Review

Forensic Characterisation of Complex Suicides: A Literature Review

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Abstract: Complex suicides refer to using two or more suicide modes. In the literature, complex suicides are distinguished into planned and unplanned. Using multiple methods is related to ensuring a fatal result or because the first method appears too painful, time-consuming, or ineffective. The review aims to provide an overview of the critical features of complex suicides in the forensic context. The review was conducted by searching online databases (PubMed Central and Scopus) up to March 2023. We identified 52 articles that met the inclusion criteria, describing 261 cases. Suicides were classified as planned in 136 cases (52.1%); 105 cases (40.2%) were defined as unplanned, while in the remaining 20 cases (7.7%), the authors did not propose any classification. In 2/261 (0.8%) cases, four modes were indicated, three modes were observed in 34/261 cases (13%), and in 224/261 (85.8%) cases the suicides were carried out using a combination of two distinct methods. The method most frequently employed in the first instance in unplanned suicides were sharp-force injuries and stabbing, followed by mechanical asphyxia (hanging, self-strangulation, plastic bag suffocation) and a fall from height. Regarding planned suicide, the most frequent suicide methods were asphyxia, intoxication (drugs, substances of abuse, or alcohol), and poisoning via toxic substances. Complex suicides represent a relatively rare entity in forensic pathology; nevertheless, they can be challenging for the forensic pathologist in terms of differential diagnosis compared to homicides, due to the sometimes multifaceted presentation.

Keywords: forensic sciences; suicide; complex suicide; unplanned complex suicide; planned complex suicide

1. Introduction

Suicide is an overwhelming public health problem. Globally, the availability and quality of data on suicide and suicide attempts are scarce. In 2019, deaths related to suicide were approximately 700,000 and the overall mortality rate was 16 per 100,000, resulting in one death by suicide every 40 s, deaths that can be considered, at least partially, preventable. Over the period 2000–2019, the age-standardised suicide rate decreased progressively by 36%, with varying rates worldwide [1].

It is currently indicated as one of the three leading causes of death worldwide for people aged 15–44. Furthermore, it has been estimated that for each person who commits suicide, 25 more attempt it, and many more have or have had suicidal thoughts. Regarding the Italian scenario, there were 3780 deaths by suicide in 2016, of which 78.8% were men. Mortality rates are highest in the country’s north, with the lowest values in the southern regions [2].

The reduction in suicide mortality has been prioritised by the World Health Organization (WHO) as a global target and included as an indicator in the United Nations
Sustainable Development Goals (SDGs) under target 3.4, as well as in the WHO’s 13th General Programme of Work 2019–2023 and in the WHO Mental Health Action Plan 2013–2020, which has been extended to 2030 [1].

It is a complex phenomenon whose characteristics are not easy to interpret. Such problems may arise, for example, in cases of death by a fall from height where, in the absence of suggestive circumstantial data (the presence of handwritten farewell letters, the presence of witnesses, etc.), it may be highly complex to define the nature of death as homicidal, suicidal, or accidental [3].

According to what was first proposed in 1974 [4], suicides can be divided into simple and complex, depending on the number of methods employed. It has been estimated that in between 1.5% and 5% of all suicides, at least two methods employed by the victim can be observed; these are defined as complex suicides (CS). CS can be further classified into planned (or primary) and unplanned (or secondary). In the first scenario, the victim plans the different methods to ensure the fatal outcome if the first method fails. In the second situation, the victim modifies the methods in mid-course because the first method proves to be unexpectedly painful or unsuccessful, or death does not occur in the foreseen time [5]. A final distinction must be made between the cases outlined above and the so-called ‘complicated suicides’ [6], in which the victim’s selected method of suicide fails, and death occurs due to a subsequent unforeseen accidental event usually referred to as secondary trauma [7]. Complex suicides can often be misleading due to the combined use of several methods. In such cases, the distinction between suicide and homicide is critical for forensic pathologists. It should also be emphasised that regarding the topic of complex suicides, an organic synthesis of the elements characterising these cases is still lacking in the literature. Therefore, the review aims to summarise the significant and characterising aspects of complex suicides, with an emphasis on aspects of forensic interest.

