
Warfarin					
rat poison	2	0	0	2	0
Naphthalene					
moth balls	1	1	0	0	0
<b>Total</b>	<b>32</b>	<b>22</b>	<b>1</b>	<b>8</b>	<b>1</b>
<b>Drugs</b>					
Salicylates	12	3	0	4	5
Iron	8	5	0	3	0
>2 drugs	7	0	3	0	4
Decongestant	6	2	1	0	3
Lomotil	5	4	0	1	0
Ethyl alcohol	5	0	2	0	3
2 Drugs	5	0	0	0	5
Darvon	3	0	0	1	2
Tylenol	3	1	0	2	0
Elavil	3	0	2	0	1
Antihistamine	3	1	0	0	2
Cardiac glycosides	3	0	0	3	0
Antihistamine atropine	2	0	0	1	1
Theophylline	2	1	0	0	1
Valium	2	0	1	0	1
PCP	2	0	0	0	2
Morphine	2	1	0	1	0
Haldol	1	1	0	0	0
Thorazine	1	1	0	0	0
Nyquil	1	0	0	1	0
Nytol	1	0	0	0	1
Unknown	1	1	0	0	0
Meprobamate	1	0	0	0	1
<b>Total</b>	<b>79</b>	<b>21</b>	<b>9</b>	<b>17</b>	<b>32</b>

The most common substances involved were hydrocarbons (17 cases, 15 percent), salicylates (12 cases, 11 percent), and iron (8 cases, 7 percent), together accounting for one third of the total poisonings. Had the drugs causing the anticholinergic syndrome been categorized as a group, they would be the second most common cause of poisoning (14 cases, 13 percent), replacing salicylates. Two patients received iatrogenic morphine overdose in their preoperative medication.

Specific age groups were involved for several

substances, including hydrocarbons (15 of 17 in children under seven years), iron (all 8 in children under seven years), caustics (all 5 in males under five years), Lomotil (all 5 in children under six years), arsenic (all 3 in males under four years), cardiac glycosides (all 3 in females under six years), and multiple drugs (all 12 in children over 12 years).

Initial management was provided in the emergency room on 109 patients (99 percent). Emesis or lavage was performed as initial man-

agement in 83 percent of patients presenting with drug ingestions; when hydrocarbons were involved, lavage was performed in 3 of 4 cases where large amounts (greater than 30 cc) were suspected and in only 1 of 13 cases where small amounts (less than 30 cc) were suspected. No cases of caustic ingestion were lavaged. Thirty-six percent of the 109 patients presented with symptoms attributable to the agent ingested and required appropriate therapy; 12 of the total 111 poisoning cases required placement in intensive care units (ICUs). There were no deaths.

Residual effects related to the poisoning were present at time of hospital discharge in only three patients: two young boys with transient liver enzyme elevations related to hydrocarbon ingestion and one adolescent girl with organic psychosis related to overdose of PCP (parachlorophenylalanine). The girl with organic psychosis remained chronically disabled secondary to drug effects requiring intense psychiatric intervention. Detailed physical and psychological outpatient follow-up was unavailable in many of the patients due to the transient nature of the armed forces population. Three cases represented recurrences, two of these in adolescent females. Six cases were reported to Child Protective Service for follow-up regarding possible neglect. Average duration of hospitalization was 2.4 days with only four patients requiring hospitalization longer than seven days, three of these being adolescent females.

## Discussion

Few studies have described the characteristics of poisoning in the military pediatric inpatient population.

A retrospective analysis of 111 cases of poisoning admitted to David Grant Medical Center from November 1973 through April 1978 represented 4.4 percent of total pediatric admissions for those dates. This incidence is less than in previous studies<sup>5</sup> despite the fact that 64 percent of patients were asymptomatic on admission and hospitalized primarily for observation. Only 12 percent required care in the intensive care unit. The low morbidity and mortality confirms the current literature.<sup>5,6</sup> There was no overall male or female predominance; however, poisonings below age 2 years were predominately male and those above 13 years were predominately female.

Of special interest are the two "peak" age

groups, ages 1½ to 4 years and 13 to 17 years, together accounting for 80 percent of admissions. All of the suicide gestures or attempts, 25 percent of total poisonings, occurred in this older age group. Accidental or nonaccidental ingestions, in fact, were rare between the ages of 6 and 12 years, due probably to an improved discrimination of toxic substances and no pressure for attempts at self-harm or alteration of consciousness in the preadolescent. The incidence of recurrence was low, at three percent. An explanation for this low incidence, besides parental poison education and safety packaging, is the fact that ingestions that were tabulated included hospital admissions only and recurrences may have been managed without hospital admission or possibly even without being evaluated by a physician.

