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Research Article

Suicide Mortality in Northern Jordan: A Four-Year Retrospective Statistical Study (2021-2024)

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Received: May 20, 2025; **Published:** June 11, 2025

Abstract

Background: Suicide is a leading global health concern with over 720,000 deaths annually. Patterns vary by region, method, age, sex, and season. This study contributes to ongoing efforts to understand and prevent suicide.

Objective: The aim of the present study is to analyze the patterns and trends of suicide mortalities in northern Jordan.

Methods: A retrospective study of suicide mortalities which were examined in the Forensic Medicine Teaching Center of North Jordan- affiliate to Jordan University of Science and Technology for the period January 2021 - December 2024 will be reviewed to explore the methods of suicide, demographic and individual characteristics of suicide victims and accompanying signs seen during postmortem examination.

Results: Over four years (2021 - 2024), 75 suicide cases were analyzed. Most victims were males (76.0%) aged 24 - 44 (49.3%). Hanging was the most common method (62.7%), with most incidents occurring indoors (72.0%) and peaking in summer, especially July. Self-harm signs appeared in 10.7%, and 17.3% had positive toxicology, mainly CNS depressants, antidepressants, and stimulants. Three poisoning cases involved agricultural chemicals.

Conclusion: This study supports global trends in suicide, including higher rates among young adults, males, and the seasonal peak in summer, with hanging as the leading method. Regional differences highlight the need for culturally and contextually tailored prevention strategies. Future research should enhance toxicological screening and address mental health and substance use in suicide prevention.

***Keywords**: Suicide; Death; Autopsy; Forensic*

Introduction

Suicide is defined by the eleventh revision of the International Classification of Diseases as "Intentional self-harm with intent to cause the death of the person". It is regarded as a significant worldwide public health concern [1], as it is estimated that more than 720,000 people die by suicide each year, making it the third leading cause of death among individuals aged 15 to 29 [2].

However, due to the sensitive nature of suicide-and its illegal status in some countries-it is highly probable that the actual numbers are under-reported [3]. It is also important to note that the majority of suicides take place in low- and middle-income countries [3]. Suicide rates can be influenced by a range of factors, including political, social, cultural, and economic conditions [4].

The most common method of suicide differs from one country to another; as it was found in the United States of America that 54% of suicides are committed using firearms [5], while in Sri Lanka 57% were committed by ingestion of pesticides [6]. In some cases, it was found that the preferred method of suicide differs from one region to another in the same country, as in China suicide by ingestion of toxic substances was the dominant method in agriculture-dominant areas while jumping was the most prominent in urban areas with high-buildings [7]. However, hanging is the predominant method of suicide globally [8]. In Jordan, a study done by Al-Sabaileh., *et al*. showed that 53% of suicides committed in Al-Balqa governorate were by hanging [9].

Suicide claims more than twice as many male lives as female, with rates of 12.6 per 100,000 males compared to 5.4 per 100,000 females. Among men, suicide rates tend to be highest in high-income countries (16.5 per 100,000), while for women, the highest rates are observed in lower-middle-income countries (7.1 per 100,000) [10]. Over half of all suicides worldwide (58%) occur in individuals under the age of 50 [11].

Regarding seasonal variation, studies have shown a consistent pattern across most age groups in the United States, with suicide rates peaking in late spring and early summer [12]. The afore mentioned statistics show that suicide is a huge global health burden that is investigated thoroughly in wide regions of the world, and we aim in our study to be a part of this global endeavor.

Study Objectives

The main objectives of the present study were to describe, over a period of 4 years, the deaths caused by suicide that occurred at the north of Jordan and received in Forensic Medicine Teaching Centre in Irbid, Jordan (2021-2024).

Subjects and Methods

This section included the basic steps that were followed in conducting the present study. It included the following points.

Study design and setting: A retrospective study was conducted to collect data from files of cases. The study was carried out in the Department of Legal Medicine, Toxicology and Forensic science, Jordan, Jordan University of Science and Technology, Irbid, Jordan and the ministry of health Forensic Medicine Teaching Center for 4 years period (January 2021 - December 2024).