2. Materials and Methods

The literature review was conducted by searching the PubMed and Scopus databases. Articles were selected using the following search strings:

- Scopus: complex PRE/0 suicide AND (LIMIT-TO (Language, “English”));
- PubMed: “Complex AND suicide”.

The articles were screened according to the inclusion criteria: English language, type of article (case report and case series only), open access articles or articles accessible through our university’s database, and publications reporting autopsy data of suicides performed using at least two methods, including intoxication via drugs or narcotics. Articles concerning ‘complicated’ suicides, i.e., situations in which the second method was the consequence of an accidental traumatic event, were excluded. No time limits were set concerning the date of publication of the articles. The articles initially retrieved using the string search were subsequently selected by assessing the relevance of their titles, abstracts, and finally the full text with respect to the inclusion criteria (Figure 1). The articles were selected by two reviewers independently. In cases of discrepancy of opinions between the two reviewers, the decision was remanded to a third reviewer. A total of 596 articles were collected. These were initially screened by evaluating the titles, then 35 duplicates were removed. At the end of the selection procedure, 52 articles were submitted for analysis, along with 42 case reports (articles concerning a single case) [4,5,8–44] and 10 case series (articles in which at least two cases were described) [45–56], all of which were published in English language in a time range from 1974 to March 2023.
3. Results
3.1. Epidemiology

A total of 261 cases were extrapolated from the 52 articles. Regarding the geographical distribution, most cases were concentrated in Europe, with Italy having the highest number of cases reported overall.

The analysis revealed that the average age of the victims of complex suicides was 46.8 years with a range of 15–86 years. The average age for women was 48.5 years, while the average age for men was 46.3 years. Within 261 cases, 196 were men, and 65 were women, with a male to female ratio of 3 (Table 1).

Figure 1. Articles selection process.

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Asphyxia, or alcohol), and poisoning via toxic substances (pesticides, insecticides and corrosive substances) (Figure 3). Finally, in one case it was reported that the victim had employed a total of six different methods. As for suicides classified as planned, the most frequently reported causes of death were asphyxia, intoxication (drugs, substances of abuse, or alcohol), and poisoning via toxic substances (pesticides, insecticides and corrosive substances) (Figure 3).

3.2. Suicidal Modalities

Suicides were classified as planned in 136 cases (52.1%); 105 cases (40.2%) were defined as unplanned, while in the remaining 20 cases (7.7%) the authors did not propose any classification. As for the suicide methods, the analysis was performed by subdividing them according to the sequence in which they were performed. In 2/261 (0.7%) cases, four modes were indicated, three modes were observed in 34/261 cases (13%), and in 224/261 (85.8%) cases, the suicides were carried out using a combination of only two distinct methods. Finally, in one case it was reported that the victim had employed a total of six different suicide methods.

Concerning the type of method used, in most cases, ‘classic’ methods were employed in various combinations. In this respect, it was observed that the method most frequently employed in the first instance in unplanned suicides was sharp-force injuries (mainly involving the neck, forearms, and abdomen), followed by mechanical asphyxia (hanging, self-strangulation, plastic bag suffocation) and jumping from a height (Figure 2).

Table 1. Data related to the epidemiological characteristics of the cases analysed. * Average age calculated on 135 cases because in 1 case the authors omitted to report it. ** Average age calculated from 103 cases because in 2 cases the authors omitted to report it.

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<td>Average age</td>
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<td>105 M/31 F</td>
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Figure 2. Schematic representation of the reported suicide methods in unplanned cases, defined according to the classification reported by authors. The poisoning group includes cases in which exogenous substances such as pesticides, insecticides and corrosive substances were used; the intoxication group includes those cases in which drugs, substances of abuse or alcohol were used; the mechanical asphyxiation group includes hanging, self-strangulation and plastic bag suffocation. The other methods group includes different methods used only once (explosion).

