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Management of Acute Poisonous Cases in the Emergency Department

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Abstract **Review Article**

Instances of acute poisoning are a major cause for concern regarding the state of the health of the general population. This article was written with the purpose of conducting a literature review on acute poisoning cases and the treatment that is given to patients in emergency rooms. This was the motivation behind the writing of this article. It was decided that a variety of search engines, including Google, Google Scholar, Science Direct, and PubMed, would be investigated. Acute poisoning cases are a problem that is significantly more widespread than we had previously estimated, as the findings of this study have shown. When everything is taken into consideration, the medical personnel working in the emergency department ought to be adequately prepared to treat and manage severe cases of poisoning. In addition, there needs to be legislation in place that identifies substances that are toxic.

Keywords: Acute poisoning cases, emergency department, management, policies, toxic substances.

1. INTRODUCTION

The present study reviewed the literature regarding the exposure of acute poisoning and its management in the emergency department. An overview of acute poisoning and their epidemiology was introduced.

2. Acute Poisoning Overview

Acute poisoning affects global health (Mathers, 2015; Bertolote, 2006; Khurram, 2008; Manzar *et al.*, 2012; Siddiqui *et al.*, 2008; Mowry *et al.*, 2014). According to the WHO, 346 000 people die year from unintentional acute poisoning and 370 000 from self-poisoning (Mathers, 2015; Bertolote, 2006). 91% of acute poisoning deaths occur in low- and middle-income countries, according to Mathers (2015). Organophosphorus, carbamates, and pyrethroids remain important toxic compounds in low- and middle-income countries (Khurram, 2008; Manzar *et al.*, 2012; Siddiqui *et al.*, 2008).

3. Studies Addressing Epidemiology and Management of Acute Poisoning

As acute poisoning episodes cause more than 2 million visits to emergency departments (EDs) yearly in the US, the strain should not be underestimated (Mowry *et al.*, 2014). In many low- and middle-income nations, equivalent statistics are hard to find (Aggarwal *et al.*, 2005; Fatmi *et al.*, 2007). Poisoning tendencies in various countries' capitals are distinct. In rich countries, the annual incidence of unintentional and purposeful human poisoning ranges from 0.2 to 9.3 poison exposures per 1000 inhabitants, and it continues to rise annually due to decreased safety and increased reporting and registry. America, Canada, and Australia are prosperous countries (Hanssens *et al.*, 2001).

Annual poisoning rates range from 0.076 percent to 0.7% over the world. Poisoning rates vary widely from country to country (Thomas *et al.*, 1996; Hanssens *et al.*, 2001). According to western research (Thomas *et al.*, 1996; McCaig *et al.*, 1999), the annual rate of poisoning-related ER visits was 0.26 percent. Male patients had a 55.8% poisoning rate, while females had 44.2%. 63% of patients were under 40 (Townsend *et al.*, 2001). Deaths due to poisoning increased 56% between 1990 and 2001, from 5.0 per 100,000 to 7.8 per 100,000. 1990 poisoning death rate: 5.0 per 100,000. In 2001, 22 242 poisoning deaths were accidental, accounting for 63% (U.S. Department of Health and Human Services, 2003).

The great majority of studies on this topic have been conducted at a single hospital, most of the time in inpatient settings, and they nearly never assess emergency department load or acute care outcomes in

instances of poisoning (Balme *et al.,* 2010; Khan *et al.,* 2014). When campaigning for prevention, acute care, and control efforts connected to acute poisoning, it's helpful to have ER data (Nishtar *et al.,* 2005).

