

Pediatrics Accidental Ingestion in Palestine: A Multi-Center Descriptive Study

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ABSTRACT

Accidental ingestion remains a common problem in the pediatric population and an important public health problem in many countries. Due to lack of local studies about the prevalence and the management of accidental ingestion in pediatrics, this study was conducted to assess the pattern of accidental ingestion in pediatrics in terms of epidemiology, demographic features, initial management and emergency interventions. Moreover, to know the most frequent accidentally ingested substances, and to analyze the circumstances and clinical findings. This descriptive study was conducted in Palestine, in the Emergency Room (ER) of six different hospitals in four cities in Palestine. The duration of this study was from March 2016, to March 2017. All children under 14 years who visited the emergency department with a history of accidental ingestion were included in the study. Demographic data was recorded in 202 cases through ER questionnaire, including patient ID, age, gender, weight, phone number and the address. The type of ingested substance, organ system affected, presenting signs and symptoms were recorded. General stabilizing management steps as well as specific measures were also reported. Moreover, some data was obtained by phone call questionnaire, including details about the event, social indicators, and more details about the management of caustic substances. In terms of baseline characteristics, majority 53.9 % of the patients were 1-2 years of age. Of the total, 61.3% patients were males. As regard the type of agents ingested, 37.6 % of the patients had ingested pharmaceutical agents followed by ingestion of caustic substance in 27.2%. Details of the clinical features showed gastrointestinal system to be the most frequently involved system in 29.7% of cases, asymptomatic cases compromised 55.9% of all cases. Regarding the outcome of these cases, 51.5% were discharged from ER and 48.5% were admitted to hospital. Medications were the most common accidentally ingested substances followed by caustic

substances. There was clear inconsistent management of ingestions between different hospitals reflecting absent national protocols.

INTRODUCTION

Poisoning occurs when cells are injured or destroyed by the inhalation, ingestion, injection or absorption of a toxic substance that can cause symptoms and signs of organ dysfunction leading to injury or death (1). According to American Poison Control Center ingestion was found to be the major route of poisoning, and the reason of this ingestion reported for children less than 5 years was unintentional, as children are curious and explore their world with all their senses, including taste, while most fatalities in adults were intentional (2).

In spite of successful interventions, latest adopted measures and safety campaigns to prevent accidental poisoning in pediatric population, toxic exposure and the number of ingested and/or toxic-related injuries from chemicals and medications continue to rise and continue to be a common occurrence. The Institute of Medicine estimates that the incidence of poisoning in the United States is approximately 4 million cases per year, with 300,000 cases leading to hospitalization, and approximately 30,000 deaths (3).

In a wide perspective, pediatric poisoning shows diverse variability that ranges from lack of maternal knowledge, improper storage of substances and insufficient supervision to curious impulsive behavior of the child (4).

Epidemiological studies on accidental poisoning in children exhibit a consistent pattern regarding age and gender, being predominant in children less than 6 years of age and having male preponderance as they are more active with a drive to explore the environment, and regarding the type ingested

substances, pharmaceutical products constitutes the major ingested substance specially in 3rd world countries like Pakistan(4), India(5), and Thailand(6), while Japan(7) has reported household materials to be the leading cause of pediatric poisoning.

Ingestion of corrosive chemicals, including acids and alkali, remains a common problem in the pediatric population and an important public health problem in many countries (8). Harm caused by alkali or acid results in a different injury pattern. Alkalis are typically colorless, odorless liquids posing an increased risk of a high volume accidental ingestion. Furthermore, because Alkali materials are thicker, they lead to longer exposure durations in the esophagus, causing progressive injury via liquefactive necrosis. In contrast to alkali, acids induce a burning sensation with subsequent pain immediately after contact with oral mucosa; accordingly, the volumes traditionally ingested tend to be small. In addition, since acids lack viscosity, their transit time through the esophagus is rapid (4). Caustic ingestions can have catastrophic sequel including serious immediate complications like perforation and bleeding. Lifelong complication, ranging from respiratory and gastrointestinal burns resulting in stricture formation leading to malnutrition and long term risk of developing malignant transformation, and death as a result of caustic ingestion(4).

As there are no available local studies about the prevalence and the management of accidental ingestion in pediatrics, we conducted this multi-centric study in six main hospitals in Palestine to assess the pattern of accidental ingestion in pediatrics in terms of epidemiology, initial management and emergency interventions representatives of Palestinian practices, and to analyze the circumstances, demographic features, clinical findings of caustic ingestion in Palestinian children.