As for suicides classified as planned, the most frequently reported causes of death were asphyxia, intoxication (drugs, substances of abuse, or alcohol), and poisoning via toxic substances (pesticides, insecticides and corrosive substances) (Figure 3).
In some cases, rarer and unusual methods were used, such as the ingestion of foreign bodies [20,23,28] (an occurrence usually associated with an unintentional event), femoral catheterisation associated with drug intoxication resulting in haemorrhagic shock (the victim, in this case, was a cardiologist) [16], self-immolation [40,47,54], and the use of a power drill on the head, neck, chest and abdomen [42,43]. On the other hand, considering the cases for which the authors did not propose any classification, different modalities were variously employed, as depicted in Figure 4.

Concerning the combinations of suicide methods used, 58 different types of complex suicides emerged. The most frequently used combinations were hanging and gunshot in 12.5% (17/136) of cases, plastic bag suffocation and gas inhalation in 11.8% (16/136) of cases, the combination of intoxication (medicine, drug or alcohol) and hanging in 7.3%
(10/136) of cases, and the combination of gunshot and self-immolation in 6.7% (9/136) of cases (Figure 5).

![Planned suicides combinations](image)

**Figure 5.** The most used methods combination in planned suicides.

With reference to unplanned suicides, the combination analysis documented 30 different types, of which the most frequently observed was the association between sharp-force injuries (all injuries, such as wrist and neck cut and self-stabbing to the abdomen or chest, using a weapon with at least one sharp edge, were considered in this group) and hanging (23.8%; 25/105 cases). In 23.8% (25/105) of the cases, the association between sharp-force injuries and a fall from height was observed (Figure 6).

![Unplanned suicides combinations](image)

**Figure 6.** The most used methods combination in unplanned suicides.

### 3.3. Psychiatric History and Circumstantial Data

In 111/261 (42.5%) cases, a positive history of psychiatric disorders (depression, psychotic disorder, and schizophrenia) or the presence of other conditions such as a history of family conflicts, alcohol, drug, and substance abuse (cocaine, hashish, and ecstasy) was reported. A total of 66/261 (25.3%) cases concerned subjects with a positive history of previous suicide attempts. In 59/261 (22.6%) cases, the presence of a farewell letter was recorded during the on-site inspections.

