Clinical management and Hospital experience in Black Widow Bites: Case Series in Matagalpa, Nicaragua

Johana F. González-Sáenz, Luz M. Lozano, Vilma E. Vásquez-Vado, Veraliz González-Hidalgo, Marlon M. Miranda Miranda, Darío S. López-Delgado, Gissell R. Reyes, Carlos Alberto Narváez Gaitán

https://doi.org/10.1590/SciELOPreprints.11216

Submitted on: 2025-02-07
Posted on: 2025-02-13 (version 1)
(YYYY-MM-DD)

1. CLINICAL MANAGEMENT AND HOSPITAL EXPERIENCE IN BLACK WIDOW BITES: CASE SERIES IN MATAGALPA, NICARAGUA

Johana F. González-Sáenz

Departamento de Pediatría, Hospital Escuela Cesar Amador Molina, Matagalpa, Nicaragua.

ORCID: https://orcid.org/0009-0001-4130-9464

Luz M. Lozano

Dirección de Salud Ambiental, Ministerio de Salud, Managua, Nicaragua.

ORCID: https://orcid.org/0009-0001-6738-2459

Vilma E. Vásquez-Vado

Cuidados Intensivos Pediátricos, Hospital Escuela Cesar Amador Molina, Matagalpa, Nicaragua.

ORCID: https://orcid.org/0009-0004-3120-4847

Veraliz González-Hidalgo

Departamento de Pediatría, Hospital Escuela Cesar Amador Molina, Matagalpa, Nicaragua.

ORCID: https://orcid.org/0009-0005-2747-5289

Marlon M. Miranda

Departamento de Pediatría, Hospital Escuela Cesar Amador Molina, Matagalpa, Nicaragua.

ORCID: https://orcid.org/0009-0003-4706-7472

Darío S. López-Delgado

Facultad de Medicina, Universidad Cooperativa de Colombia, Campus Pasto, Colombia.

ORCID: https://orcid.org/0000-0001-9826-6314

Gissell R. Reyes

Departamento de Pediatría, Hospital Escuela Cesar Amador Molina, Matagalpa, Nicaragua.

ORCID: https://orcid.org/0009-0005-3793-475X

Carlos A. Narváez

Departamento de Pediatría, Hospital Escuela Cesar Amador Molina, Matagalpa, Nicaragua.

ORCID: https://orcid.org/0009-0007-3598-8759

*Correspondence: Email: Carlos A. Narváez; albertonarvaezgaitan@gmail.com.
Matagalpa, Nicaragua.

Running head: Black Widow Bites: Clinical Management

Funding/Support: This research did not receive a specific grant from any public, commercial, or not-for-profit funding agency.

Financial disclosures: No financial disclosures.

Conflicts of interest

The authors declare no conflict of interest.

2. ABSTRACT

Introduction: Black widow spider (Latrodectus mactans) envenomation is a medical challenge in regions with limited access to standardized treatments. This study analyzes a series of 10 cases that occurred in Matagalpa, Nicaragua, highlighting the diagnosis and treatment of patients.

Description of the cases: Over a nine-year period 10 hospitalized patients, mostly adolescents (60%) and males (90%) from rural areas, were attended. Severe cases made up 30% of the total and included symptoms such as abdominal pain, neurogenic shock, and vomiting. Laboratory findings showed leukocytosis and lymphopenia in 50% of the patients. In terms of management, 60% received Aracmyn Plus antivenom, in addition, corticosteroids, antihistamines, and non-steroidal analgesics were used in most cases. There were no adverse reactions to antivenom treatment. All patients were discharged with no mortality.

Discussion and conclusion: The lack of knowledge of this disease and the limited availability of antivenom, poses significant challenges to the effective management of latrodectism in the region. Although analgesic treatment was effective in most cases, some patients required intensive care. This highlights the need for studies that reflect local experience in managing this disease. Furthermore, this case series emphasizes the importance of publishing clinical reports in areas where latrodectism has been little investigated. These data are fundamental to generating evidence to optimize treatment and establish specific protocols in Nicaragua and similar regions.