MATERIALS and METHODS

One year prospective cohort multi-centre study was conducted in the ER units of 6 main hospitals in Palestine: Makassed Hospital in East- Jerusalem, Palestinian Medical Complex in Ramallah, Red Crescent Hospital in Hebron, Al-Ahli Hospital in Hebron, Hebron Governmental Hospital in Hebron and Caritas Baby Hospital in Bethlehem, from March 2016, to March 2017. 202 patients (age less than 14) who presented to the emergency departments with a history of accidental ingestion were enrolled in the study. Patients presented with intentional -un-accidental- ingestion were excluded.

Data collection was carried out through two questionnaires, ER and phone call questionnaires, which included number of variables which were chosen based on literature review.

The ER questionnaire were filled by pediatric resident on call, it included the demographic data (age, gender, weight, phone number and address), type of ingested substances (medications, caustic substances, foreign bodies, others), presenting signs and symptoms, initial intervention and management either in home or in ER (Gastric lavage, IV fluids, nasogastric tube, charcoal use, antidote administration and other measures) and immediate outcomes in terms of discharge

or admission into the pediatric ward or ICU, and if they left against medical advice (LAMA), as shown in (Annex 1).

Name	Centre			
Event				
Date of exposure	Time of exposure			
	Time of arrival			
Circumstances				
Normal development	Yes			
Social indicators	Father			
Age				
Education	1- not educated 2- <6th grade 3- 7-9th grade 4-10-12th grade 5- community college 6- University 7- higher education	1- not educated 2- <6th grade 3- 7-9th grade 4-10-12th grade 5- community college 6- University 7- higher education		
Job				
Housing	1-Camp 2- Apartment 3- House 4.other			
Management				
Place of initial management	Home	Outpatient clinic	Ambulance	ER
Left against medical advice (LAMA)	Yes	No		
Reason if LAMA	non-affordability		Child was not sick enough to get admitted	Others :

No (please specify):

Mother:

Follow up	Any present symptoms :	
Caustic substance		
Accessibility	got access because it was stored in soft drink and water bottles	
Place of storage		
Label present	Yes	No

Annex 1: Accidental ingestion in Pediatrics - Phone call Questionnaire

The phone questionnaire call, (Annex 2) was made on average of one week after the ingestion and was mainly conducted for outcome follow up and to collect details about the event circumstances, social indicators, any residual symptoms after ingestion and reason for LAMA.

Center		Date of exposure	
Demographic Data			
Patient name		ID	
Age	Weight	Gender	
Address		Mobile \phone number	

Ingested substance				
Foreign body				
Caustic	Type	Amount		
Medication/s	Name	Dose		
Other (please specify)				
Presenting signs and symptoms				
Vomiting	Hematemesis	Dysphagia	Odynophagia	Abdominal pain
Stridor	Hoarseness	Aphonia	Dyspnea	Bleeding
Other (please specify)				
Management				
Homemanagement				
ER	X – Ray	Gastric lavage	IV fluids	
Nasogastric tube				

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Substernal chest or back pain

Loss of consciousness

Antidote
Other

Out come		Discharge	Left against medical advice	Ward or ICU	
Doctor name					

Annex2: Accidental ingestion in Paediatrics – ER questionnaire

As a result of these questionnaires, the study is designed in four levels which include: Epidemiology, initial management and emergency interventions, evaluation of caustic injury and early complications.

The study was approved by the local ARB committees and consents were obtained from all patients.

Data thus obtained was entered and analyzed using SPSS version 20.

RESULTS

During the study, 202 children presented with acute poisoning. This represented about 1% of the total ER visits. In terms of baseline characteristics, the mean age at the presentation was 2.84 ± 2.44 years and the median age was 2 years. The majority (53.9%) of the patients were 1-2 years of age, 5.9% were less than 1 year of age, 20.7% were between 2-3 years of age; while almost one third (19.3%) were above 3 year of age. One of the cases was a 3 day old female newborn, who presented to emergency department with a history of concentrated vinegar ingestion, which was administered accidentally by her mother, who wanted to give her "flower water" instead, as a traditional way to calm down the baby.

According to registrar generals classification of social class the majority were from the disadvantaged social class IV

Social class	Frequency
I	9
II	7
IIIa	42
IIIb	8
IV	78
V	2

Unknown	56
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Table I: Social Class

Out of the total, 61.3% patients were males, while 38.7% were females.

