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## Poisoning cause analysis among patients hospitalized in an emergency department

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**Key words:** poisoning, alcohol, anti-epileptic medications, sedative-hypnotic medications, narcotics, emergency department

### Abstract

Consequences of using psychoactive substances are always negative. They cause not only physical and mental dependence, but also huge damage in the body in case of poisoning. The toxicity of these substances varies and depends on the type of chemical compound. The effects can be difficult to predict and often can pose a direct threat to life and health.

The objective of this study was to analyse the causes and consequences of poisoning with psychoactive substances among patients hospitalized in the Emergency Department of Stefan Kardynał Wyszyński Province Specialist Hospital in Lublin within the period of one year (01.01.2016 - 31.12.2016).

Our own study results showed that men and people living in urban areas were the patients most frequently admitted to the Emergency Department due to poisoning. Alcohol was the most common psychoactive substance used by the patients in the study group. Poisoning with anti-epileptic, sedative-hypnotic and psychotropic medications predominated among women, whereas alcohol and narcotics and psychodysleptic medications were the most frequent cause of poisoning among men.

## **Background**

Poisoning along with cardiovascular diseases and injuries are the most common cause of death among adults in the world, including Poland. There is a steady increase in the number of patients suffering from psychotic disorders and addicted to alcohol and/or psychoactive substances. According to the statistics presented in the report of the Chief Sanitary Inspector, a total of 4369 cases of medical interventions related to poisoning or suspected poisoning with new psychoactive substances were reported in 2016. The highest number of such cases was recorded in Lodz Voivodship (1441 cases), Silesian Voivodship (987 cases) and Greater Poland Voivodship (324 cases), which constituted over 62% of all cases recorded annually in the country. The patients were mainly people aged 19-24 (31.5%) and men (87.8%) [1, 2].

Co-occurrence of a disorder resulting from the use of psychoactive substances and other mental disorders in the same person is called co-morbidity or a double diagnosis. A large percentage of all suicides are committed under the influence of psychoactive substances and the weakening of motor skills of drivers due to the consumption of alcohol or other psychoactive substances contributes to more than a half of deaths in traffic accidents. The spread of blood transmitted diseases, including HIV/AIDS and hepatitis, is largely the result of intravenous drug use. It is obvious that the phenomenon of drug abuse has negative consequences for the user as well as the closest environment and disrupts the proper functioning of the whole society by causing numerous damages and generating costs [1, 3, 4, 5].

## **Study objective**

The objective of this study was to analyse the causes of poisoning among patients hospitalized in the Emergency Department of Stefan Kardynał Wyszyński Province Specialist Hospital in Lublin.

## **Material and method**

The study was conducted using the analysis of the medical records maintained in the Emergency Department of Stefan Kardynał Wyszyński Province Specialist Hospital in Lublin. Patients who were admitted to the Emergency Department due to poisoning with psychoactive substances were selected for the study. The study covered the period of one year (01.01.2016 - 31.12.2016). 904 patients hospitalized in the Emergency Department were included in the final analysis. For the purposes of this study the following data was extracted from the medical records: gender and age of patients, place of residence of patients, time of admission and hospitalization in the Emergency Department, vitals of the patient, namely arterial blood pressure, saturation, and heart rate.

Data obtained from medical records were collected in the Microsoft Excel database of MS Office 2010 for Windows 7. Statistical analysis of the obtained results was performed by means of STATISTICA version 12 (StatSoft, Polska). In the description of quantitative data, classical position measurements were used: arithmetic mean, median, standard deviation, minimum, maximum, upper quartile, and lower quartile. Size and percentage were used to describe the qualitative data. Chi-squared test was used to assess the significant differences between the analysed qualitative variables, while non-parametric Kruskal-Wallis test was used to assess the differences between more than two groups. The value of  $p < 0.05$  was statistically significant.