1. Keywords:

Spider Bites; Latrodectism; Attack; Poisoning; Hospitalization

3. INTRODUCTION

Black widow spiders (Latrodectus mactans) are among the few spiders capable of envenoming humans (1). With the ongoing effects of climate change and globalization, these spiders have invaded new ecological niches contributing to a growing global health issue. This problem is particularly pronounced in developing countries, where access to treatment is often limited, and standardized management protocols remain scarce (2).

Latrodectism, the envenomation syndrome caused by Latrodectus species, is the most common severe spider envenomation with greater presentation in warmer parts of the Americas, Europe, and Australia (3). Pain is the most prominent feature in all cases and is the main reason a poisoning victim comes to a care unit (4). Black widow spider poisoning is frequently reported to poison control centers and the American Association of Poison Control Centers (AAPCC), with approximately 2,000 to 3,000 cases reported yearly (5). The clinical effects of poisoning typically last an average of two days, with symptoms being more severe in young children and older adults (6).

In Nicaragua, clinical documentation on latrodectism remains scarce, despite recent discoveries of Latrodectus mactans in the region sparking interest in better understanding this condition (7). This case series examines envenomation cases in northern Nicaragua to provide insights into the clinical presentation and management of latrodectism. The study is based on retrospective records obtained in a secondary care hospital, providing guidelines for the early identification of the clinical presentation and the establishment of specific management that improving patient outcomes.

4. PATIENT INFORMATION

1. Case Descriptions

Ten cases of latrodectism required hospitalization between January 2013 and December 2021, in a secondary regional care hospital unit. The highest incidence occurred in 2013 and 2018, with two cases reported each year. Ninety percent of patients were male from rural areas, with a mean age of 15.9 years (SD: 10.2 years). Most of the bites occurred in the morning (60%) and 50% of the patients were working at the time. The bites were most frequently located on the upper limbs (60%) (Table 1).

Time to secondary hospital care had a median of 9.5 hours (RIC: 4-48 hours). Within the hospital, 30% of patients were admitted to the intensive care unit (ICU), while 70% were cared for in intermediate care. The median hospital stay in the ICU was 6 days (IQR: 3-14 days), while for all patients it was 4 days (IQR: 3-5 days). Thirty percent of the cases were classified as severe poisoning, 20% as moderate, and 50% as mild.

2. Clinical findings

All patients presented throbbing pain and localized edema (100%). Systemic symptoms were observed in 30% of patients, including vomiting, tachycardia, tachypnea, weakness, sweating, and abdominal pain. Arterial hypertension and headache were observed in 20%, while erythema and seizures occurred in 10% of patients (Figure 1).

3. Diagnostic assessment

The diagnostic studies revealed a median leukocyte count of 10,700 cells/µL (IQR: 9,700–16,70 cells/µL), with a maximum value of 30,000 cells/µL observed in one patient. Lymphopenia was documented in 50% of cases, with a minimum value of 725 cells/µL in one patient. The mean random glucose level was 132.8 mg/dL (SD: 31.4 mg/dL). Total creatine phosphokinase (CPK) levels were highest in one patient at 5,379 U/L. The mean serum creatinine across all patients was 0.72 mg/dL (SD: 0.19 mg/dL) (Table 2).

4. Therapeutic Intervention

Aracmyn Plus antivenom was administered to 60% of patients. Among them, 83% received one vial, while 17% required two vials. All severe cases were treated with antivenom, and 40% of mild cases also received it (Figure 2).

Supplemental oxygen was required by 30% of patients, including one case requiring invasive mechanical ventilation and two cases using nasal prongs. In addition, 30% received tetanus vaccination, and 80% were treated with analgesics, with non-steroidal anti-inflammatory drugs (NSAIDs) being the most commonly used (88%). Corticosteroids and antihistamines were used in 90% and 80% of cases, respectively. On the other hand, antibiotics were prescribed in 50% of the patients, with crystalline penicillin being the most commonly used antibiotic (80%) in the cases (Table 3).