Study sample: 2558 files representing the number of medicolegal cases dealt with at the center during these 4-year period were reviewed. A total of 75 cases were appropriate to be included as cases of apparent suicide.

Study procedure: Procedure of the present study involved the following steps:

1. Obtaining the ethical approval of IRB from ethical committee at Jordan university of science and technology.
2. Reviewing medical files to select represented cases.
3. Creating working excel sheet for cases.
4. Study variables: Demographic and temporal variables such as age, gender, place, month, year and season of occurrence, autopsy variables such as method, presence of signs of self-harm, presence of tattoos, presence of CPR signs, presence of additional external injuries other than the cause of death, the state of post-mortem changes that the body was found in and the presence of any depressants or anti-depressants or illicit drugs in toxicology samples.
5. Data was analyzed using SPSS software; the results were presented in table and graphic form.

Results

Demographic and temporal variables

As summarized in table 1. A total of 75 suicide cases were analyzed over a four-year period from 2021 to 2024. The demographic distribution revealed a predominance of adults aged 24-44 years, who accounted for nearly half of all cases (n = 37; 49.3%). Young adults aged 18-24 represented 25.3% (n = 19), while children under 18 years constituted 21.3% (n = 16). Middle-aged individuals (44-64 years) were infrequently represented (n = 3; 4.0%), and no cases were recorded among those aged over 65 as shown in chart 1. Males constituted the majority of cases, with 57 individuals (76.0%), compared to 18 females (24.0%), resulting in a male-to-female ratio of approximately 3.2:1. Regarding temporal distribution, the highest number of cases occurred in 2021 (n = 28; 37.3%), followed by 2024 (n = 18; 24.0%), 2022 (n = 15; 20.0%), and 2023 (n = 14; 18.7%) as shown in chart 2. Monthly analysis indicated that July had the highest incidence (n = 11; 14.7%), followed by March (n = 10; 13.3%) and September (n = 9; 12.0%). The lowest number of cases occurred in April and November (n = 3; 4.0% each). When grouped seasonally, summer accounted for the largest proportion of cases (n = 26; 34.7%), followed by spring (n = 22; 29.3%), autumn (n = 14; 18.7%), and winter (n = 13; 17.3%) as shown in chart 3. With respect to the location of occurrence, suicides were significantly more likely to occur indoors (n = 54; 72.0%) than outdoors (n = 21; 28.0%).

Variable	Description
Age Group: (N, %)	
0-17 (Children)	16 (21.3%)
18-24 (Young Adult)	19 (25.3%)
24-44 (Adult)	37 (49.3%)
44-64 (Middle-aged)	3 (4.0%)
>65 (Older Adult)	0 (0.0%)
Gender: (N, %)	
Male	57 (76.0%)
Female	18 (24.0%)
Year: (N, %)	
2021	28 (37.3%)
2022	15 (20.0%)
2023	14 (18.7%)
2024	18 (24.0%)
Month: (N, %)	
January	5 (6.7%)
February	5 (6.7%)
March	10 (13.3%)
April	3 (4.0%)
May	5 (6.7%)
June	7 (9.3%)
July	11 (14.7%)
August	7 (9.3%)
September	9 (12.0%)
October	4 (5.3%)

November	3 (4.0%)
December	6 (8.0%)
Season: (N, %)	
Spring	22 (29.3%)
Summer	26 (34.7%)
Autumn	14 (18.7%)
Winter	13 (17.3%)
Place of occurrence: (N, %)	
Indoors	54 (72.0%)
Outdoors	21 (28.0%)