Rafique *et al.,* (2016) conducted a study to evaluate emergency care for individuals with acute chemical poisoning in Rawalpindi, Pakistan. The study was carried out between July 2007 and June 2008, in which three tertiary care hospitals in Rawalpindi participated in an injury surveillance study. Information was recorded using WHO's one- page standard reporting questionnaire. Using logistic regression models, the authors compared patient characteristics to ED care outcomes. These models analyzed data (i.e., whether they were admitted or discharged). Chemical poisoning was found in 434 of 62,530 injuries. This is 0.7%. Poisoning at home (61.9%), male gender (58.6%), self-harm (46.0%), and 20–29-year-olds (43.3%). 46% of patients self-harmed. 69% of patients diagnosed with acute poisoning were hospitalized. Acute poisoning cases were more likely to be hospitalized when the patients were 10–19 years old [OR = 4.41], when the poisoning happened at home (OR = 21.84), and when the poisoning was linked with self-harm (18.73) or assault (7.56). Also, 10–19-year-olds were more likely to be hospitalized for home poisoning (OR = 21.84). Limiting access to hazardous substances in families and among young people could minimize emergency department care for these conditions, a favorable public health consequence.

Chang *et al.,* (2007) conducted study in Taiwan, taking into consideration that snake bites often require urgent medical care due to envenomation. This five-year study in southern Taiwan examined fatal snake bites and their treatment. A retrospective study examined the medical records of 37 snake bit patients treated at Kaohsiung Medical University Hospital between June 2001 and July 2005. Patients were seen between 2001 and 2005. Patients bitten by an unknown deadly snake were excluded from the study. Snake bite frequency, local and systemic signs, complications, and overall results were evaluated. 11 out of 34 patients were bitten by bamboo vipers, 10 by Russell's pit vipers, 8 by Taiwan cobras, and 5 by Taiwan Habus. May through November saw 28 snake bites. Most injured people were working (15) or trekking (9). Antivenin was given to the patient at the emergency room according to industry standards. Despite many venomous snake bites, no fatalities were reported. Even though venomous snake bites are not a common cause of life-threatening crises in this location, we identified an environmental risk and a seasonal prevalence of snake bites in our research region. When delivering care, it's important to remember the different snake bite symptoms. When necessary, patients should be continuously monitored, given ventilatory support, and moved to a larger hospital. Antivenin should be easy to use. These factors reduce overall mortality.

Romo *et al.,* (2022) conducted a study to (1) evaluate hospital readmissions one year after acute poisoning cases (APC), (2) analyze early readmissions (ER) in the month after the index event, and (3) forecast ER. This study presents a descriptive analysis of APC patients treated in Hospital La Paz's ED between 2011 and 2016. Between 2011 and 2016, these patients were treated at Hospital La Paz. Several inferential statistical methods and Bayesian analysis were used to investigate factors related with total and early readmissions. 968 of 4693 APC cases had at least one readmission, with 476 being ER. 20.6% of APC cases were readmitted. Patients readmitted to APC had an average age of 41 (12.7 standard deviations), 78.9% had a history of psychiatric disease, and 44.7% had an alcohol dependence history. Accidental poisoning reduces readmission (OR 0.50; 0.26–0.96). Addiction and mental history are risk factors for first-year readmissions. Toxin type (abuse drug) had an odds ratio of 8.88 (1.17–67.25) (OR 3.30; 2.53–4.30). Women averaged three hospital readmissions every year, according to the study. The study's findings help predict emergency department visits and readmissions in the year after the index APC (Romo *et al.,* 2022).

4. Hospital Readmissions Associated with Acute Poisoning

Several studies (Anand *et al.,* 2019; Blanc *et al.,* 2017) have examined hospital readmissions' importance. Readmissions provide information on patient health status after initial hospital care and can be an indicator of care outcome. Readmissions occur when a patient returns to the hospital. Readmissions provide information about a patient's health after initial hospital care. Since 1965, hospital readmissions have been used to measure medical quality. This has made it easier to identify difficulties with care (Lindquist *et al.,* 2011; Caballero *et al.,* 2011), create interdisciplinary treatments for discharge follow-up, and minimizes repeated hospitalizations (Lindquist *et al.,* 2011; Caballero *e al.,* 2011). It's also easy to spot problems with care (Lindquist *et al.,* 2011; Caballero *et al.,* 2011; Anand *et al.,* 2019; Blanc *et al.,* 2017). Hospital readmissions can be costly to the healthcare system (Romo *et al.,* 2022). Most studies on hospital readmissions have focused on unscheduled readmissions in clinical services or internal medicine units of acute care hospitals. These readmissions are the most common. The findings primarily include elderly or sick people. These studies conclude that deterioration in chronic illness, poor outpatient management, and adverse treatment events are the leading causes of readmission in these patients (Larkin *et al.,* 2014). A high percentage of readmissions occurred early (within one month), notably in patients who had more than one previous hospitalization due to exacerbation of a chronic illness, insufficient outpatient management, a previous misdiagnosis, and/or an adverse reaction to the regular treatment (Lindquist *et al.,* 2011; Caballero *et al.,* 2011; Anand *et al.,* 2019; Blanc *et al.,* 2017). This was

