

Epidemiology of acute poisoning by substances of abuse in the Emergency Department. Descriptive study in District IV of Asturias

Epidemiología de las intoxicaciones agudas por sustancias de abuso en Urgencias. Estudio descriptivo en el área IV de Asturias

ANA FERNÁNDEZ-IBÁÑEZ*, RODRIGO UGALDE-HERRÁ**, JOSÉ ÁNGEL RODRIGUEZ-GETINO*, JUAN BAUTISTA GARCIA-CASAS*, JORGE CIPRIANO DIAZ-SUAREZ*.

* Faculty of Medicine, University of Oviedo, Asturias, Spain.

** Hospital Universitario Central de Asturias, Oviedo (Asturias), Spain.

Abstract

The incidence of acute poisonings has increased in recent years and constitutes approximately 2% of the services provided by the Emergency Department currently.

The objective of this study is to describe the frequency and characteristics of the intoxications treated at the Central University Hospital of Asturias during 2015 from biochemical-analytical, epidemiological and medical-legal perspectives. We conducted a retrospective study and a descriptive analysis of the clinical and sociodemographic variables included in the acute intoxication (AI) protocol at the national level. This hospital treated 2,478 cases of acute poisoning, representing 2.3% of the emergencies treated and corresponding to an incidence of 764 cases/100,000 inhabitants/year with an age ranging from under 1 year to over 80 years. The average age of the patients was 43.6 ($SD = 16.6$) years. Of these patients, 59.4% were males with an average age of 44 ($SD = 16.8$) years, and women represented 43.1% with an average age of 42.8 ($SD = 16.5$) years. These intoxications have a frequency of 47.2% during the weekend, while 37.4% occur between June and September. Acute voluntary intoxication is the most frequent intentionality, corresponding to 83.2% of the cases. We must point out that the medical records register 16.8% of the cases as suicide attempts. Ethanol and benzodiazepines are the most commonly-used toxics. These intoxications are treated in the Emergency Department without requiring hospitalization and have a very low mortality rate.

Keywords: Acute intoxication; Epidemiology; Toxicology; Suicide attempt; Alcohol intoxication; Drug overdose.

Resumen

La incidencia de las intoxicaciones agudas ha aumentado en los últimos años, y actualmente constituye aproximadamente el 2% de las atenciones sanitarias llevadas a cabo por los Servicios de Urgencias.

El objetivo de este estudio es describir la frecuencia y características de las intoxicaciones atendidas en el Hospital Universitario Central de Asturias durante el año 2015 desde la perspectiva bioquímica-analítica, epidemiológica y médico-legal. Se realizó un estudio retrospectivo y un análisis descriptivo de las variables clínicas y sociodemográficas incluidas en el protocolo de intoxicación aguda a nivel nacional. Este hospital atendió 2478 casos de intoxicaciones agudas representando el 2,3% de las urgencias atendidas y que corresponde a una incidencia de 764 casos/100000 habitantes/año con un rango de edad de menores de 1 año a mayores de 80 años. La edad media de los pacientes atendidos fue de 43,6 ($DE = 16,6$) años. El 59,4% de los pacientes eran varones con una edad media de 44 ($DE = 16,8$) años, las mujeres representaban el 43,1% y su edad media era de 42,8 ($DE = 16,5$) años. El 47,2% de estas intoxicaciones ocurren durante el fin de semana y el 37,4% se dan entre junio y septiembre. La intencionalidad más frecuente es la intoxicación aguda voluntaria correspondiente al 83,2% de los casos. Cabe destacar que el 16,8% de los casos están referenciados en su historia clínica como intentos de suicidio. Los tóxicos más empleados son el etanol y las benzodiazepinas. Estas intoxicaciones son resueltas en el Servicio de Urgencias sin requerir ingreso hospitalario y poseen una tasa de mortalidad muy baja.

Palabras clave: Intoxicación aguda; Epidemiología; Toxicología; Intento suicidio; Intoxicación medicamentosa; Intoxicación alcohólica; Intoxicación por drogas abuso.

Received: September 2018; Accepted: June 2019.

Send correspondence to:

Ana Fernández Ibáñez. Faculty of Medicine. University of Oviedo. Av. Julián Clavería, s/n. 33006 Oviedo, Asturias.
E-mail: anafi16@hotmail.com.

Introduction

Intoxications are as ancient as humankind, and have since early days been present in the daily lives of people conditioned by their lifestyles, jobs, and leisure and recreational activities. Currently, the acquisition of these new toxic substances usually has a direct relationship with greater access to consumer goods (da Silva Moreira et al., 2010). Technology also fosters the emergence of toxic, synthetic, illegal substances of increasing purity that enable generating and promoting pathological consumption in society. In recent decades, an increase in the number of acute intoxications (AI) in Spain constitutes a potentially serious health problem (de Miguel-Bouzas et al., 2012).

These AI not only have medical implications in requiring health assistance, but also a series of economic, socio-cultural, demographic, psychological and legal problems. Therefore, resolving them becomes increasingly complex and the social problem entails large-scale repercussions (Caballero & Dorado, 1980; de la Fuente et al., 2006).

In this study on intoxications, it is important to know which toxics are involved, together with their specific clinical characteristics and antidotes or treatments (Caballero, Dorado & Alonso, 1981). These premises may serve as the basis for prevention programs and professional training and to provide both Hospital and Primary Care services with diagnostic and therapeutic supports for correctly implementing their assistance-related functions (Pastó Cardona, Martorell Puigserver, Mercadal Orfila, Machí Ribes & Jódar Massanès, 2007).

As we have mentioned above, AI represent a widespread social phenomenon themselves, given that the behaviour of toxic substance abusers causes diverse problems for the general population. Therefore, studies are necessary to define their epidemiology (Caballero, Gutiérrez & Dorado, 1987).

The design and methodology of epidemiological studies on AI published in the 80s and 90s worldwide were vastly different. As a result, it was practically impossible to compare their results or perform an evolutionary analysis (Camí, Frati & Martín, 1980; Duce Tello et al., 1998).

