

Pattern of Acute Poisoning in a Sample of Elderly Egyptians

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Abstract: Acute toxicity is globally considered as a major health problem affecting different populations. The demographics of human population all over the world are completely different now from 100 years ago. Worldwide, the fraction of individuals aged more than 60 years increased from 9.2% in 1990 to 11.7% in 2013 and expected to reach 21.1% by 2050. Therefore, the danger of elderly poisoning is increasing all over the world, and the clinical profile of acute poisoning in the elderly is expected to be different from younger adults. Hence, the aim of this work was to reveal the pattern of acute poisoning in elderly patients. This study was a cross sectional study conducted on elderly patients aged more than 60 admitted to Toxicology Unite, Tanta Emergency University Hospital with acute poisoning throughout the period from 1st of January 2011 to the 31th of December 2017. The age of included poisoned elderly patients ranged from 60 to 80 years, with increased incidence of toxicity among males. More than half of the poisoned elderly patients were mild (53.1%) at the time of admission. Unintentional poisoning was more common with significant association between the manner of poisoning and the type of poison involved in toxicity. 11 patients (11.2%) were admitted to the ICU; four of them (4.1%) needed mechanical ventilation, which ended eventually by death in all of the four cases.

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1. Introduction

Acute toxicity is globally considered as a major health problem affecting different populations. It accounts for a major part of emergency hospital admissions, with significant morbidity and mortality in all age groups (1). The danger of elderly poisoning is increasing all over the world. The Toxic Exposure Surveillance System (TESS) reported an increase in the percentage of poisoning in patients aged more than 60 years from 2% at the year 1990 to reach approximately 5% by the year 2004. These reports also revealed more hospitalization in elderly and death rate reaching 15% of all reported poison related deaths (2). The demographics of human population all over the world are completely different now from 100 years ago. Worldwide, the fraction of individuals aged more than 60 years increased from 9.2% in 1990 to 11.7% in 2013 and expected to reach 21.1% by 2050 (3). Egypt is the most populous country in the Middle East and the second most populous country in Africa (after Nigeria). Gradual increase in the absolute and relative numbers of older people have been reported over the last few decades in Egypt, with expected growth over the next decades, as elderly people aged more than 60 years increased from 5.75% in 1996 to 6.27% in 2006, with expected rise to 9.2% in 2021, and 20.8% in 2050. In addition, Egypt is expected to maintain the highest number of elderly population in the Middle East region, where elderly people are expected to reach 26.8 million by the year 2050, which resembles a full nation in some parts of the world (4). The National

Research Council defined “the elderly” as persons who are 65 and older. However, the age of 60 has recently become the threshold of old age in the United Nations’ publications, especially in developing countries, where shorter-lived populations are found (5). Aging is considered as a process that results in physiological decline in all body systems, and increased incidence of age-related degenerative diseases (6). The clinical profile of acute poisoning in the elderly is expected to be different from younger adults. Previous studies have shown that elderly people are more likely to have unintentional poisoning, and tend to develop more severe and fatal effects following toxicity (7). Almost half of the intoxications occurring in the elderly are due to unintentional exposure. Many mechanisms have been responsible for such exposures including, age-related alteration in pharmacokinetics and pharmacodynamics, and the increased incidence of multimorbidity with polymedications’ hazards. In addition, cognitive dysfunction and poor eyesight, with advancing age, can also play a role in predisposing the elderly to unintentional poisoning (8). Moreover, the increased incidence of both dementia and delirium in elderly patients can be risky for poisoning with drug intake (9). In some Arab countries a predominance of accidental exposures in elderly aged more than 60 have been reported, with higher incidence of medication related poisoning in this age group (10). Suicide in the elderly is a major public health concern that poses huge challenges for preventing strategies. It is considered as

a serious mental problem usually associated with psychiatric diseases (11). Suicide rates increase with aging in many countries, where some countries have the highest suicide rates among elderly (12). Self-poisoning is one of the methods used by elderly for attempting suicide. Although the elderly constitutes a relatively small proportion of those admitted to hospital with acute self-poisoning, they often have more serious poisoning with multiple complications and fatal outcome (13). In Asian countries like China and India, suicide by poisoning comes on the top of the list among elderly, especially in rural areas where pesticides and other agricultural chemicals are widely available and easily accessible (14). In addition, fatal suicides from pesticide ingestion have been reported among elderly in rural areas of South Korea. This has been attributed to the easy access to pesticides and the lack of appropriate management (15).

Aim of the study:

Aim of this work was to reveal the pattern of acute poisoning in elderly patients.

