Case Scenarios in Pediatric Emergency Medicine

Childhood Poisoning

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Learning Objectives

• Epidemiology of Childhood Poisoning in Abu Dhabi

• Commonest agents ingested

• General Empirical Approach to Poisoning

• Case Scenarios focusing on cases that are representative of common but esoteric ingestions
Epidemiology in Abu Dhabi

• 1031 children 0-10 years in 2016
• Burden of illness: 0.006% of total Pediatric ED attendances
• Al Ain: 413 (0.35 per 1000 children)
• Abu Dhabi: 544 (0.26 per 1000 children)
• Al Dhafra (Western Region): 74 (0.38 per 1000 children)
Epidemiology Trend in Abu Dhabi

• In 2010 the incidence of childhood poisoning in Al Ain and Tawam Hospitals was 2.35 per 1000 children

• Significant reduction in the incidence of poisoning in children

• This was seen in both Emirati and Expat populations
Type of poisoning

- 151 (65%) with poisoning from medicinal substance
- 81 (35%) with poisoning from non-medicinal substances
- Medicine ingestions account for the majority of admitted patients 48 (79% of admissions)
## Medicinal Poisoning Cases

<table>
<thead>
<tr>
<th>Medicine</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paracetamol</td>
<td>23</td>
<td>9.9</td>
</tr>
<tr>
<td>NSAIDs</td>
<td>14</td>
<td>6.0</td>
</tr>
<tr>
<td>Multivitamin/Minerals</td>
<td>13</td>
<td>5.6</td>
</tr>
<tr>
<td>Antihistamine</td>
<td>12</td>
<td>5.2</td>
</tr>
<tr>
<td>Vitamin D</td>
<td>10</td>
<td>4.3</td>
</tr>
<tr>
<td>Thyroxine</td>
<td>9</td>
<td>3.9</td>
</tr>
<tr>
<td>Montelukast</td>
<td>9</td>
<td>3.9</td>
</tr>
<tr>
<td>Cardiovascular Meds</td>
<td>5</td>
<td>2.2</td>
</tr>
</tbody>
</table>
Results - Non-medicinal Poisoning

• Caustic ingestions are the commonest non-medicinal cause of poisoning accounting for 8.6% of total ingestions
• Also accounts for 70% of the cases admitted with non-medicinal poisoning
• Corrosive and battery ingestion resulted in all the endoscopies performed
## Non-medicinal Poisoning Cases

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bleach</td>
<td>11</td>
<td>4.7</td>
</tr>
<tr>
<td>Detergents</td>
<td>8</td>
<td>3.4</td>
</tr>
<tr>
<td>Toilet Bowl Cleaner</td>
<td>5</td>
<td>2.2</td>
</tr>
<tr>
<td>Other caustics</td>
<td>4</td>
<td>1.7</td>
</tr>
<tr>
<td>Pesticide</td>
<td>6</td>
<td>2.6</td>
</tr>
<tr>
<td>Silica Powder</td>
<td>6</td>
<td>2.6</td>
</tr>
<tr>
<td>Alcohols</td>
<td>5</td>
<td>2.2</td>
</tr>
<tr>
<td>Perfumes/Fresheners</td>
<td>7</td>
<td>3</td>
</tr>
</tbody>
</table>

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Case Scenarios

• Caustic ingestion
• Antihistamine
• Thyroxine ingestion
• Petroleum Products
General Approach to Toxic Ingestions Evaluation

• Be meticulous in establishing as many details as possible from as many sources as possible.

• Assume worst case scenario in terms of ingestion

• Anticipate potential complications based upon possible ingested medications

• These may be related to the class of medication but may also be idiosyncratic to the specific medication or to the medication in overdose (Use reference text)
General Approach to Toxic Ingestions Management

• Consider gastric decontamination
• Use antidote if available
• **Cornerstone of care is appropriate supportive measures**
• Establish safe discharge and follow up criteria at the outset
  • Based upon reference advice (Micromedex, UptoDate, Toxbase, Consultation)
  • Time to peak plasma concentration and elimination half life of the medication
Gastric Decontamination

• **GASTRIC LAVAGE NOT ROUTINELY RECOMMENDED**

• Evidence would indicate 40-50% of gastric contents remain in the stomach and up to 1/3rd are propelled forward\(^4,5\)

