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Investigation of suicide deaths in Artvin: a retrospective analysis of autopsy findings

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ABSTRACT

Aims: Suicide is defined as an act committed by an individual deciding to end their own life. It is one of the leading causes of death. The aim of this study is to reveal the multidimensional structure of suicide deaths and to contribute to the development of policies for the prevention of suicide through analyzing the data on suicide deaths in Artvin.

Methods: In this retrospective descriptive study, data from suicide cases autopsied by the Artvin Forensic Medicine Branch Directorate between 2016 and 2024 were analyzed. Only cases confirmed as suicides, as determined by a non-prosecution decision from the prosecutor's office or court, were included in the analysis. Cases currently under investigation for suspected suicides were excluded. The evaluation included age, gender, marital status, body mass index (BMI), time interval, season, location of the incident, suicide method, and medical history documented in electronic health records.

Results: A total of 50 suicide cases were analyzed. The mean age was 52.9±19.6 years, and most of the participants were male (76%). The majority were married (68% of them) and in the 50-64 age group (34% of them). Based on BMI, 42% were overweight, 26% obese, and 6% morbidly obese. Firearms were the most common method (42%), followed by hanging (38%). Most suicides occurred at home or in annexes (62%), and during spring (32%) or summer (30%). Systemic disease was present in 73.5%, psychiatric disorders or medication use in 46.9%, and both in 34.7%. Significant differences were found for age, gender, marital status, oncological disease, and suicide method ($p<0.05$), while no associations were noted with BMI, location, season, time, or health history ($p>0.05$).

Conclusions: This study examined suicide autopsies and showed that most cases involved middle-aged, married men. Suicides generally occurred at home during spring and summer, with firearms being the most commonly used method. Many cases had systemic or psychiatric illnesses and were overweight.

Introduction

Suicide is defined as an act committed by an individual to end their own life (1). The World Health Organization reports that suicides have increased globally in recent years, that one person attempts suicide every 40 seconds, and that this act ranks among the top ten causes of death. It is known that the number of deaths due to suicide worldwide is higher than the number of deaths due to causes such as human immunodeficiency virus/acquired immunodeficiency syndrome, breast cancer, malaria, war, and homicide (2). Parallel to global trends, the number of suicide deaths in Türkiye has also increased in recent years, with official data indicating that 4,061 individuals lost their lives due to suicide in 2023 (3). Suicides not only end the life of the individual but also leave long-term psychological effects

on family members, the close environment, society; strain the health system; and cause economic losses. Therefore, suicide has become an increasingly important public health problem in Türkiye in recent years (4). Despite research and preventive efforts to address this major issue, suicide rates have not decreased to the desired levels (5).

Suicide cases are complex phenomena influenced by a combination of biological, psychological, socio-economic, and cultural factors (6). These factors include a variety of risk and causal elements that may provide early warning signs. Reported risk factors for suicide include socio-cultural variables such as age, gender, marital status, employment status, economic condition, family structure and relationships, and place of residence (6), in addition to obesity, chronic systemic diseases (7), psychiatric disorders (8), and the impact of the natural environment (9).

In developing strategies for suicide prevention, it is crucial to accurately analyze the various risk factors and their effects. A thorough examination of individuals' demographic characteristics and mental states enhances our understanding of these factors and aids in implementing effective preventive measures (10). Consequently, understanding the causes, trends, and demographic characteristics associated with suicide cases is critically important from both scientific and social perspectives.

Although there are studies addressing suicide cases across Türkiye (11,12), autopsy-based retrospective research conducted in small and geographically isolated provinces is quite limited. The literature emphasizes that socio-cultural factors, regional differences, and access to methods of suicide play a decisive role in suicidal behavior (3,13). In particular, the province of Artvin- located in the mountainous and forested northeastern region of Türkiye has been reported to display distinct seasonal and demographic patterns of suicide compared to other regions (3).

In our study, we aim to uncover the multidimensional structure of suicide deaths and contribute to the development of preventive policies by analyzing data on suicide deaths in Artvin.

Methods

Study design and participants

In this retrospective descriptive study, we examined 261 cases autopsied by the Artvin Forensic Medicine Branch Directorate between 2016 and 2024.

Only cases confirmed as suicides, as determined by a non-prosecution decision from the prosecutor's office or court, were included in the analysis.

Cases that were still under investigation for suspected suicide (n=5), as well as those determined to have died from non-suicidal causes such as natural death, accident, or homicide (n=206), were excluded. A total of 50 cases that met the inclusion criteria were analyzed.

