

Comparative Analysis of Acute Toxic Poisoning in 2003 and 2011: Analysis of 3 Academic Hospitals

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Social factors may affect the available sources of toxic substances and causes of poisoning; and these factors may change over time. Additionally, understanding the characteristics of patients with acute toxic poisoning is important for treating such patients. Therefore, this study investigated the characteristics of patients with toxic poisoning. Patients visiting one of 3 hospitals in 2003 and 2011 were included in this study. Data on all patients who were admitted to the emergency departments with acute toxic poisoning were retrospectively obtained from medical records. Total 939 patients were analyzed. The average age of patients was 40.0 ± 20 yr, and 335 (36.9%) patients were men. Among the elements that did not change over time were the facts that suicide was the most common cause, that alcohol consumption was involved in roughly 1 of 4 cases, and that there were more women than men. Furthermore, acetaminophen and doxylamine remained the most common poisoning agents. In conclusion, the average patient age and psychotic drug poisoning has increased over time, and the use of lavage treatment has decreased.

Key Words: Poisoning; Epidemiology; Emergency Service, Hospital

INTRODUCTION

Many patients in emergency departments are admitted due to toxic poisoning. According to domestic research, patients admitted to emergency departments due to toxic poisoning represent between 0.68% and 5.5% of total visiting patients (1). Patients with poisoning may have been exposed to the toxic materials voluntarily or involuntarily, and the sources of the substances and reasons for poisonings are diverse. Various social factors can affect poisoning, and the characteristics of poisoning can change over time (2).

Excluding patients with chronic addiction, most patients with symptomatic acute toxic poisoning requiring medical care are treated in emergency departments. Thus, it is necessary to understand the characteristics of patients with acute toxic poisoning admitted to emergency departments in order to develop a better approach for treating such patients.

Nationwide data on toxic poisoning have not been collected in Korea. Moreover, much of the existing research is limited to single-center studies. Recently, multi-center studies were carried out, and some reports attempted to standardize data-collection systems (3, 4). Still, most studies used only data that were limited in scope and scale. However, the need for a regular data collection has increased due to the fact that epidemiologic data, regarding toxic poisoning, requires consistent monitoring. Therefore, the authors hypothesized that the characteristics of poisoning cases would change over time. And an epidemiological

study of poisoning cases in the year 2003 and 2011 was conducted to compare the differences over time, with the ultimate goal of developing data that could potentially help in the treatment of poisoned patients.

MATERIALS AND METHODS

Study subjects

For this investigation, the year from January 1 to December 31, 2003 was set, and the year from January 1 to December 31, 2011 was set. Data from patients visiting the emergency department at one of 3 university hospitals in Korea (1 in Gangnam and 1 in Gangbuk, Seoul, and 1 in Gyeonggi-do) who were admitted due to toxic poisoning were evaluated. As there are three hospitals affiliated with the one medical center at which the study was conducted, data were collected through a unified protocol from the emergency departments of all three hospitals. Electronic record-keeping at the medical center began in 2003, and thus 2003 was chosen as the first year of study, and 2011 was chosen for its most recent data.

Study design

The clinical history, symptoms, and laboratory data were extracted about all patients who visited the emergency department because of toxic poisoning. Data on patients with poisoning due to any category of toxic substance, including caustic agents, irritants, natural plant and animal poisons, chemical agents, and

medications were analysed.

In 2003, total 370 patients were admitted, and in 2011, total 569 patients were admitted respectively. The epidemiological characteristics of all 939 patients were investigated. Data on gender, age, cause of exposure to toxic material, purchase route, type of toxic material, admission details, and mortality rates were retrospectively investigated using patients' clinical histories. Patients thought to have been poisoned by a single intake of alcohol or by food poisoning were excluded.

Statistical analyses

The chi-square test and one-way ANOVA were used for frequency analysis. All statistical calculations were performed using SPSS 14.0 (SPSS, Inc, Chicago, IL, USA). The level of significance was set at *P* < 0.05. Data are expressed as mean ± SD. The characteristics of patients admitted in 2003 and those admitted in 2011 were compared.

Ethics statement

This research was carried out after receiving approval from the institutional review board of the Korea University Ansan Hospital (No. AS12174). Informed consent was waived by the board.