2. Methods of the study:

This study was a cross sectional study conducted on elderly patients admitted to Toxicology Unite, Tanta Emergency University Hospital throughout the period from 1st of July 2016 to the 31th of December 2017 (prospective part), with collection of patients' data (retrospective part), from the 1st of January 2013 till the end of June 2016. All cases aged more than 60 years admitted with acute poisoning throughout the five years' period from the 1st of January 2013 to the 31th of December 2017 were included, with exclusion of patients with chronic poisoning.

I. The following data were reported for all included cases:

Demographic data including age, sex, occupation, residence, marital state and educational level. Toxicological data including causative agent, route of exposure and manner of poisoning. Data of examination and Laboratory investigations at the time of admission were used for assessment of poisoning severity score of included elderly patients at the time of admission.

II. Statistical analysis:

Statistical analysis was performed using Statistical Package for Social Sciences (SPSS) program version 22 for Windows.

III. Ethical considerations:

This study was conducted following approval from The Ethical Committee of Tanta Faculty of Medicine.

3. Results:

In the present study, the age of included poisoned elderly patients (n=98) ranged from 60 to 80 years,

and the highest incidence of toxicity (49%) was observed between 60 to 64 years of age. The percentage of males (66.3%) was higher than that of females (33.7%), and most of poisoned elderly patients were known to be married (71.4%). 72.4% of patients came from rural areas, and 37.8% of them were still working after sixty (Table 1).

Table (1): Demographic characteristics and comorbidity of the studied elderly patients with acute toxicity (n=98).

	N	%	
Age groups (years):			
60 – 64	48	49.0%	
65 – 69	29	29.6%	
70 – 74	12	12.2%	
75 – 80	9	9.2%	
Sex:			
Male	65	66.3%	
Female	33	33.7%	
Marital status:			
Married	70	71.4%	
Single (n=16)	Widow	15	15.4%
	Divorced	1	1.0 %
Undetermined	12	12.2%	
Residence:			
Urban	27	27.6%	
Rural	71	72.4%	
Working status:			
Working	37	37.8%	
Not working	56	57.1%	
Undetermined	5	5.1%	
Educational level:			
Low	25	25.5%	
Moderate	23	23.5%	
High	20	20.4%	
Undetermined	30	30.6%	
Comorbidities:			
Yes (n=64)	Single	32	32.7%
	Multiple	32	32.7%
No comorbidities	34	34.6%	

n: number

The most prevalent agent involved in elderly poisoning in the current study was pesticides (43.8%). More than half of toxic exposures in the current study were through oral rote (52%). Also, the majority of toxicities (64.3%) reported took place at patients' homes, while 27.6% of them were considered as work place exposures. Assessment of poisoned elderly patients at the time of admission with poisoning severity score revealed that more than half of the poisoned elderly patients were mild (53.1%), whereas severe scores were reported only in 6.1% of included patients (Table 2). As regards comorbidities, 64 cases

of elderly poisoned patients were suffering from at least one comorbidity, and half of them (n=32) were suffering from more than one comorbid condition at the same time. This study showed that 67.3% of poisoned elderly patients alleged accidental exposure while the remaining gave history of self-poisoning. The manner of poisoning was significantly associated with the working status of included elderly patients, the type of poison involved in toxicity and the presence of comorbidities, while no significant

association was found between the manner of poisoning and either the age, gender or marital status of included poisoned elderly patients (**Table 3**). The duration of hospital stay ranged between 2 to 96 hours in all poisoned elderly patients in the present study. Where, the majority of cases (80.6%) were discharged within 24 hours from hospital admission. 11 patients (11.2%) were admitted to the ICU; four of them (4.1%) needed mechanical ventilation, which ended eventually by death in all of the four cases.

Table (2): Poisoning related data of the studied elderly patients with acute toxicity (n=98).

	N	%
Route of exposure:		
Oral ingestion	51	52.0%
Skin	20	20.4%
Inhalation	13	13.3%
Stings	13	13.3%
Intravenous injection	1	1.0%
Place of poisoning:		
Home	63	64.3%
Outside home	8	8.2%
Work place	27	27.5%
Type of poison		
Pesticides	43	43.8%
Drugs	20	20.4%
Stings	13	13.3%
Toxic gases	12	12.2%
Corrosives	7	7.1%
Food poisoning	2	2%
Alcohol	1	1%
*Poisoning severity score at the time of admission:		
Asymptomatic (none)	16	16.3%
Mild (minor)	52	53.1%
Moderate	24	24.5%
Severe	6	6.1%
Fatal	0	0%

n: number, *Severity grads of PSS: Asymptomatic (None) = 0, Mild (Minor) = 1, Moderate = 2, severe = 3, fatal=4.

Table (3): Comparison between intentional and unintentional poisoning in acutely poisoned elderly patients (n=98).

