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REVIEW Open Access

Fatal spider envenomation: a systematic review of autopsy findings

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Abstract

Background Fatal spider envenomation is exceptionally rare in contemporary medical practice; however, sporadic reports continue to appear in the forensic literature, often characterized by diagnostic uncertainty and heterogeneous documentation. This systematic review critically evaluated all published fatal cases attributed to spider envenomation, with emphasis on autopsy findings, histopathological patterns, and medico-legal robustness of causal attribution.

Results A systematic search of PubMed/MEDLINE, Embase, and Scopus was conducted from database inception to 14 February 2026 in accordance with PRISMA 2020 guidelines. Twelve studies met predefined inclusion criteria and were included in the qualitative synthesis. Seven cases (58%) were supported by autopsy findings, while five were clinically well-documented fatalities without post-mortem examination. Loxosceles accounted for most cases (8/12), followed by Latrodectus (3/12) and Atrax (1/12). Three recurrent genus-specific patterns emerged. Loxosceles envenomation showed a hemolytic–coagulopathic profile characterized by intravascular hemolysis, disseminated intravascular coagulation, and acute renal injury. Latrodectus cases demonstrated a predominantly cardiotoxic pattern with myocardial injury and pulmonary edema. Atrax envenomation was associated with a neurotoxic–pulmonary presentation marked by severe pulmonary edema and autonomic instability.

Conclusion Although the number of cases is limited, the recurrence of distinct pathological patterns supports biological plausibility. Nevertheless, substantial risk of misclassification persists, particularly in the absence of entomological confirmation or systematic exclusion of alternative causes of sudden death. Fatal spider envenomation should therefore be interpreted through a structured forensic framework integrating exposure plausibility, clinicopathological coherence, and exclusion of competing causes of death.

Keywords Spider envenomation, Forensic pathology, Loxosceles, Latrodectus, Atrax, Spider bite

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Background

Spider envenomation remains a global medical concern. Although more than 40,000 spider species have been described, only a limited number are capable of causing clinically significant human envenomation. Most confirmed cases result in minor or self-limited manifestations, whereas systemic syndromes are uncommon and fatal outcomes are exceptional (Warrell 2019; Isbiter et al. 2011).

The diagnosis of "spider bite" is frequently based on clinical suspicion rather than documented species identification, leading to substantial overdiagnosis and misclassification, particularly in cases of necrotic skin lesions (Isbiter et al. 2011; Fusto et al. 2020). This diagnostic ambiguity has important medico-legal implications when spider envenomation is alleged as a cause of death.

Among clinically relevant genera, Loxosceles species may cause systemic hemolysis and coagulopathy mediated by sphingomyelinase D (Swanson et al. 2006; Pinto et al. 2025; da Silva et al. 2020). Latrodectus species produce a neurotoxic syndrome through α-latrotoxin–induced autonomic activation (Holz et al. 1998; Garb et al. 2013). Funnel-web spiders of the genus Atrax act on voltage-gated sodium channels, leading to severe neuroexcitation and autonomic instability (Nicholson et al. 1998; Alewood et al. 2003). Despite these mechanisms, progression to a fatal outcome is distinctly rare and largely confined to isolated case reports.

Autopsy-based series of fatal intoxications consistently identify drugs, alcohol, carbon monoxide, and pesticides as the predominant causes of death, whereas arthropod envenomation represents an exceptional category (Boumba et al. 2013; Wang et al. 2019).

To date, no study has systematically integrated autopsy findings, pathophysiological mechanisms, and forensic reasoning into a structured interpretative approach for fatal spider envenomation.

This systematic review therefore aimed to critically evaluate all published fatal cases attributed to spider envenomation, with particular emphasis on autopsy findings, clinical evolution, and medico-legal reliability of causal attribution.

This systematic review was conducted and reported in accordance with the PRISMA 2020 (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) statement. The study protocol was prospectively registered on the Open Science Framework (OSF) prior to data extraction at: https://osf.io/czy62/. Clinical trial number: not applicable.