Variable		Percent
Mean age	<1 year	5.9% (n=12)
	1-<2 years	33.6% (n=68)
	2- < 3 years	26.1% (n=53)
	>= 3 years	34% (n=69)
Sex	Male	61.3% (n=124)
	Female	38.7% (n=78)
Type Of Ingested Substance	Medication	37.6% (n=77)
	Caustic Substance	27.2% (n=55)
	Foreign body	13.8% (n=28)
	Others	21.4% (n=43)
Body System Involved In Poisoning	Gastrointestinal Tract	29.7% (n=60)
	Respiratory System	14.3% (n=29)
	Nervous System	9.9% (n=20)
	Skin Involvement	0.5% (n=1)
	Asymptomatic	55.9% (n=113)
Outcome	Discharged From ER	51.5% (n=104)
	Admitted	48.5% (n=98)
	- LAMA* (n=11)	5.4%
	- ICU (n=7)	3.4%

Table II: Baseline Characteristics

Regarding type of ingested substances, 37.6% of the patients had ingested pharmaceutical agents followed by ingestion of caustic substances in 27.2%. In 13.8% of the cases, the ingested product was foreign body, and 21.4% of cases ingested other substances, as Table II shows.

Details of the clinical features showed gastrointestinal system to be the most frequently involved system in 29.7% of cases, followed by the respiratory system in 14.3%, the nervous system in 9.9% and there's one case presented with perioral burning. Asymptomatic cases comprised 55.9% of all cases as reported in Table II.

Moreover, Table II shows that 51.5% (n=104) were discharged from ER and 48.5% (n=98) were admitted to hospital. Seven cases were admitted to ICU as follows: Four cases had a history of medication ingestion (2 Carbamazepine, 1 Amlodipine, and 1

ipratrobiumpromide). Two cases which were cousins had presented with history of alpha -D- glucochorage ingestion (Avicide, a substance which can be used to sedate birds), and one case had presented with history of chlorine ingestion. Eleven cases left against medical advice.

Among the 98 patients of poisoning admitted to the hospital, 30 were due to medications; 29 of them were because of caustic ingestion; 17 were because of foreign body ingestion; another 8 with pesticide ingestion; and the last 5 with kerosene ingestion.

Admission (n=98)	
Age range	8 months – 13 years
M:F	3:2
Ingested Substance	Caustic substance: 29
	Medications: 30
	Foreign body: 17
	Pesticide 8
	Kerosene: 5
Presentation	9 CNS
	5 Respiratory
	24 GIT
	15 GIT + Respiratory
	1 CNS + GIT

Table III: Admission

Caustic substance (n=55)	Percentage (n=number of cases)	Complications	Outcome
		GIT (n=10)	Admission (n=12)
Chlorine	40.7 % (n=22)	Respiratory (n=2)	Discharged from ER (n=10)
		GIT + Respiratory (n=1)	
Vinegar	29.6 % (n=16)	GIT (n=6)	Admission (n=11)
		GIT + Respiratory (n=4)	Discharge from ER (n=6)
		GIT (n=5)	Admission (n=6)
Alkaline / Unknown Composition/ Cleaning Materials	22.2% (n=16)	Respiratory +GIT (n=2)	Discharge (n=10)
		CNS+GIT (n=1)	

Table IV: Outcome of Caustic Substances Ingestion

Table V: Outcome of Foreign Body Ingestion

Name of poison	Number of cases (n)	Sex distribution (M:F)	Complications	Discharged from ER	Ward	LAMA
Coin	8	5:03	Respiratory =1	4	4	-
			Respiratory +GIT=1			
			GIT =1			
Battery	5	3:02	2 (1 CNS + 1 GIT)	2	3	-
Pesticides	11	4:01	10(9 GIT, 7 Respiratory + 6 GIT + respiratory)	4	6	-
Kerosene	10	7:03		5	5	-

Table IV and Table V report the outcome of caustic substance and foreign body ingestion in terms of complications, admission and discharge, respectively.

The 104 patients, who were discharged, are belonged to 7 months and 13 years of age. 64 of them were males and 40 were females. Almost half of them presented without symptoms (n=69), while the majority of those who presented with symptoms (n=34) were complaining mainly of gastrointestinal symptoms (n=19).