especially true for individuals with several past admissions due to a chronic condition, insufficient outpatient care, or a misdiagnosis. This was especially true for repeat patients. APCs are a severe public health issue. They account for a large share of hospital emergency ward admissions (Gummin *et al.,* 2019; Observatorio Europeo, 2019; Descamps *et al.,* 2019). APC patients are readmitted often (Vallersnes *et al.,* 2018; 2019). Several studies have examined APC admission patterns, but 85% of them focused on self-poisoning. This helped identify recurring APC predictors. The yearly recurrence rate is 18%. The rate increased to 30% in the first year, with a higher frequency in the first month, regardless of the kind of APC (autolytic, abusive/recreational) (Heyerdahl *et al.,* 2009).

Kaya *et al.,* (2015) conducted a study to investigate clinical and socio-demographic features of acute poisoning in Turkey. Young people and adults (aged 16 and older) with acute drug poisoning were treated at the Emergency Service of Duzce University Medical Hospital in Turkey from January to December 2010. Patients with acute poisoning presented. All of these patients were admitted during that time. This retrospective and descriptive investigation found 95 intoxicated patients. Thirty of these patients purposefully overdosed. The hospital's Clinical Archive was searched for intoxicated patients' medical records. To determine their diagnosis, the ICD-10 was used. The codes X60–X84 were used to identify intentional drug injuries and poisonings. In this series, there were 85 patients, 60 (63.2%) of whom were female and 35 (36.6%) male. Population had 1.0 men for every 1.7 women. 17 patients (17.9%) were less than 20 years old, while 9 (9.5%) were older than 50. 29 (30.5%) of these patients were single, 7 (7.4%) were divorced, and 59 (62.1%) were married. 29 (30.5%) single patients were married. 208 minutes and 180 seconds passed after the event before the patient arrived at the ER (15–660). Emergency services treated food-intoxicated patients. Alcohol intoxicated patients were admitted 142 to 160 minutes after the incident, CO intoxicated patients were admitted 315 to 209 minutes after the incident, and undefined intoxicated patients were admitted 289 to 166 minutes after the incident (P = 0.005). Winter saw 41.1% (39) of all intoxication cases. December and April saw the most emergency room visits (21 and 16 of 95 patients, respectively). 68.4% of the instances included accidental poisoning, whereas 31.6% involved purposeful poisoning. Only one of 95 patients with acute CO poisoning died in the ER. This patient died from poisoning problems. 26 patients were near death when admitted. Female patients attempted suicide more often than male patients (21 of 30 patients, 70%, P0.05) (Kaya *et al.,* 2015).

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5. Psychoactive Chemicals: Uses and Poisonous Potential

The market for novel psychoactive chemicals has seen an increase in designer benzodiazepines, or DBZDs (NPS). Compounds have an acronym. They are often sold as benzodiazepine (BZD) replacements or in counterfeit medical products, Illegal practices. BZDs are deemed safe because mono-intoxication seldom causes severe acute negative effects. Alprazolam appears to enhance the risk of respiratory depression. This paper describes fatal flualprazolam poisoning. The dead patient's body was post-mortem. Immunoassay, gas chromatography–mass spectrometry, and liquid chromatography–mass spectrometry were used to test postmortem samples for unknowns and drug abuse. Flualprazolam levels in postmortem blood and tissues were determined using the usual addition method. TSS, the toxicological significance score, was calculated. Flualprazolam was detectable in urine, stomach contents, brain, liver, and kidneys (65.2–323 ng/g), as well as heart serum (25.4 ng/mL) and peripheral blood (21.9 ng/mL). Peripheral flualprazolam was found. The CNS, respiratory depression, and agonal aspiration of stomach contents were identified as multiple drug-related causes of death. Due to the substantial doses of other CNS depressants being eaten, flualprazolam played a role in the tragic outcome due to its high concentrations (TSS of 3) (Giorgetti *et al.,* 2022).