The aim of this review was to systematically identify and critically appraise all published reports of fatal outcomes attributed to spider envenomation, with particular attention to autopsy findings, histopathological features, post-mortem investigations, and documented ante-mortem clinical work-up. Given the well-recognized issue of overdiagnosis and misclassification of alleged spider bites in both clinical and forensic practice, particular emphasis was placed on evaluating diagnostic certainty and the medico-legal reliability of the attribution of death to envenomation.

A comprehensive literature search was performed in PubMed/MEDLINE, Embase, and Scopus from database inception to 14 February 2026. The search strategy combined controlled vocabulary terms and free-text keywords related to spider envenomation and specific medically relevant genera, including *Latrodectus*, *Loxosceles*, *Atrax*, *Hadronyche*, *Phoneutria*, and *Sicarius*, together with terms related to death and fatal outcomes. The syntax was adapted to each database. No date restrictions were applied. Articles published in English, Italian, Spanish, or French were considered eligible. The full electronic search strategy is provided in Supplementary Material 1.

To minimize the risk of missing relevant historical case reports and poorly indexed publications, supplementary searches were conducted through manual screening of reference lists and forward citation tracking. Google Scholar was also explored to enhance completeness. These additional searches did not identify further studies meeting the predefined inclusion criteria. Additional exploratory searches using historical terms including "loxoscelism", "latrodectism" and "arachnidism" combined with fatal outcome-related keywords were also conducted to minimize the risk of missing older case reports. These searches did not identify further eligible fatal cases beyond those retrieved through the primary strategy.

All retrieved records were exported to reference management software, and duplicate entries were removed prior to screening. Titles and abstracts were screened independently by two reviewers. Articles deemed potentially relevant underwent full-text evaluation. Disagreements were resolved through discussion and consensus. The entire selection process was documented using a PRISMA 2020 flow diagram.

Studies were considered eligible if they reported fatal cases attributed to spider envenomation and provided either post-mortem findings or sufficiently detailed clinical documentation supporting systemic envenomation and a plausible causal relationship with death. Both autopsy-confirmed cases and clinically well-documented fatal cases were included, provided that diagnostic attribution was supported by clinical, forensic, or entomological evidence. Studies were excluded if cases were non-fatal, if no post-mortem or adequate clinical documentation was available, if death was clearly attributable solely to secondary infectious complications without evidence of systemic envenomation, or if the diagnosis of

spider bite was purely speculative and unsupported by objective documentation.

Data extraction was performed using a standardized form developed prior to analysis. For each included case, demographic characteristics, geographic context, relevant comorbidities, reported spider species, method of species identification, and the interval between alleged envenomation and death were recorded. Available antemortem clinical data were extracted, including hemodynamic parameters, electrocardiographic findings, cardiac biomarkers, laboratory evidence of hemolysis, coagulation abnormalities, renal impairment, and treatments administered, including antivenom therapy. For forensic interpretation, primary emphasis was placed on autopsy-confirmed cases, while non-autopsy cases were included only as supportive clinical evidence.

Autopsy findings were analyzed in a structured manner. Gross examination findings, when available, included description of the cutaneous lesion, pulmonary edema, myocardial abnormalities, evidence of disseminated intravascular coagulation, renal cortical necrosis or acute tubular necrosis, and skeletal muscle injury. Histopathological findings were reviewed with specific attention to myocardial inflammatory infiltrates, interstitial edema, myocyte necrosis, microvascular thrombosis, vascular damage within the skin, and renal tubular injury. When reported, post-mortem biochemical markers and toxicological analyses were also recorded.

Diagnostic robustness was qualitatively assessed across four domains: (1) entomological confirmation, (2) completeness of autopsy data, (3) exclusion of alternative causes, and (4) clinicopathological coherence.

Results

Study selection

The database search identified a total of 1,791 records, comprising 1,481 from PubMed/MEDLINE, 41 from Scopus, and 269 from Embase. After removal of 67 duplicate records, 1,724 articles remained for title and abstract screening. Of these, 1,683 were excluded as clearly irrelevant to fatal spider envenomation.