Table VI: Initial Procedures and Management Used in ER Departments

Hospital Procedure Management	Al-Ahli Hospital	Palestine Red Crescent Society Hospital	Hebron Governmental Hospital	AlMakassed Hospital	Caritas Baby Hospital	Palestine Medical Complex	Total
Observation	1	1	-	7	5	15	29
Charcoal	1	6	13	-	4	11	35
X-ray (chest / abdomen)	13	15	10	-	-	35	73
IV fluids	14	22	20	1	1	20	78
Gastric lavage	-	10	9	8	4	3	34
H2 block	1	4	2	-	-	7	11

ers/P PI							
Decor t	1	-	-	-	-	-	1
Milk	-	-	-	-	2	-	2
Antid ote	1	1	1	-	-	-	3
Other s	7	-	1	-	1	13	22

Table VI shows the initial procedures and management used in emergency departments among the six different hospitals, which demonstrates the inconsistent management among these hospitals, beside demonstrating that IV fluids was the most used initial management used in 38.6% of cases (n=78) followed by charcoal administration in 17.3% of patients (n=35), and chest X-Ray was the most in as initial investigation used in 36.1% of cases (n=73).

Discussion

Unintentional poisoning exhibits strong age stratification. Most of the children in our study were less than 3 years of age; this comprises about two thirds of patients. This could be explained by the exploratory behavior; toddlers in this age group are very keen to explore the environment and have acquired the mobility to do so. They also have increased finger-mouth activity and/or pica putting them at greater risk for accidental ingestion, in our study males were slightly higher in number. This finding is consistent with WHO findings that boys have higher rates of poisoning than girls in all regions of the world, probably because of differences in socialization (9).

The observation of pharmaceutical products as a group being the commonest cause of childhood poisoning is no different to other studies (10), with the NSAIDs to be the most frequent accidentally ingested medication, and this can be attributed to its widespread use.

Caustic ingestions in young children more commonly occur once children are ambulating and have access to cabinets and shelves with common household products.

Acidic liquids tend to have a bitter taste, decreasing their volume of ingestion with either accidental or intentional ingestions. Strong acids with pH <2 produce tissue injury because of coagulation necrosis as the result of ischemia (11). The depth of injury is minimized by the fact that acids characterized by eschar formation, which limits further acid penetration (12). On the other hand caustic ingestions are mostly caused by alkali, which are typically colourless, odorless liquids posing an increased risk of a high volume, and they bind with tissue proteins producing liquefactive necrosis and saponification, allowing deep penetration to submucosa and muscularis, resulting in scarring of tissue, and thrombosis of vessels and impeding blood flow to already damaged tissue, and to the extreme extent leading to perforation (13).

Caustic substances were the second most common group of agents involved in our study, probably due to their inquisitive

behavior. The household laundry bleach (chlorine) typically contains sodium hypochlorite with a pH 11 was the most commonly ingested caustic substance. This is consistent with other report (14). It usually has a low concentration of 5% to 12%, with the lower concentration making it less harmful, however 13 out of 22 of our patients with chlorine ingestion were symptomatic and 12 were admitted to the hospital. The higher rate of symptomatic chlorine ingestion in our group can be attributed to higher concentration of the locally manufactured bleaching agents.

Although less than 5% of all toxic ingestions in the 2014 AAPCC (American Association of Poison Control Centers) annual report were acidic liquids, the second common ingested caustic material in our study was vinegar and was 26% of the caustic ingestion. Vinegar is available in two house hold forms in Palestine. The regular 5% concentration and the high concentrated about 50% acetic acid. The concentrated form is used to prepare homemade pickles. Ten out of twenty-two of vinegar ingestion were symptomatic and all had concentrated acetic acid ingestion. The third groups of caustic ingestion were variable materials and included detergents and cleaners.

All the containers for the caustic materials had no child-resistant caps, and some were stored in reused food containers.

Prevention of caustic ingestion is 2-fold, identifying chemicals and ensure proper storage and the second is prohibiting the use of concentrated vinegar as a house hold material and its use should be limited to food processing manufactures. This will require significant local government interventions

Kerosene is a liquid mixture of chemicals produced from the distillation of crude oil. Kerosene has traditionally been the fuel of choice for heating. Its use had substantially decreased in developed countries due to improved electrical and gas supplies. Ten cases of kerosene ingestion presented to one of the hospital in the southern part of Palestine reflecting the local practice.

About 48.5% (n=98) of the patients were admitted to hospital. Of those admitted, 7 cases were admitted to ICU who had medication ingestion for monitoring and none had long term sequel. The numbers in our study were comparatively higher than the West (15). 156 patients (77%) answer the phone call questionnaire. Only 4 patients with caustic ingestions continued with symptoms like vomiting, dysphagia and oral ulcers.

In our study, 11 patients left against medical advice; 7 of them left due to the belief that the child was not sick enough to get admitted, and the reason was unknown for the remaining 4 cases.

Conclusions

The relative small sample size and absent long term follow up are the limitations of our study. Medications were the most common accidentally ingested substances followed by caustic substances. There was clear inconsistent management of ingestions between different hospitals reflecting absent national protocols.

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