## Results

In the study material, the patients most frequently admitted to the Emergency Department were men, who made up nearly two-thirds of all cases (65.80%), people living in urban areas (70.7%), and in rural areas (29.3%). The study group was diverse in respect of age. The largest group were patients aged 20-29, and the mean age for the entire study group was 36 years.

Most of the patients were admitted to the Emergency Department between 18:00 and 23:59 (39.4 %). The most common cause of poisoning among the analysed group of patients was alcohol (27.4%). The vast majority of patients were discharged after being treated in the Emergency Department (72.3%) (see Table 1).

**Table 1.** The characteristics of the analysed group of patients

<b>Patient characteristics</b>	
<b>Gender - <i>n</i> (%)</b>	
Female	309 (34.2)
Male	595 (65.8)
<b>Place of residence <i>n</i> (%)</b>	
City	639 (70.7)
Village	265 (29.3)
<b>Age <i>n</i> (%)</b>	
≤ 19 years old	112 (12.4)
20 – 29 years old	265 (29.3)
30 – 39 years old	209 (23.1)
40 – 49 years old	134 (14.8)
50 – 59 years old	95 (10.5)
60 and older	89 (9.9)
<b>Age <i>M</i> (<i>SD</i>)</b>	36 (15)
<b>Time of admission <i>n</i> (%)</b>	
00:00 – 05:59	158 (17.5)
06:00 – 11:59	114 (12.6)
12:00 – 17:59	276 (30.5)
18:00 – 23:59	356 (39.4)
<b>Causes of poisoning <i>n</i> (%)</b>	
Narcotics and psychodysleptic medications	221 (24.5)
Anti-epileptic medications, sedative-hypnotic medications	244 (27.0)
Psychotropic medications	182 (20.1)
Alcohol	248 (27.4)
Other substances	9 (1.0)
<b>Further treatment - <i>n</i> (%)</b>	
Discharge	652 (72.3)
Transport to another hospital	219 (24.2)
Leaving the hospital against medical advice	23 (2.5)
Death	9 (1.0)

Table 2 shows the characteristics of patients admitted to the Emergency Department due to psychoactive substance poisoning. The mean systolic blood pressure was 134 mmHg and diastolic 84 mmHg. Saturation in most cases was normal, the mean was 97%, while the mean heart rate was 96 beats per minute. The hospitalization time of patients diagnosed with psychoactive substance poisoning including the hospitalization in the Toxicology Department varied from 1 to 44 days, and the mean hospitalization time was 3 days.

**Table 2.** Patient's condition characteristics

Descriptive statistics						
	Mean	Standard Deviation	Minimum	Maximum	Q1	Q3
<b>Systolic BP (mmHg)</b>	134	23	40	235	120	145
<b>Diastolic BP (mmHg)</b>	84	16	20	165	75	95
<b>SpO<sub>2</sub> (%)</b>	97	3	75	100	96	99
<b>Heart rate (beats per min)</b>	96	20	45	200	83	110
<b>Hospitalization time (days)</b>	3	3	1	44	2	3

The conducted statistical analysis considering the main cause of poisoning, gender and place of residence of the patients showed a statistically significant relationship between these variables ( $p < 0.05$ ). The analysis showed that women in comparison with men significantly more often suffered from poisoning with anti-epileptic and sedative-hypnotic medications (35.0% vs 22.9%) and psychotropic medications (33.0% vs 13.5%). Whereas men significantly more often than women suffered from alcohol poisoning (32.6% vs 17.5%) and narcotic and psychodysleptic medication poisoning (30.6% vs 12.6%). The analysis of the place of residence showed that poisonings with narcotics and psychodysleptic medications (26.1% vs 20.4%) and anti-epileptic and sedative-hypnotic medications (29.0% vs 22.3%) were significantly more often observed in patients living in urban areas than in rural areas. Patients from rural areas suffered more often from alcohol poisoning (32.1% vs 25.5%) and psychotropic medication poisoning (23.0% vs 18.9%) (see Table 3).