This trend has changed over recent decades. Multicentre studies have been implemented, including SEMESTOX and HISPATOX, two national studies carried out between 2003-2008, with the participation of the hospital Emergency Departments of different Autonomous Communities. This generated a global epidemiological vision of this pathology on a countrywide scale (Burillo-Putze et al., 2003; Burillo-Putze et al., 2008).

In addition to the characteristics and incidence of AI, it is also interesting to detect their evolution over time. To this end, some health departments have implemented a time series of epidemiological surveillance of AI (VEIA), updated regularly for validity purposes (Caballero Vallés et al., 2008; Dorado et al., 1992; Dorado, Martín, Sabugal & Caballero, 1996).

Most of the studies reviewed are from hospital Emergency Departments which is where these patients receive health assistance and treatment initially, although the first studies on AI within the hospital setting were carried out in Intensive Care units using treatment records (Amigo-Tadín, Nogué-Xarau & Miró-Andreu, 2010; Duce Tello et al., 1998; Henderson, Wright & Pond, 1993; Medina, Fuentes, Suárez, Arranz & Ochoa, 2008).

Shifting our focus to a more local scale, the Principality of Asturias has published a few isolated articles (Barraca de Ramos et al., 1991; González-Fernández & Alonso-Fernández, 2009; Rodríguez Getino & Hinojal Fonseca, 1994) that helped to reveal this Community's trend in terms of intoxications a few years ago, wherefore our goal is to study and compare updated results to the extent possible.

It is useful to explain that in AI, there usually exists an almost linear relationship between exposure to a substance, the analysis values detected in the biological samples and the emergence of symptoms and signs of illness (Borrell, et al., 2001; Carpintero Escudero et al., 2000).

The purpose of this study is to detect the frequency of AI treated in the Emergency Department of a tertiary hospital in Spain to determine their analytical and socioepidemiological characteristics and medical-legal repercussions.

Methods and materials

This descriptive retrospective study was performed in the Medical Laboratory of the Central University Hospital of Asturias, a tertiary centre that is a benchmark in this autonomous region, with 1,039 hospital beds and providing coverage to the 324,218 inhabitants of Health District IV.

This study data is based on a review of the results of the analyses carried out at the Medical Laboratory with the laboratory software (GestLab) between January 1 and December 31, 2015 to identify those patients whose analytical values of ethanol or substances of abuse exceeded the reference limit for AI. This diagnosis encompasses exposure to the toxic, together with the patient's clinical symptoms and/or analytical confirmation through a toxicology study (quantification of ethanol in blood and/or detection of substances in urine). Emergency Department medical staff request these analyses when doctors, at their discretion, consider complimentary tests necessary.

The reference limits are defined specifically for each substance. Ethanol is determined via an automated enzymatic technique, yielding a quantitative result that considers AI as of 10 mg/dL, although the initial clinical symptoms are noticeable with 40-50 mg/dL. Substances of abuse are those drugs that have a qualitative analysis only: a dichotomous positive or negative result is possible with a lateral flow immunochromatographic assay. A positive result means that the specific cut-off point for a given substance has been exceeded. In other words, the drug's concentration surpasses that value (**Table 1**).

Table 1. Cut-off values of the substances of abuse detected in the screening

Substance of abuse	Cut-off values
Amphetamine (AMP)	1000 ng/mL
Methamphetamine (MET)	1000 ng/mL
Barbiturate (BAR)	300 ng/mL
Methadone (MTD)	300 ng/mL
Cocaine (COC)	300 ng/mL
Ecstasy (MDMA)	500 ng/mL
Tricyclic antidepressants (TAC)	1000 ng/mL
Benzodiazepines (BZO)	300 ng/mL
Cannabis (THC)	50 ng/mL
Opioides (MOP)	300 ng/mL

Note. *Cut-off is the drug concentration value, above which the result is positive and when detection in the urine is possible with the corresponding analysis, in this case lateral flow immunochromatographic assay.

We performed a case-by-case review of the electronic medical records of the selected patients and completed a sheet to anonymize each record with an ad hoc code number (completely unrelated with the patient's medical record and identification) that included the study variables according to the patients' personal characteristics, intentionality, duration of abuse, substance used, therapeutic measures implemented and the medical-legal repercussions of the results. The Ethics Committee of the Principality of Asturias approved the study and the researcher, who also implemented the review, adhered to all of the mandatory confidentiality-related obligations.

AI in the Emergency Department was classified into two different groups, depending on the intentionality reported in the patient's medical records: voluntary AI, in which the patient voluntarily consumed alcohol or drugs in pursuit of psychoactive effects, and suicide attempts, in which the patient consumed the substance with the intention of committing suicide.

The IBM SPSS Statistics v21 package was used for the statistical analysis. The variables studied were described with the corresponding statistics, depending on variable type. The mean and standard deviation were used for quantitative variables and the proportion of the total for categorical variables.

Results

The cases were considered when the results of the analysis samples exceeded the defined reference limit. During that year, 4,586 cases of AI were treated, of which 2,478 received assistance at the Emergency Department, representing 2.3% of all of the hospital's emergencies in 2015. The remaining 2,108 cases correspond to AI treated and analysed as part of regular inpatient and outpatient assistance. Of these 2,478 cases treated in the Emergency Department, 5.3% (n = 131) correspond to patients that required medical assistance on two or more occasions during the same period. The incidence of intoxications attended to in the Emergency Department in relation to the total population of District IV is 764 cases/100,000 inhabitants/year with an age ranging from under 1 year to over 80 years. The mean age of the patients that received assistance was 43.6 (SD = 16.6) years. Of these patients, 59.4% were male (n = 1,411) with a mean age of 44 (SD = 16.8) years, while females (n = 1,067) represented 43.1% with a mean age of 42.8 (SD = 16.5) years (Figure 1).

