RESPIRATORY SYSTEM AFFECTION IN ACUTE POISONED CASES ADMITTED TO MENOUFIA POISON AND DEPENDENCE CONTROL CENTER (MPDCC), MENOUFIA UNIVERSITY HOSPITAL " A PROSPECTIVE STUDY "

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ABSTRACT

Background: Acute poisoning is a common cause of admission to emergency departments (ED) and often needs treatment in the intensive care unit (ICU). Breathing and pulmonary complications are frequent causes of morbidity and mortality in acute poisoning. **Aim of the work:** To study respiratory system affection in acute poisoned cases as regarding: socio demographic pattern, their clinical manifestations, investigations and outcome according to poisoning severity score (PSS). **Patients and methods:** It is a prospective study that was conducted at Menoufia poison and dependence control center (MPDCC) through one year from the 1st October 2016 to the end of September 2017. All acute poisoned cases with respiratory system affection admitted to MPDCC were studied. The socio-demographic and clinical data were collected from each patient in a designed clinical toxicological sheet. The studied cases were classified according to the poisoning severity score. **Results:** the study included 116 patients. The incidence of respiratory system affection among total numbers of acute poisoned cases during the period of the study was 4.2%. The most common age of cases was < 5 years (42.2%). Males outnumbered females (54.3% versus 45.7% respectively). Regarding (PSS); 41.4% of cases were of moderate grade. As the causing substance of acute poisoning, cholinesterase inhibitors and corrosives were the most prominent causative agents (30.2% and 27.6% respectively). Oral ingestion was the common route of administration (74.1%). ICU admission was indicated for 29.3% of cases. Mortality rate constituted 10.3% of cases. **Conclusion and recommendation:** Respiratory system affection is an important cause of morbidity and mortality in acute poisoned cases. Respiratory system affection in acute poisoned cases can occur with a lot of poisons mostly with cholinesterase inhibitors and corrosives. Children less than 5 years were commonly affected. Therefore it is recommended to conduct educational programs in rural areas, restrict the availability

of pesticides and keeping them with other household products away from easy reach by children.

Keywords: acute poisoning, respiratory affection, cholinesterase inhibitors, corrosives.

INTRODUCTION

Morbidity and mortality due to acute poisoning is a major public health problem in many countries **(Malangu and Ogunbanjo, 2009).**

Respiratory complications and breathing difficulties are important risk factors in increasing morbidity and mortality rates in acute poisoned patients **(Olson, 2012)**.

Respiratory system is commonly affected in acute poisoning as multiple poisons cause respiratory toxicity either due to poison itself by central or peripheral mechanisms or due to its complications of poisoning as aspiration pneumonia and prolonged ventilation **(Stolbach and Hoffman , 2011).**

Common poisons that cause respiratory system affection in acute state are anticholinesterases, organophossphorous nerve agents, drug overdose as opioids and other central depressants, animal bite particularly snake bite, carbon monoxide poisoning, hydrocarbons and corrosives **(Little, 2015).**

Acute poisoning associated with respiratory impairment is very dangerous and may needs treatment in intensive care unit (ICU) because they may cause life-threatening complications that may result in death **(Jayakrishnan et al., 2012; Khodabandeh and Agin, 2016)**.

AIM OF THE WORK

This work aims to study respiratory system affection in acute poisoned cases as regarding: sociodemographic pattern, their clinical manifestations, investigation, classification according to poison severity score, treatment and outcome.

PATIENTS & METHODS

This is a prospective study conducted on all acute poisoned patients suffered from respiratory system affection admitted to Menoufia Poison and Dependence Control Center (MPDCC) over one year during the period from the 1st of October 2016 to the end of September 2017 after obtaining the ethical approval from the ethical committee of Faculty of Medicine, Menoufia University. Also, the permission of authority of Menoufia Poison and Dependence control center (MPDCC) which follows Menoufia University hospitals was taken before the study. The study included patients of both sexes and different age groups after taking their written valid consent from them or their guardians. Smokers and patients who had past history of chest disease were excluded from this study. Detailed history was taken regarding sociodemographic data (age, sex, residence, marital status and occupation), types of poison, clinical manifestations, investigations, classification of

cases according to poison severity score (PSS), treatment and outcome. The studied cases were classified according to the poison severity score which is a four scale grading as (0) none, (1) minor, (2) moderate, (3) severe and (4) fatal **(Person et al., 1998).**

Laboratory (as arterial blood gases) and radiological (as chest x-ray and computed tomography (CT) of chest) investigations were done when needed. Analytical toxicological tests (as thin layer chromatography, serum Pseudocholinesterase levels, and immunoassay rapid detection kits) were done when needed. Stroboscopy was done when needed.

Statistical analysis:

Data were collected, tabulated and statistically analyzed using a personal computer with Statistical Package of Social Science (SPSS) version 20 and the following statistics were applied: descriptive statistics as percentage (%) and analytic statistics as Chi-square test and fisher exact test. P value > 0.05 was considered statistically non-significant. P value < 0.05 was considered statistically significant. P value less than 0.001 was considered statistically highly significant **(Hansen et al., 2009)**

RESULTS

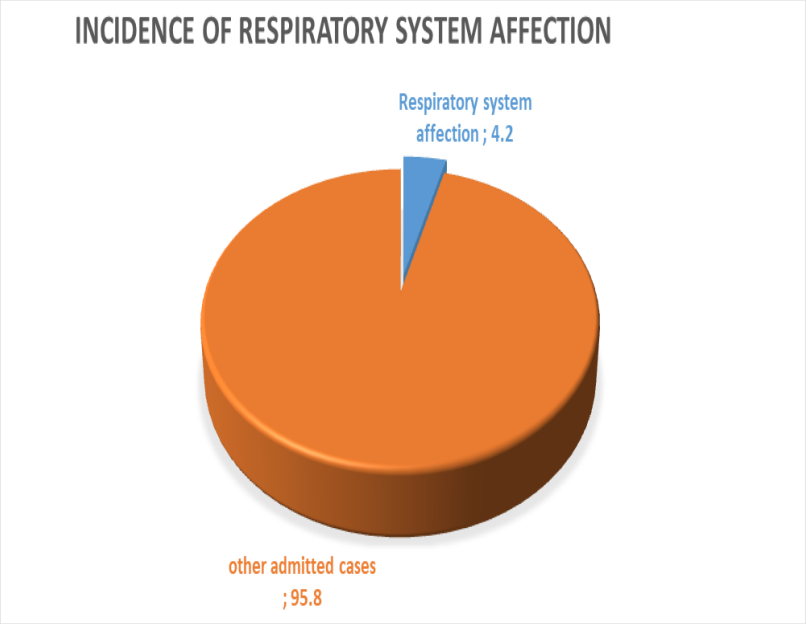

Figure (1): The incidence of respiratory system affection in acute poisoned cases during the period of the study was 4.2%.