5. FOLLOW-UP AND OUTCOMES

All patients were discharged without any mortality or allergic adverse events related to the antivenom. However, complications associated with the arachnid stings were documented in three cases: one patient developed a secondary skin and soft tissue infection during hospitalization; another presented neurogenic shock probably caused by Latrodectus mactans venom toxins, requiring vasoactive amines and invasive mechanical ventilation, but responded satisfactorily to treatment with two vials of antivenom and presented no post-discharge complications. Finally, one patient was discharged with antihypertensive therapy after diagnosis of secondary chronic arterial hypertension; the other seven patients did not present complications related to the envenomation or hospitalization.

6. DISCUSSION

The Black Widow spider, belonging to the genus Latrodectus, is one of the most common venomous species affecting humans (8). The female Latrodectus mactans has a shiny black coloration with a red marking on the abdomen that resembles an hourglass. The male is half the size of the female and is brown. These spiders are often found in woodpiles, ground cover, cracks, garages, barns, and latrines (9). Male and female black widow spiders are venomous, usually, only the female has fangs long enough to poison humans (10).

Spider venom includes different peptides and substances that affect sodium, calcium, and potassium channels in neurons, as well as glutamate and acetylcholine receptors. The venom is composed of five latrotoxins, which are specific neurotoxins: alpha, beta, gamma, delta, and epsilon (6). Three important syndromes are caused by spider bites: latrodectism, loxoscelism, and funnel-web spider syndrome (11). The severity is determined by the amount of venom administered and by factors such as the number of bites and the age of the patient.

The venom potency is superior to that of rattlesnakes; it contains several toxins, and proteins with affinity for nerve endings (12). All Latrodectus spiders are venomous and approximately 33% of patients present with systemic symptoms and signs (13). This correlates with our described case series, where 30 % of the patients presented with systemic symptoms, probably due to delay in seeking medical attention and subsequent referral to hospital, resulting in more advanced clinical pictures due to lack of timely treatment.

In the 10 cases, the most affected age group was adolescents (60%), followed by schoolchildren and adults (20% each), all from rural areas. Half of the patients were working in the field when they were bitten, while 30% were at home during the incident. The most affected areas were the upper limbs (60%) and lower limbs (40%). These findings contrast with a review of 70 records of children hospitalized in a pediatric hospital in Mexico between 1978 and 2014, where the prevalence of bites in the male gender was 61.4%, and infants under one year of age accounted for 14.2%. 70% of the patients had contact with the arachnid at home, with the lower limbs, neck, trunk, and abdomen being the most affected areas (12).

Latrodectism is a painful syndrome of muscle cramps produced by spider poisoning. Tests used to assess the severity of latrodectism are diverse, pain severity scales are widely used to evaluate pain and monitor treatment (4). The average duration of latrodectism syndrome is 3 to 6 days. Untreated patients have presented with clinical signs for 7 days, but weakness, muscle pain, and discomfort may persist for weeks (14).

In the first case reported in this series, the patient persisted with symptoms of envenomation for 7 days, because the antivenom was not available in Nicaragua until he received the antivenom and began to show improvement of all his signs and symptoms. The reason for the prolonged symptoms is probably multifactorial, depending, among other factors, on the patient, the species of Latrodectus involved, and the time to presentation (15) .

Latrodectism can be classified into three grades of severity. Grade 1 or mild envenomation may be asymptomatic or characterized by local pain around the area of the bite. Grade 2 or moderate envenomations include pain, which may extend regionally to areas other than the bite site, and also include local diaphoresis. Grade 3 or severe envenomations are characterized by generalized pain, diaphoresis, nausea, vomiting, headache, and altered vital signs such as hypertension and tachycardia (2).

Three patients in this series presented with generalized abdominal pain. Latrodectism can be misdiagnosed as an acute abdominal condition, so it should always be considered as a differential diagnosis (1). The clinical manifestations of young infants can be confused with scorpion bite poisoning due to irritability and constant crying, common signs in the bite by this arthropod; however, the child who already speaks and suffered a bite by Latrodectus can refer intense muscular pain, thoracic and abdominal pain, besides spasmodic muscular crises, this helps in the differentiation with scorpion bite poisoning (12).

Intense and persistent pain is present in half to two-thirds of cases of latrodectism and is the main target of treatments. In Australia, local pain radiating to the bitten limb or from the site of the bite is typical, while in North and South America, back and abdominal pain predominate (16).

