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# Pattern of acute poisoning in Al Majmaah region, Saudi Arabia

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**Abstract:** *Background:* Acute poisoning is a common situation in emergency departments all over the world. It may cause severe complications and death. Treatment of these cases requires great medical care and significant costs. There are many differences with respect to the pattern and cause of acute poisoning between geographical regions, even within the same country. *Objective:* This study was carried out to assess the pattern of acute poisoning with drugs, chemicals and natural toxins in both adults and children in Al Majmaah region, Saudi Arabia. *Methods:* The study was conducted at King Khaled Hospital in Al Majmaah region. The medical records of cases who were admitted due to acute poisoning from January 2009 to December 2012 were reviewed retrospectively. *Results:* This study included 591 acute poisoned cases presented to ED. There were 79.4% more than 12 years old and 20.6% under 12 years old. Number of males with toxic exposure was 435 while that of females was 156. Animal envenomation contributed to most of these cases. Unfortunately, other data of these cases could not be followed as 422 cases were observed and discharged from ED. Of them 188 were observed, received no treatment and discharged from ED. The other 234 cases were treated and discharged from ED. The medical record of 169 cases who were admitted to pediatric and internal medicine department could be retrieved and studied completely. There were 5.6% infants, 74.4% between 1–6 years old, 20% between 6-12 years old, 15.2% between 12-18 years old, 83.5 between 18-60 years old and 1.3% more than 60 years old. Pharmaceutical drugs and household products were the main causes of poisoning in cases under 12 years old (84.4%) while, animal envenomation; mainly scorpion stings contributed to most cases over 12 years old (62%). *Conclusion:* Accidental poisoning is still a significant cause of morbidity. Regarding the high prevalence of pharmaceutical drug and household products poisoning in children, implementation of legislations to ban over the counter selling of medications and to sell potentially dangerous chemicals in childproof containers is recommended. Improving proper and complete medical record-keeping is also suggested for a better information access.

**Keywords:** Acute Poisoning, Drugs, Household Products, Animal Envenomation

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## 1. Introduction

Acute poisoning is a common situation in the emergency departments all over the world and involves high medical attention and significant costs [1]. It is estimated that some forms of poisons are directly or indirectly responsible for more than 1 million illnesses worldwide annually. The exact number of incidences can be higher, because most cases of poisoning actually go unreported [2].

Poisoning cases are increasing day by day due to changes in the life style and social behavior. Advances in technology and social development have resulted in the availability of most drugs and chemical substances in the community [3].

Poisoning with drugs contributes to large numbers of acute poisoned cases. Moreover, acute household chemical poisonings, particularly in children, and natural toxins such as poisonous plants and animals also occur frequently [4].

There are many differences with respect to the pattern and cause of acute poisoning between geographical regions, even within the same country. The knowledge of the general pattern of poisoning in a particular region would help to identify the risk factors and allow early diagnosis and management of such cases, which in turn should result in a reduction of morbidity and mortality [5].

There are publications in acute poisoning in children and adults in different parts in Saudi Arabia including Jeddah, Hafr Al Batin, Abha and Al Riyadh cities. King Khalid

University Hospital Drug and Poison Information Center recorded total of 9584 poisoned cases in the study period between October 1986 and October 1996 [6]. In Jeddah, 140 children with ingestion of toxic materials were reported during the time period of Jan 1994 to December 1996 [7]. In Hafr Al Batin, 168 cases of accidental poisoning were admitted to the pediatric medical ward in King Khalid Military City hospital, over a period from Jan 1992 to Jan 1998 [8]. In Abha, 114 cases of acute poisoning in children were recorded during the period of Jan 2000 to October 2003 [9].

To the best of our knowledge, till date, no study on acute poisoning in Al Majmaah region has been published. Al Majmaah is a governorate that has an area of 30 000 km<sup>2</sup>. It is located about 170 km. to the north of Al Riyadh; the capital city of Saudi Arabia. The population of the governorate as a whole is approximately 97,349.

This study was carried out to assess the pattern of acute poisoning with drugs, chemicals and natural toxins in both adults and children in Al Majmaah region. This can be used to provide information about the agents most frequently involved in poisoning in this region and about the norms of prevention to avoid them.