### 4. Discussion

Complex suicides are a relatively rare occurrence in the forensic setting. The analysis of these events is of relevance given the difficulty in distinguishing the actual suicidal
event from homicidal or accidental events, as these require a differential diagnosis that the forensic pathologist must be able to perform whenever faced with a violent death. Therefore, in these circumstances, the accurate analysis of the elements characterising the suicide event (the study of the cadaveric injuries, both external and internal, and microscopic and toxicological analysis) and of the circumstantial elements such as the presence of a suicide note and the reconstruction of the victim’s medical history, with particular reference to the psychiatric anamnesis, a history of abuse and previous suicide attempts, are necessary. As regards the geographical distribution of the cases, we noted a significant disparity, with most cases reported in Canada and Europe (the highest absolute amount coming from Italy) and limited evidence from other continents. This is confirmed by the widely known fact that most of the published literature on suicide comes from high-income countries [57], making suicide virtually unexplored in low- and middle-income countries. Also, as reported by the WHO, only approximately 80 of the Member States provide data of good quality for use in calculating reliable rates [1]. In this framework, it is even more difficult to obtain reliable statistical data analysing the specific phenomenon of complex suicides. From the epidemiological perspective, the analysis highlighted a marked male predisposition. This finding is confirmed by what has been reported in statistical analyses concerning the suicide phenomenon in general, albeit with significant socio-demographic differences [58,59]. It has been highlighted that factors affecting the unequal distribution between males and females include age group, geographical area (the highest rates have been recorded in recent decades in China, India, and South Korea) [60], and socio-economic level. Indeed, it has been reported that the ratio of male to female suicides is higher in high-income countries than in lower-middle-income countries (3.5 vs. 1.6) and in Western countries than in Asian/Pacific countries (3.6–4.1 vs. 0.9–1.6) [61]. Although the general statistics show that suicide is more prevalent among men, it should be noted that, in most countries where the prevalence of suicidality has been studied, females have higher rates of suicidal ideation and behaviour than males. Nevertheless, mortality from suicide is typically lower for females than males [62]. This has been called the “gender paradox” [63]. It has been suggested that higher rates of suicide deaths among young males may be associated with a higher prevalence of externalising disorders (e.g., conduct disorder, substance abuse disorder, deviant behaviour) and a predilection for highly lethal methods [64–66]. Regarding the average age, it should first be underlined that the geographical distribution of the reported cases may have influenced the review’s findings. Nevertheless, it should be noted that there was substantial concordance between what emerged from our analysis of complex suicides and what can be evinced from statistics reported in the literature, according to which the suicide rate tends to increase with age [67]. According to WHO, suicide in the elderly population is highly prevalent worldwide. In detail, studies have documented that the age of individuals with suicidal ideation tends to be lower than those who complete it [68]. This suggests the likelihood that, in some cases, a variable period elapses between the suicidal ideation and the act itself, a period during which the suicidal person reinforces his or her intention. It can be assumed that in the context of complex suicides, especially planned ones, this time interval may be even longer. However, it should be noted that only a minority of those who have suicidal thoughts carry out the act. According to estimates by the Centers for Disease Control and Prevention, about 10 million people in America in 2017 had one or more suicidal thoughts compared to the 1.4 million actual attempts [69]. One of the most relevant forensic aspects is the correlation between suicide and mental disorders. This association is well known in the literature, where it is reported that up to 90% of individuals who commit suicide present the diagnostic criteria for a psychiatric disorder [70,71]. Depression and substance abuse disorders, especially alcohol, are the most common diagnoses among suicide victims [72]. The review documented that in 42.5% of the cases, the authors reported a known history of psychiatric pathology or substance abuse (including alcohol) or otherwise abuse-related distress in childhood or the family. Although meaningful, the reported result may be underestimated due to the authors’ omission to report or the lack of in-depth investigations.
into the victims’ medical history. The presence of a suicide note is also a circumstantial element that is undoubtedly useful in the correct definition of suicide, especially in the case of complex suicides. The presence next to or in the place where the suicide was performed of a note or letter is an element that can be used to reconstruct the emotional state of the victim (after having ascertained the truthfulness of it) [73]. A unique element that emerged from the review is related to the higher frequency of farewell letters in planned complex suicides (about 1 in 4) compared to unplanned ones, underlining that in these cases, planning can also be inferred from the environmental context in which the suicide is carried out. The suicide note, combined with the anamnestic victim reconstruction, with particular regard to the presence of psychiatric pathologies or related symptoms, is one of the elements used to perform the psychological autopsy, first defined in 1958 as “nothing less than a thorough retrospective investigation of the intention of the decedent” [74]. The complete and detailed reconstruction of the events preceding the suicide, especially in the case of suicides characterised by a complex dynamic, is essential to achieve a valid differential diagnosis.

A key element emerged from the review is related to the suicide modalities, the analysis of which was performed by distinguishing cases into planned, unplanned, and unclassified suicides, according to the distinctions reported by the authors. Analysing planned suicides, deaths related to mechanical asphyxia (hanging, self-strangulation, and plastic bag suffocation) were the most frequent.

As for the combinations most frequently employed in cases classified as planned, the analysis showed a greater variability (also characterised by the use of unusual combinations such as femoral catheterisation associated with drug intoxication), although this was partly related to the overall higher number of cases compared to unplanned suicides. The most frequently reported combination was hanging and gunshot. The decision to use two modes considered ‘highly lethal’ simultaneously suggests a preordained intention to organise the dynamics of the event in order to secure the fatal outcome within a short timeframe. Otherwise, in the unplanned cases, the preponderance of combinations was characterised by sharp-force injuries (including in this group both more superficial injuries typically localised at the wrists and forearms, and cases of self-stabbing, usually involving the chest and abdomen), which were variously associated with other methods used successively such as falling from height and hanging. This is hardly surprising considering that stab wounds, especially if they involve the wrists and limbs, do not always lead to a fatal outcome and tend to be extremely painful; therefore, it is understandable that, once this route has been attempted, victims choose other, quicker, more effective and less painful ways. For unplanned cases, it emerged that the most frequently used method was sharp-force injuries. Some authors have emphasised that the choice of a particularly violent and lethal method could indirectly indicate a deeply entrenched suicidal intent, compared to the use of methods such as poisoning and intoxication, classically included among the ‘less lethal’ methods [75]. This distinction may be even more significant in the context of complex suicides, especially planned ones.