Table (1): Distribution of respiratory system affection in the studied cases as regard sociodemographic data (NO=116):

Sociodemographic data	Studied group NO=116	
	NO	%
Age in years		
<5	49	42.2
5 -<10	1	0.9
10 -<20	25	21.6
20 -40	24	20.7
>40	17	14.7
Sex		
Male	63	54.3
Female	53	45.7
Residence		
Rural	70	60.3
Urban	46	39.7
Marital status		
child	50	43.1
Single	28	24.1
Married	34	29.3
Widow	3	2.6
Divorce	1	0.9
Occupation		
Child	50	43.1
Student	22	19
Employer	5	4.3
Worker	22	19
Not working	17	14.7

Table (2): Statistical analysis Fisher's exact test of gender differentiation in age groups of the studied cases (NO=116):

Age in years	Male NO =63		Female NO=53		Fisher's exact test	P value
	NO	%	NO	%		
<5	24	38.1	25	47.2		
5 -<10	0	0	1	1.9	18.01	0.001
10 -<20	7	11.1	18	34		HS
20 -40	19	30.2	5	9.4		
>40	13	20.6	4	7.5		

*P value <0.05 = significant (S) *P value <0.001 = highly significant (HS)

*P value >0.05 = non-significant (NS) *NO= number of cases

Table (3): Percentage distribution of the studied cases according to poison history (NO= 116):

Poison data	Studied group No=116	
	NO	%
Poison type		
Cholinesterase inhibitors	35	30.2
Drug overdose	14	12.1
Co ,gas inhalation	11	9.5
Corrosive	32	27.6
hydrocarbons	13	11.2
Animal bite	11	9.5
Route of exposure		
Ingestion	86	74.1
Inhalation	15	12.9
Biting	11	9.5
Injection	1	0.9
Skin contamination	3	2.6
Mode of exposure		
Accidental	92	79.3
Suicide	24	20.7
Time pass since exposure		
<3 hours	83	71.6
3-6 hours	21	18.1
> 6 hours	12	10.3
Referral		
referred	86	74.1
Not referred	30	25.9
Place of exposure		
Indoor	85	73.3
Outdoor	31	26.7
Season of exposure		
Summer	21	18.1
Autumn	23	19.8
Winter	35	30.2
Spring	37	31.9

*NO= number of cases

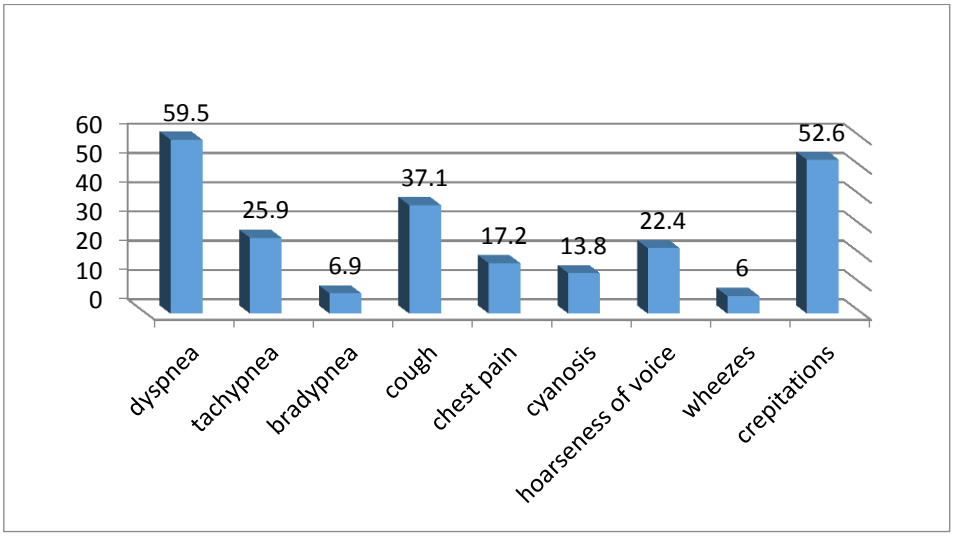

Figure (2): Distribution of clinical respiratory manifestations of studied cases at time of admission (NO=116):

Table (4): Statistical Analysis Fisher's Exact Tests of the Relation between Clinical Manifestation of studied cases and age (NO=116):

Clinical manifestations	Age (NO=116)										Fisher's exact test	P value
	<5 NO =49		5-<10 NO=1		10-<20 NO=25		20-40 NO=24		40> NO=17			
	NO	%	NO	%	NO	%	NO	%	NO	%		
Tachypnea												
Yes	14	28.6	0	0.0	4	16.0	6	25.0	6	35.3		0.65
No	35	71.4	1	100.0	21	84.0	18	75.0	11	64.7	2.7	NS
Dyspnea												
Yes	21	42.9	1	100.0	20	80.0	15	62.5	12	70.6		0.01
No	28	57.1	0	0.0	5	20.0	9	37.5	5	29.4	11.4	S
Bradypnea												
Yes	2	4.1	0	0.0	1	4.0	3	12.5	2	11.8		0.42
No	47	95.9	1	100.0	24	96.0	21	87.5	15	88.2	3.9	NS
Cough												
Yes	28	57.1	1	100.0	2	8.0	5	20.8	7	41.2		<0.001
No	21	42.9	0	0.0	23	92.0	19	79.2	10	58.8	22.8	HS
Chest pain												
Yes	2	4.1	1	100.0	5	20.0	8	33.3	4	23.5		0.001
No	47	95.9	0	0.0	20	80.0	16	66.7	13	76.5	15.6	S
Cyanosis												
Yes	3	6.1	0	0.0	3	12.0	5	20.8	5	29.4		0.09
No	46	93.9	1	100.0	22	88.0	19	79.2	12	70.6	7.5	NS
Dyspnea & hoarseness of voice												
Yes	9	18.4	0	0.0	4	16.0	12	50.0	1	5.9		0.008
No	40	81.6	1	100.0	21	84.0	12	50.0	16	94.1	12.8	S
Chest examination												
Normal	16	32.7	0	0.0	6	24.0	16	66.7	10	58.8		0.01
Wheezes	5	10.2	0	0.0	0	0.0	1	4.2	1	5.9	18.02	S
crepitations	28	57.1	1	100.0	19	76.0	7	29.2	6	35.3		

* NS=non- significant *S=significant *HS=high significant *NO= number of cases

Table (5): Statistical analysis fisher's exact test of the relation between the clinical presentations of the studied cases and the causative poisons (NO= 116):

Clinical manifestations	Poison type (NO=116)												Fisher's exact test	P value
	Anti-cholinesterase NO =35		Drug overdose NO=14		CO, gas inhalation NO=11		corrosives NO=32		volatiles NO=13		Animal Bite NO=11			
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%		
dyspnea														
Yes	26	74.3	3	21.4	5	45.5	17	53.1	6	46.2	11	100.0		<0.001 HS
No	9	25.7	11	78.6	6	54.5	15	46.9	7	53.8	0	0.0	21.7	
Tachypnea														
Yes	4	11.4	0	0.0	7	63.6	7	21.9	8	61.5	4	36.4	25.2	<0.001 HS
No	31	88.6	14	0.0	4	36.4	25	78.1	5	38.5	7	63.6		
bradypnea														
Yes	0	0.0	4	28.6	0	0.0	0	0.0	0	0.0	4	36.4		<0.001 HS
No	35	100.0	10	71.4	11	100.0	32	100	13	100.0	7	63.6	21.2	
Cough														
Yes	3	8.6	0	0.0	3	27.3	25	78.1	11	84.6	1	9.1		<0.001 HS
No	32	91.4	14	100.0	8	72.7	7	21.9	2	15.4	10	90.9	62.3	
Chest pain														
Yes	3	8.6	1	7.1	2	18.2	11	34.4	0	0.0	3	27.3		0.01 S
No	32	91.4	13	92.9	9	81.8	21	65.6	13	100.0	8	72.7	11.8	
Cyanosis														
Yes	6	17.1	4	28.6	0	0.0	0	0.0	1	7.7	5	45.5		0.001 S
No	29	82.9	10	71.4	11	100.0	32	100	12	92.3	6	54.5	17.9	
Dyspnea & hoarseness of voice														
Yes	0	0.0	0	0.0	0	0.0	16	50.0	0	0.0	10	90.9		<0.001 HS
No	35	100.0	14	100.0	11	100.0	16	50.0	13	100.0	1	9.1	60.7	
Chest examination														
Normal	3	8.6	12	85.7	9	81.8	7	21.9	7	53.8	10	90.9	63.1	<0.001 HS
Wheezes	0	0.0	0	0.0	0	0.0	4	12.5	3	23.1	0	0.0		
Crepitations	32	91.4	2	14.3	2	18.2	21	65.6	3	23.1	1	9.1		