Complications that may occur include compartment syndrome, severe life-threatening hypertension, respiratory distress, myocardial infarction, priapism and premature delivery in pregnant women (10). Four complications, including arterial hypertension, seizure, secondary soft tissue infection, and neurogenic shock in one patient, occurred in the reported cases. Cases of reversible myocarditis with cardiogenic pulmonary edema may occur after black widow spider envenomation and may require mechanical ventilation. The mechanism of myocardial injury is unknown and may include the direct toxic effect of the α-latrotoxin, catecholamine fluctuation, or hypersensitivity response (13).

1. Diagnostic Tests

General laboratory methods are used to evaluate Latrodectus poisoning, as there are no specific tests for its detection. Tests that may be useful for patient management include a complete blood count, electrolytes, creatine phosphokinase, and urinalysis. Leukocytosis, albuminuria, and an increased serum creatine phosphokinase level are common findings (10). Leukocytosis and increases in serum creatine phosphokinase were present in our case series. It is also important to also measure cardiac enzymes and monitor the electrocardiogram, because of possible cardiac complications that may occur during poisoning (12).

2. Treatment

Initial treatment measures after a mild envenomation include local measures such as gently cleaning the bite with mild soap and water, oral analgesia as needed such as paracetamol, ibuprofen, oxycodone or hydrocodone, oral muscle relaxants, and oral benzodiazepines may be used. Still, evidence of their efficacy is lacking and there may be a risk of increased adverse events. If indicated, tetanus prophylaxis should be administered. Antibiotics are prescribed only if there are signs of infection, such as increased erythema, fluctuation, and suppuration, and are rarely necessary (17).

In the case of moderate to severe envenomation, local wound care, and tetanus prophylaxis if indicated, parenteral opioids for pain, parenteral benzodiazepines to reduce the frequency and severity of muscle spasms, antiemetic therapy for nausea and vomiting should be given (17).

The antivenom if indicated intramuscularly (IM) should be administered in the anterolateral aspect of the thigh; and a tourniquet is applied proximal to the injection site if an adverse systemic reaction occurs. In the case of intravenous (IV) administration, the antidote is administered over 15 to 30 minutes; IV administration is preferred in severe cases with shock. There appear to be no clinical differences in efficacy between IM and IV routes of administration (17). In this series, all patients received the antivenom intravenously, without any adverse event, with previous medication with antihistamines and corticoids.

Most toxicologists agree that the use of antivenom is indicated in cases of severe envenomation that does not respond to standard therapy, because the administration of antivenom involves the introduction of a foreign protein into the human immune system, which can lead to early hypersensitivity reactions (5). In our case series, antivenom was administered to all patients with severe envenomation and, in two cases, also to those with mild envenomation. Antivenom should be reserved for patients with severe systemic symptoms, inadequate pain control, and life-threatening symptoms induced by envenomation, such as uncontrolled hypertensive emergencies or premature delivery (18).

Anti-poisons are available in several regions of the world, however, treatment in countries where they are not available is largely supportive (19). Treatment is mainly based on antitoxins. Early rehydration can dilute toxins, which may promote their metabolism and prevent shock. Symptomatic treatment with nonsteroidal analgesics and, in severe cases, benzodiazepines and morphine are usually effective, although the duration of symptoms may require hospitalization for 1 or 2 days (6), most patients have a good prognosis without sequelae (8). These findings are similar to ours in that the average hospitalization time was 4 days, with no sequelae at discharge, except for patient number 6 of the series, who was discharged with chronic arterial hypertension.

At present, no conclusive controlled data are demonstrating that the antivenom is superior to standard analgesics for the control of latrodectism symptoms. Based on the available controlled data and retrospective analysis, the efficacy of the antidote as an analgesic in these envenomations is relatively low and, at best, comparable to that of conventional analgesics. There are other atypical analgesic agents, such as ketamine, pregabalin, and clonidine, which may be considered in cases refractory to standard treatments and/or antivenom. Some clinicians suggest that antivenom should be used with caution and only when other therapeutic approaches have failed (19). In case of an anaphylactic reaction, the antivenom infusion should be discontinued immediately and supportive treatment with antihistamines, steroids, and epinephrine should be administered (20).