RESULTS

A total of 939 patients including, 370 patients from the 2003 and 569 patients from the 2011 were included in the analysis. The mean ± standard deviation of age of all patients was 40.0 ± 20.0 yr, (37.03 ± 18.7 yr in 2003, and 41.65 ± 20.5 yr in 2011); the age of patients with acute toxic poisoning significantly increased over time (*P* < 0.001). The male-to-female ratio was 1:1.57 in 2003 (144 male and 226 female patients) and 1:1.86 in the 2011 (199 male and 370 female patients); however, the sex ratio was not significantly different between 2003 and 2011. Most cases of toxic poisoning were due to suicidal committing in both 2003

(74.9%) and 2011 (72.0%); accidental poisoning was the next most common cause of poisoning. The toxic substances were most often obtained from pharmacies (i.e., as over-the-counter medications) and other stores in 2003; however, in 2011, the most common routes of purchase changed to hospital-prescribed drugs followed by over-the-counter medications. Patients visiting the emergency department for acute toxic poisoning represented 0.39% of all patients in both 2003 and 2011. The proportion of cases accompanied by alcohol consumption did not change significantly from the 2003 to the 2011 (25.7% and 26.7%, respectively) (Table 1).

Of the 307 patients admitted in 2003, 92 were aged in their 30s, 83 in their 20s, and 68 in their 40s. Among the 569 patients admitted in 2011, 124 patients were aged in their 30s, 90 in their 40s, and 88 in their 20s. Although, most of the patients were aged 20-40 yr in both year, the age distribution had significantly statistical difference between the 2 yr (*P* = 0.03) (Fig. 1).

Most admissions in both 2003 and 2011 occurred during the night rather than during the day (Fig. 2). Further, admissions were most common in May and August in 2003, and in April, September, and October in 2011; however, there were no meaningful differences between the 2003 and 2011 (Fig. 3).

In 2003, substances that were the most common cause of poi-

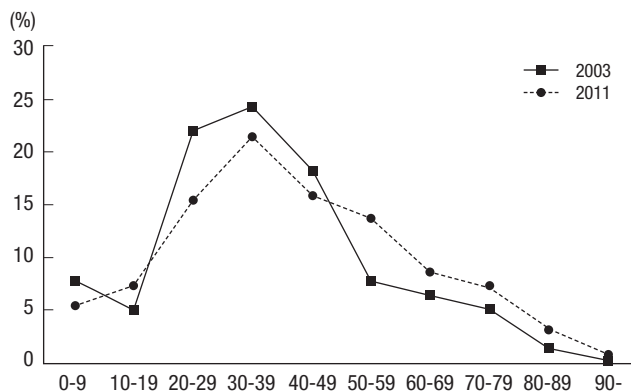


Fig. 1. Age group. Rate of emergency department visits for poisoning by age group, 2003 and 2011.

Table 1. General characteristics of the subjects

Parameters	2003 (n = 370)	2011 (n = 569)	P value
Age (mean ± SD)	37.03 ± 18.7	41.65 ± 20.5	< 0.001
Male (No.)	144	199	0.220
Purchase route, No. (%)			< 0.001
Hospital prescribed	47 (12.7)	196 (34.4)	
Over-the-counter drug	170 (45.9)	122 (21.4)	
Market	122 (33.0)	169 (29.7)	
Others	31 (8.4)	82 (14.4)	
Cause, No. (%)			0.005
Suicide	272 (73.5)	404 (71.0)	
Accident	62 (16.8)	69 (12.1)	
Abuse	13 (3.5)	43 (7.6)	
Others	23 (6.2)	53 (9.3)	
Alcohol use, No. (%)	95 (25.7)	152 (26.7)	0.83
Total ED visits (No.)	93,827	146,905	
Ratio of poisoning to total ED visit	0.39%	0.39%	

SD, standard deviation; ED, emergency department.

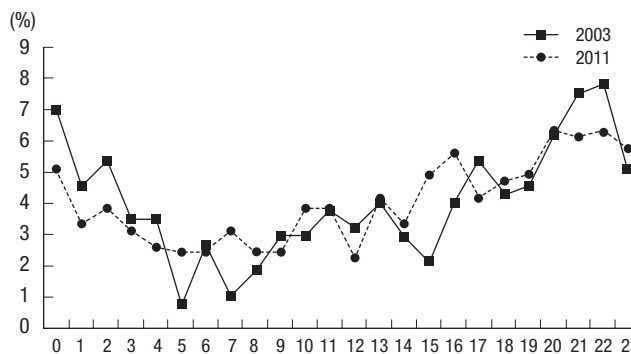


Fig. 2. Times to visit hospital. Rate of emergency department visits for poisoning by year and visiting time.