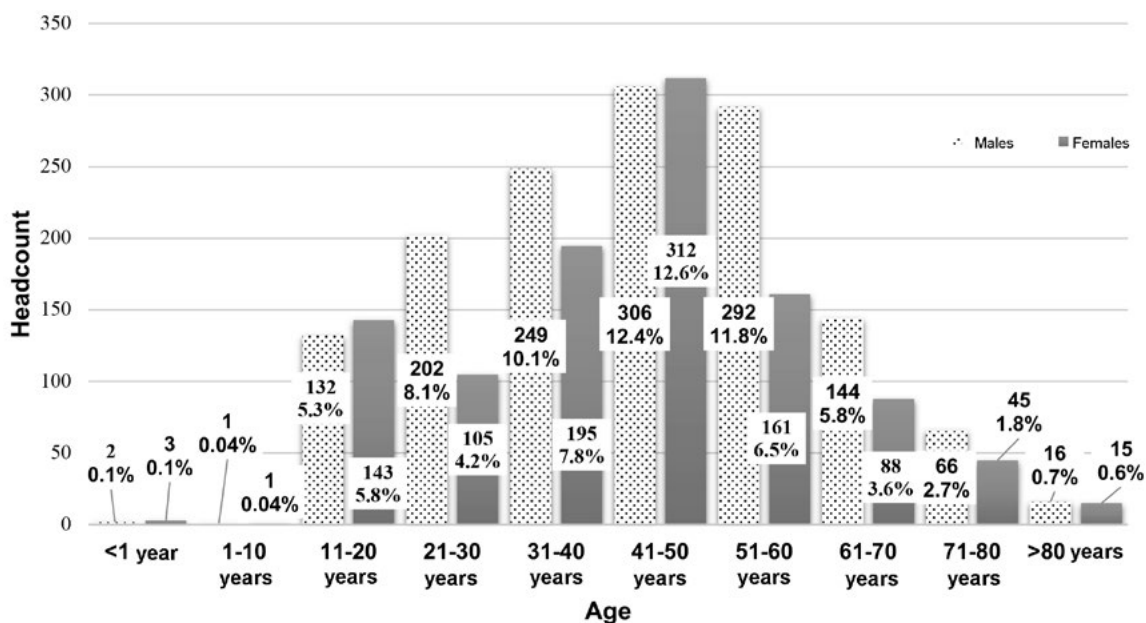
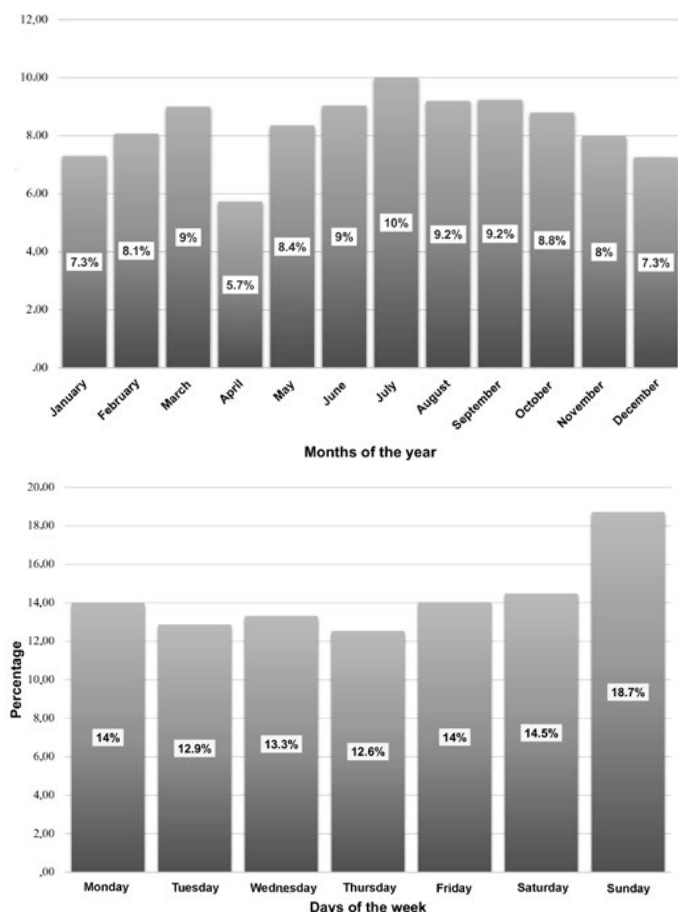


Figure 1. Distribution of AI by age and gender



Figures 2A and 2B. Distribution of AI by Emergency Department admission date

As to the diverse age groups, the ages between 41- 60 years represent 43.2% (n = 1,070) of Emergency Department patients. The most frequent age group of females was 31-50 years, representing 47.4% (n = 506), whereas the most frequent age group of males was 41- 60 years (42.3%; n = 597), with the same proportion in terms of total AI treated in the Emergency Department.

Intoxications by substances of abuse treated in the Emergency Department have a frequency of 47.2% (n = 1,170) on weekends: Friday-Sunday and 37.4% (n = 929) occur in summer: June-September (Figures 2A, 2B).

The most frequent intentionality of patients in terms of substances of abuse treated in the Emergency Department (n = 2,478) is voluntary AI (n = 2,061), corresponding to 83.2% of the cases. We must highlight the presence of 16.8% (n = 417) referenced as suicide attempts via AI with drugs, mainly benzodiazepines or other means, like hanging or lesions caused by knife wounds.

A background of psychiatric pathology (as per the DSM-V classification of 2013, including all behaviours and noticeable clinical symptoms) was present in 52.8% (n = 1,309) of all cases treated in the Emergency Department. The main pathologies were addiction disorders and substance use (n = 297; 22.7%), anxiety disorders (n = 228; 17.4%) and depression (n = 213; 16.2%).

Three groups are differentiated according to the positive toxicology analyses results of patients with presumed AI, treated in the Emergency Department. Of these, 34.6% (n = 856) had ethanol in blood, 52.4% (n = 1,298) had a qualitative screening of substances of abuse in urine, and 13% (n = 324) presented AI with ethanol and substances of abuse in urine.

When performing a joint analysis of the first and third group (n = 1,180), the most frequent range of qualitative ethanol values exceeded 100 mg/dL (n = 910), corresponding to patients with signs and symptoms of a depressed central nervous system. We must mention that in cases of drug-ethanol combinations, ethanol concentration is used as the reference value, based on the assumption of a positive screening.