* NS=non- significant *S=significant *HS=high significant *NO= number of cases

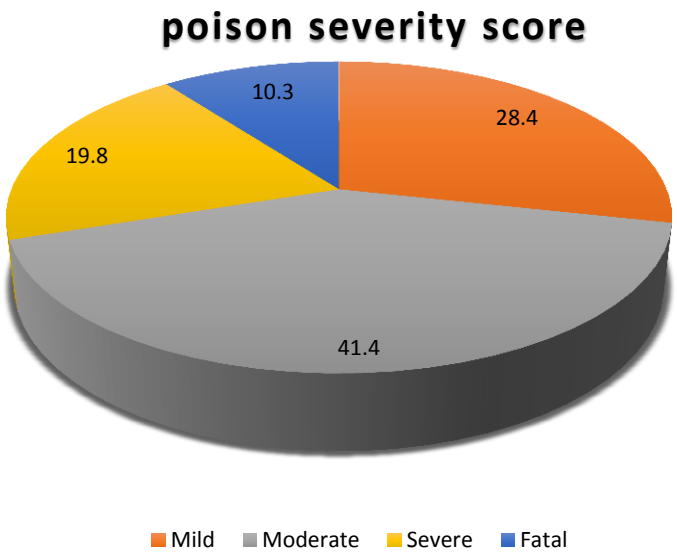

Figure (3): Percentage distribution of severity grades of the studied cases according to poison severity score (PSS)

Table (6): Distribution of the investigations done to the studied cases.

Investigations	Studied groups	
	NO	%
Arterial blood gases (done to 70.7% of cases)		
Normal	5	6.1
Acidosis (respiratory & metabolic)	33	40.2
Respiratory alkalosis	16	19.5
Mixed metabolic acidosis & respiratory alkalosis	24	29.3
Hypoxia	4	4.9
total	82	100.0
Thin layer chromatography(TLC) (done to 32.8% of cases**)**		
positive	32	84.2
Negative	6	18.8
Total	38	100.0
Pseudocholinesterase level (done to 25.9% of cases**)**		
Normal	1	3.3
Decreased	26	96.7
Total	27	100.0
Rapid detection kit (immunoassay) (done to 13.8% of cases**)**		
positive	12	75.0
negative	4	25.0
Total	16	100.0
Chest X-ray (done to 67.2% of cases**)**		
Normal	36	46.2
Abnormal	42	53.8
Total	78	100.0
Chest CT (done to 15.5% of cases**)**		
Normal	2	11.1
Abnormal	16	88.9
Total	18	100.0

No = number of cases

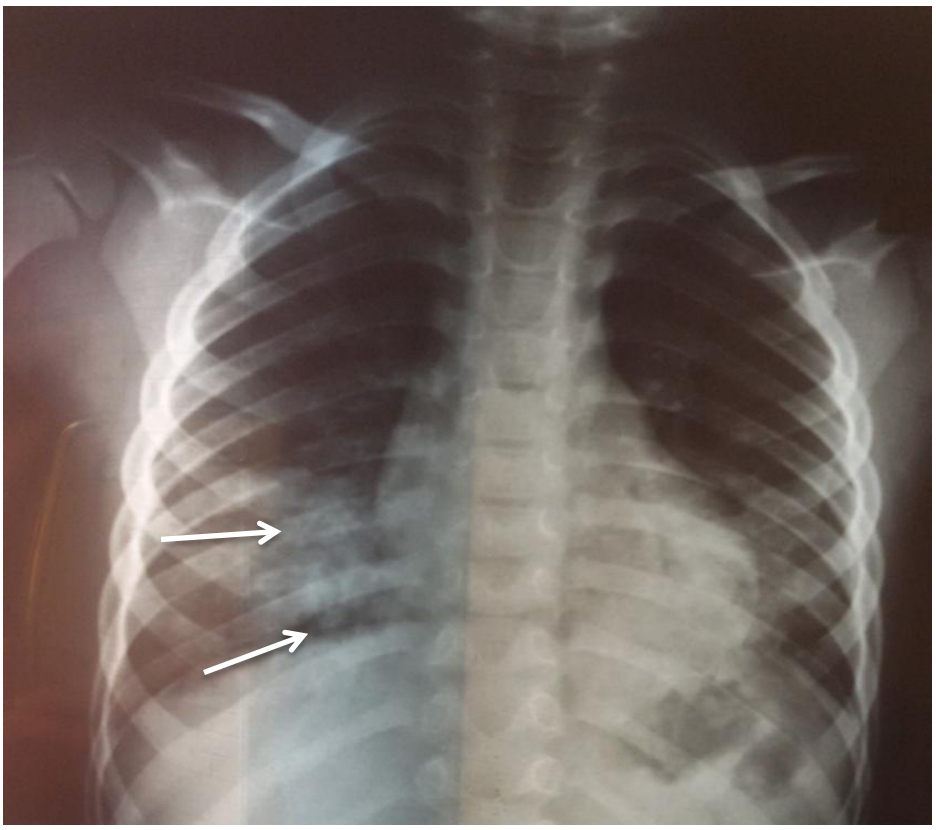

Figure (4): Chest x-ray of male patient 3 years old with kerosene toxicity showing right basal pneumonic patches (arrows)

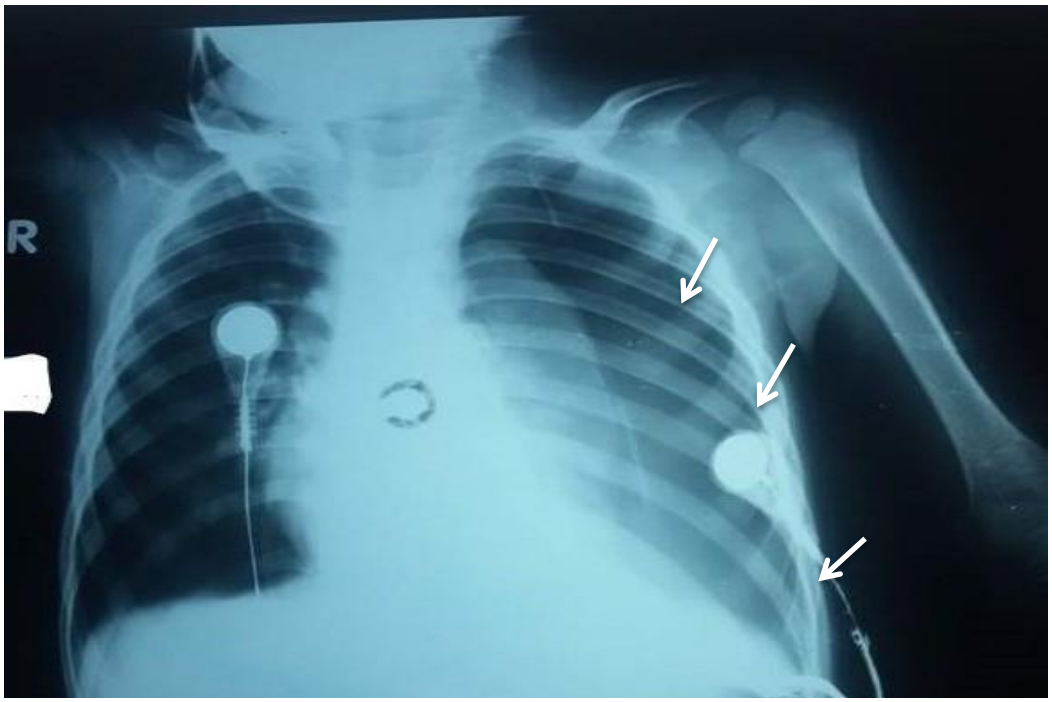

Figure (5): Chest x-ray of female patient 3 years old with corrosive toxicity showing left sided pneumothorax (arrows).

