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# ANALYSES OF THE RATES AND CAUSES OF POISONING IN TURKEY FROM 1923 TO 2019

## 1923'TEN GÜNÜMÜZE TÜRKİYE'DE ZEHİRLENME ORANLARI VE NEDENLERİNİN ANALİZİ

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## Öz

### Amaç
Türkiye'de zehirlenme vakalarına ait veriler oldukça az sayıdadır. Bu çalışmada 1923'ten günümüze Türkiye'de görülen zehirlenme vakalarının özellikleri değerlendirilmiştir. Sunulan çalışmanın bahsedilen tarihler içerisindeki zehirlenme oranları ve zehirlenme nedenlerine ait bilgileri içermesi bakımından toksikologlar, sağlık yöneticileri ve sağlık meslek mensupları tarafından kullanılabilecek önemli bir kaynak olması da amaçlanmıştır.

### Gereç ve Yöntem
Sunulan çalışma, literatür taraması yöntemine dayalı zehirlenme oranlarını değerlendirmeyi amaçlayan çalışma olarak planlanmıştır. Araştırma kapsamında Türkiye İstatistik Kurumu verileri ve Ulusal Zehir Danışma Merkezi raporları analiz edilmiştir. Zehirlenme oranları ve yüzdeleri belirlenerek elde edilen sayısal verilere ait yüzde değişim de hesaplanmıştır. Sem, ağu, zehir, zehirlenme, tesemmüm, musemmim kelimeleri kullanılarak da geçmişe dönük olarak Türkiye'de zehirlenme olgularını içeren internet tabanlı bir tarama da yapılmıştır.

### Bulgular
Cumhuriyetin ilk yıllarında evsel kazalar ya da iş yeri kazaları nedeniyle zehirlenmeler görülmüştür. 1950 ve 1980 yılları arasında tarım ilaçlarına bağlı zehirlenmelerde artış dikkati çekmektedir. 1980 yılı ve sonrasında kaza ya da intihar amaçlı zehirlenmeler sıklıkla kayıtlara geçmiştir. Son on yılda Türkiye'deki ölüm nedenlerinin dağılımı incelendiğinde ölüm nedenlerinin %4,64±0,55'ini dışsal yaralanma ve zehirlenmelerin oluşturduğu görülmektedir. 2009 yılında Türkiye'de dışsal yaralanma ve zehirlenme sonucu 11289 kişi hayatını kaybetmiştir. Bu sayı 2017 yılında şimdiye kadar görülen en yüksek değer olan 21533'e ulaşmıştır. 2009 ve 2017 yılları arasında dışsal yaralanma ve zehirlenme sonucu ölümlerde %90,74 artış tespit edilmiştir. Ayrıca 2009-2018 yılları arasında oranlarda %63,53 artış olduğu ortaya konulmuştur. Çalışma sonuçlarına göre son on yılda dışsal yaralanma ve zehirlenme sonucu ölümlerde 1,63 kat artış dikkati çekmektedir.

### Sonuç
Sunulan çalışma, Türkiye'de zehirlenme vakalarının etiyolojik, demografik ve oransal raporunu gösteren ilk çalışmadır. Türkiye'de, zehirlenmelerde ve zehirlenmelere bağlı ölümlerde yıllar içerisinde artış dikkati çekmektedir.

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## Abstract

### Objective
The data on poisoning cases in Turkey are limited. This study evaluated the characteristics of poisoning cases in Turkey from 1923 to the present (2019) to serve as an important resource for toxicologists, health managers, and health professionals regarding poisoning rates and causes during the studied period.

### Materials and Methods
The present study based on literature scanning method which poisoning rates were evaluated. Data obtained from the Turkish Statistical Institute and the National Poison Information Center reports were analyzed. Percentile changes in the numerical data were calculated. Internet-based research was also carried out using the keywords sem, ağu, poison, poisoning, tesemmüm, and musemmim.

### Results
In the first years of the republic, it was revealed that there were poisonings due to domestic or workplace accidents. The increase in poisoning related to pesticides between 1950 and 1980 is remarkable. After 1980 years, the most common causes of poisoning were accidental or suicidal cases. Examining the distribution of causes of death in the last decade in Turkey, 4.64 ± 0.55% were caused by external injuries and poisonings. Because of external injuries and poisoning cases in Turkey, 11,289 people lost their lives in 2009. This number reached 21,533 in 2017, the highest value ever seen. Between 2009 and 2017, a 90.74% increase was reported in deaths due to external injuries and poisonings. In addition, there was an increase of 63.53% in the rates between 2009 and 2018. According to present study, an increase by 1.63 times in deaths from external injuries and poisoning in the last decade.

### Conclusion
The present study is the first study to report the etiologic, demographic, and statistical datas on poisoning cases in Turkey. The increase in poisonings and deaths due to poisoning has attracted attention over the years.