Designer benzodiazepines (DBZDs) are a class of new psychoactive substances (NPS) designed as an alternative to "prescription-only" or restricted benzodiazepines. DBZDs usually relate to NPS. Most of them have never been approved as therapeutic treatments, or only intermittently or in certain regions. DBZDs are sold at low prices, similar to other designer medications, despite the lack of effective distribution limitations. DBZDs have been structurally modified to evade national narcotics laws (Huppertz *et al.,* 2015).

The European Monitoring Centre for Drugs and Drug Addiction (EMCDDA) monitors 30 different DBZDs, 21 of which are only now commercially accessible for use in NPS (EMCDDA, 2020). According to the European Monitoring Center for Drugs and Drug Addiction (EMCDDA), the number of DBZD-containing material seizures increased significantly from 2017 to 2018 (EMCDDA, 2020). This is a considerable increase in DBZD-containing materials seized. The STRIDA study, which tracks NPS-related intoxications in Sweden, found a rise in DBZD-positive urine samples (from 4% in 2012 to 19% in 2015) (Bäckberg *et al.*, 2019).

DBZDs are positive allosteric modulators of GABAA receptors used therapeutically. Their pharmacological profile and effects are similar to BZDs. Benzodiazepines (DBZDs) BZDs have less side effects than barbiturates, another CNS depressant. BZDs function differently. In mono-intoxications, they rarely cause death, but when coupled with opioids or alcohol, they can (Jones *et al.*, 2012).

6. Poisoning Treatment Approaches

Acute poisoning requires a quick diagnosis and treatment. After a thorough exam, patients must be stabilized.

6.1 History

Identifying the poison shouldn't delay life-saving care. Toxins should be identified. Effort is needed (Bateman and Good, 2006). The patient's vital functions must be examined and stabilized while a full medical history is acquired. Nature of the hazardous material, degree of exposure, and time since last exposure are important for risk assessment (Erickson *et al.*, 2007). Toxins, which include pharmaceuticals, fall into two groups (Muller *et al.*, 2003). A. Poisons (and/or their metabolites) that directly destroy organ structure or function, either irreversibly or very slowly. These substances may contain naturally occurring poisons. Substances in this category cause symptoms and signs slowly (e.g. paracetamol). B. Poisons that don't immediately destroy tissue or have reversible toxic effects. Luckily, most deadly chemicals belong to this class. Full recovery is almost usually guaranteed if symptomatic and supportive therapy is given during the acute phase (Erickson *et al.*, 2007). When dealing with a toxic exposure or poisoning, it's vital to find chemicals with high inherent toxicity (Muller *et al.*, 2003). Early diagnosis allows for rapid cleaning and antidotal therapies, which help prevent serious or permanent tissue damage. 5 Patients who take toxins with a high tissue- damaging capability usually experience significant gastrointestinal symptoms (Muller *et al.*, 2003). Medical histories of poisoned patients are typically unreliable (Perrone *et al.*, 2001). If feasible, friends and family members should also be questioned about the poison. It's crucial to get a sample of the hazardous chemical and its container. Pre-hospital experts should collect these to ensure effective care (Erickson *et al.*, 2007). To quickly and accurately detect a poison, either the suspected or eaten drug must be analyzed. This helps determine which was consumed. After stabilizing the patient, a physical exam must be undertaken. A detailed review of the patient's signs and symptoms can help determine the ailment's fundamental cause and severity (Flomenbaum *et al.*, 2006). Serious poisonings sometimes cause severe and persistent gastrointestinal symptoms and signs, hypo- or hypertension, hyperthermia, cardiac dysrhythmias, altered mental status, seizures, hypoglycemia, acid–base and electrolyte imbalances, and liver and kidney damage. Signs of liver and renal failure distinguish serious poisonings. Poisoning deaths are prevalent (Muller *et al.*, 2003). During diagnosis, focus on the patient's respiratory system because respiratory compromise causes most poisoning deaths (Muller *et al.*, 2003). In cases of suspected acute poisoning, it's important to rule out other life-threatening causes of the symptoms (Erickson *et al.*, 2007). Changes in a patient's vital signs may indicate how well they are responding to antidotal or supportive treatment (Flomenbaum *et al.*, 2006). Recognizing a specific toxidrome, a cluster of poisoning-related signs and symptoms, may help determine the type of toxin consumed. A toxidrome is a set of poisoning-related symptoms. Toxidromes can be deceiving when a person is exposed to more than one hazardous ingredient at once. Sometimes harmful symptoms develop slowly. This happens with Amanita phalloides poisoning, organophosphates, paracetamol, and vitamin K-dependent anticoagulants (Boyle *et al.*, 2009).