Forty-one reports were considered potentially eligible and were sought for full-text retrieval. Six reports could not be accessed despite reasonable efforts. Thirty-five full-text articles were assessed for eligibility. Twenty-three were excluded after detailed evaluation because they reported non-fatal cases, lacked post-mortem or sufficiently detailed clinical documentation, attributed death solely to secondary infectious complications, or presented speculative diagnoses unsupported by objective evidence.

Twelve studies fulfilled the predefined inclusion criteria and were included in the qualitative synthesis (Gomez Cifuentes et al. 2016; González Valverde et al. 2001; Meadows et al. 2024; Mouhaoui et al. 2009; Pezzi et al. 2016; Pneumatikos et al. 2003; Rosen et al. 2012; Taylor et al. 1966; Torda et al. 1980; Vorse et al. 1972; Wiliams et al. 1995; Zambrano et al. 2005). The study selection process is illustrated in Fig. 1.

Characteristics of included studies

The twelve included studies consisted predominantly of individual case reports describing fatal outcomes attributed to spider envenomation, with a minority of small case series providing extractable case-level data. The cases originated from regions where medically significant spiders are endemic, including North and South America, Southern Europe, North Africa, and Australia.

The most frequently implicated genus was *Loxosceles* (eight cases), followed by *Latrodectus* (three cases) and *Atrax* (one case). The principal spider genera implicated in the reviewed fatal cases are illustrated in Fig. 2.

Species confirmation was documented in a subset of cases, particularly those involving *Latrodectus* and *Atrax*, whereas several *Loxosceles* cases were classified as probable based on clinical presentation and epidemiological context.

The interval between the reported envenomation and death varied considerably across genera. Fatal *Latrodectus* cases typically evolved rapidly, with death occurring within 15–36 h. Fatal *Loxosceles* cases demonstrated a broader temporal spectrum, ranging from less than 24 h in fulminant pediatric presentations to several weeks in cases characterized by progressive systemic hemolysis and renal failure. Fatal *Atrax* envenomation presented either with rapid deterioration within 24 h or with a more protracted course marked by severe pulmonary complications.

Autopsy was performed in seven of the twelve cases, providing detailed gross and histopathological documentation. The remaining five cases were supported by comprehensive clinical documentation consistent with systemic envenomation but lacked formal post-mortem examination. An overview of the 12 included studies is reported in Table 1.

Pathophysiological patterns of fatal envenomation

Across the included cases, three recurrent pathophysiological patterns emerged, largely corresponding to the implicated spider genus.

Fatal *Loxosceles* envenomation was characterized by a hemolytic–coagulopathic pattern associated with severe hemolysis, coagulopathy, and multiorgan dysfunction. Death was typically associated with multiorgan dysfunction and refractory shock. Even in cases without autopsy, the clinical course showed laboratory evidence of severe hemolysis, coagulopathy, metabolic acidosis,