		Manner of poisoning				Fisher exact/Fisher-Freeman-Halton Exact tests	
		Unintentional (n=66)		Intentional (n=32)		X ²	p
		N	%	n	%		
Age groups	60 – 64	30	45.5%	18	56.3%	1.158	0.764
	65 – 69	20	30.3%	9	28.1%		
	70 – 74	9	13.6%	3	9.4%		
	75 – 80	7	10.6%	2	6.3%		
	Total	66	100.0%	32	100.0%		
Gender	Male	44	66.7%	21	65.6%	FE	1.000
	Female	22	33.3%	11	34.4%		
	Total	66	100.0%	32	100.0%		
**Marital status	Married	51	85.0%	19	73.1%	FE	0.232
	Single	9	15.0%	7	26.9%		
	Total	60	100.0%	26	100.0%		
Residence (Urban or rural)	Urban	18	27.3%	9	28.1%	FE	1.000
	Rural	48	72.7%	23	71.9%		

		Manner of poisoning				Fisher exact/Fisher-Freeman-Halton Exact tests	
		Unintentional (n=66)		Intentional (n=32)		X ²	p
		N	%	n	%		
	Total	66	100.0%	32	100.0%		
***Working status	Manual worker	2	3.1%	1	3.4%	5.913	0.104
	Farmer	28	43.8%	6	20.7%		
	Housewife	20	31.3%	10	34.5%		
	Retired	14	21.9%	12	41.4%		
	Total	64	100.0%	29	100.0%		
Comorbidities	No	28	42.4%	6	18.8%	FE	0.025*
	Yes	38	57.6%	26	81.3%		
	Total	66	100.0%	32	100.0%		
****Type of poison	Pesticides	28	44.4%	15	46.9%	33.589	<0.001*
	Drugs	4	6.3%	16	50.0%		
	Stings	13	20.6%	0	0.0%		
	Toxic gases	12	19.0%	0	0.0%		
	Corrosives	6	9.5%	1	3.1%		
	Total	63	100.0%	32	100.0%		
Duration of hospital stay status	≤ 24	59	89.4%	21	65.6%	8.482	0.008*
	>24 – 48	3	4.5%	7	21.9%		
	> 48	4	6.1%	4	12.5%		
	Total	66	100.0%	32	100.0%		
Need for ICU	No	61	92.4%	26	81.3%	FE	0.169
	Yes	5	7.6%	6	18.8%		
	Total	66	100.0%	32	100.0%		
Need for MV and Death	No	65	98.5%	29	90.6%	FE	0.101
	Yes	1	1.5%	3	9.4%		
	Total	66	100.0%	32	100.0%		

n: number, FE: Fisher- exact, *P-value significant < 0.05. **12 cases with undetermined marital status and ***5 cases with undetermined working status were not included in the statistical test. ****two cases with food poisoning and one case with methanol poisoning were not included in the statistical test.

4. Discussion

In the present study, the age ranged from 60 to 80 years old with the highest incidence of toxicity was observed between 60 to 64 years of age, and the percentage of males over-numbered that of females. In the study conducted on elderly poisoned patients visiting Taiwan National Poison Control Center, the age ranged from 65 to 100 years. And over half of the patients (52.2%) were categorized as very old (75–84 years old), 32.4% as old (65–74 years old) and 15.2% as extremely old (> 84 years old), also males accounted for 69.2% of elderly patients included in the later study conducted (16). Most of the studied patients in the current study came from rural areas (72.4%), which may be related to the location of Tanta University Hospital that serves a large sector of rural community in Middle Delta Region in Egypt. In the current study, 57.1% of poisoned elderly patients were not working; they were either housewives or retired previous governmental jobs. This is mostly related to the legal age of retirement in Egypt, which is set at 60 years old. Similarly, the large percentage of retired patients was also reported by other studies on elderly poisoning (13). On the other hand, thirty-seven

patients (37.8%) in the current study were still working after the age of 60, but all were either farmers or manual workers. This may be attributed to the large number of patients presenting from rural areas, where working outside the formal sector of the government is very common with much less importance of the retirement age (17). More than half of toxic exposures in the current study were through oral rout (52%). Also, the majority of toxicities (64.3%) reported took place at patients' homes. Similarly, in the study conducted by **Karbakhsh and Zandi (18)**; oral ingestion was the most common route of exposure among Iranian poisoned elderly included in their study with most of poisoning incidents occurring at patients' homes. As regards the manner of poisoning, 67.3% of patients alleged accidental exposure, while 32.7% of them gave history of self-poisoning. The vulnerability of older adults to accidental poisoning is mostly related to the age related changes affecting all body systems, rendering them susceptible to poisoning (19). Asaging is associated with a reduction in both hepatic volume and hepatic blood flow which may affect drug metabolism. The hepatic volume is reduced in elderly by approximately 20–35%, and hepatic blood flow