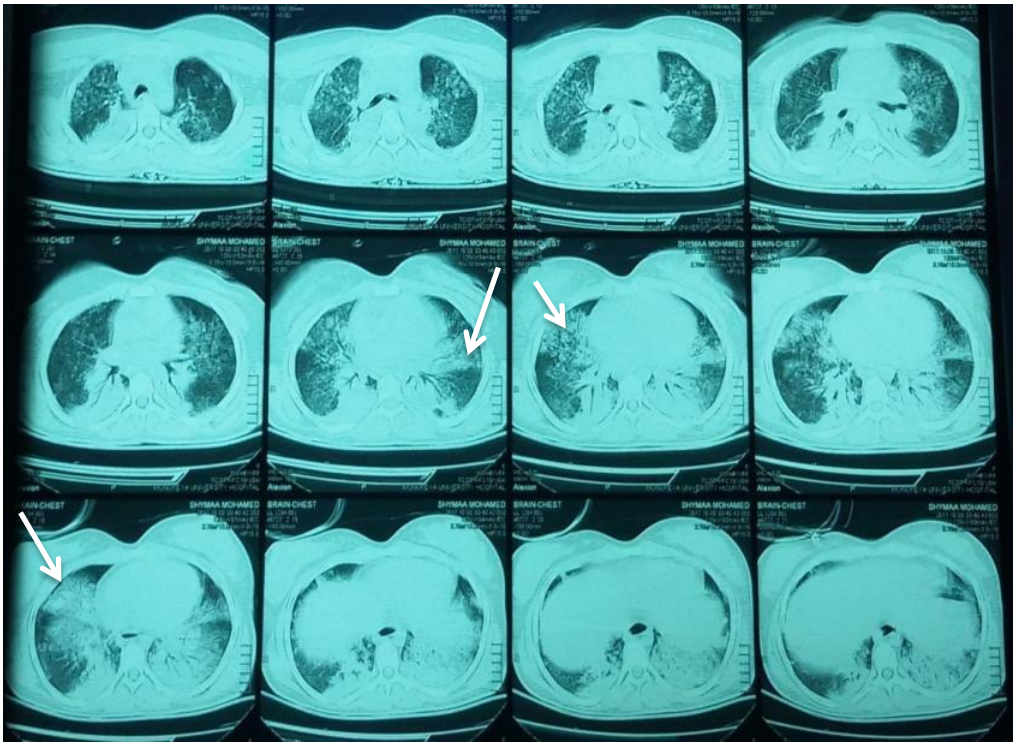

Figure (6): C.T. chest of female patient 18 years old with insecticide toxicity (white powder ingestion) showing bilateral pulmonary consolidation (arrows)

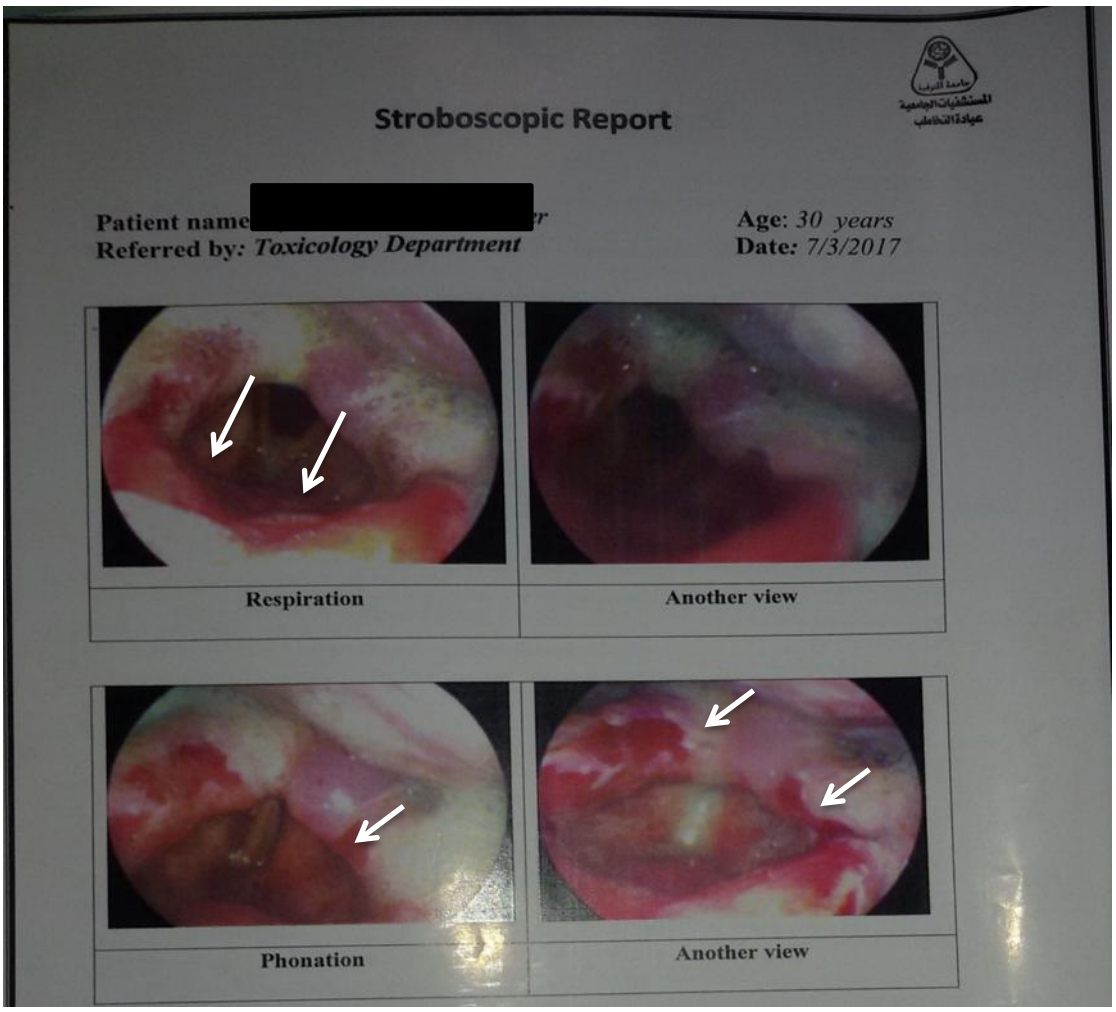

Figure (7): shows stroboscopic examination of male patient 30 years old showing highly edematous congested supraglottic area with macerated ulcerated mucosa and congested edematous subglottic area (laryngitis) after corrosive ingestion (arrows).

Table (7): Statistical Analysis Chi-square (X^2) and Fisher's Exact Tests of the Relation between radiological finding of the studied cases, type of poison and age (NO=116):

Clinical manifestations	Age (NO=116)										Fisher's exact test	P value
	<5 NO =49		5-<10 NO=1		10-<20 NO=25		20-40 NO=24		>40 NO=17			
	NO	%	NO	%	NO	%	NO	%	NO	%		
Chest X-ray												
Normal	15	30.6	1	100	5	20	9	37.5	6	35.3		0.31
Abnormal	20	40.8	0	0	7	28	7	29.2	8	47.1	8.9	NS
Not done	14	28.6	0	0	13	52	8	33.3	3	17.6		
Chest CT												
Normal	0	0	0	0	1	4	1	4.2	0	0		0.02
Abnormal	2	4.1	0	0	6	24	3	12.5	5	29.4	16.1	S
Not done	47	95.9	1	100	18	72	20	83.3	12	70.6		
Poison type												
Anticholinesterase	9	18.4	0	0	16	64	4	16.7	6	35.3		
Drug overdose	7	14.3	0	0	2	8	3	12.5	2	11.8		0.03
Co ,gas inhalation	0	0	0	0	3	12	5	20.8	3	17.6	15.7	S
Corrosive	20	40.8	1	100	2	8	5	20.8	4	23.5		
hydrocarbons	13	26.5	0	0	0	0	0	0	0	0		
Animal bite	0	0	0	0	2	8	7	29.2	2	11.8		

* NS=non- significant *S=significant *HS=high significant *NO= number of cases

Table (8): Statistical Analysis Fisher's Exact Test of the Relation between ABG and Age, sex, poison type (NO=116):