## 2. Subjects and Methods

### 2.1. Collection of Data

The study was conducted at King Khaled Hospital in Al Majmaah (a referral hospital to other hospitals in five nearby cities; Thadig, Shaqra, Al Zulfi, Hawtah Sudayr, Al Artawiyah and Al-Ghat hospitals). The medical records of cases of acute poisoning were retrospectively studied in the period from January 2009 to December 2012. Diagnosis of poisoning was made according to history of the patient or his relatives or clinical examination. Every effort was made to get the optimum benefit from the available data in the patient's files.

### 2.2. Studied Parameters

The demographic and poisoning data including age, sex, causative agent, mode of poisoning, route of poisoning, duration of hospitalization, treatment given and final outcome were recorded.

### 2.3. Exclusion Criteria

Cases of food poisoning and chronic poisoning were excluded from the study.

### 2.4. Ethical Clearance

Ethical clearance was obtained from BHSRC (Basic and Health Science Research Centre). Permission to use medical records was confirmed from the continuous education and training department. Confidentiality on the content of the medical records was maintained. The information was only utilized by the investigators for the research purpose.

### 2.5. Classification of Cases

Cases were classified into two main groups according to their ages; pediatric group (less than 12 years) and adolescent and adult group (more than 12 years).

### 2.6. Statistical Analysis

The obtained data were recorded and statistically analyzed using chi square test. A p value of less than 0.05 was considered to be significant.

## 3. Results

### 3.1. Poisoning Data

Five hundred ninety one cases presented to emergency department (ED) of King Khaled hospital suffering from acute poisoning. There were 79.4% more than 12 years old and 20.6% under 12 years old. Most of cases were males (73.6%). Animal envenomation was the most common cause of poisoning (66.2%). All cases undergo complete recovery. One hundred eighty eight cases were only observed and discharged from ED while 234 cases were observed, treated and discharged from ED. The remaining 169 cases required hospital admission (Table 1). Most of the cases that were discharged from ED were due to animal envenomation that was managed properly according to national wide protocol for treatment of scorpion sting and snake bite leading to excellent prognosis and early discharge.

All cases (591) presented to the hospital during the study period were supposed to be included in the study. Unfortunately, some data of these cases could not be followed and only records of admitted cases (169) could be retrieved and studied completely.

**Table (1).** Age, sex, type of poison and fate of 591 acutely poisoned cases presented to hospital

Variables		Number	%
Age	< 12 years	122	20.6
	> 12	469	79.4
Sex	Male	435	73.6
	Female	156	26.4
Type of poison	Animal envenomation	391	66.2
	Pharmaceutical drugs and household products	200	33.8
	Observation, recovery and discharge	188	31.8
Fate	Treatment, recovery and discharge	234	39.6
	Admission, complete recovery and discharge	169	28.6

Table (2) shows that the preschool age (1-6 years) accounted for the highest percent (74.4 %) of poisoning in pediatric group. Male gender achieved a higher percentage than female (57.8 % versus 42.2). It also shows that the adult age (more than 18 years) accounted for the highest percent (83.5 %) of poisoning in adolescent and adult group. Slightly more than one half were females (53.2 %).

**Table (2).** Age and sex distribution of acute poisoned pediatric, adolescent and adult cases

Variables	Pediatric		Adolescent and Adult			
	N	%	N	%		
Age	< 1 year	5	5.6	12-	12	15.2
	1 -	67	74.4	18 -	66	83.5
	6 - < 12 year	18	20	> 60 year	1	1.3
Sex	Male	52	57.8	Male	37	46.8
	Female	38	42.2	Female	42	53.2

N: number

### 3.2. Causes of Poisoning

Table (3) shows that the most common cause of poisoning in pediatric group was the pharmaceutical drugs (54.4 %), followed by household products (30 %). Animal envenomation; mainly scorpion accounted for 15.6 % of cases. In adolescent and adult group, animal envenomation contributed to 62% of cases of followed by pharmaceutical drugs and household products (30.4% and 7.6% respectively).