It has been suggested that the frequency with which suicide methods are used tends to vary depending on several variables, including the geographical area (which may also correlate with the greater availability of certain weapons such as firearms) and the age and gender of the victim. It has been highlighted in this regard that suicide methods vary in different regions of the world. Some authors also attribute the choice of a method to an extreme form of communication of personal and social needs, as if it were a kind of last message [66].

Concerning gender differences, it has been noted that men tend to choose more violent and lethal methods (firearms and hanging) compared to women, who prefer less lethal methods such as poisoning and a fall from height [76,77]. These data could also explain why suicidal deaths are more frequent among men than women. However, it should be noted that in some studies, these differences were not found to be statistically significant. The Italian official statistics report that the prevalent suicide modes are ‘Hanging
and suffocation’ (52.1%) for men, ‘Precipitation’ (35.1%), and ‘Hanging and suffocation’ (33.4%) for women [78]. Hanging is the most frequent modality, mainly in high-income countries. According to a study conducted in Europe based on data from 16 countries, the most frequent mode used by both genders was hanging (54.3% in men and 35.6% in women) [66]. The explanation can be sought in the ease with which this suicidal mode can be implemented, which requires using easily and commonly available means. Exceptions to this are in the United States and Australia, where firearms are the most used method [79]. It has been estimated that around 8% of global suicides are related to the use of firearms [80]. In Asia, on the other hand, the most used method is poisoning, particularly using pesticides, as is also the case in some countries of South and Central America, probably due to the greater availability of such poisonous means since these are predominantly rural areas [81].

The investigation of suicide modalities appears to be of fundamental importance concerning implementing any preventive measures, even though the phenomenon of suicide appears challenging to eliminate. It has been emphasised that suicide reduction can still be achieved by reducing access to lethal means [82], but this requires a comprehensive systemic approach that includes collaboration between various actors, such as policymakers and health professionals, to act on modifiable risk factors [83].

Concerning the reliability of our results, one of the study’s main limitations is that the scientific literature on the subject is based on case reports and case series, mostly from high-income countries, making the phenomenon still largely unrecognised in much of the world. This geographical distribution could be a confounding factor concerning the most used methods, which, as reported widely in the literature with respect to the suicide phenomenon in general, tend to vary in different parts of the world. Another limitation of the analysis is the incomplete information reported by the different authors, with reference to anamnestic information regarding the presence of predisposing psychiatric conditions and previous suicide attempts.

5. Conclusions

This review aimed to provide a synthesis of the characterising elements from a forensic point of view of complex suicides which can represent a diagnostic challenge for forensic pathologists and investigators.

One of the most interesting elements that emerged from our review is how planned and unplanned suicides are carried out, and the most significant differences between them. It has been found that the methods most frequently used in the first instance in the unplanned suicide event are stab wounds, whereas in the case of pre-planned suicide, other methods such as asphyxia and intoxication with drugs or drugs of abuse are more frequent. The use of cutting weapons suggests an unplanned suicide, carried out without preparation and using easily available tools, even in a domestic environment. Conversely, suicides carried out with more original and constructed methods suggest preparatory planning. Another difference between the two types of complex suicide is the presence of farewell letters, which, as our results show, suggests suicidal planning.

Moreover, to reach a correct differential diagnosis between these cases and homicide, a multidisciplinary approach appears to be essential, based on the integration of data from the investigation activities (with particular attention to the recovery of the victim’s circumstantial and anamnestic information) and the data obtained from the body examination. This is especially relevant in unplanned suicide cases, which may appear more difficult to circumscribe.

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