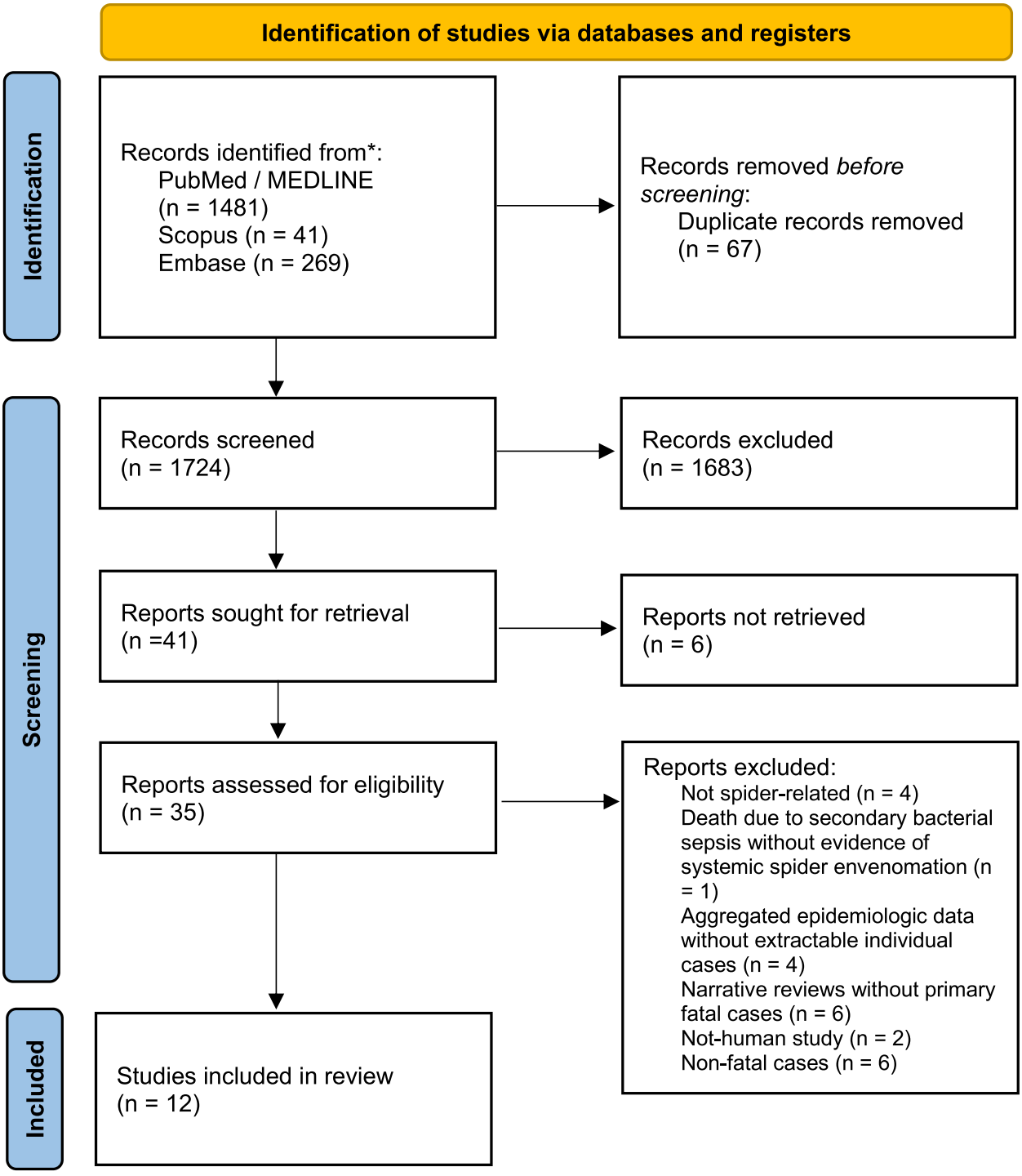

Fig. 1 PRISMA 2020 flow diagram

and progressive organ failure, supporting a consistent systemic mechanism.

Fatal *Latrodectus* envenomation exhibited a predominantly cardiotoxic pattern associated with acute cardiovascular dysfunction. The clinical evolution was typically rapid and marked by severe autonomic dysregulation, hypertensive crisis, and subsequent cardiovascular collapse. In these cases, death was attributed primarily to acute cardiac dysfunction rather than coagulopathy or hemolysis.

Fatal *Atrax* envenomation displayed a distinct neurotoxic–pulmonary pattern characterized by severe autonomic instability and respiratory compromise. The clinical course was characterized by rapid autonomic

Fig. 2 Representative medically important spiders associated with fatal envenomation. **A** *Loxosceles* spp. habitus. Photograph courtesy of Pierluigi Rizzo, used with permission. **B** Characteristic ocular arrangement of *Loxosceles* spp. Photograph courtesy of Pierluigi Rizzo, used with permission. **C** *Latrodectus* spp. (black widow spider). Photograph courtesy of Marco Colombo, used with permission. **D** *Atrax robustus* (Sydney funnel-web spider). CC0 public domain image via Wikimedia Commons

instability, respiratory compromise, and progressive hemodynamic deterioration. In contrast to *Loxosceles*, hemolysis was not a dominant feature.