**Keywords:** Poisoning, The National Poison Solidarity Center, TurkStat, Turkey

## Introduction

The first Public Health Laboratory of the Republic of Turkey was established on 27 May 1928 in Ankara (Refik Saydam Hygiene Institute) in Refik Saydam Hygiene Center to combat rapidly-spreading infectious diseases as specific laboratories at the peripheral level (1). Worldwide, the first poison control center opened in Chicago 1953, followed by one at Duke University, North Carolina in 1954 and in Boston in 1955 (2). In Turkey, the Poison Research Directorate was established within the Refik Saydam Hygiene Institute on 12 November 1984. The National Poison Solidarity Center (NPSC) was established on 23 June 1986 and transitioned to 24 hours a day on 23 March 1988 (3,4). Today, NPSC continues to work under the General Directorate of Public Health affiliated with the Ministry of Health (5).

In the screenings made with the word “tesemmüm”, poisonings related to alcohol exposure were recorded especially in children in the first years of the Republic (6). One prominent poisoning case in the Republic of Turkey from 1923 to the present was food poisoning in 1955 June. Food poisoning symptoms appeared in more than 500 individuals eating in the cafeteria at the Turkey Sugar Company Corporation enteritis and gastroenteritis were seen in 71 of the patients (7,8). Between 1955 and 1958, more than 3000 people living in Diyarbakır, Mardin, and Urfa were diagnosed with "porphyria cutaneous tarda". An epidemic poisoning was observed in 1956 in the population of Diyarbakır and its vicinity caused by eating bread made from seed wheat treated with hexachlorobenzene (HCB), a fungicide, that was distributed by the agricultural organization. Of these cases, 10% resulted in death (9,10).

Another pesticide poisoning caused the death of 7 out of 32 people who ate peaches treated with Folidol in Bursa in 1963 (11). In 1964, seed wheat was distributed to 42 villages in the Eleşkirt district of Ağrı. The symptoms and clinical course of mercury poisoning were reported by health officials in 9 of these villages. The mercury antidote, dicaptol, was administered to patients. This was the first phenylmercuric acetate poisoning case in Turkey and probably in the world (12). The first major pesticide-related poisonings in Turkey occurred with Folidol, which contains the active ingredient parathion. In 1973, 37 people died who used Folidol in the Damal village of Kars in Turkey (11). In 1979, 16 people were poisoned leading to 6 deaths after eating a pie cooked by an old lady who

accidentally used a Folidol bottle instead of an olive oil bottle for frying the pies in Ödemiş. Seven people who ate watermelon treated with Folidol in Ödemiş in 1979 were poisoned (11).

Another important poison factor in Turkey is asbestos. As of 2012, asbestos-containing soil was used in 473 villages and approximately 1,000,000 people lived in contact with asbestos in rural areas, of which 32,600 developed asbestos-related diseases (13,14). In a study using the data of TACSP, 5617 mesothelioma cases between 2008 and 2012 were examined. Asbestos exposure continued in 379 villages based on the analysis of samples taken from rural areas where these cases were reported. Approximately 158,000 people living in these villages faced high risk and the expected number of new cases between 2013 and 2033 is 2511 (14). At least 1,200,000 tons of asbestos fiber and its products were consumed domestically between 1930 and 2010 (15). Every 170 tons of asbestos consumption can cause a case of mesothelioma. Because of imported and domestic production, the total cases in Turkey are expected to be 6000-7000 (15,16). Table 1 shows the most common poisoning factors in Turkey.

In the present study, the number of poisoning cases from 1923 to 2019, the causes of poisoning, the numerical data, the percentage change over the years in admission to the poison control center, and the death rates in Turkey due external injuries and poisoning were analyzed.

## Materials and Methods

This study was planned as literature scanning method assessing poisoning cases in the literature between 1923 and 2019. The web-based data included the year 1970 and henceforth. Data about poisonings before 1970 were obtained from case reports, articles, and books using sem, ağu, tesemmüm, musemmim, poison, and poisoning terms. Data for the year 1970 and beyond were obtained from the Turkish Statistical Institute (23) and National Poison Solidarity Center (3) reports. In addition, percentage change was calculated from NPSC data for 1988, 1998, and 2008. From the TurkStat data between 2008 and 2018, the percentage change for the last ten years in deaths due to external injury and poisoning was calculated. In addition, the percentage change of deaths from external injury and poisoning in the last decade in the 12 regions of Turkey (the Eastern Marmara Region, the Western Marmara Region, Istanbul Region, the Aegean Region, the Mediterranean Region, the Western Anatolia Region, the Middle Anatolia Region, the Middle Eastern Anatolia Region, the Northeast Anatolia Region, the Southeast Anatolia Region, the Eastern Black Sea Region, the Western Black Sea Region) was calculated and shown on a map of Turkey. The objective of this study was to evaluate characteristics of the poisonings from 1923 to 2019 in Turkey.