**Table (3).** Variable distribution of acute poisoned pediatric, adolescent and adult cases according to type of poison

Variables	Pediatric		Adolescent and adult		
	N	%	N	%	
Pharmaceutical drugs	Analgesic and anti-inflammatory	4	4.4	4	5.1
	Antihistaminic	2	2.2	1	1.3
	CNS acting *	4	4.4	1	1.3
	Oral hypoglycemic	4	4.4	0	0
	Oral contraceptive	2	2.2	0	0
	Bronchodilator	2	2.2	0	0
	Iron	2	2.2	0	0
	Other	4	4.4	1	1.3
	Unknown (unidentified)	25	27.8	17	21.6
	Total	49	54.4	24	30.4
Household products	Pesticides	8	8.9	1	1.3
	Bleaches	13	14.4	5	6.3
	Kerosene	6	6.7	0	0
Total	27	30	6	7.6	
Animal envenomation	Scorpion	12	13.3	44	55.7
	Snake	0	0	4	5.1
	Unknown sting	2	2.2	1	1.3
Total	14	15.6	49	62	

N: number, CNS acting \* Central Nervous System acting drugs as tranquilizers, anti- psychotics and antidepressant.

**Table (6).** Comparison between the poisoned pediatric, adolescent and adult groups according to route, mode and type of poisoning

Variables	Pediatric poisoning		Adolescent and adult poisoning		$\chi^2$	P	
	N	%	N	%			
Route of poisoning	Oral	76	84.4	30	38	43.4	<0.0001
	Dermal	14	15.6	49	62	43.4	<0.0001
Mode of poisoning	Accidental	90	100	51	64.6	40.49	<0.0001
	Intentional	0	0	28	35.4	40.04	<0.0001
Type of poison	Pharmaceutical drugs	49	54.4	24	30.4	10.83	<0.0001
	Household products	27	30	6	7.6	14.3	<0.0001
	Animal envenomation	14	15.6	49	62	43.4	<0.0001

N:number, p&lt;0.0001 highly significant

### 3.3. Type of Poison Versus Age Groups and Sex

Table (4) shows no statistically significant difference between pediatric male and female subjects as regard type of poison. In contrast, a significant difference was observed between male and female subjects in adolescent and adult group. A significant increase in number of cases poisoned by pharmaceutical drugs and household products was observed in female subjects. As regards male subjects, a significant increase in number of cases poisoned by animal envenomation was observed ( Table 5).

**Table (4).** Comparison between pediatric male and female subjects according to type of poison

Variables	Male		Female		$\chi^2$	P
	N	%	N	%		
Pharmaceutical drugs	28	31.1	21	23.3	1.24	>0.05
Household products	14	15.6	13	14.4	0.03	>0.05
Animal envenomation	10	11.1	4	4.4	2.59	>0.05

N:number, p&gt; 0.05 non significant

**Table (5).** Comparison between adolescent and adult male and female subjects according to type of poison

Variables	Male		Female		$\chi^2$	P
	N	%	N	%		
Pharmaceutical drugs	3	3.8	21	26.6	18.44	<0.0001
Household products	0	0	6	7.6	5.96	<0.05
Animal envenomation	34	43	15	19	12.37	<0.0001

N: number, p&lt; 0.05 significant, p&lt;0.0001 highly significant

### 3.4. Route, Mode and Type of Poison Versus Age Groups

Table (6) shows statistically significant difference in route, mode and type of poisoning between the two studied groups. Oral route was the most common route of poisoning in pediatrics group (84.4%). In contrast, dermal route was the most common route of poisoning for adolescent and adult group ( 62 %). It also shows that all pediatric cases were poisoned accidentally. In adolescent and adults group, accidental poisoning achieved a higher percentage than intentional poisoning (64.6 %versus 35.4%).

Regarding the poisonous agents; pharmaceutical drugs and household products were more significantly pronounced in pediatric group while in adolescent and adult group, animal envenomation was more significantly pronounced.

### 3.5. Seasonal Variation

Table (7) shows that the highest percentage of pediatric poisoning occurred in autumn (37.8%) followed by summer (23.3%). In contrast, the highest percentage of poisoning in adolescent and adult group was in summer (39.2%) followed by autumn (29.1). The difference between the two groups regarding seasonal variation was statistically insignificant ( $P > 0.05$ ) except for summer ( $P < 0.05$ ).