We conducted a retrospective analysis of crime scene investigation reports, death examination reports, autopsy reports, and electronic health records (E-Pulse) for these cases. We evaluated various factors, including age, gender, marital status, body mass index (BMI), suicide time, season, location of the incident, method of suicide, and relevant medical conditions documented in the E-Pulse records. The E-Pulse system contains individuals' health records provided by the relevant doctor. Additionally, medical histories were verified through clinical records. This study was approved by the Ministry of Justice's Forensic Medicine Institute Education and Scientific Research Commission (decision no.: 21589509/2024/1104, date: 03.09.2024). The research was conducted in accordance with the principles of the Declaration of Helsinki.

The decision of the Artvin Çoruh University Scientific Research and Publication Ethics Committee (decision no.: E-18457941-050.99-152405, date: 09.10.2024), determined that "approval of compliance with scientific research and publication ethics is not required" for our study.

Statistical Analysis

Statistical analyses were performed using IBM SPSS Statistics for Windows, version 26.0 (IBM Corp., Armonk, NY, USA). The normality of data distribution was evaluated using the Shapiro-Wilk test. Descriptive statistics were presented as percentages, means, and standard deviations. Differences between categorical variables were analyzed using Fisher's exact test, as the expected frequency in some cells was less than 5. A p-value of <0.05 was considered statistically significant.

Results

Demographic characteristics

A total of 50 suicide cases were analyzed. The mean age was 52.94±19.61 years, and the majority were male (76%, n=38). Suicides were most frequently observed in the 50-64 age group (34%, n=17), followed by individuals aged 65 and older (26%, n=13).

Regarding marital status, 68% (n=34) were married, 22% (n=11) were single, and 10% (n=5) were widowed. Based on BMI classifications, 42% (n=21) were overweight (BMI: 25-29.9 kg/m^2), 26% (n=13) were obese (BMI: 30-39.9 kg/m^2), and 6% (n=3) were morbidly obese (BMI ≥40 kg/m^2).

Suicide characteristics (methods, location, and time)

Firearms were the most commonly used method of suicide (42%, n=21), followed by hanging (38%, n=19) and jumping from a height (14%, n=7). Two individuals committed suicide by drowning, and one by using a sharp instrument. Among the firearm suicides, 66.7% (n=14) involved pistols and 33.3% (n=7) involved shotguns. The head was the most frequently targeted region (66.7%, n=14), followed by the chest (28.6%, n=6) and the neck (4.7%, n=1).

Most suicides occurred at home or its annexes (62%, n=31), followed by open areas (34%, n=17). In 80% (n=40) of the cases, death occurred at the scene, whereas 20% (n=10) occurred in the hospital.

Seasonal distribution showed that suicides were most frequently reported during the spring (32%) and summer (30%). The most common time interval for suicide was between 06:00 and 12:00 (42%).

Medical and psychiatric history

Health records of all 50 cases were reviewed using the E-Pulse system integrated with the National Judiciary Informatics System. Health information for 49 cases was accessed; however, data for 1 case could not be obtained due to the individual's foreign nationality. Among the analyzed cases, 73.5% (n=36) had at least one systemic disease, 4.1% had at least one oncological disease, and 46.9% (n=23) had at least one psychiatric disorder or a history of psychiatric medication use. Additionally, 34.7% (n=17) of the cases had both systemic diseases and psychiatric disorders (Table 1).

Statistically significant differences were found regarding age (p=0.033), gender (p=0.012), marital status (p=0.005), the presence of oncological disease (p=0.017), and preferred method of suicide (Table 2). However, no statistically significant associations were found between the method of suicide and factors such as BMI, location of suicide, season, and time of suicide, or records of systemic diseases and psychiatric disorders (p>0.05) (Table 2).

Discussion

This retrospective autopsy-based study analyzed 50 confirmed suicide cases in Artvin, a province in northeastern Türkiye. Most cases involved middle-aged, married individuals, with the most frequently used methods being firearms and hanging. Suicides predominantly occurred at home or in their annexes, particularly during the spring months and morning hours. A considerable proportion of the decedents had a history of systemic disease, psychiatric disorder, or both.

The majority of suicide cases (76%) involved males, consistent with a national study in Türkiye, reporting 79.1% male involvement in suicide deaths (13). Similar male predominance is observed in the United States of America and European countries (14). Other research consistently shows that males significantly outnumber females in suicide cases (12,13,15). These findings align with existing literature. Men tend to choose more lethal methods such as firearms, hanging, or jumping from heights. In contrast, women often prefer less fatal means, like poisoning or overdose with psychiatric medication (16). This difference may partly explain the higher suicide mortality among males. One study found that suicide attempts were 3.4 times more likely to be fatal in men, largely due to the lethality of the methods chosen (16).

