

Relation between Factors Affecting Animal Bite Poisoning and Patients' Clinical Outcomes

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ABSTRACT

Context: Globally, animal bite poisoning ranks as a leading cause of emergency department visits. Therefore, identifying clinical outcomes and understanding the associated factors is crucial for reducing mortality from poisoning.

Aim: This study aimed to assess the relation between factors affecting animal bite poisoning and patients' clinical outcomes.

Methods: A descriptive correlational research design was employed to achieve the study's aim. The study was conducted at the emergency department of Assiut General Hospital, an Egyptian Ministry of Health-affiliated hospital. The study included a purposive sample of 104 adult patients with snake and scorpion bites who were admitted to the previously mentioned setting. Data collection tools included the Sociodemographic Characteristics Assessment Questionnaire, Dunbar Scale for Animal Bite Patterns, Poisoning Severity Score, and Clinical Outcomes Assessment Record.

Results: The current study reveals that 39.5% of the studied patients were in the age group 30-≤45, and 51.9% were males. The results showed that 42.4% of the studied patients had level 2 of animal bites, and 32.7% of them had moderate severity of poisoning. Furthermore, 98.1% and 96.2% of patients survived without tissue damage, respectively. In addition, a relationship was found between the level of animal bites and the clinical outcomes of patients (infection, shock), and a statistically significant relationship was observed between the severity of animal bites and certain clinical outcomes, including death, infection, tetanus, loss of function, scarring, tissue damage, shock, and osteomyelitis.

Conclusion: The study findings indicate that the severity of animal bites significantly affects patient clinical outcomes, including death, infection, tetanus, loss of function, scarring, tissue damage, shock, and osteomyelitis. Additionally, the level of animal bites significantly impacts patient clinical outcomes. The study recommends implementing an appropriate educational program to raise public and family awareness of animal bites and first aid practices, as well as guidelines for preventing and avoiding animal bites to save lives.

Keywords: Animal bite, clinical outcomes, factors, poisoning, patients

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1. Introduction

Animal bites and subsequent poisoning represent a critical public health concern globally, affecting millions of individuals annually and leading to significant morbidity and mortality rates (Kumar & Reddy, 2024). This pervasive threat underscores the urgent need to understand the factors influencing clinical outcomes for patients with animal bite poisoning in order to improve treatment strategies and mitigate the global burden of these injuries (WHO, 2022).

According to data from the *World Population Review* (2024), Sub-Saharan Africa experiences a significant number of snakebites, with estimates ranging from 435,000 to 580,000 cases requiring treatment each year. This region is likely home to one of the highest numbers of venomous snake bites globally (*World Population Review*, 2024). According to the *World Health Organization* (2022), it was estimated that 4.5 to 5.4 million individuals are bitten by snakes annually, with up

to 2.7 million venomous snakebites resulting in clinical envenoming and 81,000 to 138,000 fatalities.

Recently, epidemiological studies conducted by the WHO and other global health organizations have provided valuable insights into the prevalence and distribution of animal-bite-related poisoning worldwide. These studies highlight regional variations in incidence rates, with certain geographic areas experiencing a higher burden of snakebite envenoming and other animal-related injuries (Kumar & Reddy, 2024).

Animal bites typically create puncture or laceration wounds. An animal bite typically results in a break in the skin, but it can also cause contusions, which are caused by excessive pressure on body tissue from the bite. The contusions can happen without a break in the skin. Bites may be provoked or unprovoked (Li et al., 2021).

The consequences of animal bites and the severity of clinical outcomes are influenced by factors such as the type of biting animal and the toxicity of its venom. Research on snakebite envenoming has identified distinct venom profiles among different snake species, with some species producing more potent toxins that result in severe

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envenoming and higher mortality rates (Nigussie et al., 2022).

Moreover, there are other factors contributing to increased severity of clinical outcomes, such as delayed medical attention, the severity of the bite, the types and health of the animal involved, the size and overall health of the bitten patients, and accessibility to appropriate health care (Li et al., 2021; Fielding & Messahel, 2021).

The diagnosis and management of animal bites often rely on taking a detailed history from the patient, describing the animal bite, and identifying the animal. Therefore, information on animal bite incidents and associated complications will help primary healthcare providers perform appropriate patient assessment and predict the outcome of the animal bite (Reis-Castro & Lee, 2024). In recent years, there have been advancements in the development of novel anti-venom therapies and diagnostic tools for identifying venomous species and assessing the severity of envenoming (Clare et al., 2024).

In cases of minor bites from non-rabid animals, such as dogs or cats, the primary concern is often preventing infection (Fielding & Messahel, 2021). Additionally, prompt wound cleaning and immediate medical attention can help mitigate the severity of animal bites. In the case of snakebites, immediate medical attention is crucial to prevent serious complications (Sasidharan et al., 2025). A study by Millán Reyes et al. (2025) highlighted the importance of early intervention and proper wound care in preventing adverse outcomes.