	ABG (NO =116)												Fisher's exact test	P value
	Normal NO =5		Acidosis NO=33		Resp. alkalosis NO=16		Mix metabolic acidosis &respiratory alkalosis NO=24		Not done No=34		Hypoxia No=4			
	N	%	N	%	N	%	N	%	N	%	N	%		
Sex														
Male	3	60	20	60	9	56.3	10	41.7	18	52.9	3	75	2.9	0.74
Female	2	40	13	40	7	43.7	14	58.3	16	47.1	1	25		NS
Age in years														
<5	0	0.0	10	30.3	7	43.8	7	29.2	25	73.5	0	0.0		
5 -<10	0	0.0	1	3.0	0	0.0	0	0.0	0	0.0	0	0.0		
10 -<20	1	20.0	6	18.2	3	18.8	9	37.5	5	14.7	1	25.0	22.5	0.002
20 -40	1	20.0	10	30.3	4	25.0	3	12..5	4	11.8	2	50.0		S
>40	3	60.0	6	18.2	2	12.5	5	20.8	0	0.0	1	250		
Poison type														
Anticholinesterase	0	0	13	39.4	1	6.3	13	54.2	8	23.5	0	0		
Drug overdose	0	0	12	36.4	0	0	1	4.2	0	0	1	25		
Co ,gas inhalation	0	0	1	3	5	31.3	4	16.7	0	0	1	25	29.2	0.001
Corrosive	4	80	2	6.1	4	25	3	12.5	19	55.9	0	0		S
hydrocarbons	0	0	0	0	4	25	2	8.3	7	20.6	0	0		
Animal bite	1	20	5	15.2	2	12.5	1	4.2	0	0	2	50		

* NS=non- significant *S=significant *HS=high significant *NO= number of cases

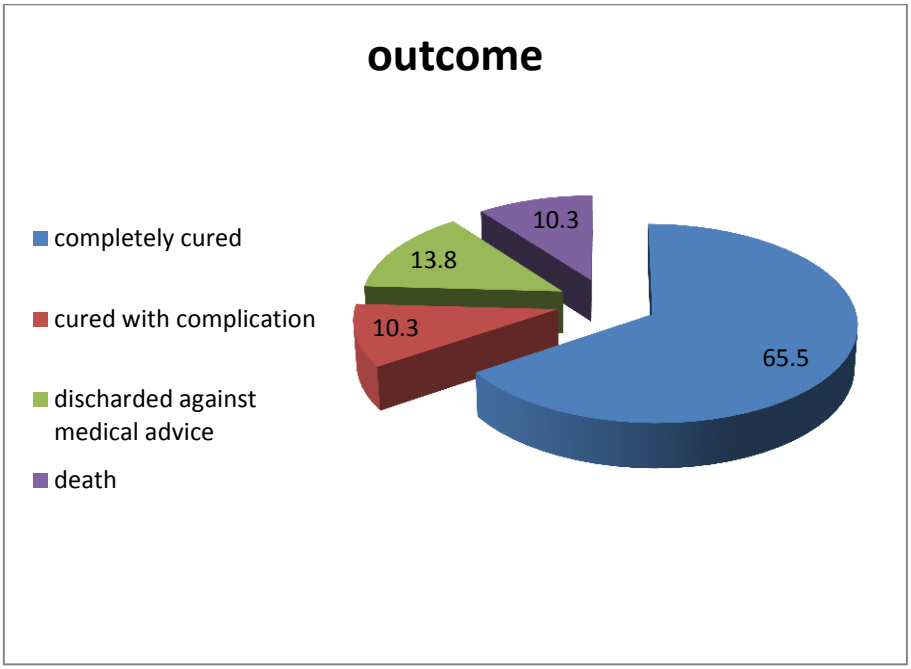

Figure (8): Percentage distribution of studied cases according to their outcome.

Table (9): Statistical Analysis Fisher's Exact Test of the Relation between rout of exposure poison severity score, Outcome and ICU admission (NO=116):

	Rout of exposure (NO =116)										Fisher's exact test	P value
	Ingestion NO =86		Inhalation NO=15		biting NO=11		Injection NO=1		Skin contamination No =3			
	N	%	N	%	N	%	N	%	N	%		
PSS												
Mild	28	32.5	5	33.3	0	0.0	0	0.0	0	0.0	21.03	0.01
Moderate	35	39.3	8	53.4	2	18.2	1	100.0	2	66.7		S
Severe	13	14.6	2	13.3	7	63.6	0	0.0	1	33.3		
Fatal	10	11.2	0	0.0	2	18.2	0	0.0	0	0.0		
Outcome												
Completely cured	10	11.6	0	0.0	2	18.2	0	0.0	0	0.0		
Cured with complication	56	65.1	11	73.3	8	72.2	0	0.0	1	33.3	19.7	0.16 NS
Discharged against medical advice	11	12.8	3	20.0	0	0.0	0	0.0	2	66.7		
Death	9	10.5	1	6.7	1	9.1	1	100.0	0	0.0		
ICU admission												<0.001
Yes	21	24.4	3	20	9	81.8	1	100	0	0	27.1	HS
No	65	75.6	12	80	2	18.1	0	0	3	100		

Table (10): Statistical analysis Fisher's exact test of the relation between severity grades of the studied cases according to PSS and poison type, need for ICU admission, duration of hospital stay and outcome (NO=116):

	Poison severity score (NO =116)								**Fisher's exact test**	**P value**
	Mild NO =33		**Moderate NO=48**		**Severe NO=23**		**Fatal NO=12**			
	NO	**%**	**NO**	**%**	**NO**	**%**	**NO**	**%**		
Poison type										
Anticholinesterase	5	15.2	14	29.2	9	39.1	7	85.3		
Drug overdose	3	9.1	5	10.4	4	17.4	2	16.7		
Co, gas inhalation	3	9.1	6	12.5	2	8.7	0	0.0	50.1	<0.001
Corrosive	19	57.6	11	22.9	1	4.3	1	8.3		HS
hydrocarbon	3	9.1	10	20.8	0	0.0	0	0.0		
Animal bite	0	0.0	2	4.2	7	30.7	2	16.7		
ICU admission										
Yes	0	0.0	6	12.5	16	69.6	12	100.0	68.8	<0.001
No	33	100.0	42	87.5	7	30.4	0	0.0		HS
Duration of hospital stay								16.7		
	20	60.6	16	33.3	0	0.0	2	25.0		
Up to 24 hours	10	30.3	19	39.6	9	39.1	3	16.7	37.9	<0.001
1-3 days	3	9.1	6	12.5	6	26.1	2	41.7		HS
3 days to 1 week	0	0.0	7	14.6	8	34.8	5			
> 1 week										
Outcome										
Completely cured	31	93.3	29	60.4	16	69.6	0	0.0		
Cured with	0	0.0	5	10.4	7	30.4	0	0.0		
complications									87.04	<0.001
Discharged against	2	6.1	14	29.1	0	0.0	0	0.0		HS
medical advice										
Death	0	0.0	0	0.0	0	0.0	12	100.0		

*NO= number of cases *HS=high significant

This study is a prospective study carried on 116 acute poisoned cases suffered from respiratory system affection attended to MPDCC.

The most affected age group was children < 5 years (42.2%). More than half of patients were males (54.3%) and the studied patients were mainly from rural areas (60.3%) (Table 1)

On studying the sex differentiation in different age groups, there was statistically highly significant relation (P value = 0.001) where females outnumbered males in age group 10-<20 years (34% versus 11.1% respectively) while males outnumbered females in age group 20-40 years and >40 years (30.2% and 20.6% versus 9.4% and 7.5% respectively) (Table 2)

Cholinesterase inhibitors and corrosive poisonings were the most common cause of respiratory system affection (30.2% and 27.6% respectively) followed by drug overdose, hydrocarbons toxicity, animal bite toxicity and carbon monoxide & other gases inhalation toxicity (12.1%, 11.2%, 9.5% and 9.5% respectively).

