

Assessment of Aspiration-Induced lung Injuries among Acute Drug Poisoning Patients; Loghman Hakim Hospital, Poisoning center

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ABSTRACT

Background: Following pulmonary aspiration of gastric contents, a variety of conditions occurs ranging from the acute inflammatory response (aspiration pneumonitis) to an infectious process (aspiration pneumonia). They cause due to the failure of protecting mechanism of airway patency following poisoning toxicity.

Methods: Patients with acute drug poisoning for assessment of aspiration-induced lung injury evaluated during the twelfth months.

Results: 410 participants followed the study. Of those, 249 (61 %) were male and 161 (39%) female. They ranged between 17-55 years. The mode was 25-39 years with frequency of 38%. The mean±SD of age was 32.3±14.5 (Female 34% and Male 27% respectively). The mean age ±SD of females was lower than males (27.3±12.4 vs. 34.4±14.4 years old). An episode of vomiting was recorded positive in 62% (254) of patients. They were recorded by self-reported or witnessed by someone else within the first hours of poisoning. The chest radiograph abnormality was observed mostly in both lungs (45%, 185). They consisted of multifocal patchy infiltrates in lungs 44% (178), diffuse bilateral infiltration 35% (144), and bilateral perihilar consolidation 18% (72) and lobular consolidation 4% (16) mainly in both lung fields (45%, 185). Aspiration related pulmonary complications attributed to pneumonitis 43.5% (178) including ARDS 35% (144), pneumonia 18% (72), and lung abscess 4% (16). There was a significant relationship with vomiting (P=0.04).

Conclusion: Aspiration pulmonary abnormalities were the commonest lung manifestation of drug toxicities. Chest x-ray abnormalities associated with vomiting presentation are clues to finding pulmonary complications of acute drug toxicity.

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► *Implication for health policy/practice/research/medical education:* Aspiration-Induced lung Injuries among Acute Drug Poisoning Patients

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1. Introduction:

Inhalation of substances within the lungs is frequently associated with aspiration-induced lung injury, which is either due to a direct toxic effect or stimulation of an inflammatory response (1).

Aspiration of gastric contents into the lower respiratory tract is a common event in critically ill patients, and can lead to pulmonary squeal (1). They lead to pulmonary damage due to gastric acid, food and other ingested material (e.g., activated charcoal as in the treatment of overdose). Although, aspiration is rarely diagnosed problem that often remained unrecognized. Consequences of pulmonary aspirating range from no injury at all, to a variety of clinical syndromes or death. It depends on the types of material volume and pH of aspirated events (2).

Apparent aspiration occurs in up to 70% in obtunded patients, which could have a significant adverse effect on morbidity and mortality in non-intubated patients (2). Hospitalized patients are also at greater risk for developing respiratory complications following pulmonary aspiration. It may be developed due to a decreased level of consciousness such as conditions; drug overdose, seizures, long-term use of nasogastric feeding tubes, tracheotomy, Poor oral motor skills, depressed cough and gag reflexes, immobility, and decline of respiratory functions (1).

The majority of self-poisoning incidents are associated with the ingestion of psychiatric medication (Antidepressants, Mood Stabilizers, Sedative/Antianxiety, Antipsychotics) which impair the level of consciousness and depressed respiration (2). Acutely poisoned patients with impaired mentation are at greater risk for developing respiratory complications following

pulmonary aspiration (3). However, the pathophysiology and risk factors for aspiration pneumonitis and aspiration pneumonia are similar in the other aspects. Aspiration pneumonitis is more likely to occur in a patient with a drug overdose (4).

The aim of this study was to determine the prevalence of aspiration induced lung complications such as aspiration pneumonitis and aspiration pneumonia among patients with acute drug poisoning.

2. Materials and Methods:

The population for this prospective cross-sectional study involved 410 patients with history of drug/ chemical poisoning, admitted through poisoning emergency service -Loghman Hakim hospital, a general teaching hospital in Tehran, during a 12-months period from 1st August 2013 to 31st July 2014.

The study included poisoned patients of both genders 16 years of age and older.

The general approach and initial management of patients with suspected or confirmed poisoning include, complete history, physical examination and indicated laboratory tests.

Demographic information as well as the poisoning pattern (type, dose, route and interval between overdose, and presentation) and history of witnesses vomiting were recorded. During hospitalization, the research consisted of two phases, using clinical assessment and chest radiology evaluation in patients with suspected aspiration.

Chest radiography was performed in patients with findings suggestive of acute respiratory symptoms (one or more of the following symptoms: cough, sputum, dyspnea, and chest pain). Positive findings on CXR were defined as the presence of consolidations, pleural effusion, abscess or empyema in the setting of acute respiratory symptoms.