Furthermore, we must highlight that 33.7% (n = 836) of all intoxicated patients treated in the Emergency Department had positive values in the qualitative screening of benzodiazepines in urine.

When analysing the toxics used in AI according to intentionality, 53.5% (n = 223) of the patients who visit the Emergency Department as a result of suicide attempts presented AI with benzodiazepines. To the contrary, 39.6% (n = 816) of the voluntary intoxications (n = 2,061) detected the use of ethanol (Table 2).

The concomitant clinical symptoms reported in the medical records of intoxicated patients treated in the Emergency Department were: 34.3% (n = 208) traumatology-related injuries (lesions, fractures, head trauma, contusions), which despite not directly resulting of intoxications seem to be associated with these, given the accidents and falls these patients frequently suffer. Of the cases, 27.4% (n = 166) showed neurological clinical symptoms (dizziness, unsteadiness of gait, decreased level of consciousness). There was a lower frequency of cardiology-related (palpitations, fainting) and digestion-related symptoms (nausea, vomiting).

The Emergency Department treated 38% of the AIs (n = 942), and the patients were discharged a few hours after their arrival or kept under observation. Of these, 19.7% (n = 489) required hospitalisation and 16.1% (n = 399) required follow-up by the Mental Health Centre on the grounds of this acute episode, due neither to psychiatric comorbidities nor addiction disorders. One male died during our study (mortality rate of 0.1%) as a result of a suicide attempt by intoxication with substances of abuse. This male, addicted to several drugs (user of several types of narcotics, substances or drugs) and with a history of psychiatric pathology was brought to the Emergency Department in a mobile ICU from prison, hardly conscious and with septic shock of unknown aetiology. The patient was hospitalised in the ICU, where he passed away.

Therapeutic measures were used in 4.8% of the intoxications treated in the Emergency Department (n = 120), with 68.3% of the patients (n = 82) requiring treatment

Table 2. Individual and combined toxics detected in the different AI types treated in the Emergency Department.

Substance of abuse	Suicide attempt	Voluntary intoxication	Total
Ethanol	40 (9.6%)	816 (39.6%)	856 (34.5%)
Amphetamines (screening)	1 (0.2%)	0 (0%)	1 (0.1%)
Tricyclic antidepressants (screening)	3 (0.7%)	10 (0.5%)	13 (0.5%)
Barbiturates (screening)	0 (0%)	3 (0.2%)	3 (0.1%)
Benzodiazepines (screening)	223 (53.4%)	613 (29.7%)	836 (33.7%)
Cannabis (screening)	7 (1.7%)	89 (4.3%)	96 (3.8%)
Cocaine (screening)	4 (1%)	12 (0.6%)	16 (0.6%)
Methadone (screening)	0 (0%)	5 (0.2%)	5 (0.2%)
Opioids (screening)	1 (0.2%)	9 (0.4%)	10 (0.4%)
Methamphetamines (screening)	0 (0%)	1 (0.1%)	1 (0.1%)
Prescribed drug + illegal drug	35 (8.4%)	132 (6.4%)	167 (6.7%)
Prescribed drug + several drugs	10 (2.4%)	51 (2.5%)	61 (2.5%)
Several prescribed drugs	15 (3.6%)	41 (2%)	56 (2.3%)
Several prescribed drugs + illegal drug	1 (0.2%)	10 (0.5%)	11 (0.4%)
Several prescribed drugs + several drugs	2 (0.5%)	2 (0.1%)	4 (0.2%)
Several drugs	1 (0.2%)	17 (0.8%)	18 (0.7%)
Alcohol + prescribed drug	57 (13.7%)	116 (5.6%)	173 (7%)
Alcohol + several prescribed drugs	2 (0.5%)	1 (1%)	3 (0.1%)
Alcohol + illegal drug	5 (1.2%)	64 (3.1%)	69 (2.8%)
Alcohol + several drugs	0 (0%)	15 (0.7%)	15 (0.6%)
Alcohol + prescribed drug + illegal drug	8 (1.9%)	39 (1.9%)	47 (1.9%)
Alcohol + prescribed drug + several drugs	2 (0.5%)	15 (0.7%)	17 (0.7%)
Total	417	2061	2478

with drugs. Flumazenil was used in 41 cases of AI caused by benzodiazepines, Naloxone in eight intoxications with opioids, a combination of Flumazenil and Naloxone in 19 patients with several drug addictions, and Thiamine (Vita-

min B1) with Pyridoxine (Vitamin B6) in 14 alcohol poisonings. In 31.7% of the cases (n = 38), a gastric lavage with activated charcoal with/without perfusion of Flumazenil was also necessary (Figure 3).

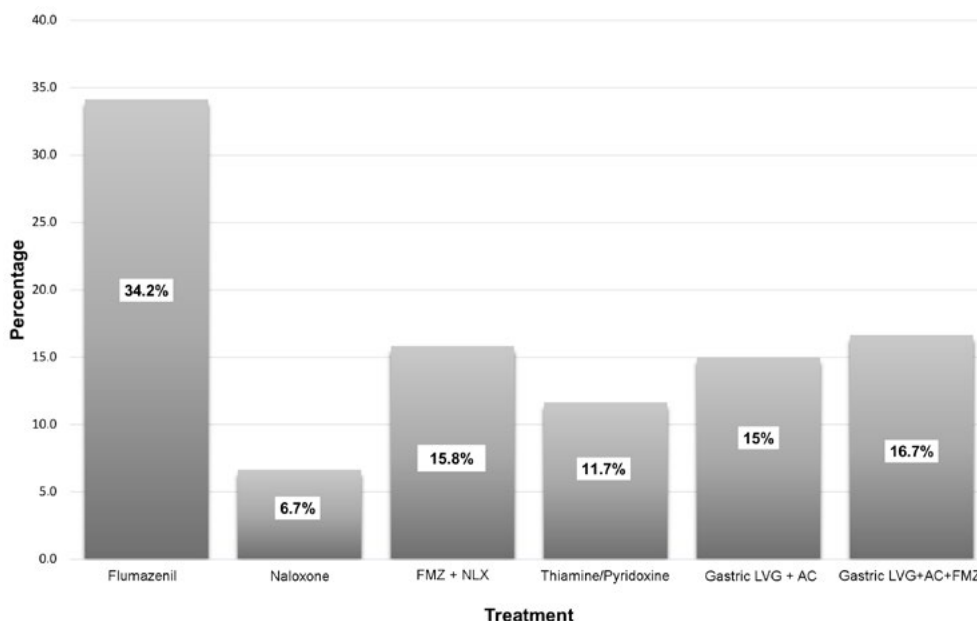


Figure 3. Treatment used in the Emergency Department by resolution of the AI.