• When compared to activated charcoal alone the vast majority of the evidence shows either no benefit or worse outcomes, mainly due to aspiration\(^6,7\)

• One study in which GL was only carried out on obtunded patients indicated some benefit with p value <0.05 if administered within 1 hour.\(^8\)

• **GL SHOULD ONLY BE CONSIDERED FOR OBTUNDED INTUBATED PATIENTS WITHIN 1 HOUR OF INGESTION.** (In practice this will mean that in accidental poisoning in children it will practically never be used)
Case Scenario 1
• 14 month old child ingested an unknown amount of AC Cleaning Liquid consisting of Sodium Hydroxide.

• Mother noted lip swelling and facial redness. Child brought to ER.

• On examination child had marked lip swelling but was otherwise well looking. Normal vital signs.

• Oropharyngeal examination revealed 1 small ulcer of the tongue but was otherwise unremarkable.

• Labs unremarkable.
Should the child undergo endoscopy, inpatient observation or discharge from ED?

Evidence for the reliability of symptoms and signs as a predictor of esophageal injury is mixed.⁹,¹⁰,¹¹
Caustic ingestion

Household Products containing alkalis or acids

- Alkalis: bleach (chlorine-based), ammonia or sodium hydroxide
- Acids: toilet cleaners containing HCl, bleach (peroxide-based)

- Ingested substances (Abu Dhabi) in order of frequency¹:
  - Bleach (Clorox)
  - Toilet Bowl Cleaner
  - Drain cleaner/opener
Positive predictive value for severe esophageal lesions according to ingested caustic.
Positive predictive value for severe esophageal lesions according to symptoms.
Caustic ingestion

Child does not usually need an endoscopy if:

1. Ingestion was **accidental** OR it is **unclear** if the child actually ingested anything
2. The suspected product is of **low causticity** (ex: household bleach)
3. Patient is **asymptomatic** for 2-4 hours of observation
4. Examination reveals **no signs of oropharyngeal injury**
Case Scenario 2

Antihistamines
• 4 year old ingested 20mls of Fenistil
• Mother witnessed the ingestion and brought straight to the ER within 60 mins
• Child symptom free
• Normal physical examination with normal vital signs
• Activated charcoal given immediately
Antihistamine

• Commonest antihistamine medications ingested in Abu Dhabi were (in order of frequency)¹:

  • Cetirizine
  • Dimethindine (Fenistil)
  • Chlorpheniramine
  • Diphenhydramine
Antihistamine

• For therapeutic doses:
  • Peak plasma concentration: Range 1 hr (cetirizine) – 6 hrs (chlorpheniramine)
  • Half Life: 2-42 hrs
  • Duration of Action: 6-8hrs (chlorpheniramine/diphenhydramine) – 24 hrs (cetirizine)

• No studies available studying pharmakokinetics of the medications in overdose
Clinical complications & mechanisms\textsuperscript{12,13,14,15}

- Drowsiness: H1 receptors
- Anticholinergic Toxidrome: Muscarinic Receptors
- Uncommonly for diphenhydramine a serotonin syndrome has been reported (idiosyncratic)
- Idiosyncratic Cardiotoxicity with QT prolongation rarely with cetirizine
- Idiosyncratic Cardiotoxicity (Prolonged QTc/Brugada/VTs)
- Neurotoxicity for diphenhydramine
Antihistamine

- Observe 6 hours minimum
- All patients require 12 lead ECG
- Symptomatic patients require basic labs
- Sick patients require supportive measures as necessary
- CPR may need to be prolonged because of some evidence of recovery without neuro sequelae after prolonged CPR
Case Scenario 3

Thyroxine
• 3 year old child
• Accidental ingestion of 3 x 100mcg tablets of her mother’s thyroxine 1 hour prior to arrival.
• Thyroxine similar in appearance to homeopathic medication the child was being given on a daily basis
• Child remained completely symptom free
• Physical examination normal
• Activated charcoal given
Main Clinical Questions

Should we do baseline labs?

Should we observe or discharge?