7. CONCLUSION

As a consequence of an increase in the consumption of pharmaceuticals and synthetic substances, it is anticipated that there would be an increase in the number of instances of acute poisoning. Acute poisoning can be either unintentional or deliberate, depending on the circumstances. In order to prevent patients from losing their lives due to acute poisoning, the emergency department's medical staff should develop specific procedures that can be followed in the event that one of their patients experiences this condition.

REFERENCES

- Aggarwal, P., Handa, P., & Wali, J. P. (2000). Acute poisoning-management guidelines. *J Indian Acad Clin Med*, 5(2), 142-7.
- Anand, P., Kranker, K., & Chen, A. Y. (2019). Estimating the hospital costs of inpatient harms. *Health Serv. Res.*, 54, 86-96. [CrossRef]
- Bäckberg, M., Pettersson Bergstrand, M., Beck, O., & Helander, A. (2019). Occurrence and time course of NPS benzodiazepines in Sweden - results from intoxication cases in the STRIDA project. *Clin Toxicol*, 57, 203–

212. https://doi.org/10.1080/15563650.2018.1506130

- Balme, K. H., Roberts, J. C., Glasstone, M., Curling, L., Rother, H. A., London, L., ... & Mann, M. D. (2010). Pesticide poisonings at a tertiary children's hospital in South Africa: an increasing problem. *Clinical Toxicology*, *48*(9), 928-934.
- Bateman, D. N., & Good, A. M. (2006). Five years of poisons information on the internet: the UK experience of TOXBASE. *Emerg Med J*, 23(8), 614–7.
- Bertolote, J. M., Fleischmann, A., Eddleston, M., & Gunnell, D. (2006). Deaths from pesticide poisoning: are we lacking a global response? *Br J Psychiatry*, 189, 201-3.
- Blanc, A. L., Fumeaux, T., Stirneman, J., Bonnabry, P., & Schaad, N. (2017). Hospital readmissions: Current problems and perspectives. *Rev. Médicale Suisse*, 13, 117–120.
- Boyle, J. S., Bechtel, L. K., & Holstege, C. P. (2009). Management of the critically poisoned patient. *Scand J Trauma Resusc Emerg Med*, 17(1), 29.
- Caballero, A., Carrillo, P., Suárez, I., Ibañez, M., Acevedo, J., & Bautista, O. (2011). Características y factores pronósticos de reingresos hospitalarios en pacientes afiliados a la Organización Sanitas Internacional durante el año 2008. *Rev. Med. Sanitas*, 14, 12–26.
- Chang, K. P., Lai, C. S., & Lin, S. D. (2007). Management of poisonous snake bites in southern Taiwan. *The Kaohsiung journal of medical sciences*, *23*(10), 511-518.
- Descamps, A. K., Vandijck, D. M., Buylaert, W. A., Mostin, M. A., & Paepe, P. (2019). Characteristics and costs in adults with acute poisoning admitted to the emergency department of a university hospital in Belgium. *PLoS ONE*, 14, e0223479.
- EMCDDA (2020). European drug report 2020: trends and developments. https://www.emcdda.europa.eu/system/files/publications/13236/TDAT20001ENN_web.pdf. Accessed 7 Jul 2021.
- Erickson, T. B., Thompson, T. M., & Lu, J. J. (2007). The approach to the patient with an unknown overdose. *Emerg Med Clin North Am*, 25(2), 249–81.