## Results

The most important cases of poisoning from 1923 to 2019 in Turkey were due to oral or dermal exposure to pesticides. The most important case of mass poisoning in Turkey was the oral exposure to HCB which affected over 3000 people in 1955. Table 2 shows the number of effected persons and number of deaths from poisoning cases in Turkey from 1923 to 2019.

Over the last decade, the poisoning rate tended to increase in both genders for each year between 2009 and 2018 in Turkey. The number of deaths due to external injuries and intoxications increased from 11,289 in 2009 to 18,462 in 2018, an increase of 63.33% throughout the country. The total death rates and ex-

**Table 1** Reasons of Poisoning in Turkey

| Factor | Cause of Poisoning | References |
|---|---|---|
| **Food** | Mushrooms, black sea mad honey, eating cyanide (apricot kernel) etc. | (17-19) |
| **Pesticides** | Organophosphorus pesticides<br>Organochlorine pesticides | (10, 11) |
| **Herbicides** | Phenylmercuric acetate | (12, 20, 21) |
| **Toxic gases** | Carbon monoxide | (20) |
| **Poisonous animal** | Scorpion sting, Snake bites | (21) |
| **Chemicals** | Household chemicals, Industrial chemicals (Asbestos) | (16, 22) |

ternal injury/poisoning death rates in Turkey between 2009 and 2018 based on TurkStat data are shown in Graphic 1.

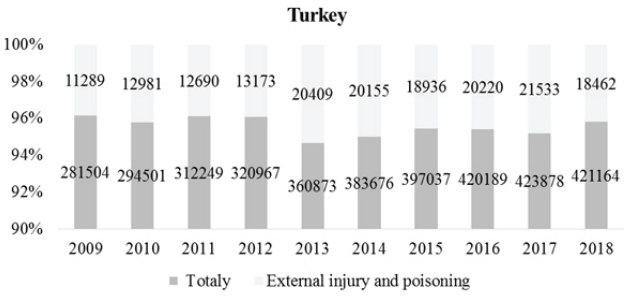
In the present study, the percentile changes in deaths related to external injury and poisoning in 12 different regions in Turkey were calculated using the data obtain from TurkStat. In Istanbul, 1803 deaths related to external injury and poisoning were recorded in 2009. This number decreased to 1646 in 2018 and the percentile changes in deaths related to external injury and poisoning decreased 8.70% over this time.

In Eastern Marmara, 1099 deaths related to external injuries and poisoning cases in 2009 increased to 1675 in 2018 (52.41% increase). In Western Marmara, 489 deaths related to external injuries and poisoning cases in 2009 increased to 988 in 2018 (102.04% increase). In the Aegean Region, 1510 deaths related to external injuries and poisoning cases in 2009 increased to 2988 in 2019 (97.88% increase). In the Western Anatolia Region, 1468 deaths related to external injuries and poisoning cases increased to 1816 (23.70% increase). In the Central Anatolian Region, 704 deaths related to external injuries and poisoning cases increased to 1161 (64.91% increase). In the Central Eastern Anatolia Region, 438 deaths related to external injuries and poisoning cases increased to 657 (50.00% increase). In the Northeast Anatolian Region, 238 deaths related to external injuries and poisoning cases increased to 539 (126.47% increase). In the Southeast Anatolia Region, 973 deaths related to external injuries and poisoning cases increased to 1080 (10.99% increase). In the Eastern Black Sea Region, 380 deaths related to external injuries and poisoning cases increased to 534 (40.52% increase). In the Western Black Sea Region, 996 deaths related to external injuries and poisoning cases increased to 1347 (35.24% increase).




**Figure 1**
The percentile changes in deaths related to external injury and poisoning in 12 different regions in Turkey*

* According to TurkStat data

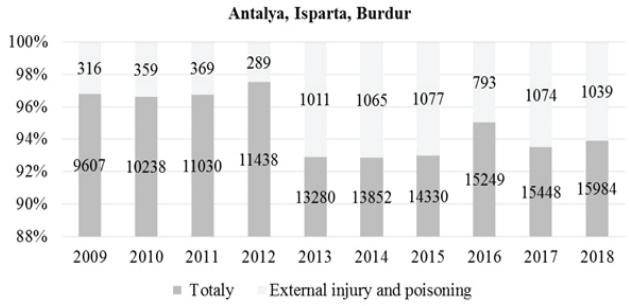



**Graphic 1**
Death rates in Turkey because of external injury and poisoning*

* According to TurkStat data

**Table 2** Important poisoning cases in Turkey from 1923 to 2019

| Year | City | Contaminations | Poisoned | Deaths | References |
|---|---|---|---|---|---|
| 1955 | Ankara | Food | 500 | No data | (7, 8) |
| 1955 | Diyarbakır, Mardin, Urfa | HCBs | >3000 | No data | (9, 10) |
| 1963 | Bursa | Methyl parathion | 32 | 7 | (11) |
| 1964 | Ağrı | Phenylmercuric acetate | No data | No data | (12) |
| 1973 | Kars | Methyl parathion | No data | 37 | (11) |
| 1979 | İzmir | Methyl parathion | 23 | 6 | (11) |