Only 0.8% (n = 19) of these positive toxicology results for different intoxications due to substance abuse are subsequently used as samples in judicial processes, therefore having medical-legal implications.

Discussion

The results of our study detect 2,478 intoxications by substances of abuse, mainly ethanol and benzodiazepines, treated in the Emergency Department. In sociodemographic terms, the former corresponds to males with ages between 41-60 years and the latter to women in their 30s or 40s. In terms of medical-legal repercussions of AI, only 0.8% of the positive toxicology results were required for judicial proceedings.

The Central University Hospital of Asturias is the benchmark centre of the Autonomous Community and provides healthcare to a population of 324,218 inhabitants, distributed across 20 councils of District IV, including Oviedo. These figures usually increase due to the approximately 3,000 patients from other districts, wherefore some intoxications that do not require emergency hospital treatment are referred to Primary Care Facilities.

The incidence of AI of this study, 764 cases/100,000 inhabitants/year, considerably exceeds the figures published previously in similar studies implemented in Spain. This result is coherent with the observed increase of AI over recent decades (Caballero, Dorado, Brusint, Jerez & Medina, 1999; Caballero Vallés et al., 2004; Dorado et al., 1992 & Dorado et al., 1996).

The 44-year mean age of the intoxicated patients was quite higher than that obtained by other authors (Fernández-Egido, García-Herrero, Romero-García & Marquina-Santos, 2008; García-Baró et al., 2005), suggesting that perhaps increasingly older individuals are habitual consumers of toxics.

We must point out that 2.9% of the AI with ethanol occurred in adolescents (ages 14-15 years), a figure quite lower to the 8.2% corresponding to the alcohol use level in Spain for the same age range (Bousoño et al., 2019), coherent with some authors' claim of a direct relationship between users' habitual consumption of toxic substances and higher availability of economic resources (Díaz Geada, Busto Miramontes & Caamaño Isorna, 2018).

The distribution of AI by gender confirms predominant use by males, in our study corresponding to 59.4%, as occurs in most studies published in Spain and abroad alike (Clemente Rodríguez et al., 2010; da Silva Moreira et al., 2010; Fernández et al., 2003; Ferrer et al., 2005).

There is a major increase of voluntary AI on weekends (Friday-Sunday), corresponding to 47.2%, and 37.4% during summer vacation (mainly June-September) possibly as a result of an increase in recreational activities. Many authors highlight an association between the use of sub-

stances of abuse and leisure time (Burillo-Putze et al., 2003; Echarte et al., 2005).

The percentage of suicide attempts (16.8%) is similar to other published studies, and mainly corresponds to drug-related AI involving benzodiazepines (Lambert, Manel, Bellou & el Kouch, 1997; Riquelme Rodríguez, Burillo-Putze, Jiménez Sosa & Hardisson De La Torre, 2001). Compared with the rest of Spain, this Autonomous Community has a high suicide rate (National Statistics Institute, 2016), but with the methods of hanging and jumping from heights (Iglesias García & Álvarez Riesgo, 1999). Published medical studies (Borrell et al., 2001; Fernández González, Sáiz Martínez, González G-Portilla, González Seijo & Bobes García, 2000; Jimenez-Trevino et al., 2012) show that suicide attempts (n = 417) are more frequent in women (n = 252; 60%) between the ages of 41-50 years (n = 135; 32.2%). The Principality of Asturias has designed a protocol for detecting and addressing cases of persons at risk of suicide as a preventive measure (Ministry of Health and Health Services of the Principality of Asturias, 2018).

In our study, 47.6% of the cases of intoxication involved ethanol, whether alone or combined with other drugs. Over the last 20 years, ethanol has always been considered the toxic involved in most AIs (de las Cuevas, Sanz, de la Fuente, Cabrera & Mateos, 1999; García del Pozo et al., 2004). The second substance was benzodiazepines, a medication that despite requiring a medical prescription is quite accessible by the population, present in isolation in 33.7% of the AIs (Bugarin, Galego, Gude, García & Galban, 2000; Carpintero Escudero et al., 2000; Fernández, Sertral, Bermejo & Taberero, 2005).

At the Emergency Department, some of these patients (n = 606) presented a concomitant injury, many times accidental and other times intentional, including traumatic brain injury (TBI) with/without lesions and post-traumatic headaches (n = 208; 34.3%) and neurological pathology (n = 166; 27.4%) which do not differ from those found in other similar studies with the Spanish population (Medina et al., 2008; Pascual Catalán, Fuentes Solsona, Castellano Arroyo, Ferrer Dufol & López Lancis, 1992; Pinillos, Grijalba & Alfaro, 2003).

Improvements in techniques for analytical determination of drugs has fostered an increase in complementary examinations of patients and the obtention of more reliable results than in the past. Of our patients, 34.6% had their blood analysed for ethanol, 52.4% underwent a qualitative screening of substances in urine, and 13% experienced both. With these facts, we must mention that the quantitative results via the automated enzymatic technique analyses exceeding 100 mg/dL (36.7%) were most frequently detected in patients with AI with ethanol who showed clinical signs and symptoms of a depressed central nervous system, like lethargy and delayed reflexes (Aragón, Miquel, Correa & Sanchis-Segura, 2002; Bajo Bajo et al., 1999).