There are other treatments whose efficacy is questionable, as demonstrated by some retrospective studies. In one case series, 96% of patients who received calcium gluconate did not experience pain relief or resolution of other symptoms; these patients required subsequent administration of opioids. In addition, the use of opioids appeared to be effective in some cases, while other patients did not respond to this treatment (21). Therefore, the

choice of which analgesic treatment to use will depend on the intensity of the pain, its characteristics, as well as its availability, being as individualized as possible.

Since 2014, the use of anti-venom has been reduced, no difference was found in the reported reduction of pain in patients treated with analgesia alone compared with anti-venom treatment, including patients who reported severe pain at presentation (19). Thus, it is emphasized that hospitalization and administration of anti-venom should be limited to patients with severe systemic symptoms or who have insufficient pain management, making rapid pain relief the most crucial goal for all patients (22).

This case series describes and analyzes the results of the experience accumulated over several years in the clinical management of black widow spider envenomations. Although these cases are rare in this geographic region, their severity, together with factors such as waiting times for care, length of hospital stay, variability in symptoms and lack of standardization in pain management treatments, and their limited availability, make this problem still relevant, so this descriptive analysis will contribute to optimizing patient care, based on the best available resources.

Limitations of this case series include the lack of specific data on certain outcomes, such as pain intensity, which was only recorded qualitatively. In addition, the identification of the causative arachnids was based on testimonies of patients or relatives, who described Latrodectus mactans according to its morphological characteristics, a method still commonly used for its recognition. Only in the first case reported in 2013 in Nicaragua, the arachnid was sent to an entomological center in the west of the country for precise identification, which facilitated the importation of the antidote for the first time since it was not available in the country due to the absence of previous reported cases of this type of envenomations (23).

3. Conclusion

Enhancing the understanding of the pathophysiology of latrodectism is crucial for developing more effective treatments. It is important to continue exploring alternatives that optimize clinical management, establish standardized protocols, and conduct larger randomized controlled clinical trials with new drugs. These studies will enable a more accurate assessment of their safety and efficacy across diverse populations, generating high-quality evidence to improve patient care.

7. ETHICS APPROVAL AND INFORMED CONSENT

This study was carried out with the approval of the Ethics Committee of the Hospital Escuela César Amador Molina, as well as with the support of the Ministry of Health of Matagalpa, Nicaragua (SILAIS-Matagalpa), for the collection of data from medical records.

8. AUTHOR CONTRIBUTIONS

J.F.G.-S. Contributed to the study design, conceptualization of the study, and drafting of the manuscript.

L.M.L. Participated in data collection and contributed to the methodology section of the study.

V.E.V.-V. Assisted in the analysis of data and contributed to the writing of the manuscript.

V.G.-H. Played a role in the drafting of the study and data analysis.

M.M.M. Contributed to the design and execution of the study and reviewed the manuscript.

D.S.L.-D. Provided expertise in the methodology and helped refine the analytical approach.

G.R.R. Contributed to data collection and participated in drafting the manuscript.

C.A.N. Led the study design, supervised the overall study process, and contributed to the final review of the manuscript.

These contributions were made collaboratively to ensure a uniform approach to the design and execution of the study.

9. ACKNOWLEDGMENTS

Department of Statistics of the Hospital Escuela César Amador Molina, Matagalpa, Nicaragua, for their valuable collaboration in facilitating and organizing the medical records used in this case series. We also thank the medical and nursing staff for the attention and exceptional care provided to each patient during their stay at the hospital.

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Tables

Table 1. Baseline characteristics of the patients.