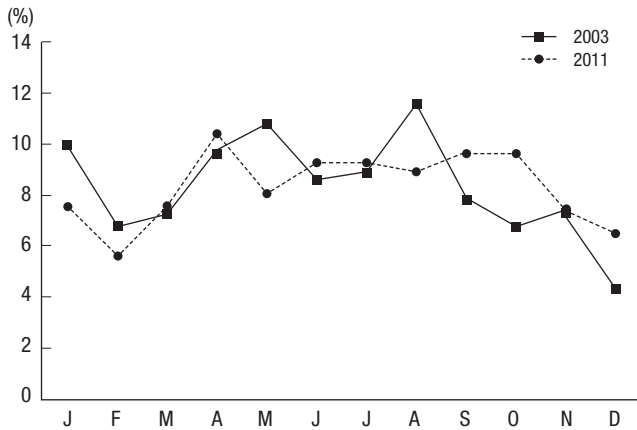


Fig. 3. Monthly distribution. Rates of emergency department visits for poisoning by month, 2003 and 2011.

Table 2. Substances of poisoning

Poisons	No. (%) of patients		P value
	2003	2011	
Over-the-counter drug	157 (42.4)	187 (32.9)	< 0.05
Acetaminophen	17 (10.8)	37 (19.8)	
Aspirin	6 (3.8)	1 (0.5)	
Antihistamine	2 (1.3)	18 (9.6)	
Doxylamine	65 (41.4)	92 (49.2)	
NSAID	12 (7.6)	14 (7.5)	
Others	55 (35.0)	25 (13.4)	
Household toxic materials	66 (17.8)	70 (12.3)	0.155
Pesticide	58 (15.7)	60 (10.5)	0.175
Insecticide	35 (60.3)	43 (71.7)	
Herbicides	5 (8.6)	8 (13.3)	
Rodenticide	11 (19.0)	6 (10.0)	
Others	6 (10.3)	2 (3.3)	
Psychotropic drugs	47 (12.7)	119 (20.9)	< 0.05
Sedative-hypnotics	30 (63.8)	54 (45.4)	
Antipsychotics	11 (23.4)	57 (47.9)	
Others	6 (12.8)	8 (6.7)	
Prescription medicine	13 (3.5)	47 (8.3)	0.769
DM medication	2 (15.4)	4 (8.5)	
Cardiovascular medication	3 (23.1)	9 (19.1)	
Antibiotics	1 (7.7)	6 (12.8)	
Anticonvulsant	0 (0)	5 (10.6)	
Others	7 (53.8)	23 (48.9)	
Dependent drug	2 (0.5)	9 (1.6)	
Working	2 (0.5)	17 (3.0)	
Naturally occurring toxic material	3 (0.8)	8 (1.4)	
Gas poisoning	5 (1.4)	8 (1.4)	
Unknown	17 (4.6)	44 (7.7)	

DM, diabetes mellitus.

soning were over-the-counter drugs, acetaminophen and doxylamine, followed by household items and chemical substances. In 2011, although the percentage of poisonings caused by over-the-counter drugs decreased, they remained the most common causative agents, followed by psychiatric drugs (Table 2).

Fifty percent of patients returned to their home in 2003, whereas only 36.2% of patients in 2011 returned to their homes. Among poisoned patients, 6 and 9 patients died in 2003 and 2011, re-

Table 3. Disposition comparison of 2003 vs 2011

Disposition	No. (%) of patients by year		P value
	2003	2011	
ED disposition	370	569	< 0.001
Discharge to Home	185 (50)	206 (36.2)	
Transfer to other Hospital	60 (16.2)	115 (20.2)	
Admission to same hospital	33 (8.9)	16 (2.8)	
Expire	6 (1.6)	9 (1.6)	
ICU	65 (17.6)	81 (14.2)	
Self discharge	21 (5.7)	142 (25.0)	
Lavage	170 (45.9)	31 (5.4)	< 0.001
Charcoal	5 (1.4)	278 (48.9)	< 0.001

ED, emergency department; ICU, intensive care unit.