**Graphic 2**
Death rates in Turkey because of external injury and poisoning*

* According to TurkStat data

When regional distribution of poisonings was investigated, poisoning was higher in the Mediterranean Region (160.57% increase). According to TurkStat datas the map in Figure 1 shows the percentile changes in deaths related to external injuries and poisoning cases in 12 different regions in Turkey between 2009 and 2018.

The percentile change during 2009-2018 in the Mediterranean Region where the highest increase was observed in Turkey, especially in Antalya, Isparta, and Burdur, increased from 316 to 1029 (316%). Graphic 2 was shown death rates in in the Mediterranean Region because of external injury and poisoning.

According to the NPSC reports, the poisoning rate increased 728,45% between 1988 and 1998 and 755, 78% between 1998 and 2008. In Turkey, the most common cause of poisonings were accidents and suicides. According to TurkStat, death rates due to external injury and poisoning increased 1.90 times (90.74%) between 2009 and 2017. In addition, death rates due to external injury and poisoning increased 63.53% between 2009 and 2019. The most striking results in this study were that poisoning rates of Turkey increased 1.63 times during the last decade.

## Discussion

In the first thirty years of the republic, poisoning cases mostly alcohol poisonings due to home accidents (6). However, there are no mass poisoning events recorded. The years of the foundation of the Turkish Republic is a time when the State, which had recently come out of many wars, had to cope with various infectious diseases (24). During that period, fighting against the most common infectious diseases not a mass poisoning. When examining the historical process it did not include the first and second world war years in important cases of poisoning caused by toxic gas in the records in Turkey. But, booklet were distributed (25) and books (26-28) were printed for protection against them and even trainings were provided. During the period from 1950 to 1980, food and pesticide mass poisoning are attracts attention in Turkey (7,11). When evaluated the largest mass poisoning in the world one of them 1970s and 1980s, in Bangladesh by drinking surface water contaminated with bacteria (29). In addition, the unprecedented situation has been described by the World Health Organization (WHO) as the biggest outbreak of mass poisoning in world history (30). In the last ten years in the world suicide, and chemicals exposure has been shown as the cause of poisoning. Especially, ingestion of pesticides causes 370,000 deaths each year (31). According to the results, the most common causes of poisoning were accidental or suicidal cases in Turkey. The reports indicated that 1100 admissions to the National Poison Advisory Center in 1988 occurred for poisoning. This number reached 77,988 in 2008 (3). Examining the distribution of causes of death in the past decade in Turkey, 4.64 ± 0.55% were caused by external injuries and poisonings. Because of external injuries and poisoning cases in Turkey, 11,289 people lost their lives in 2009. This number reached 21,533 in 2017, the highest value ever seen (23). Present study shows that between 2009 and 2017, a 90.74% increase was reported in deaths due to external injuries and poisonings. There has been an increase by 1.63 times in deaths from external injuries and poisoning in the last decade. In addition, there was an increase of 63.53% in the rates between 2009 and 2018. When evaluated death rates because of external injury and poisoning in 12 different regions in Turkey the most increase in Mediterranean region. The increase in the number of poisonings in the Mediterranean region may be due to increased agricultural activities and pesticide use in the region in recent years. Most of the poisoning cases seen in Turkey are due to pesticide poisoning especially between 1950-1980 years. However, there is no NPSC reports after 2008. Recent NPSC datas could be shared also new studies should be conducted to find out the reason for the remarkable increase in poisoning cases in this area.

## Conclusion

Poisoning is an important health and socioeconomic problem in humans. Poisoning caused by toxic chemicals is increasing both in Turkey and in the world. In the first thirty year of the republic, it was revealed that there were poisonings due to domestic or workplace accidents. Between 1950-1980 years, pesticide poisoning, and food poisoning were the most common poisoning cases in Turkey. When the data after 1980

were evaluated, the most common poisonings were accidental or suicidal. NPSC should publish annual reports in accordance with its terms of reference. New poisoning agents should be identified by the public authorities and their frequency of exposure should be determined. The reasons for the remarkable increase in poisonings during the last decade should be investigated and preventive measures taken by the Ministry of Health.

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