Therapeutic measures were used in 4.8% of the intoxications treated (n = 120). Treatment with drugs was necessary for 68.3% of the patients. Flumazenil was used in 41 cases of AI with benzodiazepines, Naloxone in eight intoxications with opioids, a combination of Flumazenil and Naloxone in 19 patients with several drug addictions, and Thiamine (Vitamin B1) with Pyridoxine (Vitamin B6) in 14 alcohol poisonings. In 31.7% of the cases (n = 38), a gastric lavage with activated charcoal with/without perfusion of Flumazenil was also necessary, following current recommendations (Benson et al., 2013; Burillo-Putze et al., 2003; Chyka et al., 2005).

The most frequent end actions of the Emergency Department (n = 2,478) were home-based observation/discharge (n = 942; 38%), hospitalisation (n = 489; 19.7%) whether in the ICU or not depending on the aetiology of the AI and, finally, follow-up by the Mental Health Centre (n = 399; 16.1%) given that 52.8% of the patients treated (n = 1309) had a prior background of psychiatric pathology. There was only one case of exitus as a result of intoxication with several substances. The percentage of hospitalisation is lower than that observed in other studies (Hermida, Fernández, Ferrer, Bermejo & Taberero, 2003).

As regards the judicial-legal complications applicable in cases of AI, 19 cases were associated with crimes against road safety stipulated in Act 6/2014 dated 7 April, of which 84.2% (n = 16) had a blood alcohol concentration above 0.5g/L, entailing fines of €500 and the reduction of 4 points from the driver's license.

Conclusions

The incidence rate of our study is higher than that published previously, according to the last 20-year trend. The percentage of intoxicated males who are taken to the Emergency Department for treatment is approximately 60%, similar to the figure of previous studies.

Likewise, the tendency of AI to occur on weekends and during summer vacation (June-September) is the same in our study. The number of suicide attempts, corresponding to 16.8% of the patients taken to the Emergency Department for urgent treatment, is similar to previous findings. The most-frequently used toxic is ethanol, in line with the trend of recent decades, followed by benzodiazepines, despite requiring a medical prescription. The quantitative results of the toxicology analyses implemented as complementary tests showed that 36.7% of the intoxications with ethanol had values in the blood exceeding 100 mg/dL, with symptoms of a depressed central nervous system.

Patients mostly had accidental head trauma of the head and neck, followed by neurological pathology. Of the patients, 54.1% were treated in the Emergency Department and discharged with either home-based observation/discharge or follow-up at the Mental Health Centre, without

requiring hospitalisation. The mortality of 0.1% was quite lower than that of recent publications.

Ethical issues

Legislation in effect on clinical research as established in the Declaration of Helsinki, the Convention for the protection of Human Rights and Dignity of the Human Being with regard to the Application of Biology and Medicine: Convention on Human Rights and Biomedicine of the European Council, and the Universal Declaration of Human Rights of the UNESCO, were all taken into account during this study. Likewise, our study complied with the requirements set forth in Spanish Act 14/2007 of July, on Biomedical Research, the protection of personal data and bioethics, and other related legislative requirements. The study was approved by the Clinical Research Ethics Committee of the Central University Hospital of Asturias (HUCA).

Acknowledgements

The authors wish to thank the Emergency Department of the Hospital Universitario Central de Asturias collaborator in this study.

Conflict of interests

The authors declare the inexistence of conflicts of interest.

References

- Act 6/2014, dated 7 April, modifying the articulated text of the Act on Traffic, Motor Vehicle Circulation and Road Safety (Ley sobre Tráfico, Circulación de Vehículos a Motor y Seguridad Vial), approved by Legislative Royal Decree 339/1990, dated 2 March. *Boletín Oficial del Estado (BOE)*, 85, de 8 de abril de 2014, 29508-29528.
- Amigo-Tadín, M., Nogué-Xarau, S. & Miró-Andreu, O. (2010). Presentación clínica, actitud terapéutica y evolución de las intoxicaciones agudas tratadas con carbón activado: ¿existen diferencias entre hombres y mujeres? *Enfermería Clínica*, 20, 273. doi:10.1016/j.enfcli.2010.06.003.
- Aragón, C., Miquel, M., Correa, M. & Sanchis-Segura, C. (2002). Alcohol y metabolismo humano. *Adicciones*, 14 (Supl. 1), 23-42. doi:10.20882/adicciones.541.
- Bajo Bajo, A., Santos Pérez, M. E., Sanz Ortega, F., Zapico Álvarez, N., Okatsu, K. T., García Pérez, A. & Borrás Beato, R. (1999). Estudio epidemiológico sobre intoxicaciones agudas y dotación de botiquines de antidotos. *Anales de Medicina Interna*, 16, 285-289.