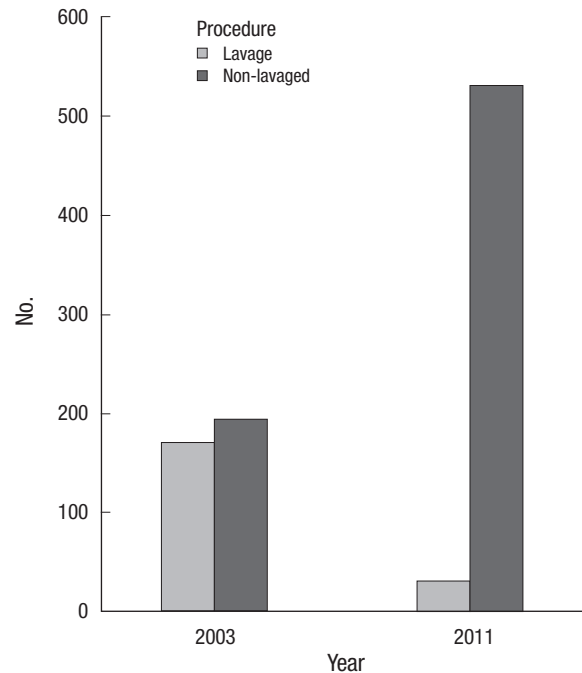


Fig. 4. Patients treated by lavage in 2003 and 2011 (2003, 45.9%; 2011, 5.4%).

spectively. Lavage was conducted in 45.9% of patients in 2003 but was done only in 5.4% in 2011 (Table 3, Fig. 4). Additionally, charcoal administration increased in 2011. These changes between the 2 yr were all statistically significant (Table 3). Among the patients who died in both years, paraquat was the most common toxic substances: paraquat poisoning was responsible for 5 of the 6 deaths in 2003 and 5 of the 9 deaths in 2011 (Table 4).

Comparing the characteristics of poisoning cases between hospitals revealed that the Gangbuk hospital had a total of 32,606 Emergency Department patients in 2003, and 47,597 in 2011. The Gangnam hospital had 24,344 Emergency Department patients in 2003, and 54,545 in 2011. Finally, The Ansan hospital had 36,877 Emergency Department patients in 2003 and 44,763 in 2011.

The characteristics of three hospitals are shown in the Table 5. There was no difference in sex or age of poisoning patients

among the three hospitals. In 2003, the Gangnam hospital showed a relatively lower rate of poisoning by prescription drugs, with a higher rate of use of over-the-counter drugs. The Gyeonggi-do hospital continued to have the highest rate of accidental exposure among the three hospitals in both years.

DISCUSSION

In emergency departments, the proportion of patients with toxic poisoning differs depending on which substances are defin-

ed as toxic and classification of these toxic materials. Toxic poisoning may be broadly or narrowly defined, and its definition may differ in different countries and societies, and over time (2). In addition, collection and analysis of nationwide data on poisoning plays a key role in informing policies for toxic substances, including the production and sales management of toxic substances as well as, placement of poison control centers and stores of rare antidotes (4, 5). Therefore, relying on treatment data from other countries is problematic. In USA for example, nationwide toxic poisoning centers participate in the Toxic Poisoning Surveillance System (TESS), and data are stored in a database operated by the American Association of Poison Control Centers (AAPCC) (6). However, there are no standardized nationwide guidelines for such classifications in Korea (3).

Our study focused on determining the changes over time of the characteristics of Korean patients with toxic poisoning who were admitted to emergency departments. Comparative research was conducted on data from patients attending 3 university hospitals in Korea in 2003 and in 2011.

The average age of patients with toxic poisoning increased from 37.03 ± 18.7 yr in 2003 to 41.65 ± 20.5 yr in 2011. Among the 370 patients assessed in 2003, 90 (24.3%), 82 (22.2%) and 68 (18.4%) patients were aged in their 30s, 20s, and 40s; among the 569 patients assessed in 2011, 122 (21.4%), 90 (18.8%), and 88

Table 4. Characteristics of expired patients in 2003 vs 2011

Parameters	No. of patients		P value
	2003 (n = 6)	2011 (n = 9)	
Poisoning substances			0.614
Pesticide (insecticide; paraquat)	5	5	
Household toxic materials	1	2	
Cyanide	0	1	
Pesticide (Herbicide)	0	1	
Age (mean ± SD)	59.7 ± 15.8	59.6 ± 15.6	0.990
Male (No.)	4	7	0.633
Suicide committing (No.)	5	9	0.205
Market purchased drug (No.)	5	7	
Lavage treatment (No.)	2	1	
Charcoal treatment (No.)	2	2	