### 3.6. Symptoms of Poisoning

Table (8) shows that asymptomatic presentation was the commonest in pediatric group (47.8%) followed by GIT (25.6%) and dermal symptoms (15.5%). On the other hand, dermal symptoms contributed to 43% of clinical presentation of adolescent and adults group followed by GIT (37.9%) and neurologic symptoms (24%). The difference between the two groups was statistically significant ( $P < 0.05$ ) except for GIT, CVS and respiratory symptoms ( $P > 0.05$ ).

### 3.7. Management

Table (9) shows that for poisoned pediatric group, gastric

decontamination was suggested as a potentially necessary mode of therapy (63.3%) followed by specific antidote and oxygen therapy. In adolescent and adult group specific antidote was the main suggested mode of therapy (62%) followed by gut decontamination and oxygen therapy. A statistically significant difference regarding gut decontamination and antidote was observed between the two studied groups ( $P < 0.0001$ ). The table also shows that most of the poisoned cases were admitted for 1 day. Only two pediatric cases were admitted for 3 days or more due respiratory distress in cases of kerosene ingestion. Seven adolescent and adult cases were admitted for 3 days or more. Of these, one case was due to digoxin, the others were due to insecticide, scorpion sting, paracetamol and unknown drugs. No significant difference between the two poisoned groups was observed. All of the poisoned cases undergo complete recovery and discharge (100%).

**Table (7).** Comparison between the poisoned pediatric, adolescent and adult groups according to seasonal variation

Variables	Pediatric poisoning		Adolescent and adult poisoning		$\chi^2$	P
	N	%	N	%		
Summer	21	23.3	31	39.2	5.3	<0.05
Autumn	34	37.8	23	29.1	1.4	>0.05
Winter	17	18.9	8	10.1	2.5	>0.05
Spring	18	20	17	21.5	0.03	>0.05

N: number,  $p < 0.05$  significant

**Table (8).** Comparison between the poisoned pediatric, adolescent and adult groups according to symptoms of poisoning\*

Variables	Pediatric poisoning		Adolescent and adult poisoning		$\chi^2$	P
	N	%	N	%		
GIT	23	25.6	30	37.9	3.8	>0.05
CVS	2	2.2	5	6.3	1.17	>0.05
Neurologic	8	8.9	19	24	7.11	<0.05
Respiratory	2	2.2	1	1.3	0.3	>0.05
Dermal	14	15.5	34	43	16.25	<0.0001
Others	4	4.4	11	13.9	4.95	<0.05
No symptoms	43	47.8	8	10.1	33.2	<0.0001

\*Some patients presented with more than one symptom, N: number,  $p < 0.05$  significant,  $p < 0.0001$  highly significant

**Table (9).** Comparison between the poisoned pediatric, adolescent and adult groups according to management, duration of hospitalization and final outcome

Variables		Pediatric poisoning		Adolescent and adult poisoning		$\chi^2$	P
		N	%	N	%		
Management	Gut decontamination	57	63.3	25	31.6	18.05	<0.0001
	Antidote *	16	17.8	49	62	38.5	<0.0001
	Oxygen therapy	2	2.2	1	1.3	0.33	>0.05
Duration of hospitalization	1 day	75	83.3	64	81	0.34	>0.05
	2 days	13	14.4	8	10.1	0.43	>0.05
	3 days	1	1.1	3	3.8	0.82	>0.05
	> 5 days	1	1.1	4	5.1	1.55	>0.05
Final outcome	Complete recovery	90	100	79	100	-----	-----

\*Antidote as antivenin, atropine and vitamin k. N: number,  $p < 0.05$  significant,  $p < 0.0001$  highly significant

## 4. Discussion

Acute poisoning is a common cause of hospital admission

worldwide [10]. Intentional or accidental drug overdose results in significant morbidity and mortality and tremendously adds to the health care expenditure [11].

In the present study, the medical records of five hundred

ninety one acute poisoned cases presented to King Khaled hospital, Al Majmaah region were retrieved. Unfortunately, some data of these cases could not be followed and only records of admitted cases (169) could be retrieved and studied completely.