The more severe bites, especially those from animals with known rabies or other infectious diseases, can lead to serious complications, including tissue damage, cellulitis, osteomyelitis, and even death if not treated promptly and appropriately (Fielding & Messahel, 2021). Other complications of animal bite poisoning include infection, tetanus, scarring, contractures, limb loss, loss of function, anaphylactic shock, and psychological sequelae. These factors collectively contribute to the clinical outcomes and management strategies for patients with animal bite poisoning, highlighting the importance of comprehensive care and timely interventions (Kumar & Reddy, 2024).

Positive clinical outcomes are associated with the timely administration of appropriate treatments, such as anti-venom for snakebites, which can prevent complications. Negative outcomes of snake bites include infections and systemic complications (Millán Reyes et al., 2025). There is a direct correlation between the severity of an animal bite and patient outcomes. Severe bites, characterized by deep tissue damage or envenomation, are associated with higher morbidity and mortality rates. Prompt medical intervention, including wound cleaning and appropriate prophylaxis, is crucial for improving outcomes. In Kenya, the average interval between an animal bite and hospital visit was two days, reinforcing the importance of prompt treatment to mitigate severe risks (Alfaifi et al., 2024).

Emergency nurses take an important role in the initial assessment and management of patients presenting with animal bites. A fundamental aspect of their role is measuring and monitoring vital signs, which include temperature, pulse, respiratory rate, and blood pressure.

This monitoring enables early detection of signs of deterioration or complications, allowing timely intervention and treatment. Additionally, emergency nurses are responsible for supporting breathing, when necessary, particularly in cases where respiratory distress or compromise is evident due to the bite or associated envenomation (Brown & Drobotz, 2018).

2. Significance of the study

Animal bites and the consequent risk of poisoning are widely acknowledged as a major public health hazard, affecting millions of people globally annually. According to the *World Population Review (2024)*, Egypt has a recorded snakebite fatality rate of 14 per million inhabitants. Understanding the factors that contribute to animal bites, as well as their frequency and severity, can help healthcare personnel tailor treatment programs to address both the bite damage and the toxic effects of the bite.

This understanding can enhance patient outcomes, reduce the risk of complications, minimize the likelihood of animal-related injuries, and improve overall health. Therefore, it is crucial to investigate the factors that influence clinical outcomes in patients with animal bite poisoning, particularly in terms of severity and progression. These variables lead to a more thorough strategy for controlling this illness. Additionally, it enables nurses to deliver better care and improve patient outcomes.

3. Aim of the study

This study aimed to assess the relation between factors affecting animal bite poisoning and clinical outcomes of patients through:

- Assessment of factors affecting animal bite poisoning.
- Assessment of clinical outcomes of patients with animal bite poisoning.
- Correlate the factors affecting animal bite poisoning with the clinical outcomes

3.1. Research questions

- What are the factors affecting patients with animal bite poisoning?
- What are the clinical outcomes of patients with animal bite poisoning?
- What is the relation between factors affecting clinical outcomes of patients after animal bite poisoning?

3.2. Operational definition

Clinical outcomes for this study include death, infection, Tetanus, loss of function, loss of limb, scarring, contractures, cellulitis, tissue damage, shock, and osteomyelitis.

4. Subjects and Methods

4.1. Research Design

To accomplish the objectives of this study, a descriptive correlational research design was adopted. It is a type of research that combines elements of both descriptive and exploratory research methods. It aims to provide a detailed description of a particular phenomenon while also investigating it to uncover new insights or hypotheses (Carter et al., 2023). Correlational design is a

non-experimental research design in which the researcher measures two variables and assesses the statistical relationship (i.e., the correlation) between them with minimal or no effort to control extraneous variables (*Esser & Vliegthart, 2017*).

4.2. Study setting

The current study was conducted in the emergency department of Assiut General Hospital, an affiliated to the Ministry of Health in Egypt. It was established in 1987. The emergency department is located on 23rd July Street, Al-Majzoub Square, Assiut. It serves both urban and rural areas, providing services such as vaccination, minor operations, first aid, and cardiopulmonary resuscitation, as well as conducting necessary medical examinations, comprehensive medical assessments, and administering medication. The services are free. The department provides its services for adult patients with animal bite poisoning. The flow rate of patients diagnosed with snake and scorpion bites last year at the emergency department of Assiut General Hospital was 1177.

This department is located on the hospital's first floor and comprises 12 rooms. First room for triage of patients, second room for doctors, third for nurses, fourth room for cardiopulmonary resuscitation, fifth for minor operations, sixth room for storage and administering of vaccine, seventh room is the laboratory, eighth room for x-ray, ninth and tenth rooms for males and females patients, eleventh room is the pharmacy and twelfth room is the registration room of admitted patients with animal bite poisoning.