Table 5. Characteristics of patients by 3 hospitals

Parameters	2003			2011			P value
	Gangnam (n = 165)	Gangbuk (n = 73)	Gyeonggi-do (n = 132)	Gangnam (n = 235)	Gangbuk (n = 170)	Gyeonggi-do (n = 164)	
Age	37.3 ± 18.3	36.6 ± 15.7	36.92 ± 20.6	40.76 ± 19.3	43.31 ± 21.2	41.2 ± 21.4	0.016
Male, n (%)	58 (35.2)	29 (39.7)	57 (43.2)	75 (31.9)	71 (41.8)	53 (32.3)	0.137
Purchase route, n (%)							< 0.001
Hospital prescribed medicine	2 (1.2)	15 (20.5)	30 (22.7)	71 (30.2)	58 (34.1)	67 (40.9)	
Over-the-counter drug	104 (63.0)	16 (21.9)	50 (37.9)	83 (35.3)	11 (6.5)	28 (17.1)	
Market	57 (34.5)	22 (30.1)	43 (32.6)	60 (25.5)	50 (29.4)	59 (36.0)	
Others	2 (1.2)	20 (27.4)	9 (6.8)	21 (8.9)	51 (30.0)	10 (6.1)	
Cause, No. (%)							< 0.001
Suicide	128 (77.6)	49 (67.1)	95 (72.0)	187 (79.6)	109 (64.1)	108 (65.9)	
Accident	27 (16.4)	9 (12.3)	26 (19.7)	25 (10.6)	19 (11.2)	25 (15.2)	
Abuse	8 (4.8)	1 (1.4)	4 (3.0)	11 (4.7)	14 (8.2)	18 (11.0)	
Others	2 (1.2)	14 (19.2)	7 (5.3)	12 (5.1)	28 (16.5)	13 (7.9)	
Alcohol use, No. (%)	39 (23.6)	26 (35.6)	30 (22.7)	40 (17.0)	70 (41.2)	42 (25.6)	< 0.001
Total ED visits (No.)	32,606	24,344	36,877	47,597	54,545	44,763	
Ratio of poisoning to total ED visit (%)	0.5	0.3	0.36	0.49	0.31	0.37	
Substances							< 0.05
Over-the-counter drug	75 (45.5)	28 (38.4)	54 (40.9)	80 (34.0)	51 (30.0)	56 (34.1)	
Household toxic materials	28 (17.0)	14 (19.2)	24 (18.2)	20 (8.5)	29 (17.1)	21 (12.8)	
Pesticide	28 (17.0)	11 (15.1)	19 (14.4)	20 (8.5)	20 (11.8)	20 (12.2)	
Psychotropic drugs	21 (12.7)	5 (6.8)	21 (15.9)	58 (24.7)	32 (18.8)	29 (17.7)	
Prescription medicine	3 (1.8)	6 (8.2)	4 (3.0)	20 (8.5)	12 (7.1)	15 (9.1)	
Dependent drug	2 (1.2)	0 (0.0)	0 (0.0)	6 (2.6)	1 (0.6)	2 (1.2)	
Working	1 (0.6)	0 (0.0)	1 (0.8)	7 (3)	2 (1.2)	8 (4.9)	
Naturally occurring toxic material	0 (0.0)	2 (2.7)	1 (0.8)	4 (1.7)	1 (0.6)	3 (1.8)	
Gas poisoning	4 (2.4)	1 (1.4)	0 (0.0)	3 (1.3)	0 (0.0)	5 (3.0)	
Unknown	3 (1.8)	6 (8.2)	8 (6.1)	17 (7.2)	22 (12.9)	5 (3.0)	
Lavage	73 (44.2)	29 (39.7)	68 (51.5)	6 (2.6)	8 (4.7)	17 (10.4)	< 0.05
Expire	1 (0.6)	2 (2.7)	3 (2.3)	4 (1.7)	4 (2.4)	1 (0.6)	