**Table 3.** The relationship between the main causes of poisoning and gender and place of residents of patients

Main causes of poisoning	Gender				Place of residence			
	Female		Male		City		Village	
	N	%	N	%	N	%	N	%
Narcotics and psychodysleptic medications	39	12.6	182	30.6	167	26.1	54	20.4
Anti-epileptic medications, sedative-hypnotic medications	108	35.0	136	22.9	185	29.0	59	22.3
Psychotropic medications	102	33.0	80	13.5	121	18.9	61	23.0
Alcohol	54	17.5	194	32.6	163	25.5	85	32.1
Other	6	1.9	3	0.5	3	0.5	6	2.3
<b>Statistical analysis</b>	Chi <sup>2</sup> =97.7341 df=4 p=0.0000				Chi <sup>2</sup> =16,1989 df=4 p=0.0028			

The conducted statistical analysis showed a statistically significant relationship between the main causes of poisoning and the time of admission of the patient to the Emergency Department ( $p < 0.05$ ). Poisoning with narcotics and psychodysleptic medications (31.7%) and alcohol (31.7%) were the main causes of admission to the Emergency Department between 0:00-5:59. The main causes of admission between 6:00 and 11:59 (29.0%) were poisoning with anti-epileptic medications and sedative-hypnotic medications. The causes were the same in the case of admissions between 12:00-17:59. Whereas between 18:00 and 23:59 alcohol poisoning (32.0%) was predominating among patients admitted to the Emergency Department (see Table 4).

**Table 4.** The relationship between the main causes of poisonings and the time of admission to the Emergency Department

Main causes of poisoning	Time of admission							
	00:00 – 05:59		06:00 – 11:59		12:00 – 17:59		18:00 – 23:59	
	N	%	N	%	N	%	N	%
Narcotics and psychodysleptic medications	50	31.7	28	24.6	60	21.7	83	23.3
Anti-epileptic medications, sedative-hypnotic medications	24	15.2	33	29.0	92	33.3	95	26.7
Psychotropic medications	31	19.6	27	23.7	62	22.5	62	17.4
Alcohol	50	31.7	26	22.8	58	21.0	114	32.0
Other	3	1.9	0	0.0	4	1.5	2	0.6
<b>Statistical analysis</b>	Chi <sup>2</sup> =32.0512 df=12 p=0.0014							

The conducted statistical analysis concerning the main causes of poisoning and the age and the hospitalization time showed that there is a statistically significant relationship between these variables ( $p < 0.05$ ). The analysis revealed that younger patients were significantly more often diagnosed with narcotic and psychodysleptic medication poisoning (26.5 years), whereas alcohol poisoning was more often observed in older patients (40.1 years). The analysis of the hospitalization time showed that the hospitalization time of patients with narcotic and psychodysleptic medication poisoning was the shortest (2.6 days), whereas patients poisoned with other psychoactive substances stayed in hospital the longest (5.0 days) (see Table 5).

**Table 5.** The relationship between the main causes of poisoning and the mean age of the patients and the mean time of

Main causes of poisoning	Age		Hospitalization time	
	Mean	Standard deviation	Mean	Standard deviation
Narcotics and psychodysleptic medications	26.5	8.2	2.6	1.6
Anti-epileptic medications, sedative-hypnotic medications	39.4	15.4	3.1	2.2
Psychotropic medications	38.0	16.0	3.6	3.0
Alcohol	40.1	15.8	3.7	4.5
Other	37.6	18.8	5.0	4.9
<b>Statistical analysis</b>	H (4, N=904) 128.7782 p=0.0000 I-II; I-III; I-IV; I-V		H (4, N=904) 42.5598 p=0.0000 I-III; I-IV; I-V; II-IV	

## Discussion

On the one hand, the continuous development of civilization and industrial and technical progress facilitate functioning in the modern world and improve the quality of life, on the other hand they contribute to the deterioration of health through the emergence of new threats to health and life. Chemical poisoning is one of the most serious environmental threats that poses a challenge for modern healthcare systems [6,7].