- Fatmi, Z., Hadden, W. C., Razzak, J. A., Qureshi, H. I., Hyder, A. A., & Pappas, G. (2007). Incidence, patterns and severity of reported unintentional injuries in Pakistan for persons five years and older: results of the National Health Survey of Pakistan 1990-94. *BMC Public Health*, 7, 152.
- Flomenbaum, N. E., Goldfrank, L. R., & Hoffman, R. S. (2006). Initial evaluation of the patient: vital signs and toxic syndromes. In: Flomenbaum LR, Goldfrank LR, Hoffman RS, Howland MA, Lewin N, Nelson L, editors. Goldfrank's toxicologic emergencies. 8th ed. New York: McGraw-Hill; p. 37–41.
- Giorgetti, A., Sommer, M. J., Wilde, M., Perdekamp, M. G., & Auwärter, V. (2022). A case of fatal multidrug intoxication involving flualprazolam: distribution in body fluids and solid tissues. *Forensic Toxicology*, *40*(1), 180-188. https://doi.org/10.1007/s11419-021-00591-w.
- Gummin, D. D., Mowry, J. B., Spyker, D. A., Brooks, D. E., Beuhler, M. C., Rivers, L. J., Hashem, H. A., & Ryan, M. L. (2018). Annual Report of the American Association of Poison Control Centers' National Poison Data System (NPDS): 36th Annual Report. *Clin. Toxicol.,* 57, 1220–1413. [CrossRef]
- Hanssens, Y., Deleu, D., & Taqi, A. (2001). Etiologic and demographic characteristics of poisoning: a prospective hospital-based study in Oman. *J Toxicol Clin Toxicol.*, 39, 371–380. [PubMed] [Google Scholar]
- Heyerdahl, F., Bjornaas, M. A., Dahl, R., Hovda, K. E., Nore, A. K., Ekeberg, O., & Jacobsen, D. (2009). Repetition of acute poisoning in Oslo: 1-Year prospective study. *Br. J. Psychiatry*, 194, 73–79.
- Huppertz, L. M., Bisel, P., Westphal, F., Franz, F., Auwärter, V., & Moosmann, B. (2015). Characterization of the four designer benzodiazepines clonazolam, deschloroetizolam, flubromazolam, and meclonazepam, and identification of their in vitro metabolites. *Forensic Toxicol*, 33, 388–395. https://doi.org/10.1007/s11419-015-0277-6.
- Jones, J. D., Mogali, S., & Comer, S. D. (2012). Polydrug abuse: a review of opioid and benzodiazepine combination use. *Drug Alcohol Depend*, 125, 8–18. https://doi.org/10.1016/j.drugalcdep.2012.07.004.
- Kaya, E., Yilmaz, A., Saritas, A., Colakoglu, S., Baltaci, D., Kandis, H., & Kara, I. H. (2015). Acute intoxication cases admitted to the emergency department of a university hospital. *World journal of emergency medicine*, *6*(1), 54–59. https://doi.org/10.5847/wjem.j.1920-8642.2015.01.010.
- Khan, N. U., Mir, M. U., Khan, U. R., Khan, A. R., Ara, J., Raja, K., & Mirza, F. H. (2014). The current state of poison control centers in Pakistan and the need for capacity building. *Asia Pacific journal of medical toxicology*, *3*(1), 31-35.
- Khurram, M., & Mahmood, N. (2008). Deliberate self-poisoning: experience at a medical unit. *J Pak Med Assoc*, 58(8), 455-7.
- Larkin, C., Di Blasi, Z., & Arensman, E. (2014). Risk factors for repetition of self-harm: A systematic review of prospective hospital-based studies. *PLoS ONE*, 9, e84282.
- Lindquist, L. A., & Baker, D. W. (2011). Understanding preventable hospital readmissions:

Masqueraders, markers, and true causal factors. *J. Hosp. Med.*, 6, 51–53.