(18.5%) patients were in their 30s, 40s, and 20s. The most common age range for patients with poisoning seemed to increase after a decade from patients in their 20s-30s to those in their 30s-40s. In 1992, Song et al. (1) reported that patients in their 20s were the highest proportion (35.7%) of patients with toxic poisoning. In addition, Lee et al. (7) also found that the most common age group with poisoning patients were in their 20s (46.8%) in 1996. Kang et al. (8) also reported that 23.7% of patients with toxic poisoning were in their 20s in 1999. On the other hand, the mean age of patients with toxic poisoning was 47.8 yr according to data reported by Park et al. (3) in 2004, and So et al., (4) reported that the mean age was 46.02 ± 20.12 yr, with patients in their 40s representing the most common age group (20.4%) in 2008. In other countries, Burillo-Putze et al. (9) reported that the average age of patients with toxic poisoning in Spain in 2003 was 33 yr. Xiang et al. (10) reported that most patients with toxic poisoning admitted to emergency departments in USA were aged 35-44 yr. In Korea, the highest portions of poisoning to toxic substances were found in young and socially active people in their 30s and 40s, and the average age appears to be increasing slightly.

In this study, toxic poisoning was more common in women than men during both years. In 2003, the male-to-female ratio was 1:1.57 (144 males to 226 females), and in 2011, the ratio was 1:1.86 (199 males to 370 females). In other data from Korea, Lee et al. (7) reported a male-to-female ratio of 1:1.73 for patients with poisoning. Likewise, the proportion of females among poisoning patients was reported to be 52.1% by So et al. (4), 53.3% by Kang et al. (8), and 68.4% by Song et al. (1). Park et al. (3) reported a male-to-female ratio of 1:1.14. Given that female patients are exposed to toxic substances at a higher rate than male patients, and the main cause of poisoning being consumption of toxic material while committing suicide, this finding is most likely related to the high rate of suicidal attempts among women (14). According to Xiang et al. (10), 56.7% of all suicide attempts are made by women. In contrast to that reported in Korea, Burillo-Putze et al. (9) reported that 56% of suicides are committed by men in Spain.

Most cases of toxic poisoning are due to consumption of toxic substances for committing suicide, while accidental poisoning are the second most common cause. Burillo-Putze et al. (9) reported that 77.7% of patients admitted to emergency departments with acute toxic poisoning had attempted suicide, which are similar to our study findings: 74.9% and 72.0% of admissions in 2003 and 2011, respectively, were due to suicide attempts. Similar rates were reported by Song et al. (67.2% in 1992) (1), Lee et al. (86.8% in 1996) (7), Kang et al. (72.6% in 1998) (8), Park et al. (89.2% in 2004) (3), and So et al. (61.0% in 2008) (4).

The proportion of toxic poisoning cases due to prescribed drugs tended to increase over time. In 2003, pharmacies were the most common source of toxic materials followed by other

types of stores. However, in 2011, substances most commonly source causing poisoning were hospital prescriptions, followed by over-the-counter drugs. Lee et al. (7) reported that in 1996, 47.8% of toxic poisonings were due to pharmacy-purchased drugs, which is similar to our results for the year 2003.

In our study, in both 2003 and 2011, patients with toxic poisoning represented 0.39% of all patients admitted to emergency departments. Meanwhile, Burillo-Putze et al. (9), reported this percentage as 0.66% in Spain. In the Korean study by Song et al. (1) in 1992, the rate was 0.68%. These rates are somewhat lower than that reported in the 1980s, in which the proportions were between 3.2% and 5.5% (2).

There was little change in the proportion of toxic poisoning cases that were accompanied by alcohol consumption (25.7% in 2003 and 26.7% in 2011). According to the report by Kang et al. (8) in 1996, 44.4% of male and 27.8% of female patients admitted with toxic poisoning involved alcohol consumption, and Burillo-Putze et al. (9) reported 26.3% of toxic poisonings were accompanied by alcohol consumption.

Most cases of toxic poisoning occur during the night rather than during the day, and no temporal change was observed in the present study. Kang et al. (8) reported that in 1998, most patients with toxic poisoning visited emergency departments between 8 p.m. and 12 p.m., whereas the least number of patients were admitted between 4 a.m. and 8 a.m. (5.2%). In 2003, most patients with toxic poisoning were admitted to emergency departments in May and August, whereas in 2011, most were admitted in April, September, and October; however, this difference was not significant. Kang et al. (8) reported that in 1998, 33.3% of cases of toxic poisoning occurred in September, October, and November, which is similar to the incidence observed in 2011 in the present study and Shin et al. (15).

