Initial Management of Poisoned Patients in Emergency Medical Services and Non-poisoning Hospitals in Tehran: The Comparison between Expected and Performed Managements

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ABSTRACT

Background: There is no clear data on the adherence of emergency medical services (EMS) paramedics and hospital staff rather than those working in poisoning centers to the guidelines for managing acutely poisoned patients in developing countries.

Methods: During a 6-month period, all EMS-managed poisoned patients along with those initially managed in a non-poisoning center before being referred to a poisoning hospital in Tehran, Iran, were instructed. Then the indications for administrating the activated charcoal (AC) as well as performing gastric lavage (GL) and tracheal intubation were studied and compared to the recommended guidelines.

Results: A total of 3347 cases, including 1859 males (55.6%), were evaluated. There were significant differences between expected and performed endotracheal intubations in both EMS and other medical centers (P-value = 0.002 and 0.001, respectively) as well as the administration of GL and AC in other medical centers (P-values= 0.003 and 0.03, respectively).

Conclusion: More extensive educational programs should be established to improve the preliminary management of poisoned patients performed by EMS paramedics and staff of hospitals other than poisoning centers.

Keywords: Activated Charcoal, Endotracheal Intubation, Gastric Lavage, Iran, Management, Poisoning.

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INTRODUCTION

Poisoning is a health concern in both developed and developing countries. Annually, many individuals are intoxicated either intentionally or accidentally, a condition which results in a considerable increase in the morbidity and mortality rate [1, 2]. The efficacy of gastric lavage (GL) and activated charcoal (AC) is a field of controversy in the management of acutely poisoned patients [3-7]. As a result, the available guidelines for the management of acute poisoned patients have been revised frequently during the recent years [8]. Current guidelines discourage the routine use of GL in these patients, adding that AC should only be prescribed in patients who have ingested potentially toxic amounts of a poison in the past hour [3, 7, 9]. Not many emergency medical services (EMS) paramedics and staff of hospitals other than poisoning centers, however, follow such guidelines, particularly in developing countries.

The present study, therefore, aims to assess the adherence of EMS paramedics and medical staff of non-poisoning health centers

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to the available guidelines through comparing the interventions performed in these countries to the standard ones.

MATERIALS AND METHODS

After approval by the Institutional Review Board Committee of our university, this study was carried out at a referral poisoning center in Tehran, Iran. All acutely poisoned patients aged older than 12 years referred to the hospital after receiving initial managements by EMS paramedics or medical staff of non-poisoning centers during a 6-month period, were enrolled in the study.

The patients were followed during the hospitalization period and the required data, such as demographics, poisoning characteristics, time interval between the incidence of poisoning and admission to the hospital, level of consciousness upon admission along with details regarding the initial management performed by EMS or other medical centers, were recorded. The patients were then categorized into three groups based on where they had received the initial managements: EMS, non-poisoning centers, and other medical centers including private offices. The indications for administrating AC and intubating the patient with an endotracheal tube were recorded and compared between the two groups. Considering the fact that GL should only be performed in a hospital setting, the expected GL rules were compared with those conducted by the latter group. According to the guidelines, GL, which should be performed in an hour of intoxication, is not allowed in patients who have ingested potentially life-threatening amounts of a toxic agent [9]. Absence of protective airway reflexes (except for patients who had undergone endotracheal intubation as the first step), ingestion of a strong acid, alkali, or hydrocarbon with high aspiration potential, or a heightened risk of gastrointestinal bleeding due to an underlying medical or surgical condition were considered as contraindications for performing GL [7].

The indications for administrating AC, which should be administered within an hour after an acute toxic ingestion in patients who have taken potentially toxic amounts of a poison known to be absorbed into charcoal, were determined based on the guidelines released by the American Academy of Clinical Toxicology and the European Association of Poisoning [10].

Level of consciousness was determined based on a previously-described grading system (Table 1) [11]. Endotracheal intubation is recommended for patients with grade three or four in the very scoring system.

The indications for AC administration, performing GL and tracheal intubation were compared with the available guidelines and the results were categorized into four main categories: a. intervention was indicated and performed; b. intervention was indicated but not performed; c. intervention was not indicated but was performed; d. intervention was not indicated and not performed. Data were entered into SPSS 15 (SPSS Inc., Chicago, IL) and analyzed using Chi Square and Fisher's exact tests (when appropriate). P-values < 0.05 were considered statistically significant.

Table 1. Grading of level of consciousness.