Autopsy and histopathological findings

In the seven autopsy-confirmed cases, several recurrent pathological features were observed, as reported in Table 2.

Among *Loxosceles* cases, gross examination frequently revealed necrotic cutaneous lesions at the presumed bite site. Renal findings were prominent and included acute tubular necrosis and intratubular hemoglobin casts, consistent with severe intravascular hemolysis. Evidence of disseminated intravascular coagulation was documented in multiple cases. Pulmonary findings were generally secondary and consisted of congestion or edema rather than primary toxic injury.

In contrast, *Latrodectus* autopsy cases demonstrated minimal local skin findings but significant cardiac pathology, including myocardial necrosis or inflammatory infiltrates consistent with toxic myocarditis. Diffuse pulmonary edema was frequently present and interpreted as secondary to acute cardiac dysfunction.

Among the seven autopsy-confirmed cases, renal involvement consistent with acute tubular injury or hemoglobin casts was documented in 5/7 cases, disseminated intravascular coagulation in 4/7, and pulmonary edema in 4/7 cases. Myocardial necrosis or inflammatory changes were identified in 2/7 autopsy cases, both involving Latrodectus envenomation.

Table 1 Overview of the 12 included studies

Study	Country	Age/Sex	Genus	Certainty	Bite → Death	Autopsy	Main Pathophysiological Pattern and Presumed Mechanism of Death
Gomez Cifuentes et al. (2016)	Colombia	16 M	Loxosceles	Probable	96 h	Yes	Viscerocutaneous loxoscelism with massive intravascular hemolysis, DIC, acute renal failure, and multiorgan dysfunction leading to shock
Gonzáles Valverde et al. (2001)	Spain	80 M	Latrodectus	Probable	15 h	No	Severe latrodectism characterized by autonomic storm, hypertensive crisis, and rapid cardiorespiratory decompensation
Meadows et al. (2024)	USA	44 M	Loxosceles	Probable	37 h	No	Fulminant systemic loxoscelism with hemolysis, coagulopathy, metabolic acidosis, and refractory shock
Mouhaoui et al. (2009)	Morocco	28 M	Latrodectus	Confirmed	22 h	Yes	Acute cardiotoxic envenomation with myocardial necrosis and cardiogenic shock
Pezzi et al. (2016)	Italy	65 F	Loxosceles	Probable	~12–24 h (estimated)	No	Systemic necrotic arachnidism with hemolysis, coagulopathy, and rapid hemodynamic collapse
Pneumatikos et al. (2003)	Greece	19 F	Latrodectus	Confirmed	36 h	Yes	Toxic myocarditis with diffuse pulmonary edema and acute cardiac failure
Rosen et al. (2012)	USA	3 F	Loxosceles	Probable	19 h	Yes	Pediatric fulminant loxoscelism with massive hemolysis, DIC, and acute multiorgan failure
Taylor et al. (1966)	USA	Adult male	Loxosceles	Confirmed	< 24 h	Yes	Viscerocutaneous loxoscelism with severe intravascular hemolysis, acute renal failure, and fatal systemic deterioration
Torda et al. (1980)	Australia	31 F	Atrax robustus	Confirmed	6 days	No	Progressive envenomation with non-cardiogenic pulmonary edema, consumption coagulopathy, and multiorgan failure
Vorse et al. (1972)	USA	Adult	Loxosceles	Probable	< 24 h	Yes	Systemic loxoscelism with massive intravascular hemolysis, disseminated intravascular coagulation, and acute renal injury leading to cardiovascular collapse
Williams et al. (1995)	USA	24 F	Loxosceles	Probable	~4 days	Yes	Systemic hemolytic syndrome with DIC, acute renal injury, and fatal multiorgan dysfunction
Zambrano et al. (2005)	Chile	71 M	Loxosceles	Probable	≈5–6 weeks	No	Delayed viscerocutaneous loxoscelism with persistent hemolysis, acute renal failure, and progressive systemic deterioration