Patient	Sex	Origin	Age (years)	Year	Time of day of Spider Bite	Location of bite	Activity performed	Time of initial care (hours)	Care Level	Length of stay (days)	Severity of clinical presentation
1	Male	Rural	13	2013	Morning	Left wrist	Cutting firewood	3.5	Intensive care	14	Severe
2	Male	Rural	6	2013	Afternoon	Right hand	Manipulating the spider	48	Intermediate care	4	Moderate
3	Male	Rural	7	2014	Morning	Right foot	NA*	48	Intermediate care	4	Mild
4	Male	Rural	16	2016	Morning	Left foot	NA	4	Intermediate care	4	Mild
5	Male	Rural	12	2016	Afternoon	Right foot	Sleeping	96	Intermediate care	5	Mild
6	Male	Rural	21	2017	Night	Right thigh	Sleeping	3	Intermediate care	4	Moderate
7	Male	Rural	12	2017	Morning	Left hand	Walking in the field	6	Intermediate care	1	Mild
8	Male	Rural	12	2018	Afternoon	Right and Left hand	Stripping corn on the cob	12	Intensive care	6	Severe
9	Male	Rural	18	2018	Morning	Left forearm	Working the field	7	Intensive care	3	Severe
10	Female	Rural	42	2020	Morning	Left hand	Cutting coffee	24	Intermediate care	3	Mild

*NR: Not available.

Table 2. Diagnostic tests**.**

Patient	Leukocytes count (cells/µL)	Lymphocytes count (cells/µL)	Glycemia (mg/dL)	Total CPK* (U/L)	Serum Creatinine (mg/dL)
1	30000	1400	114	1337	1.0
2	9800	1245	127	NA*	0.7
3	16700	1787	77	NA	0.6
4	9800	725	186	NA	1.0
5	8700	2932	153	NA	0.7
6	9400	2303	97	867	0.8
7	11600	NR*	142	NA	0.4
8	13200	1320	158	1040	0.5
9	19000	760	129	5379	0.7
10	9700	2386	145	NA	0.8

*Abbreviations; CPK: Serum creatine phosphokinase; NA: Not available; NR: Not reported.

Table 3. Medications administered.

Medications	Number of patients	Percentage (%)
Tetanus toxoid	3	30
Corticosteroids	9	90
Diphenhydramine	8	80
Analgesic	8	80
NSAIDS*	7	88
Opioids	1	12
Parenteral hydration	10	100
Oxygen	3	30
Endotracheal intubation	1	33
Nasal prongs	2	67
Antibiotics	5	50
Crystalline penicillin	4	80
Cloxacillin	1	20
Aracmyn plus antivenin	6	60
2 bottles of antivenin	1	17
1 bottle of antivenin	5	83

*NSAIDs: Non-steroidal anti-inflammatory drugs.

Figures

Figure 1. Clinical manifestations of the patients.