Table 1. Demographic, clinical, and forensic characteristics of suicide cases in Artvin province (n=50)

		n	%
Gender	Male	38	76
	Female	12	24
Age	≤18	1	2
	19-29	7	14
	30-39	6	12
	40-49	6	12
	50-64	17	34
	≥65	13	26
Marital status	Married	34	68
	Single	11	22
	Widow	5	10
Body mass index (kg/m²)	Underweight (<18.5)	1	2
	Normal weight (18.5-24.9)	12	24
	Overweight (25-29.9)	21	42
	Obese (30-39.9)	13	26
	Morbidly obese (>40)	3	6
Suicide method	Firearm	21	42
	Hanging	19	38
	Throwing from a height	7	14
	Sharp instrument	1	2
	Drowning	2	4
Injury site in firearm suicides (n=21)	Head	14	66.7
	Neck	1	4.7
	Chest	6	28.6
Suicide season	Spring	16	32
	Summer	15	30
	Autumn	14	28
	Winter	5	10
Suicide time	24.00-6.00	5	10
	06.00-12.00	21	42
	12.00-18.00	13	26
	18.00-24.00	11	22
Scene	Home and its annexes*	31	62
	Open spaces	17	34
	Others	2	4
Place of death	Scene	40	80
	Hospital	10	20
Systemic diseases (n=49)**	Yes	36	73.5
	No	13	26.5
Oncological diseases (n=49)**	Yes	2	4.1
	No	47	95.9
Psychiatric disorder (n=49)**	Yes	23	46.9
	No	26	53.1
Systemic diseases and psychiatric disorder (n=49)**	Yes	17	34.7
	No	32	64.3

*Residence and annexes include places such as houses, barns, serenders, coal storage areas, balconies, and apartment stairwells as reported in forensic investigation files and crime scene reports, **E-Pulse data could not be accessed for one case involving a foreign national, while data for 49 other cases was successfully evaluated

Suicides were most commonly observed among individuals aged 50 to 64, with a mean age of 52.94±19.61 years. While suicides occur across all age groups, certain age ranges exhibit higher rates. Previous research indicates that suicides typically occur in the age range of 24.2 to 41.6 years (12,13,15,17). According to data from the Turkish Statistical Institute, suicide deaths in our country over the past decade have been most frequently reported in individuals over 60, and those aged 40 to 59 (3). This finding supports the trend that suicide risk is higher in middle-aged and elderly individuals. Factors such as increasing loneliness, chronic diseases, physical losses, and psychosocial issues may contribute to the elevated risk among the elderly population.

A considerable proportion (68%) of suicide cases involved married individuals. However, research on marital status and suicide presents varied findings. Some studies (11,15) report higher rates among married individuals, while others (7) suggest single or widowed individuals are at greater risk. Although marriage is often viewed as protective, it may also pose a risk when stress, conflict, or increased responsibilities are present.

When cases were classified by BMI, approximately three-fourths had a BMI of 25 kg/m² or above. Obesity has both physical and psychosocial consequences (18), and is considered a potential factor influencing suicides (7). A high BMI not only impacts physical health but also significantly affects mental well-being. Recent studies indicate a complex relationship between obesity, high BMI, and suicide risk (18,19). Literature reports increased suicidal ideation and suicide attempts among overweight (BMI: 25-29.9) and obese (BMI: 30 and above) individuals (19). One study found that obesity was associated

Table 2. Comparison of suicide methods by demographic, temporal, and clinical variables