- Barraca de Ramos, R., Alonso Calo, L., Del Busto Prado, F., Ibarra Peláez, A., Menéndez Fernández, J. & Álvarez García, A. J. (1991). Aproximación epidemiológica a las intoxicaciones agudas en Asturias. *Revista de Sanidad e Higiene Pública*, 65, 53-60.
- Benson, B. E., Hoppu, K., Troutman, W. G., Bedry, R., Erdman, A., Höjer, J.,... European Association of Poisons Centers and Clinical Toxicologists. (2013). Position paper update: gastric lavage for gastrointestinal decontamination. *Clinical Toxicology*, 51, 140-146. doi:10.3109/15563650.2013.770154.
- Borrell, C., Pasarin, M. I., Cirera, E., Klutke, P., Pipitone, E. & Plasència, A. (2001). Trends in young adult mortality in three european cities: Barcelona, Bologne and Munich, 1986-1995. *Journal of Epidemiology and Community Health*, 55, 577-582. doi:10.1136/jech.55.8.577.
- Bousoño, M., Al-Halabí, S., Burón, P., Garrido, M., Díaz-Mesa, E. M., Galván, G.,... Bobes, J. (2019). Predictive factors of alcohol consumption in adolescents: data from 1-year follow-up prospective study. *Adicciones*, 31, 52-63. doi:10.20882/adicciones.998.
- Bugarin, R., Galego, P., Gude, F., García, A. & Galban, C. (2000). Estudio de intoxicaciones etílicas agudas en un servicio de urgencias. *Anales de Medicina Interna*, 17, 588-591.
- Burillo-Putze, G., Munne, P., Dueñas, A., Pinillos, M. A., Naveiro, J. M., Cobo, J.,... the Clinical Toxicology Working Group, Spanish Society of Emergency Medicine (SEMESTOX). (2003). National multicentre study of acute intoxication in emergency departments of Spain. *European Journal of Emergency Medicine*, 10, 101-104. doi: 10.1097/00063110-200306000-00006.
- Burillo-Putze, G., Munné Mas, P., Dueñas Laita, A., Trujillo Martín, M. M., Jiménez Sosa, A., Adrián Martín, M. J.,... Investigadores del Estudio HISPATOX. (2008). Intoxicaciones agudas: perfil epidemiológico y clínico, y análisis de las técnicas de descontaminación digestiva utilizadas en los servicios de urgencias españoles en el año 2006 – Estudio HISPATOX-. *Emergencias*, 20, 15-26.
- Caballero, P. J. & Dorado, M. S. (1980). Factores epidemiológicos de la intoxicación. *Medicine*, 59, 3691-3699.
- Caballero, P. J., Dorado, M. S. & Alonso, F. (1981). Intoxicación aguda: Estudio de 673 casos. *Medicina Clínica*, 77, 139-145.
- Caballero, P. J., Dorado, M. S., Brusint, B., Jerez, B. & Medina, M. (1999). Vigilancia epidemiológica de la intoxicación aguda 1997 (Estudio de 1.140 casos del área sur de la Comunidad de Madrid). *Revista Clínica Española*, 199, 424-430.
- Caballero, P. J., Gutiérrez, F. & Dorado, M. S. (1987). Epidemiología de la intoxicación aguda: Estudio comparativo 1979-1985 en el área sur de la Comunidad Autónoma de Madrid. *Revista Clínica Española*, 181, 334-339.
- Caballero Vallés, P. J., Dorado Pombo, S., Díaz Brasero, A., García Gil, M. E., Yubero Salgado, L., Torres Pacho, N.,... Cantero Bengoechea, J. (2008). Vigilancia epidemiológica de la intoxicación aguda en el área sur de la Comunidad de Madrid: estudio VEIA 2004. *Anales de Medicina Interna*, 25, 262-268. doi:10.4321/S0212-71992008000600003.
- Camí, J., Frati, M. & Martín, M. L. (1980). Intoxicación aguda en Barcelona. Epidemiología y consideraciones sobre su terapéutica. *Medicina Clínica*, 75, 287-291.
- Carpintero Escudero, J. M., Ochoa Gómez, F. J., Ruiz Aspiazu, J. I., Bragado Blas, L., Palacios Marín, G., Ramalle-Gómara, E.,... Grupo de Toxicología de SEMES-La Rioja (2000). Prevalencia de las intoxicaciones agudas en Urgencias de La Rioja. *Emergencias*, 12, 92-97.
- Chyka, P. A., Seger, D., Krenzelok, E. P., Vale, J. A., American Academy of Clinical Toxicology & European Association of Poisons Centres and Clinical Toxicologists. (2005). Position paper: Single-dose activated charcoal. *Clinical Toxicology*, 43, 61-87.
- Clemente Rodríguez, C., Echarte Pazos, J. L., Aguirre Tejedro, A., Puente Palacios, I., Iglesias Lepine, M. L. & Supervía Caparrós, A. (2010). Diferencias entre hombres y mujeres en las características de las intoxicaciones. *Emergencias*, 22, 435-440.
- da Silva Moreira, C., Rezende Barbosa, N., Alves Vieira, R. C. P., Carvalho, M. R., Marangon, P. B., Carneiro Santos, P. L. & Teixeira Júnior, M. L. (2010). Análise retrospectiva das intoxicações admitidas no hospital universitario da UFJF no período 2000-2004. *Ciencia & Saúde Coletiva*, 15, 879-888. doi:10.1590/S1413-8123201000030003.
- de la Fuente, L., Brugal, M. T., Domingo-Salvany, A., Bravo, M. J., Neira-León, M. & Barrio, G. (2006). Más de treinta años de drogas ilegales en España: una amarga historia con algunos consejos para el futuro. *Revista Española de Salud Pública*, 80, 505-520.
- de las Cuevas, C., Sanz, E. J., de la Fuente, J., Cabrera, C. & Mateos, A. (1999). Prescribable daily doses and risk factors associated with the use of benzodiazepines in primary care. *Pharmacoepidemiology and Drug Safety*, 8, 207-216. doi:10.1002/(SICI)1099-1557(199905/06)8:3<207::AID-PDS421>3.0.CO;2-1.
- de Miguel-Bouzas, J. C., Castro-Tubío, E., Bermejo-Barreira, A. M., Fernández-Gómez, P., Estévez-Núñez, J. C. & Tabernero-Duque, M. J. (2012). Estudio epidemiológico de las intoxicaciones agudas atendidas en un hospital gallego entre 2005 y 2008. *Adicciones*, 24, 239-246. doi:10.20882/adicciones.95.
- Díaz Geadá, A., Busto Miramontes, A. & Caamaño Isorna, F. (2018). Consumo de alcohol, tabaco y cannabis en adolescentes de una población multicultural (Burela, Lugo). *Adicciones*, 30, 264-270. doi:10.20882/adicciones.915.