The number of poisoned cases presented to the hospital in pediatric age group was less than adolescent and adult age group (122 cases versus 469 case). Consistent with this, 400 cases of acute poisoning were reported in Al Qassim region of Saudi Arabia where 189 cases were less than 15 year and 215 cases were above 15 years old [12]. Moreover, in another study that was carried out in Tanzania, children under 15 years of age accounted for 9.3% of acute poisoned cases in contrast to 90.7% of the adults [13]. In contrast, National Drug and Poisoning information Centre in King Khaled University Hospital recorded 1161 poisoned case. Of them, 371 were above 12 years and 790 were of pediatric age [14].

The present study showed that 74.4% of acute poisoned pediatric cases that required admission occurred in the 1-6 years age group and slightly more than one half (57.8%) were boys. A similar trend was observed in the study of [15] where most (89.5%) of the children were under 6 years and slightly more than one half (50.6%) were boys. This pattern came also in accordance with other studies in Saudi Arabia that showed the highest incidence of poisoning in children under 4 years ([9,12,14,16].

One would expect more cases to be in children under 6 years since they have tendencies to explore the surroundings by putting everything in their mouths without the knowledge to discriminate between dangerous and safe products. Also the increased number of boys in poisoned pediatric group could be attributed to more mobility and exploratory behavior in male children than female [13].

Adolescent and adult group showed an opposite trend where slightly more than one half were females (53.2%) as compared to 64.6% in Addis Ababa, Ethiopia [2], 53.7% in Gondar, Ethiopia, [17] and 74.1% in Mersin, Turkey [18].

The current study revealed that accidental poisoning contributed to all pediatric cases (100%). This came in accordance with [8,16] who in their study in Makkah and Hafr Al Baten, Saudi Arabia found that there were no cases of suicidal poisoning in this age group which may be due to the rarity of this behavioral pattern in this area of the world. The authors attributed this to the higher degree of adherence of this age group to their families which provide some protection against suicidal poisoning.

On the other hand, accidental poisoning contributed to 64.6% of adolescent and adult cases. Contrary to this study, intentional self-harm poisoning was the commonest manner for poisoning representing 96.5% in Addis Ababa, Ethiopia [2], 72% in Gondar, Ethiopia [17], 71% in Istanbul, Turkey [19] and 79% in Tehran, Iran [20]. This difference from other studies could be attributed to the large number of poisoned cases due to animal envenomation. This could also explain the predominance of dermal route in this group.

Consistent with reports published by Toxic Exposure

Surveillance Systems of the American Association of Poison Control Centers (TESS) database and National Health Interview Survey (NHIS), the most common route of poisoning in children was by the way of ingestion. It seems that higher prevalence of ingestion in this age group is related to their attitude in putting small foreign objects into the mouth [15].

Regarding type of poison, pharmaceutical drugs represented the highest percentage in pediatric poisoning while animal envenomation; mainly scorpion represented the highest percentage in adolescents and adults.

Similar to the study of [21], approximately 54.4% of the poisonings in pediatrics in our surveillance involved medications. The predominance of animal envenomation, mainly scorpion stings in adolescent and adult group could be explained by the fact that large number of people usually move out to the surrounding deserts for recreation [16,22].

Scorpion stings in males outnumbered females (43% versus 19%). This finding is in agreement with the results of a previous study on scorpion stings in Saudi Arabia [23] and other studies, such as in Brazil where 62.8% of the patients were young adult males [24]. This may reflect the fact that women in Saudi Arabia, in contrary to men, spend most time indoors with their families. The high rate of scorpion stings in young adult victims may be explained on the basis that most stings occurred during work where this age category is associated with most outdoor activities [23].

On the other hand, poisoning by pharmaceutical drugs had higher percentage in female adolescents and adults. This result is in agreement with [25] who found that among adolescent females, the type of poisons most frequently ingested was pharmaceutical drugs and plant poisons.

Poisonous agents show geographical variations influenced by economic status. In developed countries, poisoning mostly happens because of drugs, cosmetics and beauty products, household cleansing products and alcohol, while for developing countries, where the economy is based on agriculture, common causes of poisoning are hydrocarbons, pesticides, traditional medicines and mushrooms [26].