The analysed material covering the period from January to December 2016 showed that 904 patients were admitted to the Emergency Department of Stefan Kardynał Wyszyński Province Specialist Hospital in Lublin due of the poisoning of psychoactive substances. Among these patients men were predominating. Wiktorowicz et al. in their study concerning acute poisoning among patients hospitalized in the Department of Internal Medicine and Family Medicine of Medical University of Warsaw (WUM) found that men were predominating, which is consistent with our study results [8]. Similarly, Filip et al, who analysed poisonings in patients hospitalized in the Toxicology Department in Rzeszów, found that men made up almost two thirds of the patients [6].

Our own study results showed that men aged 20-29 and 30-39 were the most numerous group. Whereas, Wiktorowicz et al. found that the mean age of the analysed group of patients was 45 years [8].

Our own study results showed that most of the cases of poisoning occurred in urban areas. The most common cause of poisoning in the analysed group was ethyl alcohol, followed by anti-epileptic medications, sedative-hypnotic medications, narcotics and psychodysleptic medications as well as psychotropic medications. In the study conducted by Filip et al. minor poisoning predominated among the hospitalized patients, which accounted for 77.7% of all cases, while the main cause of poisoning was ethyl alcohol [9]. Wiktorowicz et al. found that the most common cause of poisoning were: ethyl alcohol, medications combined with alcohol, medications, drugs, alcohol combined with drugs, alcohol combined with medications and drugs [8]. Whereas Jackowska and Grzelczyk-Wielgórska, who analysed the causes of poisoning among children and teenagers hospitalized in the Paediatrics Department, found that medications (47.9%) and ethyl alcohol (20.6%) were the most frequent cause [9]. The study conducted by Richoux et al. revealed that 41% of patients treated in the Emergency Department were previously treated due to disorders connected with alcohol abuse and 23% of the patients were hospitalized directly due to alcohol abuse [10].

The problem of alcohol abuse despite numerous preventive measures does not decrease in Poland. The number of patients admitted to toxicology departments due to acute ethyl alcohol poisoning and symptoms of substance withdrawal is increasing. According to data from the National Health Fund (NFZ), heavy ethyl alcohol poisoning in Poland constituted 16.57% of all poisonings among people over 25 years of age and 33.49% of cases in people aged 46-55 in 2010 [11, 12, 13]. According to the statistics of the World Health Organization (WHO) 3 million people died due to alcohol abuse in 2016 [14, 15]. Our own study results showed that 9 patients died due to poisoning.

Our own study results also showed that patients were most often transported to the Emergency Department by EMS teams. Most of the cases of poisoning were reported in December, on Saturdays and between 18:00 and 23:59. The vast majority of patients after being treated in the Emergency Department were discharged and did not require hospitalization in the Toxicology Department. However, in the studies of Filip et al., showed that nearly two-thirds of the patients were admitted to the Toxicology Department in the urgent mode and were brought by EMS teams [6]. The study of Wiktorowicz et al. showed that the mean time of hospitalization was 3.6 days. Patients poisoned with drugs and ethyl alcohol were hospitalized the longest [8].

## Conclusion

The main causes of poisoning in patients hospitalized in the Emergency Department of Stefan Kardynał Wyszyński Province Specialist Hospital in Lublin was alcohol and anti-epileptic medications and sedative-hypnotic medications. Men suffer from poisoning significantly more often than women. The predominating cause of poisoning in men was alcohol and in women anti-epileptic medications and sedative-hypnotic medications. Age was related with the cause of poisoning among patients hospitalized in the Emergency Department. People under 29 years of age most often suffered from poisoning with narcotics and psychodysleptic medications, people aged 30-49 with anti-epileptic and sedative-hypnotic medications, patients aged 50-59 most frequently suffered from psychotropic medication poisoning, and people over 60 were most often poisoned with alcohol. The place of residence was related with the cause of poisoning; anti-epileptic and sedative-hypnotic medications were the main cause of poisoning among persons living in urban areas, and alcohol among people in rural areas.

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