The data collection was made in the emergency ward from medical records. The sources were from admitting patients with a history of acute drug/chemical poisoning, up to 16 years age-old. They were based on demographic profile, poisoning pattern,

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patient's responsiveness, according to AVPU responsiveness scale, respiratory symptoms, history of witnesses vomiting, emergency management (Gastric decontamination, use of activated charcoal), nasogastric tube insertion, time and Place (prehospital, hospital) of endotracheal intubation (ETT). The data was tabulated and analyzed by using SPSS software version 13. Chi-square and Fischer's exact test was performed on the data. The significant level was set at $P < 0.05$.

3. Results:

Of 410, participants included 249 (61%) male and 161 (39%) female. As shown in Table 1, the majority (38%) of admitted patients was for ages 25-39 years with Mean \pm SD 32.3 \pm 14.5 (Female 34% and Male 27% respectively). The mean age \pm SD of females was lower than males (27.3 \pm 12.4 vs. 34.4 \pm 14.4 years old). The average intensive care unit lengths of stay were with Mean \pm SD (3 \pm 1.1days). The frequency of the hospitalization period was less than 48 hours (30%) and more than a week (25%). Intentional Drug Overdoses (IDO) by a single drug (Benzodiazepines in 25% and opioids in 24%, respectively) were the most common cause of poisoning in the majority of the cases (54%, 222).

The AVPU responsiveness scale was evaluated in the Emergency Department (ED) at: being alert (conscious) 40% (n=165), verbal (drowsy) 31% (n=125), painful (stupor) 19% (n=76) and unresponsive (coma) 10.7% (n=44).

Most of the patients were received activated charcoal for their initial management, 50% (205), mainly by mouth (86%, 175). Administration of activated charcoal following gastric lavage was reported in 34% (140).

The remaining 16 % (n=65) had already received initial treatment in other medical centers. An episode of vomiting was recorded positive in 62% (no=254) patients, either self-reported or witnessed by someone else within the first hours of poisoning.

Of 84% (no=345) patients, underwent ETT performance, 48% (no= 164) needed airway

protection and ventilatory support within the first six hours in the Emergency Department. Intubation was considered before and after receiving initial management (Activated charcoal and GI decontamination) in 35% (no=119), 61% (no=211) patients respectively. The condition of 4% (no=15) patient was unclear (Table 2).

Chest radiograph changes were observed mainly in both lungs (45%, 185), including multifocal patchy infiltrates in both lungs 44% (no=178), diffuse bilateral infiltrates 35% (no=144), bilateral perihilar consolidation 18% (no=72), lobular consolidation 4% (no=16), mainly in both lungs (45%, 185) (Table 2).

Table 3 shows Correlation regarding spectrum of symptoms with intubation ($P < 0.05$).

Aspiration related pulmonary complications attributed to: pneumonitis 43.5% (178); ARDS 35% (144); pneumonia 17.5% (72); lung abscess 4% (16), with a significant relationship with vomiting ($P=0.04$) (Table 4).

4. Discussion:

In clinical practice, among ICU-treated patients, the most common complications leading to prolonged ICU and hospital stay have been pulmonary complications (11-17%) (6-8). Adnet and Baud demonstrated that the risk of aspiration increases with the degree of impairment in consciousness by the Glasgow Coma Scale measurement (8).

Acute drug poisoning is one of the emerging issues, which accounts for about 0.7-15% of emergency admission in different parts around the world (8-10).

Prior research has found that international overdosing on medication is the most common motivation to self-harm and attempt suicide (28-85%), especially among young people (11-13).

In this study, we also found that international drug overdose, by a single drug (54%) (Benzodiazepines in 25% and opioids in 24%, respectively) was the most common cause of poisoning (74%) in the majority of the patients aged 25-39 (38%).

Table 1: Demographic Profile and Clinical Assessment of Patients with acute Lung Injuries Following Acute Drug Poisoning.

Variable		Frequency	Percent	Mean \pm SD
Sex	Male	249	60.7	
	Female	161	39.3	
Age group	<18 years	42	10.2	28 \pm 14.5
	18-24 years	102	24.9	
	25-34 years	154	37.6	
	35-44 years	96	23.4	
	>45 years	16	3.9	
Poisoning Cause	Accidental	35	8.5	
	Suicide	304	74.1	
	overdose	71	17.3	
AVPU responsiveness	Alert (15 GCS)	165	40.3	
	Voice(12 GCS)	125	30.5	
	Pain(8 GCS)	76	18.5	
	Unresponsive(3 GCS)	44	10.7	
Number of drug	single drug	222	54.1	
	Multiple drugs	133	32.4	
	Unknown	55	13.4	
ED Procedures	Charcoal by	205	50.0	
	• NG	30	14.6	
	• Self	175	85.4	
	Lavage+ Charcoal	140	34.1	
	• Self	13	9.3	
	• NG	127	90.7	
	None	65	15.9	
H/o Vomiting	Positive	254	62.0	
	Negative	156	38.0	

One of the most commonly reported complications in patients admitted to the hospital due to acute poisoning is aspiration

induced lung injury, the which may be preventable in some cases (14, 15).