Does she need admission for extended observation?
Acute Thyroxine Overdose

- Evidence consists largely of case reports
- 7 case series
- No dose-response relationship between the occurrence or severity of symptoms and amount levothyroxine ingested.
- 2 case reports of seizures developing after overdoses.
- Overwhelming majority of patients develop no or mild symptoms
Acute Thyroxine Overdose
Evidence Based Advice\textsuperscript{16-21}

- For symptomatic patients symptom onset was between 12 and 48 hours but can be delayed
- Observe for 12-24 hrs
- Solid safety net advice
- Review in clinic after 3-6 days (elimination half lives for T4 approx 3 days and for T3 approx 6 days)
- Follow up to continue for up to 2 weeks
Case Scenario 5

Hydrocarbons

- Petrol
- Kerosene
- Naphtalene
- Camphor
2 year old child brought to ER 30 minutes after ingestion of an unknown quantity of kerosene stored in a mineral water bottle whilst at a barbecue.

Child coughed and vomited at the time.

Symptom free on arrival to ER

Examination including vital signs unremarkable.
Main Clinical Questions

Should gastric decontamination with AC or GL be performed?

Should we do any investigations particularly CXR?

How long should we observe?
Hydrocarbons are categorized into:

- **Aromatic**: Benzene, Toluene, Xylene used primarily in solvents, glues, nail polishes, paints and paint removers
- **Aliphatic**: Petroleum distillates like petrol, kerosene and naptha.
- **Halogenated**: Chloroform, Carbon tetrachloride
- **Terpene**: Turpentine and Pine oil (camphor)
Main accidental hydrocarbon poisoning seen in children in Abu Dhabi are:

• Accidental ingestion of kerosene or petrol that is stored in a mineral water bottle

• Accidental ingestion/exposure to Naphthalene Moth Balls or Camphor in Moth Balls or Vick’s VapoRub
Petrol and Kerosene

- Main complication of Ingestion of petroleum distillates is pulmonary aspiration
- **Uncommon** occurring in only 1 patient out of 15 identified on our initial review of the data from Abu Dhabi in 2016
- Consistent with the previous studies\(^{24}\)
- Systemic symptoms are very uncommon and occur more frequently with inhalation
• AC not useful and NOT ADVISABLE GL CONTRAINDED

• Treatment is supportive (avoid racemic epi nebs as sensitized myocardium may be prone to ventricular arrhythmias)

• Symptoms occur within 30 mins for the majority but may be delayed

• Symptomatic patients should have CXR and admitted

• Asymptomatic children should be observed for 6 hours then have CXR and discharged if normal
Ingestion of hydrocarbon

Asymptomatic
- Monitor oximetry, cardiopulmonary status
- NPO
- Reassess for tachypnea
- Observe 6 hours
- CXR at 6 hours post ingestion or when becomes symptomatic

Asymptomatic normal CXR
- Discharge home
- Close follow-up

Becomes symptomatic or has an abnormal chest radiograph
- Support respiratory status
  - Oxygen
  - Monitor oximetry, cardiopulmonary status
  - IV fluids
- Admit

Symptomatic
- Large ingestion or suicide attempt
- Support respiratory status
  - Oxygen
  - Intubation if needed
- Monitor oximetry, cardiopulmonary status
- NPO, IV fluids
- Chest radiograph
- Admit
Naphtalene and Camphor

- Toxicity has been documented with ingestion as well as topical exposure either directly (Vick’s VapoRub) or by wearing clothes stored with the mothballs.\(^{23}\)

- Camphor mainly complicated by CNS toxicity (drowsiness, seizures, delirium). Very rapid onset within 30 mins

- Napthalene: Methemoglobinemia as well as intravascular hemolysis which is well documented after exposure to napthalene in patients with G6PD.
Camphor

- Camphor is HIGHLY TOXIC
- Mainly complicated by CNS toxicity (drowsiness, seizures, delirium). Very rapid onset within 30 mins
- Gastric decontamination may be considered
- ECG and basic labs including LFTs
- Minimum 6 hours observation
- Supportive treatment as necessary
Naphtalene

- Methemoglobinemia as well as intravascular hemolysis which is well documented after exposure to naphthalene in patients with G6PD.
- All patients to have ECG, U&Es, LFTs, hemolysis screen and methemoglobin levels.
- Observation for at least 4 hours
- However in Case Reports the onset of symptoms for Naphthalene is usually delayed, case reports present within 24-48 hours.

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References


References


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Thank You