By dividing the substances involved into drug and non-drug ingestions, specific characteristics could be seen in each age group. Drug ingestions (72 percent) occurred predominately in children over four years of age while non-drug ingestions (28 percent) were seen almost exclusively in children less than four years old. This could result from the inquisitive toddler exploring the utility closet or kitchen. As discrimination improves, non-drug ingestion in the older population becomes a rarity and ingestion of medicinal agents increases, either accidentally from imitation of adults or from overdosage, or purposefully in an attempt at various levels of consciousness alteration.

The most common substances ingested in order of frequency were hydrocarbons, salicylates, and iron, together accounting for over 35 percent of ingestions. Despite safety packaging of aspirin and the increasing use of the antipyretic acetaminophen in the past ten years in the United States and the United Kingdom,<sup>7,8</sup> aspirin remains the second most commonly ingested drug in this review. Surprisingly, an increase in acetaminophen poisoning<sup>7</sup> was not reflected by this study. Also, if those drugs capable of causing the anticholinergic syndrome had been grouped together, they would form the second most common poison group with 15 percent of ingestions. Therefore, pediatricians and family physicians should not only be familiar with the concepts of poison management for hydrocarbons, the antipyretics (aspirin and acetaminophen), and heavy metals (especially iron), but should also be acquainted with the clinical presenta-

tion and management of the anticholinergic syndrome. Furthermore, all physicians prescribing drugs capable of causing anticholinergic poisoning, including tricyclics and amitriptyline, should be aware that they are becoming a very common cause of poisoning in infants.

Because of direct competition at cholinergic receptor sites, anticholinergic drugs (Table 2) cause central as well as peripheral anticholinergic toxicity. Central toxicity would include delirium, hyperactivity, seizures, and coma. Peripherally, one would expect tachycardia, hyperpyrexia, ileus, urinary retention, dry mouth, and mydriasis. Besides emesis, charcoal instillation, and supportive care, physostigmine, an anticholinesterase, has been recommended in cases of severe poisoning with cardiac toxicity, coma, or convulsions.<sup>9</sup>

In summary, the findings from this study include the following: (1) Two "peak" age ranges exist for poisonings: the 1½-to 4-year-old toddler who accidentally ingests both drugs and non-drugs, and the female adolescent who ingests drugs as a suicide gesture or manipulative attempt. (2) The most common agents in this study were hydrocarbon and aspirin, as in larger studies,<sup>5</sup> with hydrocarbons the most common agent. However, if grouped, anticholinergics would be the second most common agent. (3) Emergency treatment included emesis or lavage in a high percentage of cases except those of hydrocarbon or caustic ingestion. (4) Incidence of recurrence was surprisingly low at three percent, and morbidity and mortality was rare. (5) Sixty-four percent of patients were asymptomatic on admission and hospitalized primarily for observation, reflecting perhaps a more liberal admission policy in a military setting.

While other studies have concentrated on environmental and psychological factors,<sup>10-12</sup> this study presented an analysis of the relationship of age and sex with the type of poisoning, the methods of initial management, and the mortality/morbidity associated with poisonings in a military setting. Although a larger study involving more patients is needed, these findings may be used in the following manner: (1) pre-education of parents regarding ingestions and usage of ipecac, (2) standardization of treatment policies regarding use of lavage or emesis in hydrocarbon ingestions, (3) education of family physicians, pediatricians, and paramedical technicians in recognizing and treating the anticholinergic syndrome, (4) place-

**Table 2. Anticholinergic Substances<sup>9</sup>**

**Drugs**

Amitriptyline  
 Antihistamines  
 Atropine  
 Belladonna  
 Doxepin (Sinequan)  
 Imipramine (Tofranil)  
 Methapyrilene (Compoz)  
 Dicyclomine (Bentyl)  
 Desipramine (Norpramin)  
 Protriptyline (Vivactil)  
 Antiparkinsonian agents

**Plants**

Jimson weed  
 Black night shade  
 Amanita muscaria  
 Potato leaves  
 Wild tomato

ment of emphasis on follow-up of adolescents hospitalized following an ingestion as a suicide gesture or manipulative attempt, and (5) monitoring of hospital orders of patients receiving preoperative medications to prevent iatrogenic overdosage.

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