Table 1: *Demographic and temporal variables of suicide cases.*

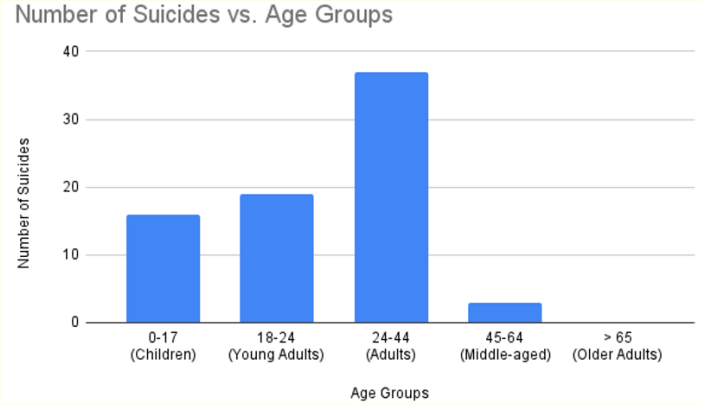

Chart 1: *Age group distribution.*

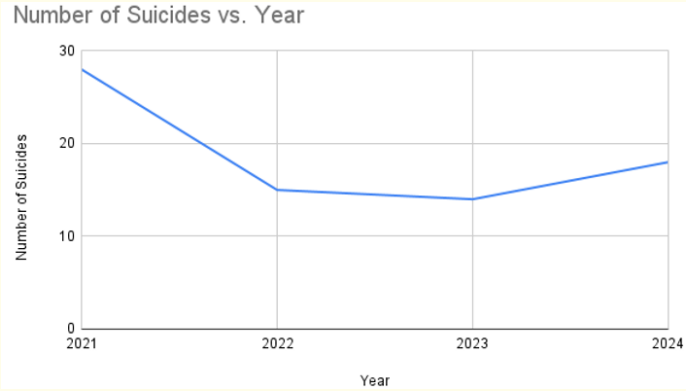

Chart 2: *Year distribution.*

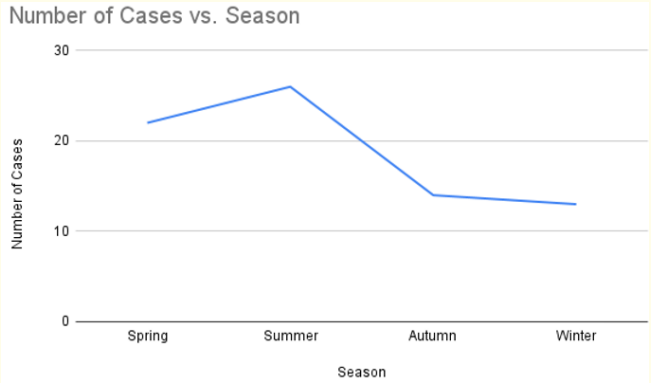

Chart 3: *Seasonal distribution*

Autopsy findings variables

As summarized in table 2. The most commonly employed method of suicide was hanging, observed in 47 cases (62.7%). This was followed by firearm-related suicides (n = 12; 16.0%), falls from height (n = 9; 12.0%), burn injuries (n = 4; 5.3%), and poisoning (n = 3; 4.0%). As shown in chart 4. Evidence of self-inflicted injuries (indicative of self-harm behavior) was present in 8 cases (10.7%), while the majority (n = 67; 89.3%) showed no such signs. Tattoos were noted in 18 individuals (24.0%), whereas 57 decedents (76.0%) had no visible tattoos.

Variable	Description
Method: (N, %)	
Hanging	47 (62.7%)
Firearm	12 (16.0%)
Falling down	9 (12.0%)
Burns	4 (5.3%)
Poisoning	3 (4.0%)
Signs of self-harm: (N, %)	
Present	8 (10.7%)
Absent	67 (89.3%)
Tattoos: (N, %)	
Present	18 (24.0%)
Absent	57 (76.0%)
CPR signs: (N, %)	
Present	29 (38.7%)
Absent	46 (61.3%)
Presence of additional external injuries other than the cause of death: (N, %)	
Present	22 (29.3%)
Absent	53 (70.7%)

Post-mortem state: (N, %)	
Putrefied	1 (1.3%)
Not Putrefied	74 (98.7%)
Toxicology results: (N, %)	
Positive	13 (17.3%)
Negative	41 (54.7%)
Test was not done	21 (28.0%)