Drugs were a major problem in several reports from Saudi Arabia [6,16,27,28]. Some of the reasons include the dispensing of drugs in envelopes instead of child-resistant containers, an easy access to medications without even prescriptions in addition to the careless storage of drugs inside homes [14].

Paracetamol and other analgesics (NSAIDs); the most available drugs at homes, were the most common causes of drug related poisonings [12,16]. Unfortunately, the type of most ingested drugs could be neither identified by the parents nor confirmed by laboratory techniques as no toxicological drug screen test is available at Al Majmaah King Khaled hospital.

Similar to other studies household products were common among children [15,29]. Household chemicals are thus an important source of poisoning for children as these tend to be kept in easily opened bottles.

The current study showed that most of pediatric cases were asymptomatic followed by GIT symptoms. In contrast, GIT symptoms were the main presenting complaint in the study of [12,15]. Regarding adolescents and adults, dermal symptoms were the main presenting complaint followed by GIT and neurologic symptoms. This is consistent with the study of [30] who reported that local signs and pain were the most common clinical manifestations seen in 61% of patients and that most common systemic manifestations were restlessness and irritability (31.7%) followed by vomiting (26.8%) and cold extremities (19.5%).

Regarding seasons, the highest percentage of pediatric poisoning occurred in autumn followed by summer. On the other hand, summer has the highest percentage in adolescent and adult poisoning as most of these cases were due to animal envenomation, mainly scorpion stings. Consistent with this finding, [31] stated that the seasonal sting cycle showed the highest record in the summer period (51%) as compared to the lowest winter period (10%). The peak of stings incidence in the summer months and the low incidence in winter could be attributed to the fact that scorpions do not hibernate but become less active in winter. The periods with predominant cases of scorpion stings were reported in different places as follows: Mexico (April-July), Tunisia (July-September) with maximum frequency in August, while in Brazil, stings occurred uniformly throughout the year, with slight increases in August. These variations may be due to environmental conditions especially rainy or dry summer [23].

Despite the lack of many specific antidotes for drug and chemical poisonings in the current study, all pediatric cases undergo complete recovery and discharge. The pattern appears consistent with studies of [15,16] who reported that most of poisoning in children requires mainly observation and noninvasive treatment.

The full recovery in poisoned adolescents and adults could be explained by early and proper intervention. All patients with scorpion stings or snake bites received scorpion or snake antivenin according to Ministry of Health Guidelines in Saudi Arabia. In a national study in Saudi Arabia over 12 years for more than 3800 patients, the incidence of severe venom toxicity after antivenin administration was almost negligible [32]. Comparing scorpion stings outcome in this study to that of other countries, it was concluded that the scorpion sting syndrome in Saudi Arabia does not carry the same degree of threat that has been reported in other countries despite the high rate of scorpion stings. This may be due to the excellent medical facilities and supportive care developed in recent years in different regions of Saudi Arabia in addition to the comprehensive multi-center evaluation of antivenin use where the overall mortality rate was reduced from 3% between 1985 and 1993 to less than 0.05% when antivenom was used, as seen in study of [23].

Finally, as in some retrospective studies, there is some limitations as missing data in the collected medical record such as time elapsed between ingestion and clinical

presentation and delay time in cases referred from hospitals. Also missing data in cases who discharged from ED.

## 5. Conclusion and Recommendation

Acute poisoning is an important health problem in Al Majmaah region. Pharmaceutical drugs and household products were the main causes of poisoning in pediatrics while, animal envenomation ;mainly scorpion stings contributed to most cases in adolescents and adults especially males. Application of a national wide protocol for treatment of scorpion stings and snake bites leads to excellent prognosis.

Exposure of children to toxic agents requires more attention especially among families to improve their awareness about safety requirements inside homes and to provide training programs especially for recently married couples. Legalizations should be implemented to ban over the counter selling of medications and to sell potentially dangerous chemicals in child proof containers.

Toxicology screen tests are recommended at hospitals for proper identification of type and level of poisonous substances that leads to early and proper management of these cases. Improving proper and complete medical record-keeping is also suggested for a better information access.

Establishing poison control center in different parts of the country and ensuring easy availability of antidotes is also recommended.

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