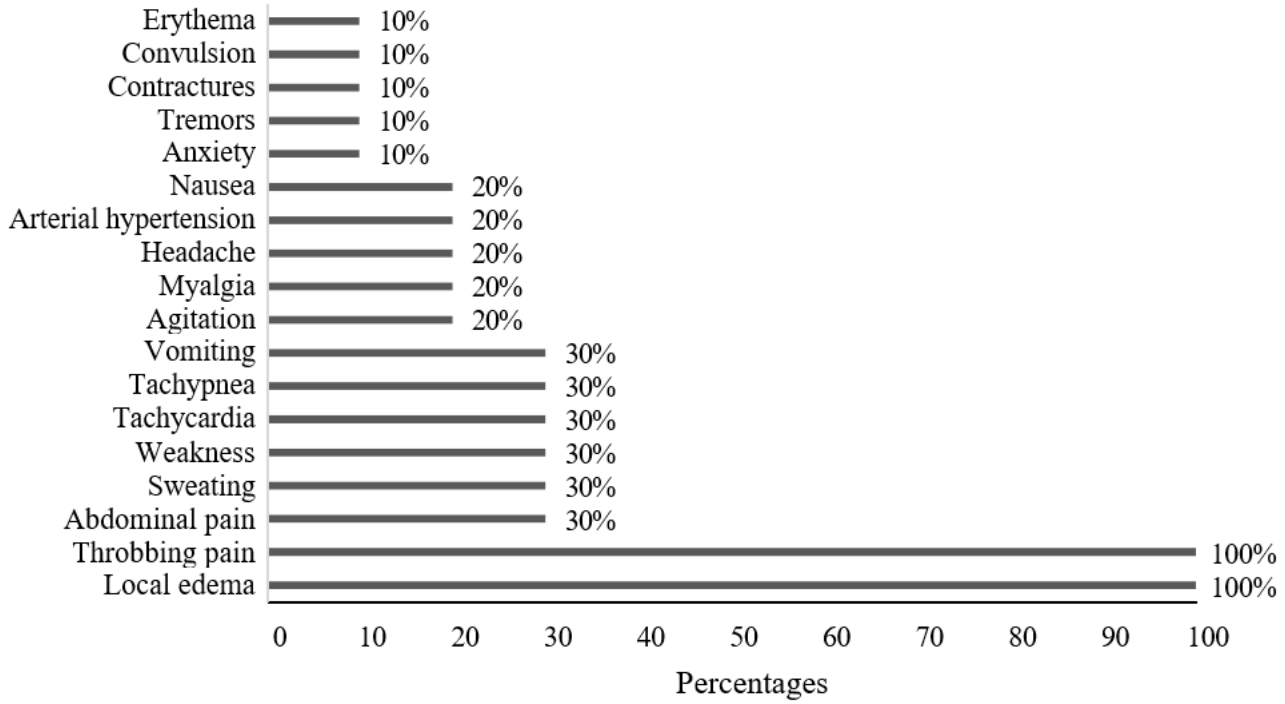
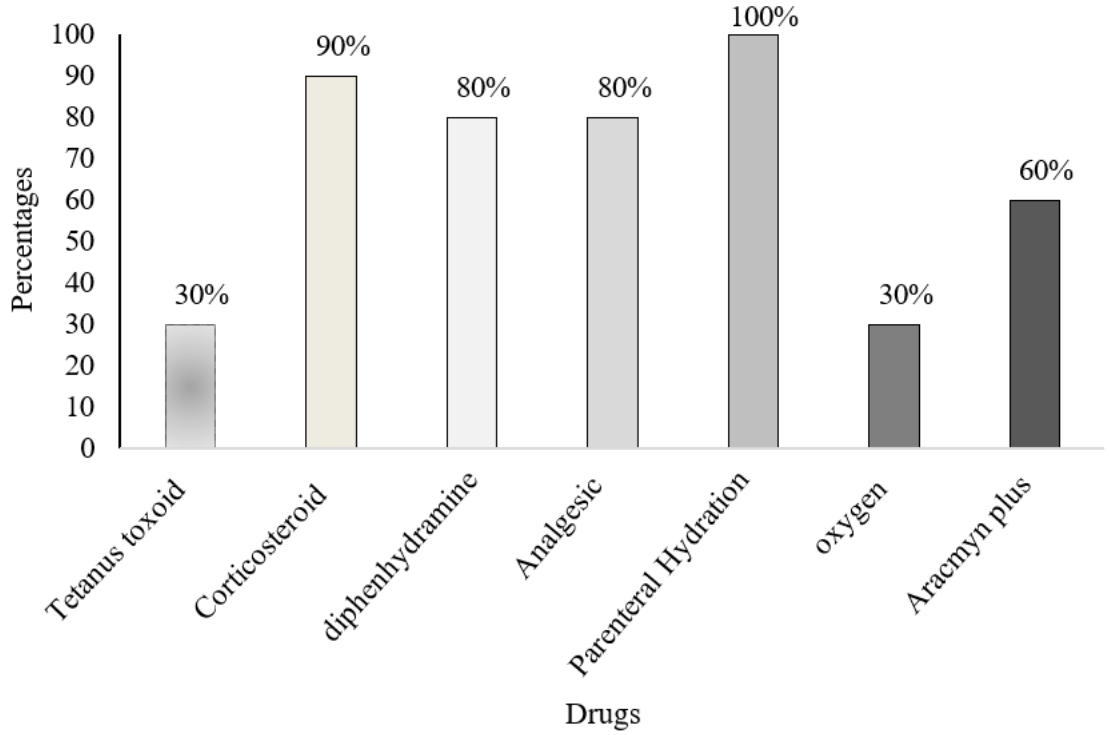


Figure 2. Medications administered to the patients.



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