Table 2: *Autopsy findings variables of suicide cases.*

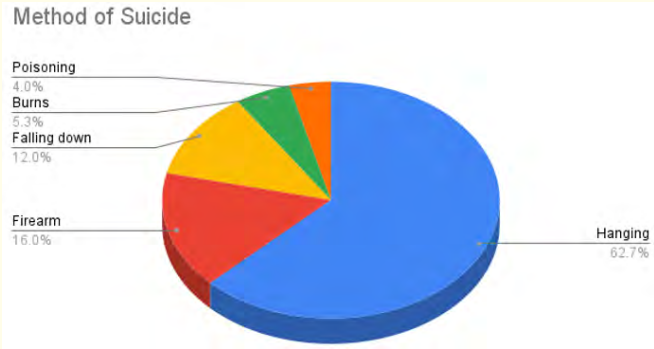

Chart 4: *Method distribution.*

Cardiopulmonary resuscitation (CPR) efforts were documented in 29 cases (38.7%), while 46 cases (61.3%) showed no evidence of attempted resuscitation.

Additional external injuries-distinct from the primary cause of death-were observed in 22 individuals (29.3%), while 53 cases (70.7%) had no such injuries. Regarding the post-mortem condition, almost all cases were found in a non-putrefied state at the time of examination (n = 74; 98.7%), with only one case (1.3%) exhibiting signs of decomposition. Toxicological analysis was conducted in 54 cases (72.0%). Of these, 13 (17.3% of the total sample) yielded positive results for substances such as CNS depressants or anti-depressants or illicit drugs, while 41 (54.7%) were toxicologically negative. In 21 cases (28.0%), toxicological testing was not performed.

Among the three poisoning cases (4.0% of the total sample), one involved dimethoate, an insecticide. Another case was linked to aluminum phosphate, a rodenticide that releases toxic gas. The third case involved a combination of chlorpyrifos and cypermethrin, both common pesticides. These cases highlight the variety of toxic substances associated with fatal poisonings in suicides.

Among the 13 cases with positive toxicology results, most involved multiple substances, reflecting patterns of polysubstance use. Amphetamines were detected in five cases, while methamphetamines were found in four cases. Antidepressants were identified in four individuals, and central nervous system (CNS) depressants were present in two cases-one involving cannabidiol and the other ketamine. Additionally, benzodiazepines were detected in three cases. These findings suggest a notable overlap of stimulant, sedative, and psychotropic drug use among the decedents, underscoring the complexity of substance involvement in suicide cases.

Discussion

The present study offers valuable insight into the characteristics of suicide cases over a four-year period. A total of 75 cases were analyzed, revealing several notable trends in terms of demographics, methods, temporal distribution, and associated forensic findings. These findings are consistent with, and in some cases, diverge from patterns observed in previous studies.

Demographic patterns

A clear age-related pattern was observed, with the majority of cases occurring among individuals aged 24-44 (49.3%), followed by young adults aged 18-24 (25.3%) and children under 18 (21.3%). This highlights a concerning prevalence of suicide among youth and early adulthood. According to the World Health Organization (WHO), suicide is the second leading cause of death globally among individuals aged 15-29 years [2]. This study's data aligns with this global trend, reinforcing the need for targeted prevention strategies for young adults. Notably, no cases were reported in individuals aged over 65, which is in contrast to studies in high-income countries where older adults often show higher suicide rates, as a study performed in Italy in the small city of Parma showed that around 14 cases of suicide were committed annually by individuals older than 60 years [13]. In this dataset, the absence of older adult suicides could reflect regional or cultural differences as elderly in Jordan are usually surrounded by close relatives and have a stronger social network than high-income countries.

Gender distribution was heavily skewed toward males, who accounted for 76% of cases, a finding consistent with international research showing that males are significantly more likely to die by suicide than females. The global male-to-female suicide ratio is typically reported as 3:1, and this study's ratio of approximately 3.2:1 mirrors this broader pattern [11].