Abbreviation: *DIC* Disseminated intravascular coagulation

Table 2 Autopsy and histopathological findings

Study	Genus	Cutaneous	Pulmonary	Cardiac	Renal	Coagulation	Other
Gomez Cifuentes et al. (2016)	Loxosceles	Necro-hemorrhagic skin lesions	Not detailed	Not detailed	Acute renal failure	DIC documented	Multiorgan involvement
Rosen et al. (2012)	Loxosceles	Hemorrhagic vesicle	Massive hemorrhage during resuscitation	Not detailed	Acute hemolysis-related injury	Fulminant DIC	Pediatric rapid collapse
Taylor et al. (1966)	Loxosceles	Necrotic ulcer with dermal and subcutaneous vascular thrombosis and arteritis	Not specifically detailed	No primary myocardial lesion reported	Tubular degeneration with hemosiderin casts	Intravascular hemolysis	-
Vorse et al. (1972)	Loxosceles	Necrotic lesion with vasculitis	Congested, edematous lungs	Not specific	Hemoglobin casts in tubules	DIC confirmed	Petechiae
Williams et al. (1995)	Loxosceles	Necrotic lesion	Pulmonary congestion and edema	No specific primary myocardial lesion	Severe intravascular hemolysis with renal injury	DIC clinically suspected	Pericardial & pleural effusions
Pneumatikos et al. (2003)	Latrodectus	Minimal local lesion	Diffuse pulmonary edema	Toxic myocarditis	Not significant	No DIC	Cardiogenic shock
Mouhaoui et al. (2009)	Latrodectus	Mild local signs	Pulmonary congestion	Myocardial necrosis	Not described	Not described	Troponin elevation

Abbreviation: *DIC* Disseminated intravascular coagulation

Overall, the autopsy data supported the existence of genus-specific pathological patterns rather than a single uniform mechanism of death attributable to spider envenomation.

Discussion

From pathophysiology to forensic interpretation

Envenomation by spiders capable of causing systemic toxicity produces organ damage through distinct mechanisms that are reflected in the autopsy findings observed in fatal cases. Understanding this genus-specific pathobiology is essential for interpreting post-mortem patterns in a forensically meaningful way.

In Loxosceles envenomation, phospholipases D are responsible for the principal systemic effects, inducing endothelial injury, complement activation, and intravascular hemolysis that may culminate in disseminated intravascular coagulation and acute renal failure (Gremski et al. 2022). Clinically, systemic loxoscelism is characterized by hemolytic anemia, thrombocytopenia, hemoglobinuria, and renal impairment (Nguyen et al. 2019). This sequence provides biological plausibility for the recurrent autopsy findings in fatal cases, including microvascular thrombosis, acute tubular necrosis with hemoglobin casts, and consumptive coagulopathy (Gomez Cifuentes et al. 2016; Pneumatikos et al. 2003; Taylor et al. 1966; Vorse et al. 1972; Williams et al. 1995). The predominance of renal and hematologic involvement in the reviewed cases is therefore consistent with the known systemic effects of phospholipase D–mediated injury.

Latrodectus venom acts primarily through α-latrotoxin, which induces massive neurotransmitter release and profound autonomic activation. Although the classical presentation is dominated by pain and neuromuscular symptoms, severe cases may involve cardiovascular complications, including troponin elevation, myocarditis-like changes, arrhythmias, and transient ventricular dysfunction (Khakh et al. 2024; Terzi et al. 2026). Catecholamine excess provides a plausible mechanism for myocardial injury and secondary pulmonary edema. Accordingly, myocardial inflammatory infiltrates or necrosis associated with acute pulmonary congestion in fatal cases are compatible with severe latrodectism when interpreted within the clinical context (Mouhaoui et al. 2009; Pneumatikos et al. 2003).