		Suicide method					x^2	p
		Firearm	Hanging	Throwing from a height	Sharp instrument	Drowning		
		n (%)	n (%)	n (%)	n (%)	n (%)		
Age	≤64	16 (43.3)	14 (37.8)	7 (18.9)	0	0	**11.051**	**0.026**
	≥65	5 (38.5)	5 (38.5)	0	1 (7.6)	2 (15.4)		
Gender	Male	20 (52.6)	13 (34.2)	3 (7.9)	0	2 (5.3)	**12.873**	**0.012**
	Female	1 (8.3)	6 (50)	4 (33.4)	1 (8.3)	0		
Marital status	Married	14 (41.2)	16 (47.1)	3 (8.8)	0	1 (2.9)	**22.168**	**0.005**
	Single	6 (54.5)	1 (9.1)	4 (36.4)	0	0		
	Widow	1(20)	2 (40)	0	1 (20)	1 (20)		
Body mass index	Underweight	0	1 (100)	0	0	0	11.839	0.755
	Normal weight	6 (50)	4 (33.4)	1 (8.3)	0	1 (8.3)		
	Overweight	10 (47.6)	9 (42.8)	1 (4.8)	0	1 (4.8)		
	Obese	4 (30.7)	4 (30.7)	4 (30.7)	1 (7.9)	0		
	Morbidly obese	1 (33.3)	1 (33.3)	1 (33.3)	0	0		
Suicide season	Spring	7 (43.8)	5 (31.2)	3 (18.8)	0	1 (6.2)	7.276	0.839
	Summer	6 (40)	4 (26.6)	3 (20)	1 (6.7)	1 (6.7)		
	Autumn	6 (42.9)	7 (50)	1 (7.1)	0	0		
	Winter	2 (40)	3 (60)	0	0	0		
Suicide time	24.00-6.00	4 (80)	0	1 (20)	0	0	9.216	0.684
	06.00-12.00	8 (38.1)	9 (42.9)	3 (14.3)	0	1 (4.7)		
	12.00-18.00	5 (38.4)	4 (30.8)	2 (15.4)	1 (7.7)	1 (7.7)		
	18.00-24.00	4 (36.4)	6 (54.5)	1 (9.1)	0	0		
Systemic diseases (n=49)	Yes	15 (41.7)	14 (38.9)	4(11.1)	1 (2.8)	2 (5.5)	2.065	0.724
	No	5 (38.5)	5 (38.5)	3(23)	0	0		
Oncological diseases (n=49)	Yes	0	1 (50)	0	0	1 (50)	**12.031**	**0.017**
	No	20 (42.6)	18 (38.3)	7 (14.9)	1 (2.1)	1 (2.1)		
Psychiatric disorder (n=49)	Yes	6 (26.2)	11 (47.9)	4 (17.4)	1 (4.3)	1 (4.3)	4.650	0.325
	No	14 (53.9)	8 (30.8)	3 (11.5)	0	1(3.8)		

x^2: Fisher's exact test

with higher rates of suicidal thoughts and attempts (18). It has been suggested that obesity leads to chronic systemic inflammation (20), and suicide risk is elevated in people with such inflammation (21,22). However, despite the increased prevalence of suicidal ideation and attempts in individuals with high BMI (18,19), the same pattern is not consistently seen in suicide deaths. Literature presents conflicting findings regarding the relationship between elevated BMI and suicide mortality. While some studies (7,23) report a positive association, others find no significant link or even suggest an inverse relationship (7,24). In our study, elevated BMI and obesity among suicide cases may have interacted with other contributing factors. This aligns with findings that high BMI and obesity often coexist with chronic diseases and psychiatric disorders (23). Obese individuals often face low self-esteem and depression due to social stigmatization and marginalization. Moreover, a decline in quality of life due to chronic diseases and eating disorders is an important factor that can increase suicidal tendencies (18).

Firearms were the most common suicide method (42%), followed by hanging (38%). There are regional variations in preferred suicide methods worldwide. While firearms are commonly used in South America and Africa, hanging remains the most prevalent method globally (25). In Türkiye, hanging is recognized as the leading method, followed by firearms (3). The choice of method may be influenced by customs, accessibility of means, and socio-cultural norms. The widespread use of firearms in some regions may stem not only from cultural familiarity with hunting or self-sufficiency but also from evolving perceptions of safety and personal protection (26). Historically used for hunting and food provision, firearms have increasingly become tools for household defense. Factors such as gender, age, income level, urban versus rural residence, and perceived safety influence firearm ownership (27). The higher prevalence of firearm use in our study, compared to national trends, may reflect unique regional characteristics. In the Eastern Black Sea region, for example, challenging terrain and scattered rural settlements may contribute to a greater reliance on firearms for both utility and protection (28). In some areas, residents also use firearms to guard against wildlife, a factor shaping local attitudes toward weapon ownership. These dynamics are reflected in national reports. According to a civil organization monitoring gun violence, the northern region of Türkiye, including the Black Sea area, ranked second in firearm-related incidents in 2023 (29). As firearm ownership rises, so does the risk of firearm-related deaths (26). There also appears to be a gender-related pattern in suicide methods. Our findings indicate a higher rate of firearm use among males, consistent with evidence that men tend to choose more lethal, accessible, and often irreversible methods; suggesting male suicides may be more premeditated and intentional.