Grade 1	Awake, lethargic, or sleeping but arousable by voice or tactile stimulation; able to converse and follow commands; maybe confused
Grade 2	Responds to pain but not voice; can vocalize but not converse; spontaneous motor activity present; brainstem reflexes intact
Grade 3	Unresponsive to pain
Grade 4	Unresponsive to pain; flaccid paralysis; brainstem reflexes and respirations absent; cardiovascular vital signs decreased

RESULTS

Of a total of 9809 patients recruited during the study period, 3347 cases (34.1%), including 1859 males (55.6%), had received initial managements before being admitted to the hospital. The mean age of the patients was 26.4 ± 11 years, ranging from 12 to 90 years.

The median time between getting poisoned and being admitted to the Emergency Department was about 4 hours and 20 minutes (ranging from 17 minutes to 72 hours). The mean duration of hospital stay, on the other hand, was 1.5 ± 3.15 days.

Six hundred and twelve subjects (18.3%) were visited by the EMS paramedics or physicians in other medical centers within the first hour of intoxication. Intravenous (IV) fluid administration was the most common intervention performed in 2277 of the cases (68.0%). Of these, IV fluid therapy was the sole performed intervention in 1298 cases. Table 2 demonstrates details on the initial managements performed for these patients before being admitted to the center.

Level of consciousness of the studied patients is summarized in Table 3. As this table demonstrates, there was a significant difference between the consciousness level of the patients in the three studied groups (P<0.001). A total of 182 deaths (5.44%) occurred during the study period.

Regarding endotracheal intubation, there was a significant difference in the standard indications and those provided by the EMS and healthcare providers in non-poisoning centers. As for GL and AC administration, the standard indications were significantly different from those provided in the non-poisoning centers (Tables 4 and 5).

Table 6 demonstrates the association between the accuracy of the initial management and the patients' outcome. A significant association was found between the accuracy of GL and endotracheal intubation and the patients' outcome (P<0.001); such an association, however, was not true for AC administration (P=0.28).

Table 2. Details of initial managements presented in three groups of emergency medical service (EMS), non-poisoning hospitals, and other medical centers.

	EMS 969 cases	Non-poisoning hospitals 2249 cases	Other medical centers 129 cases	Total 3347 cases
	N (%)	N (%)	N (%)	N (%)
Oral fluid replacement therapy	14 (1.3)	34 (1.1)	55 (37.9)	103 (2.3)
Intravenous fluid therapy	629 (57.9)	1611 (49.5)	37 (25.5)	2277 (50.7)
Oxygen therapy	55 (5.1)	78 (2.4)	2 (1.4)	135 (3)
Gastric lavage	43 (3.9)	1073 (33.1)	17 (11.7)	1133 (25.2)
Activated charcoal	5 (0.5)	104 (3.2)	1 (0.7)	110 (2.5)
Ipecac syrup	0 (0)	18 (0.6)	19 (13.1)	37 (0.8)
Antidote administration	298 (27)	149 (4.6)	6 (4.2)	453 (10.1)
Airway management	12 (1.1)	52 (1.6)	0 (0)	64 (1.4)
CPR	4 (0.4)	10 (0.3)	0 (0)	14 (0.3)
Unknown	40 (3.7)	118 (3.6)	8 (5.5)	166 (3.7)
Total	1100 (100)	3247 (100)	145 (100)	4492 (100)

Table 3. Level of consciousness in studied patients.

	EMS N (%)	Other hospitals N (%)	Others N (%)	Total N (%)	P-value
Grade 1	238 (25.1)	1131 (49.8)	107 (81.7)	1476 (44.1)	< 0.001*
Grade 2	347 (36.5)	748 (33)	22 (16.7)	1117 (33.4)	
Grade 3	287 (30.6)	290 (12.7)	1 (0.8)	578 (17.3)	
Grade 4	73 (7.8)	102 (4.5)	1 (0.8)	176 (5.2)	
Total (%)	945 (100)	2271 (100)	131 (100)	3347 (100)	

* Chi square test

Table 4. Comparison between standard and performed managements in the emergency medical service (EMS) group.

Performed intervention		Expected intervention		P-Value
		Yes N (%)	No N (%)	
Activated charcoal	Yes	0 (0)	5 (0.5)	0.59
	No	53 (100)	911 (99.5)	
Endotracheal intubation	Yes	10 (2.7)	2 (0.2)	0.002
	No	355 (97.3)	602 (99.8)	

Table 5. Comparison between standard and performed interventions in the non-poisoning hospitals.