Table 2: Emergency Treatment and Radiology Findings of Patients with acute Lung Injuries Following Acute Drug Poisoning.

Variable		Frequency	Percent
ETT Time	<6 hour	47.5	164
	6-12 hour	26.3	91
	12-24 hour	16	55
	>24 hour	10.2	35
ETT Decision	Before Initial treatment	119	34.5
	After Initial treatment	211	61.2
	unclear	15	4.3
Total		345	84.1
CX ray_ Infiltration	Rt		
	upper Lobe		136
	Middle lobe	66	48.5
	lower Lobe	21	15.5
		49	36
	Lt		
upper Lobe		89	21.7
Middle lobe		31.5	
lower Lobe		0	
		68.5	
	Both lungs		185
			45.2

Pulmonary complications raise the mortality rate to 4.3–8% of patients admitted to the hospital due to acute drug poisoning (16, 17).

In general, any condition that leads to altered mental status or decreased the level of consciousness, depressed upper airway reflexes, increased gastric volume and

vomiting or delayed gastric emptying can result in aspiration (18).

In this study, acute poisoning followed by a decrease in the level of consciousness reported in 305 (74.3%) subjects. Respiratory symptoms were developed in about 63.4% (n= 260). Criteria of aspiration related -lung injury (dyspnea, wheeze, cyanosis, shortness of breath) showed in 153

Table 3: The spectrum of symptoms correlated with intubation.

spectrum of symptoms		ITT Done		Total (%)	P value
		Yes (%)	No (%)		
AVPU responsiveness	Alert (15 GCS)	105 (63.7)	60 (36.3)		0.001
	Voice(12 GCS)	85 (68)	40 (32)		
	Pain(8 GCS)	70 (92)	6 (8)		
	Unresponsive(3 GCS)	44 (100)	0 (0)		
ED Manengment	Charcoal	166 (81)	39 (19)		.002
	Lavage+ Charcoal	94 (67)	46 (33)		
	None	39 (60)	26 (40)		
respiratory symptoms	Dyspnea				.001
	• Yes	264 (81.2)	61 (18.8)		
	• no	81 (95.3)	4 (4.7)		
	Cynosis				.003
	• Yes	283 (82)	62 (18)	345 (84.1)	
	• No	62 (95.4)	3 (4.6)	65 (15.9)	
	Wheeze				.003
	• Yes	284 (82.3)	61 (17.7)	345 (84.1)	
	• no	61 (93.8)	4 (6.2)	65 (15.9)	
	Cough				.001
• Yes	78 (95.1)	4 (4.9)	82 (20)		
• No	267 (81.4)	61 (18.6)	328 (80)		

(37%) patients. The need for pre-hospital intubation reported in 3%, which was lesser than other studies (19, 20), and maybe

because of nature and a dose of a drug used, failure to do initial management (charcoal and lavage) before arriving at the hospital.

Table 4: Aspiration related Pulmonary complications of Patients with acute Lung Injuries Following Acute Drug Poisoning.

Lung pathology	Lung_Injury			
	Pneumonitis	Pneumonia	ARDS	Lung Abscess
Bilateral perihilar consolidation	0	72	0	0
		100%		
Multifocal patch infiltration	178	0	0	0
	100%			
Diffuse bilateral infiltration	0	0	144	0
			100%	
Lobular consolidation	0	0	0	16
				100%
Total	178	72	144	16
	43.5%	17.5%	35.1%	3.9%

The intubation for airway protection in less than six hours was indicated mostly for patients (48%, n=164) after receiving initial treatment. That causes included using charcoal (10 % of self, 85% by NG, 5%, unclear) and GI decontamination methods (34%, n=140). The correlation between charcoal therapy alone, without GI decontaminations, does carry the risk of regurgitation and probability of aspiration of stomach content into the lung, (p=0.002), as mentioned in other researchers (21, 22).

Our findings show radiographic features of pulmonary aspiration syndrome (pulmonary infiltration) were mostly seen (72%, n=182) in patients with a history of vomiting in the state of decreased levels of consciousness (Drowsy 32%, stupor 15. %, coma 6%), (P=0.001), which is like other researchers (23).

5. Conclusion:

Early risk assessment and organized management of acutely poisoned patients, constitutes a core emergency competency.

The predictive value of airway protection is well defined.

To eliminate the risk of pulmonary aspiration, proper airway management, and careful precaution during gastric decontamination and charcoal therapy will minimize risk.

Despite clear protocols for prevention of aspiration syndromes, this condition still remains one of the major risks involving acute poisoning.

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7. Conflict of Interest:

The authors of the present work declare no conflict of interest.

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