The head was identified as the most frequently targeted region in firearm suicides, accounting for 66.7% of cases. This aligns with existing literature indicating that head injuries are most common, followed by those to the chest and abdomen (30). The preference for the head may reflect a desire for a rapid and irreversible outcome in suicide attempts.

Suicides occurred most frequently during the spring (32%) and summer (30%) months. However, the timing of suicides varies across the literature. Some studies (31,32) report that suicides peak in winter and spring, while others (3,33) indicate that suicides peak in spring and summer. Data from the Turkish Statistical Institute also show that suicide deaths in Türkiye are most frequent in the spring and summer (3). The seasonal prevalence in our study may reflect how seasonal changes influence suicide risk. One study found that each 1 °C increase in temperature corresponded to a 2.18% rise in suicides (33). Similarly, research conducted in East Asia revealed comparable findings, indicating that the relationship between rising temperatures and suicide rates did not vary by age or gender (34).

Most suicides were committed at home or in annexes, with 80% of deaths taking place at the scene. This aligns with previous studies showing that both suicide attempts and deaths predominantly occur at home (11,13). The home may be preferred due to its privacy and low likelihood of intervention. Additionally, an individual's psychological state may be affected by household social dynamics, with stressors in this setting potentially increasing suicide risk. People may prefer the home for its privacy and reduced chance of being interrupted. Furthermore, household stress and interpersonal dynamics may worsen mental health and elevate suicide risk. That most deaths occurred at the scene suggests the methods used tend to be highly lethal, limiting chances for intervention.

Approximately three-fourths of individuals had at least one chronic systemic disease. Chronic diseases significantly diminish quality of life, often causing social isolation, occupational limitations, and emotional issues. Their ongoing nature and the treatment process create substantial stress that deeply affects patients' lives. This negatively impacts mental health and further reduces quality of life. Additionally, the financial burdens associated with treatment exacerbate their mental health challenges. Chronic diseases often bring social, occupational, and emotional challenges. These combined difficulties place additional strain on mental health. Research indicates suicidal ideation risk is higher among patients with chronic diseases (35,36).

A study examining suicide attempts among adults over 50 from various countries found that suicidal ideation was especially common among patients with chronic systemic diseases, with the risk increasing for those with multiple chronic conditions. Furthermore, chronic diseases may contribute to suicidal

thoughts by creating psychological effects that lead individuals to despair and perceive life as intolerable (37). Suicides may be linked not only to the presence of chronic diseases but also to the treatments administered for these conditions. One study reported that certain medications increased the risk of suicide by heightening suicidal thoughts (38).

Approximately half of the cases examined were found to have at least one psychiatric disorder and a history of medication use. The presence of these disorders is a significant factor in both suicide attempts and suicide deaths. Research indicates that a vast majority of suicide deaths are linked to an underlying psychiatric disorder (39). While psychiatric disorders alone do not fully account for suicidal behavior, they are among the most critical risk factors influencing the suicide process. One study highlighted that the impact of psychiatric disorders on suicides arises from a combination of factors, including the occurrence of psychiatric episodes, access to methods of suicide, lack of help or social support, and inadequate coping skills (40). Our findings are consistent with existing literature, suggesting that psychiatric disorders adversely affect individuals' cognitive, emotional, and behavioral functioning, thereby increasing the likelihood of suicidal thoughts and behaviors.

This study has several limitations due to its retrospective design and single-center nature. The small sample size restricts the generalizability of the findings. Moreover, the lack of data on the socio-economic status, and the recent life events of the victims before suicide are among the limitations of the study.

Conclusion

This study, which examined suicide autopsies in Artvin, found that most of those who committed suicide were middle-aged, married men. Suicides predominantly occurred at home during spring and summer, with firearms being the most common method. Many victims had systemic or psychiatric illnesses and were overweight. These findings suggest that suicide prevention efforts should focus on stricter firearm regulations, improved mental health screenings, and community-based psychosocial support-especially for the elderly and the chronically ill.

Ethics

Ethics Committee Approval: This study was approved by the Artvin Çoruh University Scientific Research and Publication Ethics Committee (decision no.: E-18457941-050.99-152405, date: 09.10.2024)

Informed Consent: Retrospective study.

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Footnotes

Authorship Contributions

Surgical and Medical Practices: B.K., Concept: B.K., Design: B.K., Data Collection or Processing: B.K., A.S., Analysis or Interpretation: B.K., Literature Search: B.K., A.S., Writing: B.K., A.S.

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