Performed intervention		Expected intervention		P-Value
		Yes N (%)	No N (%)	
Activated charcoal	Yes	1 (0.8)	103 (4.9)	0.03
	No	130 (99.2)	2015 (95.1)	
Gastric lavage	Yes	26 (24)	1047 (21.4)	0.003
	No	56 (76)	1120 (78.6)	
Endotracheal intubation	Yes	42 (1.09)	10 (0.5)	0.001
	No	344 (89.1)	1853 (99.5)	

Table 6. Association between initial managements and patients' outcome has been demonstrated.

		Indicated and performed (%)	Indicated but not performed/ (%)	Not indicated but performed (%)	Not indicated and not performed (%)	P- Value
Charcoal administration	Survived	1 (100%)	249 (98.8%)	106 (97.2%)	2883 (96.6%)	0.28
	Dead	0 (%)	3 (1.2%)	3 (2.8%)	102 (3.4%)	
Gastric lavage	Survived	534(97.1%)	988 (94.0%)	574 (98.5%)	1143 (98.3%)	<0.001
	Dead	16 (2.9%)	63 (6.0%)	9 (1.5%)	20 (1.7%)	
Endotracheal intubation	Survived	41 (78.8%)	632 (90.2%)	11 (91.7%)	2555 (99.0%)	<0.001
	Dead	11 (21.2%)	69 (9.8%)	1 (8.3%)	27 (1.0%)	

DISCUSSION

The present study revealed that 65.9% of the poisoned cases do not receive any prehospital care in Tehran. Except for endotracheal intubation, there was no significant divergence between the standard guidelines for the required interventions and those used by the EMS group. However, it was not the same in patients who had been managed initially in non-poisoning hospitals and significant differences were found between expected and performed AC administration and GL. The present study failed to show the beneficial effects of AC administration on reducing the mortality rate in poisoned patients. However, our findings demonstrated a significant association between performing GL and endotracheal intubation and patients' outcome.

AC administration has fueled controversy among EMS paramedics. While certain studies have shown the beneficial effects of prehospital administration of the drug in poisoned patients with protected airways [4, 12-14], others have noted that the intervention is of little help and may increase the aspiration risk [15]. Meigian et al. have indicated that AC administration neither improves the outcome nor reduces the rate of vomiting or the hospital stay [16]. While insufficient data supports the efficacy of AC administration after an hour of ingestion only

a small proportion of patients are treated within the first hour as the majority of them visit hospital too late [3, 10, 17]. LoVecchio et al. reviewed 16914 poisoned cases admitted to a health care facility, reporting that only 16% of them had been admitted within the first hour of intoxication [18]. Moreover, a discrepancy was observed between expected and performed airway managements (tracheal intubation) in the EMS group which may reflect inappropriate airway protection before AC administration. This may increase the risk of aspiration, pneumonia, and mortality. The present study failed to show the influence of AC administration on the outcome of the studied patients; thus, large randomized controlled trials are required to elucidate the definite role of AC administration in the context of acute poisoning.

In the management of acute poisonings, GL should not be performed routinely. Experimental studies have shown that the amount of ingested materials which can be removed by GL is highly variable. Clinical studies have reported that GL has no beneficial effects on the outcome of poisoned patients. Serious complications, such as hypoxia, dysrhythmias, laryngospasm, perforation of the gastrointestinal tract or pharynx, fluid and electrolyte disturbance, and aspiration pneumonitis, may occur following GL [7]. In the present study, significant discrepancies were observed between standard and performed GL as well as airway management in non-poisoning hospitals. This may indicate that appropriate airway protection had not been provided before performing GL which translates into the increasing risk of complications. Overusing GL has also been reported in Sri-Lanka, another developing country, and has been considered as a reason for the higher rate of self-poisoning-related mortality in developing countries (10-20%) compared to the corresponding rate (5%) in developed countries [5]. The findings of the present study also demonstrated that performing GL without considering the recommended guideline may adversely affect patients' outcome.

LIMITATIONS

The limitations of this study are related to its design. Although data were collected prospectively, required information for this study were obtained by retrospective review of recorded data. In fact, the present study was part of a large cross-sectional study that aimed to determine the epidemiologic profile of acute poisonings in Tehran, Iran. Therefore, some details of poisoning managements were not available in our database.

CONCLUSION

Despite the disparity reported between the standard guidelines for AC administration and that provided by health staff in non-poison centers, EMS paramedics were reported to follow the standard guidelines. Considering the above mentioned disparities, it can be concluded that more extensive educational programs regarding the management of poisoned patients should be implemented for medical staff working in general hospitals.

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Conflicts of Interest: The authors declare no conflicts of interest.

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