Accidental exposure to poisoning was the most common mode of exposure (79.3%) followed by suicidal poisoning (20.7%) with no homicidal cases. The majority of cases was exposed to poison through oral route (74.1%) followed by inhalation, biting, skin contamination and injection (12.9%, 9.5%, 2.6% and 0.9% respectively).

Patients that came to MPDCC immediately within 3 hours after poison exposure represented 71.6% while 18.1% came within 3 to 6 hours and 10.3% came after 6 hours. 74.1% of cases were referred from other hospitals. Indoor was the major place of poison exposure (73.3%). Most of poisoning exposure occurred in spring (31.9%) and winter (30.2%). (Table 3)

The most frequent presentations noticed in the studied cases were dyspnea (59.5%), chest crepitation (52.6%), cough (37.1%), tachypnea (25.9%) and hoarseness of voice (22.4%). (Figure 2)

On studying the relation between types of respiratory presentation with age, there was statistically high significant relation between cough and different age groups where the most common cases presented with cough were in age group of < 5 years old and there were statistically significant relations between dyspnea, chest pain, hoarseness of voice, wheezes and crepitation in different age groups. (Table 4)

On studying the relation between the presentations of the study cases with the causative poisons, it was observed that the relations between dyspnea, tachypnea, bradypnea, cough, dysphonia, wheezes and crepitation and the causative poisons were highly significant (P value= < 0.001) while the relations were significant with chest pain and cyanosis. (Table 5)

Poison severity score was used to estimate the severity of the studied cases. The majority of cases were in moderate grade (41.4% of cases), followed by mild, severe and fatal grades (28.4%, 19.8% and 10.3% respectively) (Figure 3).

Regarding the investigations that were done to the studied cases, arterial blood gases were done to 70.7% of cases. Acidosis was noticed in 40.2% of them followed by mixed metabolic acidosis and respiratory alkalosis and respiratory alkalosis (29.3% and 19.5% respectively). (Table 6)

Thin layer chromatography was done to 32.8% of cases, 84.2% of them had positive results. Pseudocholinesterase level was measured in 25.9% of cases and decreased levels were noticed in 96.7% of them. Rapid immunoassay detection kits were done to 13.8% of cases and 75% of them showed positive results (table 6)

Chest x-ray was done to 67.2% of cases, 53.8% of them showed

abnormal findings as increased bronchovascular markings (19.2%), pneumonic patches (29.5) and pneumothorax (5.1%). Computed tomography (CT) of the chest was done to 15.5% of cases, 88.9% of them showed abnormal findings in the form of pulmonary consolidation (72.2%) and pleural effusion (16.7%) (Table 6) (Figures 4, 5 and 6)

Stroboscopy was done to 3.4% of cases, all of them showed abnormal findings as signs of laryngitis. (figure 7)

Table (7) shows statistically significant relation between the CT findings and the different age groups where most of abnormal findings were presented in 10-<20 years and >40 years (24% and 29.4% respectively). It was also noticed that statistically significant relation was found between age and causative poisons where corrosives and hydrocarbons were common in age of < 5 years (40.8% and 26.5% respectively) and cholinesterase inhibitors were common in age of 10-< 20 years.

On studying the relation between the ABG findings and age, the relation was significant where acidosis was found commonly in age of < 5 years and 20-40 years (30.3% for each), respiratory alkalosis was found commonly in the age of < 5 years (43.8%) but mixed acidosis and alkalosis was found in age of 10-< 20 years (37.5%). (Table 8)

The relation between ABG findings and poison type was significant where acidosis was found commonly with cholinesterase inhibitors and drug overdose (39.4% and 36.4% respectively) while respiratory alkalosis was found commonly with CO and other gas inhalation (31.3%). (Table 8)

Regarding the cases' outcome, the majority of cases were completely cured (65.5%), cure with complications was noticed in 10.3% (as chronic laryngitis (3.4%), tracheostomy (1.7%), ventilator associated pneumonia (2.6%), dysphagia, esophageal stricture and surgical emphysema (0.9% for each)) and mortality represented 10.3% of cases (the main cause of death was anticholinesterase poisoning (58.3%)) (figure 8)

This study reveals that the relation between the different routes of exposure and the severity grades of the studied cases was statistically significant where oral intake was the common in all severity grades while injection was the route in moderate grade cases only and skin contamination was the route in moderate and severe grade cases only (table 9)

The study also shows statistically high significant relation (P value= <0.001) between the route of exposure to poison and the need for ICU admission where most of bitten cases (81.8%) and the case who injected the poison were admitted in ICU while most of cases who ingested the poison didn't need admission in ICU (75.6%). (Table 9)

Table (10) revealed statistically high significant relation between the severity grades of the studied cases and the poison type (P value = <0.001) where severe and fatal

grades were commonly associated with anticholinesterase poisoning.

Our study showed statistically high significant relation between the severity grades of the cases and their need to ICU admission as all cases of fatal grade and 69.6% of severe grade were admitted to ICU (P value = <0.001). (table 10)

This study showed statistically high significant relation between the severity grades of the studied cases according to PSS and the duration of their hospital stay (P value = <0.001), as patients who stayed for up to 24 hours were mainly of mild and moderate grades (60.6% and 33.3% respectively) while patients who stayed for more than one week were mainly of severe and fatal grades (34.8% and 41.7% respectively).

The difference between the severity grades of cases and their outcome was statistically highly significant (P value = <0.001), where most of mild (93.3%) were cured completely while complicated cases were of moderate and severe grades (10.4% and 30.4% respectively).

DISCUSSION

Respiratory system is often affected in acute poisoning as a lot of poisons can cause respiratory toxicity by several mechanisms. Several poisons may cause central or peripheral respiratory system affection in addition to acute poisoning complications as aspiration pneumonia and prolonged ventilation **(Stolbach and Hoffman , 2011)**

The incidence of respiratory system affection in acute poisoned cases through the period of the study was 4.2% as the total admitted cases were 2724 cases and the respiratory system affection was found only in 116 cases. Similarly to **Abd-Elhaleem and Al Muqem, (2014)** who observed respiratory symptoms in 3.5% of acute poisoned cases in their retrospective study in King Khaled Hospital in Al Majmaah Region, Saudi Arabia. Several studies reported different rates of respiratory symptoms and complications in acute poisoned cases as **Kishore et al., (2008)** who stated that respiratory system affection represented 10.56% of systems affection in their study of the pattern of poisoning cases in a teaching hospital in Western Nepal , **Lund et al., (2012)** who noticed that respiratory complications were the most recorded complications in his study of acute poisonings in adults (≥16 years) in Olso and **Teklemariam et al., (2016)** who found that 9.7% of patients of acute poisoning in Ethiopia were complaining from breathing difficulties**.**

Regarding age, most of patients were < 5 years old. This may be due to children less than 5 years old are at high risk of exposure to acute poisoning because children are curious and try to explore the world with all their senses beside improper storage of medicines and household chemicals within reach of children **(Dayasiri et al., 2017)**. Young children are in great risk of respiratory system affection in acute poisoning due to sensitive respiratory centers and high possibility of aspiration during

vomiting. Also, the pediatric airway is narrow specifically the subglottic region so it can be easily obstructed by edema or secretions **(Joshi and Ross, 2017)**.

The most common causative agent of respiratory affection in age below five years are corrosives and hydrocarbons, this comes in agreement with **Madboly and Elgendy, 2014; Gangal and Haroon, 2015.**

Regarding sex, males outnumbered females (54.3% versus 45.7% respectively).