Envenomation by funnel-web spiders of the genus Atrax is mediated by δ-atracotoxins acting on voltage-gated sodium channels, producing sustained neuronal depolarization and marked autonomic excitation (Vetter et al. 2008). Severe envenomation may progress to cardiogenic shock and acute pulmonary edema, with evidence of catecholamine-mediated myocardial injury even after antivenom administration (Millet et al. 2016). This mechanism supports the pulmonary edema and cardiovascular instability reported in fatal cases (Torda et al. 1980). Unlike Loxosceles, funnel-web fatalities are primarily characterized by neurotoxic–autonomic collapse with secondary cardiopulmonary involvement.

Taken together, these mechanisms account for the three pathological patterns identified in this review and underscore the need to interpret autopsy findings within a biologically grounded toxicological framework rather than attributing death solely to the presence of a cutaneous lesion.

Forensic attribution: from suspicion to cause of death

The attribution of death to spider envenomation requires more than the identification of a compatible skin lesion or a suggestive clinical history. In the forensic setting, causal determination must rely on the convergence of scene investigation, clinical evolution (when available), and a coherent internal pathological pattern. Based on the cases reviewed, three principal autopsy patterns can be delineated.

Pattern 1 – Hemolytic–coagulopathic (Loxosceles)

In suspected *Loxosceles*-related deaths, the presence of a necrotic cutaneous lesion may support exposure but is not, in itself, diagnostic. The core forensic pattern consists of systemic hemolysis associated with coagulopathic and renal involvement.

However, this pattern is not specific. Disseminated intravascular coagulation is a secondary, systemic coagulopathy occurring in association with sepsis, malignancy, trauma, and other severe systemic conditions (Adelborg et al. 2021), including fulminant bacterial infections characterized by rapid systemic collapse (Santunione et al. 2025a, b). Differential diagnoses therefore include septic shock with DIC, thrombotic microangiopathies, hemolytic–uremic syndrome, severe drug-induced hemolysis, and underlying hematologic disorders. The absence of laboratory or histological evidence of systemic hemolysis or renal injury should raise serious doubt regarding causal attribution to *Loxosceles* envenomation.

Pattern 2 – Cardiotoxic/myocarditic (Latrodectus)

In alleged fatal *Latrodectus* envenomation, cutaneous findings are frequently minimal or absent. The forensic focus shifts to the heart and lungs. The dominant forensic pattern is characterized by acute cardiopulmonary dysfunction compatible with severe autonomic toxicity. These changes are compatible with severe autonomic activation and catecholamine-mediated myocardial injury.

The principal differential diagnoses include viral myocarditis, acute coronary syndromes, primary arrhythmogenic disorders, and non–venom-related catecholamine

storms. Toxicological analysis and exclusion of structural heart disease are therefore essential before attributing death to latrodectism.

Pattern 3 – Neurotoxic–pulmonary (Atrax)

Fatal funnel-web envenomation is primarily characterized by severe neurotoxic and autonomic dysregulation with secondary cardiopulmonary compromise.

Differential diagnoses include acute respiratory distress syndrome, opioid or sedative overdose, anaphylaxis, and other causes of non-cardiogenic pulmonary edema. The rapidity of clinical deterioration, when documented, may provide important contextual support. In the absence of corroborative scene or clinical evidence, pulmonary edema alone is insufficient to establish causality.

Risk of overdiagnosis and attribution bias

Spider envenomation is historically prone to overdiagnosis, particularly in cases of necrotic skin lesions or unexplained systemic deterioration. Clinical analyses consistently demonstrate that presumed "spider bites" are frequently misclassified infections—most notably *Staphylococcus aureus*—as well as inflammatory dermatoses, vasculitis, neoplastic conditions, or other ulcerative disorders (Nishioka 2001; Gaver-Wainwright et al. 2011; Stoecker et al. 2017).

In the forensic context, attribution bias may be reinforced by circumstantial narratives or the incidental presence of an arthropod at the scene. A necrotic lesion or compatible geographic setting alone does not establish causality.