- Manzar, N., Manzar, B., Yaqoob, A., Ahmed, M., & Kumar, J. (2012). The study of etiological and demographic characteristics of neonatal mortality and morbidity-a consecutive case series study from Pakistan. *BMC Pediatr*, 12, 131.
- Mathers, C., Boerma, T., & Ma Fat, D. (2015). The global burden of disease: 2004 update. Geneva: *World Health Organization.*
- McCaig, L. F., & Burt, C. W. (1999). Poisoning-related visits to emergency departments in the United States 1993–1996. *J Toxicol Clin Toxicol.*, 37, 817–826. [PubMed] [Google Scholar]
- Mowry, J. B., Spyker, D. A., Cantilena, L. R., Jr, McMillan, N., & Ford, M. (2013). Annual report of the American Association of Poison Control Centers' National Poison Data System (NPDS): 31st annual report. *Clin Toxicol (Phila)*, 52(10), 1032-283.
- Muller, G. J., Hoffman, B. A., & Lamprecht, J. (2003). Diagnosis of acute poisoning. *CME*, *21*(8), 438-44.
- Muñoz Romo, R., Borobia Pérez, A. M., Mayayo Alvira, R., Urroz, M., Rodríguez Mariblanca, A., Guijarro Eguinoa, F. J., ... & Carcas Sansuán, A. J. (2022). Acute poisoning readmissions to an emergency department of a tertiary hospital: evaluation through an active toxicovigilance program. *Journal of clinical medicine*, *11*(15), 4508. https:// doi.org/10.3390/jcm11154508.
- Nishtar, S., Bile, K. M., Ahmed, A., Amjad, S., & Iqbal, A. (2005). Integrated population-based surveillance of noncommunicable diseases: the Pakistan model. *Am J Prev Med*, 29(5 Suppl 1), 102-6.
- Observatorio Europeo de las Drogas y las Toxicomanias. (2019). Informe Europeo Sobre Drogas. Tendencias y Novedades 2018; Oficina de Publicaciones de la Unión Europea: Luxembourg, pp. 45–65.
- Perrone, J., De Roos, F., Jayaraman, S., & Hollander, J. E. (2001). Drug screening versus history in detection of substance use in ED psychiatric patients. *Am J Emerg Med*, 19(1), 49–51.
- Rafique, I., Akhtar, U., Farooq, U., Khan, M., & Bhatti, J. A. (2016). Emergency care outcomes of acute chemical poisoning cases in Rawalpindi. *Journal of Acute disease*, *5*(1), 37-40.
- Siddiqui, E. U., Razzak, J. A., Naz, F., & Khan, S. J. (2008). Factors associated with hydrocarbon ingestion in children. *J Pak Med Assoc*, 58(11), 608-12.
- Thomas, S. H. L., Bevan, L., Bhattacharyya, S., Bramble, M., Chew, K., Connolly, J., ... & Bateman, D. N. (1996). Presentation of poisoned patients to accident and emergency departments in the north of England. *Human & experimental toxicology*, *15*(6), 466-470. [PubMed] [Google Scholar]
- Townsend, E., Hawton, K., Harriss, L., Bale, E., & Bond, A. (2001). Substances used in deliberate self-poisoning 1985–1997: trends and associations with age, gender, repetition and suicide intent. *Soc Psychiatry Psychiatr Epidemiol.*, 36, 228–234. [PubMed] [Google Scholar]
- U.S. Department of Health and Human Services, CDC, National Center for Injury Prevention and Control; 2003. CDC. Web-based Injury Statistics Query and Reporting System (WISQARS™) Available at http://www.cdc.gov/ncipc/wisqars/default.htm . [Google Scholar]ز
- Vallersnes, O. M., Jacobsen, D., Ekeberg, O., & Brekke, M. (2009). Mortality, morbidity and follow-up after acute poisoning by substances of abuse: A prospective observational cohort study. *Scand. J. Public Health*, 47, 452–461.
- Vallersnes, O. M., Jacobsen, D., Ekeberg, Ø., & Brekke, M. (2019). Mortality and repeated poisoning after self-discharge during treatment for acute poisoning by substances of abuse: A prospective observational cohort study. *BMC Emerg. Med.*, 19, 5.