Temporal distribution

The distribution of cases across the years appeared relatively steady, with 2021 showing a slightly higher frequency (37.3%). This could reflect the ongoing stress and mental health challenges associated with the COVID-19 pandemic, which has been linked to increased suicidal ideation and suicide attempts [14]. It was also confirmed in a study performed in Jordan that the suicide rate increased during the COVID-19 pandemic [9]. Seasonal trends also emerged, with suicide rates peaking during the summer months (34.7%), followed by spring (29.3%). This seasonal variation is consistent with research conducted in both the United States, where suicides tend to increase in late spring and early summer [12]. This pattern is often attributed to environmental factors, such as longer daylight hours and warmer weather, which may affect mood and behavior.

Place and circumstances

Most suicides occurred indoors (72%), this may be related to the choice of method and is consistent with what was shown in a previous study that with hanging and firearm use suicide was 3 times more likely to be committed indoors [15]. The presence of CPR signs in 38.7% of cases indicates that there may have been an attempt at resuscitation, whether by emergency responders or family members, which is a critical observation in forensic investigations.

Additional external injuries unrelated to the cause of death were noted in 29.3% of cases. Which could indicate trauma from a failed suicide attempt or could be related to the method of suicide like falling down.

Methods and toxicology

Hanging was the most commonly employed method (62.7%), followed by firearm use (16%) and falling from height (12%). This distribution is consistent with global patterns where hanging is predominant method of suicide globally [8]. In contrast, suicide by firearms is more prevalent in countries with high gun ownership, such as the United States [5], whereas hanging predominates in countries with lower rates of gun availability such as Jordan.

Poisoning was the method in only three cases (4%), and the substances identified included dimethoate, aluminum phosphide, and a combination of chlorpyrifos and cypermethrin. These findings are inconsistent with reports from countries where pesticide ingestion is a common method of suicide, especially in rural areas (6). In this study, however, the overall low rate of poisoning is lower this could be attributed to the recent government campaign to restrict the spread and accessibility of pesticides [16].

Toxicological testing revealed that 13 cases had multiple substances present in their systems.

Among these, amphetamines were the most common (5 cases), followed by methamphetamine and antidepressants (4 cases each). This finding is noteworthy, as polysubstance use is frequently observed in suicide cases, particularly among individuals with underlying substance use disorders [17]. CNS depressants such as cannabidiol and ketamine were also detected, reflecting a broader trend of self-medication or misuse of psychoactive substances. Benzodiazepines were found in 3 cases, which is consistent with studies that have linked benzodiazepine use to an increased risk of suicide [17].

The presence of multiple substances highlights the complexity of the suicides in this study, suggesting that many individuals may have been dealing with co-occurring mental health and substance use disorders. However, toxicology was not performed in 28% of the cases, which is a significant limitation of the study. The high number of cases without toxicological testing can be attributed to the center's policy, which indicates that such tests are unnecessary in apparent suicides with no signs of foul play or in cases involving hospitalized individuals. Incomplete toxicological data can underestimate the role of substances in suicide, further underscoring the need for comprehensive post-mortem toxicology screenings in all cases.

Psychosocial indicators

Tattoos were observed in 24% of cases. Although the presence of tattoos is not directly linked to suicide, some studies have suggested that tattoos may be symptom of another set of developmental risk factors and personality traits of which can be risk factors for suicide [18]. The relatively low incidence of self-harm signs (10.7%) in this study is inconsistent with previous studies, as prior self-harm is a well-established risk factor for suicide [19], this can be attributed to the fact that in sociocultural contexts where suicide and mental illness are heavily stigmatized or regarded as taboo, individuals may suppress or conceal psychological distress, resulting in a lack of observable warning signs. Consequently, the act of suicide may emerge as the first overt manifestation of underlying mental health struggles.

Conclusion

This study reinforces several important global trends in suicide epidemiology, such as the higher risk among young adults, the male predominance in suicide rates, the seasonality of suicide occurrences and the predominance of hanging as a method. However, regional variations lead to complexity of suicide prevention, suggesting that interventions need to be tailored to specific cultural, geographical, and socioeconomic contexts. Future research should focus on improving toxicological screening, understanding the role of mental health and substance use in suicide, and exploring effective prevention strategies for vulnerable populations.

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