Fatal outcomes attributed to *Loxosceles* are particularly vulnerable to misclassification, as disseminated intravascular coagulation, hemolysis, and acute renal failure are non-specific findings shared by sepsis, thrombotic microangiopathies, autoimmune disorders, and toxic exposures. Likewise, myocardial inflammation and pulmonary edema reported in alleged *Latrodectus* fatalities overlap with viral myocarditis, stress cardiomyopathy, and acute coronary syndromes.

Without a toxicological pattern consistent with the known effects of the implicated genus and careful exclusion of alternative causes, attribution remains speculative. Similar interpretative challenges have been highlighted in post-mortem microbiology, where isolated findings require integration within a structured multidisciplinary framework to avoid misattribution of cause of death (Camatti et al. 2026).

Recognition of this overdiagnostic tendency is essential to prevent erroneous cause-of-death certification.

Structured forensic interpretation in suspected spider-related deaths

When spider envenomation is alleged as a potential cause of death, a structured interpretative approach is required to minimize misclassification and ensure medico-legal reliability. Attribution should not rely solely on the presence of a cutaneous lesion or anecdotal history, but on the convergence of exposure plausibility, clinicopathological coherence, and systematic exclusion of alternative causes (Santunione et al. 2025a, b).

The first step is the assessment of exposure plausibility, including geographic compatibility, documentation of a witnessed bite or recovered specimen, and temporal coherence between the alleged envenomation and clinical deterioration. Careful on-site inspection and structured scene documentation are essential components of causal assessment (Cecchi et al. 2022; Camatti et al. 2025).

The second step involves systematic exclusion of more common causes of death presenting with overlapping pathological patterns. In particular, septic shock with disseminated intravascular coagulation, thrombotic microangiopathies, myocarditis, acute coronary syndromes, intoxications, and anaphylaxis must be carefully considered and ruled out through appropriate autopsy and toxicological investigations.

The third step consists of targeted interpretation of autopsy findings guided by genus-specific pathophysiological patterns. In suspected Loxosceles cases, the presence of intravascular hemolysis, disseminated intravascular coagulation, and acute renal injury should be actively sought. In Latrodectus cases, attention should focus on myocardial injury and pulmonary edema in the context of autonomic dysregulation. In Atrax envenomation, marked pulmonary edema and signs of acute cardiopulmonary instability represent the dominant pattern.

Finally, causal attribution should rely on the integration of all available elements rather than isolated findings. This structured interpretative approach aims to reduce attribution bias in a context where the main forensic risk is not underdiagnosis, but over-attribution of death to spider envenomation.

Limitations

This review is limited by the small number of documented cases and the heterogeneity of reporting across decades, including variability in clinical detail, autopsy methodology, toxicological work-up, and entomological confirmation. The risk of misclassification remains substantial, particularly in the absence of specimen identification or systematic exclusion of alternative causes. The limited sample size precluded quantitative analysis, and publication bias toward unusual presentations cannot be excluded.

Conclusions

Fatal spider envenomation remains an exceptional event in modern medical and forensic practice. The limited number of documented cases requires interpretative restraint and rigorous clinicopathological correlation. Across the limited documented cases, three coherent clinicopathological patterns can be identified: a hemolytic–coagulopathic profile associated with *Loxosceles*, a cardiotoxic pattern linked to *Latrodectus*, and a neurotoxic–pulmonary presentation in *Atrax* envenomation. Accurate attribution requires careful integration of exposure plausibility, clinical evolution, targeted autopsy findings, and exclusion of more common causes of sudden death.

In the absence of a consistent toxicological pattern and careful exclusion of more common causes of sudden death, spider envenomation should not be certified as the primary cause of death. The interpretative approach proposed in this review provides a practical framework to guide forensic decision-making when spider envenomation is alleged.

Abbreviation

DIC Disseminated intravascular coagulation

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s41935-026-00557-2.

Supplementary Material 1.

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Authors' contributions

J.C. and M.P.B. contributed to the conception of the study. M.P.B. drafted the manuscript. J.C., A.L.S., R.C., and E.R. critically revised the manuscript. All authors read and approved the final manuscript.

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Data availability

No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate

Not applicable.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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