reduction reaches up to 35% of the original hepatic flow (20). In addition, reduction in renal blood flow and GFR associated with aging usually results in impairment of drug elimination. Moreover, the presence of comorbidities such as diabetes, hypertension and atherosclerosis may worsen the renal function in elderly patients rendering them at high risk of accidental exposure to drug toxicity (21). Moreover, the regulation of heart rate in the elderly may become unstable (22), with reduction in cardiac contractility and lowering cardiac output in advanced ages (23). Such changes in the function of cardiovascular system in elders usually affects the response to different pharmacological agents (24). In addition, heart failure in elderly patients results in reduction of kidney function with consequent reduction of drug elimination (25). Accidental exposure in elderly may be related also to the increased incidence of adverse drug reactions in elderly patients that put them at continuous risk for accidental drug poisoning (26). In the study conducted on European elders, 46% of elderly patients receiving multiple medications had at least one clinically relevant drug–drug interaction, and at least 10% of these interactions were classified as highly severe interactions (27). In addition, cognitive dysfunction and poor eyesight, with advancing in age, can also play a role in predisposing the elderly to unintentional poisoning (8). Moreover, the increased incidence of both dementia and delirium in elderly patients can be risky for poisoning with drug intake (9). On the other hand, the lower incidence of self-poisoning in the present study may be attributed to different cultural and social factors together with ethnic background that may influence the incidence of suicidal attempts among different societies (28). There was no significant association between the manner of poisoning and the age of included patients in the present study. Which was found also in elderly Taiwanese (16). In contrast, **Piekarska-Wijatowska, Kobza-Sindowska** (29) reported an increase in the incidence of suicide with advancing in age in elderly Polish. Older age has been considered as risk factors for suicide in previous studies, but it was unclear how this factor was related to the nature and severity of medicinal self-poisoning (30). In the present study, no significant difference was found between both genders as regards the manner of poisoning. However, the number of males committing suicide in the current study was nearly double that of females, which was also reported in a study conducted on self-poisoning in elderly people of Isfahan (13). Male sex was also reported as a risk factor of suicide with advancing in age in Canada, but the exact cause of such association was not clear (30). In contrast, other studies on elderly poisoning reported higher incidence of suicide among female patients in Tehran (18) and Taiwan (16). In

younger adults, committing suicide is more common among females, but with aging males comprise the largest proportion of elderly suicides, with a male to female ratio of almost 4:1.7 (31). In many countries, sex-specific data on suicide in older adults are lacking, and only few countries as European Union countries, the United States, Canada and several Asian countries, reported increased incidence of non-fatal suicidal behavior (para-suicide) in females while suicide is more common in elderly males (28). The manner of poisoning was not associated with the marital status of elderly poisoned patients in our study. In a systematic review on suicide, **Fässberg, Orden** (28) found association between marital status and suicidal intent in older adults only in four of the studies included in their review, whereas seven studies found no association. They also concluded that, the marital status per-seis not an indicator for quality of a relationship, even in long lasting marriages, the circumstances for a married couple can vastly change with age-related changes of both mental and physical health affecting one or both of them. On the other hand, significant association was found between the manner of poisoning and the working status of elderly included in the present study, where the social isolation and loss of role in community associated with retirement act usually as contributing factors to the suicide of elderly (32). Similarly, the manner of poisoning was association significantly with the type of poison, as the majority of patients poisoned with drugs (80%) alleged intentional exposures; whereas most of pesticide exposures were accidental. Drugs were also reported as the most prevalent agent involved in other studies concerned with self-poisoning in elderly in Iran (13) and Poland (29). In addition, a significant association as found between the presence of comorbidities and the manner of poisoning, as 81.2% of cases with self-poisoning were suffering from other comorbidities (28.1% had single comorbidity and 53.1% had multiple comorbidities). Other studies also reported a higher incidence of suicide attempts by poisoning in elderly with chronic physical and psychiatric disease in Tehran, Iran (18) and in Taiwan (16). Functional disability, as well as a number of specific physical illnesses, was shown to be associated with suicidal behavior in older adults (33). Additionally, the risk of suicide have been generally associated with the increased burden of disease especially for patients suffering from more than one chronic illness (34) and (13). This may be attributed to the disease itself or other associated factors, such as physical pain and suffering, the feelings of hopelessness associated with some diseases, and loss of independence (35) and (29). Substantially, it has been reported that chronic illnesses like cancer, asthma, musculoskeletal and cardiovascular disease

may play a role in the development of suicidal behaviors (36).

Conclusion

The most prevalent agent involved in elderly poisoning was pesticides followed by poisoning with drugs was more common in self-poisoning. Accidental poisoning was more common than self-poisoning, with higher incidence of self-poisoning in non-working elderly patients. Additionally, the presence of comorbidities played a significant role in self-poisoning. There was no significant association between the manner of poisoning and either the age, gender or marital status. Most of cases that ended up with death were following self-poisoning.

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