The most important factor to consider in the treatment of acute toxic poisoning is the causative substance. Decontamination and treatment methods as well as antidotes used are different according to toxic substances. Therefore, access to data on substances commonly associated with toxic poisoning is very important for doctors dealing with patients in emergency departments. The substances most commonly causing poisoning vary depending on the patient's society, for example, the ease of purchase and acquisition of toxic substances; changes over time may also be affected. In our research, over-the-counter drugs and household toxic materials were the most common causative agents in 2003. Meanwhile, the percentage of poisonings due to over-the-counter drugs decreased in 2011; however, these drugs remained the most common causative substances, followed by psychiatric drugs. The subject of psychiatric treatment has traditionally been taboo in Korea. Therefore, the treatment of such conditions has historically been rare. The growing number of patients receiving psychiatric treatment in recent years may have facilitated the acquisition and use of

psychiatric drugs, especially antipsychotics.

In 2003 and 2011, 50% and 36.2% of patients with toxic poisoning returned to their homes, respectively. Compared to the 2003, the proportion of discharged patients decreased and the proportion of self-discharged patients increased in the 2011. This may be because many poisonings were due to consumption of toxic substances while committing suicide. Although poisoning itself may not be life threatening, the ratio of patients for whom hospital transfers or hospitalization would have been recommended increased because of reattempted suicides. Nevertheless, many patients do not want to be hospitalized, and increased awareness of a doctor's obligation to obtain informed consent is thought to be one of the reasons for the increased rates of self-discharge.

Six patients in the 2003 and 9 patients in the 2011 expired from toxic poisoning. Among them, 5 of 6 patients in 2003 and 6 of 9 patients in 2011 died due to paraquat poisoning. In Korea, the sale and production of paraquat are forbidden by law since 2012. Accordingly, we expect a decrease in mortality due to paraquat poisoning.

In terms of treatment, the most remarkable change over time was observed in the procedure of gastric lavage. In 2003, 45.92% of patients received lavage treatment, whereas in 2011 only 5.4% received lavage. In addition, the administration of charcoal increased significantly in 2011 (Table 3). Lavage was previously used indiscriminately for gastrointestinal decontamination in cases of acute poisoning. However, it is now thought that the advantages of lavage do not justify the risk of complications, such as aspiration. The study by Benson et al. (11) emphasized that gastric lavage should only be performed under correct indications. Even though the rate of unnecessary use of gastric lavage has decreased, the rate is still high according to a domestic study (12). In addition, a recent study in Denmark regarding gastric lavage revealed that the procedure was still overused (13). This study is important as it is the first to report the decrease in use of gastric lavage in Korea, and as such, is in accordance with the international trend.

Comparing the characteristics of poisoning cases between hospitals revealed that the Gangnam hospital experienced more cases that involved the consumption of alcohol. The Gangbuk hospital had a higher proportion of poisoning cases out of the total patients admitted to the emergency department. The Gyeonggi-do hospital had more cases of accidental exposure and gastric lavage in comparison to the other hospitals.

One of the limitations of this study is that the use of antidotes besides lavage and charcoal was not investigated. Because we focused mainly on temporal changes, not all therapeutic information was verified. However, because antidotes are specific to each toxic substance and the toxic substances were verified, it can be assumed that antidotes were used appropriately in each case. Another limitation of this study is that although it was a

multi-center study, data from only three centers were included. Because drug poisoning is affected by time, social factors, and regional factors, national data would be of great interest and allow meaningful regional comparisons. Lastly, this study was initially designed to have a 10-yr interval. However, due to electronic difficulties in data collection, the authors chose to study year 2003 and 2011. We believe the additional future studies monitoring changes over one or two decades would be greatly beneficial to gain a deeper understanding.

In conclusion, this multi-center study compared the characteristics of patients admitted to the emergency department with toxic poisoning in 2003 and 2011. Among the elements that did not change over time were the facts that suicide was the most common cause of toxic exposure, that alcohol consumption was involved in roughly one out of four cases, and that there were more female than male cases. Furthermore, acetaminophen and doxylamine remained the most common poisoning agents. On the other hand, increases in average poisoning patient age, exposure to psychiatric drugs and a decrease in gastric lavage cases were the most salient features that had changed over time. Understanding the characteristics of patients with acute toxic poisoning is important for providing optimal care. Our study results suggest that it is necessary to continuously collect data of patients admitted to emergency departments with toxic poisoning at multiple centers.

DISCLOSURE

The authors have no conflicts of interest to disclose.

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