The high incidence of poisoning in males may be due to high exposure rates to poisoning in work places especially in fields due to insecticides handling during spraying trees and snake bites **(Mate et al., 2017).**

This study showed statistically significant relation between gender and different age groups. Females outnumbered males in age of 10-<20 years while males outnumbered females in age of 20-40 years and >40 years. The increased incidence in males in this age group of >20 years may be due to they are the only earning members of their families so they are more vulnerable to stress as unemployment and marital problems in addition to occupational hazards to poisoning as insecticides and animal bites in fields, while increased incidence in females in age of 10-<20 years may be due to their vulnerability to stress during puberty, emotional status of young girls and domestic violence **(Asawri et al., 2017**)

The same results were observed by Association of Poison Control Centers' (AAPCC) and National Poison Data System (NPDS) according to the annual report published in 2017 which stated that female predominance was found among poison exposure victims in age group of 13-19 years while male predominance was found in patients between 20 to 39 years old **(Gummin et al., 2017)**

Cases from rural areas outnumbered those from urban areas. This may be due to the rural nature of Menoufia governorate, where availability of pesticides and other toxic materials in home and fields beside the presence of snakes. Lack of awareness about children may attribute to high incidence of poisoning noticed in rural areas **(El-Gendy et al., 2008).** This study comes in agreement with **Hassan and Siam, (2014); Siva et al., (2015) and Ramesh et al., (2016).**

This study revealed that, the most common poisons causing respiratory system affection were cholinesterase inhibitors (30.2%) followed by corrosives (27.6%)**.**

Gangal and Haroon, (2015) noted that 1.34% of patients in their study suffered from respiratory distress and the most common toxic agents were insecticides followed by corrosives.

Cholinesterase inhibitors was reported to be the common cause of respiratory complications in many studies as **Bhat et al., (2012)**; **Ssemugabo et al., (2017); Nazima et al., (2018)**; **Rao et al., (2018).**

Chibishev et al., (2014) and **Caganova et al., (2017)** stated that corrosives poisoning are a common cause of poisoning induced pulmonary symptoms.

Ingestion of the poison was the most common route of exposure (74.1%). It may be because most of respiratory toxicants present in liquid form and easily to be ingested as cholinesterase inhibitors, corrosives, drugs and hydrocarbons **(Coskun et al., 2015).**

There was statistically significant relation between the different routes of exposure and the severity grades of the studied cases where oral intake was the common in all severity grades. This may be due to most of respiratory toxicants in this study are available in oral formulation and easily to be ingested.

There was statistically high significant relation (P value= <0.001) between the route of exposure to poison and the need for ICU admission where most of bitten cases (81.8%). This may be due to patients of animal bites specifically poisonous snake bites were more susceptible to respiratory muscle failure and they are in great need for mechanical ventilation in ICU **(Mehvish et al., 2016)**.

The same result was reported by **Al-Barraq and Farahat (2011); Alazab et al., (2012); Mbarouk et al., (2017)** and AAPCC, NPDS according to the annual report published in 2017 **(Gummin et al., 2017).**

Accidental poisoning was more frequent between the studied cases represented 79.3%. Careless labeling and unsafe storage of poisonous substances may be causes of accidental poisoning, beside that lack of parental supervision may increase incidence of accidental poisoning specially in children **(Oliveira and Suchara, 2014)**

This is in agreement with **Sahin et al., (2011); Hassan and Siam, (2014); Azab et al., (2016) and Seif et al., 2018.** In contrary to this result, many studies stated that intentional poisoning is more than accidental as **Boshehri et al., (2012); El-Masry and Tawfik, (2013)** and **Teklemariam et al., (2016)**

It was found that the majority of the studied cases (71.6%) sought medical advice within the first three hours of exposure. This may be because the population is aware that poisoned patients need an immediate medical care as acute poisoning is a medical emergency especially if associated with respiratory manifestations as dyspnea and cyanosis. The fear from these manifestations especially in children encourages the emergency transfer of the patients to hospital.

This is in agreement with **Siddiqui et al., (2008); Ramesha et al., (2009); Manzar et al., (2010)** and **Saleem et al., (2015).**

As regard referral data, 74.1% of the studied cases were referred from other health centers. This is may be due to that the MPDCC is known to be the only center treating poisoning cases in menoufia governorate so cases came rapidly to it**.**

Indoor exposure of poisoning represented 73.3% while 26.7% exposed to poison outdoor. The Annual Report of the American Association of Poison Control Centers' (AAPCC) National Poison

Data System (NPDS) according to the published 2015 annual report found that 93.5% of cases exposure occurred at a residence **(Mowry et al., 2015).** Studies done by **El-Gendy et al., (2008); Hassan and Siam, (2014); Azab et al., (2016); Mbarouk et al., (2017)** agree with these results.

As regard seasonal variation, most of cases were prevalent in spring (31.9%) and winter (30.2%). This may be due to spring is a season of agriculture in agricultural governorate as Menoufia with availability of pesticides and other toxic substances for agricultural purposes. **(Ahmad et al., 2017)**. It may be also due to the maximum incidence of suicidal attacks is mainly in April and May as this period precedes examination in most schools and universities, which is characterized by high levels of stresses **(Shreed et al., 2011)**. This is in agreement with **Andýran and Sarýkayalar, (2004)** and **Wang et al., (2017)**. Moreover, increased prevalence in winter may be due to using of fired coal and stoves for warmth with high risk of carbon monoxide poisoning and hydrocarbon toxicity. This comes in agreement with **Sahin et al., 2011)**.

As regard the clinical presentation of the studied cases on admission, dyspnea, chest crepitation (pulmonary odema), cough and tachypnea were the most common.

A retrospective study by **Chibishev et al., 2014** of 415 patients at the University Clinic for Toxicology in Skopje, Republic of Macedonia for a period of five years, with this study as the most common noticed respiratory symptoms were difficult breathing, suffocation, cough, cyanosis and chest pain.

The same results also stated by **Lifshitz et al., 2003; Madboly and Elgendy, 2014 and Anwar et al., 2014.**

Regarding the cholinesterase inhibitors poisoning, this study noticed that pulmonary edema (chest crepitation) and dyspnea were the most frequent presentations (91.4% and 74.3% respectively. **Nazima et al., (2018)** agreed with this result and stated that aspiration pneumonia and pulmonary edema were commonly found in organophosphorous patients in his study of management of organophosphorous poisoning patients in ICU in Srinagar, India during the period between2007 to 2009.

On studying the relation between types of presentations and the age of the studied cases, there was statistically high significant relation between cough and age where most of cases presented with cough were in age of < 5 years.

Madboly and Elgendy, (2014) agreed with this result in their study at Benha university over one year 2013-2014 who stated that the most poisoned cases were below age of five and cough was the most frequent presentation. This may be due to children below five years try to put everything in their mouth with high risk of vomiting and aspiration which presented with respiratory irritation and cough.

According to poison severity score (PSS), the current study showed that most cases were of

moderate grade (41.4%) followed by mild grade and severe grade (28.4% and 19.8% respectively). Selection of poison severity score (PSS) for classification of the studied cases is as PSS is more comprehensive and appears to represent each system involved in a sequential progression. **(Akdur et al., (2010); Abd El Salam et al., (2011)**

Ebrahimi et al., (2018) in a Medical Research Center in Kermanshah, Iran stated that the majority of cases in their study were in grade 2 (moderate) which come in agreement with the current study.

On the contrary**, Akdur et al., (2010)** found that the majority of cases were in mild grade followed by severe grade and then moderate grades.

This study showed that, different abnormalities were noticed in arterial blood gases results. **Liu et al., (2008)** stated that, there was highly significant relation between the blood acidity (metabolic, respiratory and mixed) and severity and outcome of cases of organophosphorous poisoning.

This study noticed significant relations between ABG findings and the age of the studied cases and the poison type.

The present study revealed that respiratory acidosis occurred commonly with drug overdose. This comes in agreement with **Rahimi et al., 2014** in his retrospective study in Loghman Hakim Hospital, Iran who stated that, pure respiratory acidosis was found in patients with acute tramadol poisoning and this may be due to respiratory center depression induced by tramadol.