- Dorado, M. S., Álvarez, R., Caballero, P. J., Medina, J., Casanova, C. & Granada, J. A. (1992). Epidemiología de la intoxicación aguda: Estudio de 815 casos habidos en 1990 en el área sur de la Comunidad de Madrid. *Revista Clínica Española*, 191, 131-136.
- Dorado, M. S., Martín, J., Sabugal, G. & Caballero, P. J. (1996). Epidemiología de la intoxicación aguda: estudio de 613 casos habidos en 1994 en el área sur de la Comunidad de Madrid. *Revista Clínica Española*, 196, 150-156.
- Duce Tello, S., López Martínez, E., Navas Serrano, V., Piqueras Villaidea, M., Jara Peñacoba, M., Servián Carroquino, R.,... Abril García, A. (1998). Intoxicaciones medicamentosas voluntarias atendidas en un Servicio de Urgencias. *Emergencias*, 10, 225-233.
- Echarte, J. L., Iglesias, M. L., Hernández, E., García, L., Orriols, M., Villar, J.,... Skaf, E. (2005). Registro de las intoxicaciones agudas en un Servicio de Urgencias hospitalario. *Revista de Toxicología*, 22, 116.
- Fernández, P., Ortega, M., Bermejo, A. M., Tabertero, M. J., López-Rivadulla, M. & Concheiro, M. E. (2003). Intoxicaciones agudas en Santiago de Compostela en un período de cuatro años. *Revista de Toxicología*, 20, 216-220.
- Fernández, P., Sertral, R., Bermejo, A. M. & Tabertero, M. J. (2005). Intoxicaciones agudas por psicofármacos y drogas de abuso en Pontevedra durante el año 2001. *Revista de Toxicología*, 22, 37-40.
- Fernández-Egido, C., García-Herrero, G., Romero-García, R. & Marquina-Santos, A. J. (2008). Intoxicaciones agudas en las urgencias extrahospitalarias. *Emergencias*, 20, 328-331.
- Fernández González, C., Sáiz Martínez, P. A., González G-Portilla, M. P., González Seijo, J. C. & Bobes García, J. (2000). Tentativa suicida versus intención suicida: un estudio de las características diferenciales. *Actas Españolas de Psiquiatría*, 28, 224-230.
- Ferrer, A., Royo, R., Rivas, M., Menao, S., Moreno, M. & Civeira, E. (2005). Perfil de las intoxicaciones agudas en el Servicio de Urgencias del Hospital Clínico de Zaragoza. *Toxicología*, 22, 121.
- García-Baró, M., Lasarte-Turumbay, L., Prieto-Ferrer, M., Montiel, J. A., Lloret, J. & Marruecos, L. (2005). Intoxicaciones agudas del adulto. Epidemiología en un Servicio de Urgencias. *Toxicología*, 22, 119-120.
- García del Pozo, J., de Abajo Iglesias, F. J., Carvajal García-Pando, A., Montero Corominas, D., Madurga Sanz, M. & García del Pozo, V. (2004). Utilización de ansiolíticos e hipnóticos en España (1995-2002). *Revista Española de Salud Pública*, 78, 379-387.
- González-Fernández, D. & Alonso-Fernández, M. (2009). Intoxicaciones agudas en un Servicio de Urgencias. Estudio descriptivo en el Área Sanitaria III de Asturias. *Revista de Toxicología*, 26, 122-127.
- Henderson, A., Wright, M. & Pond, S. M. (1993). Experience with 732 acute overdose patients admitted to an intensive care unit over six years. *Medical Journal of Australia*, 158, 28-30.
- Hermida, I., Fernández, P., Ferrer, A., Bermejo, A. M. & Tabertero, M. J. (2003). Perfil psicosocial de pacientes ingresados por intoxicación aguda voluntaria. *Revista de Toxicología*, 20, 33-37.
- Iglesias García, C. & Álvarez Riesgo, J. A. (1999). Un estudio del suicidio en Asturias: incremento de la frecuencia en las dos últimas décadas. *Actas Españolas de Psiquiatría*, 27, 217-222.
- Jimenez-Trevino, L., Saiz, P. A., Corcoran, P., Garcia-Portilla, M. P., Buron, P., Garrido, M.,... Bobes, J. (2012). The incidence of hospital-treated attempted suicide in Oviedo, Spain. *Crisis*, 33, 46-53. doi:10.1027/0227-5910/a000094.
- Lambert, H., Manel, J., Bellou, A. & el Kouch, S. (1997). Morbidity and mortality from acute drug poisoning in France. *La Revue du Practicien*, 47, 716-720.
- Medina, L., Fuentes, M. E., Suárez, J. P., Arranz, M. I. & Ochoa, E. (2008). Epidemiología de las intoxicaciones medicamentosas durante un año en el Hospital Universitario Ramón y Cajal. *Revista Clínica Española*, 208, 432-436. doi:10.1157/13127603.
- Ministry of Health and Health Services of the Principality of Asturias. (2018). *Protocolo de detección y manejo de caso en personas con riesgo de suicidio*. Asturias: Unidad de Coordinación del Programa Marco de Salud Mental - SESPA. Retrieved at <https://www.astursalud.es/documents/31867/225127/PROTOCOLO+SUICIDIO+def.pdf/48775c44-b688-961e-be16-f81511d4eba2>.
- National Statistics Institute. (2016). Estadística del suicidio en España 2015. Retrieved at <http://www.ine.es/jaxi/tabla.do?type=pcaxis&path=/t15/p417/a2014/10/&file=06004.px>.
- Pascual Catalán, A., Fuentes Solsona, F., Castellano Arroyo, M., Ferrer Dufol, A. & López Lancis, A. (1992). Estudio epidemiológico de las intoxicaciones agudas en la población de Zaragoza. *Anales de Medicina Interna*, 9, 381-385.
- Pastó Cardona, L., Martorell Puigserver, C., Mercadal Orfila, G., Machí Ribes, J. J. & Jódar Massanès, R. (2007). Intoxicaciones agudas en el servicio de urgencias de un hospital universitario de nivel III: cambios producidos en los últimos 10 años. *Revista de Toxicología*, 24, 36-41.
- Pinillos, M. A., Grijalba, A. & Alfaro, J. (2003). Situación de las intoxicaciones en Navarra. *Anales del Sistema Sanitario de Navarra*, 26 (Supl. 1), 7-19.
- Riquelme Rodríguez, A., Burillo-Putze, G., Jiménez Sosa, A. & Hardisson De La Torre, A. (2001). Epidemiología global de la intoxicación aguda en un área de salud. *Atención Primaria*, 28, 506-509.

Rodríguez Getino, J. A. & Hinojal Fonseca, R. (1994). Intoxicaciones agudas: estudio epidemiológico retrospectivo en un Área Asturiana (1985-1989). *Revista de Toxicología*, 11, 99-104.