Decreased serum cholinesterase levels were found mainly with cholinesterase inhibitors poisoning. An Indian study in 2008 reported that serum cholinesterase may be useful to assess the severity of the cases and prolonged duration of hospital stay **(Rehiman et al., 2008)**

Most of the studies have reported association of low serum acetylcholinesterase levels with the case severity **(Bhattacharyya et al., 2011; Muley et al., 2014)**

Abnormal chest x-ray findings as increased broncho-vascular marking, pulmonary consolidation, pneumonic patches and pneumothorax were found mainly with corrosives, cholinesterase inhibitors and hydrocarbon poisonings and abnormal CT findings were found mainly with cholinesterase inhibitors poisoning.

The study of corrosive poisoning in adults by **Chibishev et al., (2014)** in Skopje, Republic of Macedonia agreed with the current study as it reported multiple abnormal x-ray findings as bronchopneumonia, pulmonary consolidation and pleural effusion.

In a case control study by **Siddiqui et al., (2008**) of sixty seven children with hydrocarbon ingestion in Aga Khan Hospital, Karachi, it was found that 57% of patients had radiological consolidation of lungs. This is in agreement with **Lifshitz et al., (2003) and Sen et al., (2013)**.

Sun et al., (2015) reported that pneumonia was a very important prognostic factor of severity and outcome in

cholinesterase inhibitor poisoning and abnormal radiological findings as pulmonary infiltrates were helpful in diagnosis of pneumonia during the hospital course.

As regarding the outcome of the studied cases, the majority of cases (65.5%) were completely cured, while 10.3% of cases were cured with complication as dysphagia, tracheostomy and esophageal stricture.

Different studies report tracheostomy done among acute poisoning patients as **Hiremanth et al., (2016)** who report 21 patients (56.7%) out of 37 patients with tracheostomy, whereas **Kang et al., (2009)** who report 17 patients (25%) out of 68 patients with tracheostomy.

The mortality rate among the studied cases was 10.3%, cholinesterase inhibitor poisoning was the most common cause of death (53.3%). This coincides with **Muley et al., (2014)** who reported mortality of 10.56% in his study in India and **Jamal et al., (2017)** stated that the reported mortality rate was 9.7% in their study in Abassi Shaheed Hospital, Karachi.

Vaidya and Hulke, (2012) stated that overall mortality due to poisoning was 20 %. It was highest in insecticidal poisoning (51.3%)

This study showed statistically high significant relation between the severity grades of the cases and the poison type where cholinesterase inhibitors poisoning were the most common of causing severe and fatal toxicity. This result comes in agreement with **Eddleston et al., (2006); Vaidya and Hulke, (2012**) and **Ssemugabo et al., (2017).**

This study showed that, there was statistically high significant relation between the severity grades of the cases and their need for ICU admission where most of severe (69.6%) and all fatal grades cases admitted in ICU. This result were in agreement with **Abd-El Salam et al., (2011)** and **Sam et al., (2009)**.

One of important indication of ICU admission is the requirement for mechanical ventilation (MV). Patients requiring mechanical ventilation due to respiratory depression usually need prolonged MV support. Excessive fatigue of respiratory muscles, central nervous system toxicity, hypopnea, aspiration of the gastric contents or even aspiration of active charcoal in the patients who do not have secure airways are major indications for MV **(Acikalin et al., 2017)**

The study demonstrated statistically high significant relation between the severity grades of the cases and the duration of hospital stay.

Ebrahimi et al., (2018) stated that there was more correlation between the real duration of hospitalization and PSS (correlation coefficient = 0.23). Positive correlation indicated that increasing the poisoning severity in the sample led to increasing the criteria mean that cause increasing the hospitalization duration.

This study showed that, there was statistically high significant relation between the severity grades of the studied cases according to

PSS and their outcome. This comes in agreement with a study done by **Churi et al., (2012)** and **Hrabetz et al., (2013)**. **Ebrahimi et al., (2018)** who stated that, patient with the severity poisoning ≥2 (moderate) might lead to death and the condition of the patients with the severity poisoning <2 (moderate) might lead to surviving.

CONCLUSION

The present study showed that respiratory system is commonly affected in cases of acute poisoning due to poison action or its complications. Respiratory system affection is a major cause of morbidity and mortality in acute poisoned cases. Cholinesterase inhibitors poisoning and corrosives are common respiratory toxicants. Children less than 5 years are more susceptible to acute poisoning induced respiratory manifestations.

RECOMMENDATIONS

Encouragement of early seeking medical advice in cases of acute poisoning especially if associated with respiratory system affection. Proper evaluation and management of poisoned cases should be done to decrease morbidity and mortality. All potentially poisonous chemicals, especially cholinesterase inhibitors and corrosives, should always be stored in secure containers and in a secure place away from children.

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الملخص العربى

تأثر الجهاز التنفسى فى حالات التسمم الحاد التى تصل الى مركز علاج التسمم والإدمان بستشفيات جامعة المنوفية " دراسة مستقبلية "

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المقدمة: يعد التسمم الحاد احدالاسباب الشهيرة للدخول فى قسم الطوارىء وقد يحتاج إلى الدخول فى العناية المركزة. مضاعفات الجهاز التنفسى فى حالات التسمم الحاد قد تؤدى الى الكثير من المضاعفات المرضية وكذلك الوفاة.

الهدف من الدراسة: دراسة تأثر الجهاز التنفسى فى حالات التسمم الحاد من حيث الأنماط الاجتماعية والديموجرافية، الأعراض السريرية، الفحوصات اللازمة، درجة خطورة الحالات، طرق العلاج وما آلت اليه تلك الحالات عند خروجها من المستشفى.

المرضى والطرق: دراسة مستقبلية لجميع حالات التسمم الحاد التى تعانى من اعراض فى الجهاز التنفسى والتى تم استقبالها بمركز علاج التسمم والإدمان بمستشفيات جامعة المنوفية خلال عام واحد منذ بداية شهر أكتوبر 2016 حتى نهاية شهر سبتمبر 2017. تم استكمال استمارات البيانات الإكلينيكية الخاصة بكل مريض بحيث اشتملت على البيانات الديموجرافية والاجتماعية والأعراض السريرية. تم تقسيم الحالات على حسب درجة خطورتهاز

النتائج: تم دراسة عدد 116 حالة وقد أظهرت النتائج ان معدل تاثر الجهاز التنفسى فى حالات التسمم الحاد التى تم دراستها 4.2%. الأطفال الأقل عمرا من 5 سنوات هم الأكثر تأثرا فى هذه الدراسة (42.2%) وكانت نسبة الذكور أعلى من نسبة الإناث (54.3% مقابل 45.7%). فيما يخص تقسيم الحالات من حيث درجة الخطورة وجد ان نسبة الحالات متوسطة الخطورة كانت 41.4%. التسمم بالميدات الحشرية والمواد الآكلة كانت الأكثر (30.2% و 27.6%) شيوعا بين السموم الآخرى التى تسبب تأثيرا على الجهاز التنفسى. تعرضت معظم الحالات للتسمم عن طريق الفم (74.1%). تم دخول 29.3% من الحالات فى وحدة العناية المركزة وكانت نسبة حدوث الوفاة كانت 10.3%.

الاستنتاج والتوصيات: يعد تأثر الجهاز التنفسى فى حالات التسمم الحاد أحد أهم الأسباب التى تزيد من الحالات المرضية وقد تؤدى إلى الوفاة. هناك الكثير من المواد السامة التى قد تؤدى إلى تأثر الجهاز التنفسى فى حالة التسمم الحاد مثل المبيدات الحشرية والمواد الآكلة. الأطفال الأقل عمرا من 5 سنوات هم الأكثر عرضة لهذا التأثير. لذلك يوصى بتكثيف البرامج التعليمية والتثقيف الصحى وبخاصة فى المناطق الريفية وكذلك حظر تداول المبيدات الحشرية والمنتجات المنزلية الآخرى التى تسبب التسمم وحفظها بعيدا عن متناول الأطفال.