4.3. Subjects

A total of 104 adult patients with snake and scorpion bites were purposively selected upon emergency admission to Assiut General Hospital for inclusion in the study. The total number of patients in the emergency department at Assiut General Hospital who were diagnosed with snake and scorpion bites was 1,177 (*Assiut General Hospital Statistical Record, 2020–2021*).

The required sample size was estimated using a statistical equation that accounted for a test power of 80%, a 95% confidence interval, and a 5% margin of error. Based on these parameters, a sample of 104 patients was calculated (*Rosner, 2011*).

$$n = \frac{Z_{\alpha/2}^2 \cdot P(1 - P)}{\epsilon^2}$$

n= Sample size (Total number of documented cases of snake and scorpion bites in the last year at Assiut General Hospital that was 1177 patients).

$Z_{\alpha/2}$ = 1.96 (The critical value that divides the central 95% of the Z distribution from the 5% in the tail).

ϵ = is estimate of error Level at 0.1

p=prevalence of snake and scorpion bites which was 1177 in Assiut general hospital (*Assiut General Hospital Statistical Record, 2020-2021*)

Therefore, by calculation, the sample will consist of 96 patients, and adding a 15% dropout rate, the sample size will be 104 patients.

4.4. Tools of Data Collection

Four tools were used for data collection in order to assess the relation between the factors affecting animal bite poisoning and clinical outcomes of patients, as follows:

4.4.1. Sociodemographic Characteristics Assessment Record

This tool was designed in English by the researcher, drawing upon related literature (*Owczarzak-Garstecka et al., 2019; Gooch & Roberts, 2017*). It was used to collect sociodemographic data on the studied patients, including age, gender, educational level, marital status, residence, and occupation.

4.4.2. Dunbar Bite Scale of Animal Bite Patterns

This scale was adopted from *Lu Dunbar (2016)*. It was used to assess the level of animal bites. It was designed in English. The scale includes six levels. Level 1: Aggressive behavior by snakes and scorpions, but no skin contact with teeth. Level 2: Teeth touch skin, but no puncture. Level 3: Create shallow wounds with a single animal bite. Level 4: A single bite makes deep wounds. Level 5: Multiple bites with deep wounds. Level 6: death of the victim and/or flesh consumed.

4.4.3. Poisoning Severity Score (PSS)

The scale was developed by *Persson et al. (1998)* and used in this study to assess the severity of poisoning. This scale was designed in English. The grading of poisoning severity is based solely on the observed 48 clinical symptoms and signs. The severity grades include:

- None (0): No signs or symptoms related to poisoning.
- Minor (1): Symptoms are mild, transient, and spontaneously resolving.
- Moderate (2): Symptoms are pronounced or prolonged.
- Severe (3): Severe or life-threatening symptoms.
- Fetal (4): Death.

Scoring system

The total score of this scale ranged from 0-48 that categorized as follows:

- None if total score = 0.
- Mild if total score = 1-12.
- Moderate if total score = 13-24.
- Severe if the total score = 25-36.
- Death if total score = 37- 48.

4.4.4. Clinical Outcomes Assessment Record

This record was used to assess and document potential complications and clinical outcomes associated with animal bites. It was developed based on the related literature by *Pfortmueller et al. (2013); Akosu et al. (2020)*. It is composed of 11 items that include death, infection, tetanus, loss of function, loss of limb, scarring, contractures, cellulitis, tissue damage, shock, and osteomyelitis.

Scoring system

Every complication was assigned a single grade, and the scoring system was categorized as follows:

- Mild complications: 0-3 grades.
- Moderate complications: 4-7 grades.

- Severe complications: 8-11 grades.

4.5. Procedures

The related literature and theoretical knowledge from various aspects of the study were reviewed using books, articles, journals, and periodicals to develop tools for data collection and analysis.

The study was approved by the Scientific Ethics Research Committee at the Faculty of Nursing, Ain Shams University, prior to its commencement. The researcher explained the study's objectives and aims to the patients included in the study. The researcher ensured the subject's data remained anonymous and confidential. Patients were informed that they could participate in the study or decline, and they retained the right to withdraw at any time without penalty or consequences.

To conduct this study, the Faculty of Nursing at Ain Shams University sent an official letter to the Director of Assiut General Hospital, outlining the study's purpose and requesting approval to collect the data.

Tool validity and reliability: A group of five experts evaluated the tools for content and face validity. The experts consisted of two lecturers from the Faculty of Medicine of Assiut University, one professor, and two assistant professors from the Medical-Surgical Nursing Department at the Faculty of Nursing of Ain-Shams University. The panel was asked to review the tools for clarity, comprehensiveness, relevance, consistency, accuracy, and layout format. Minor adjustments were made based on their feedback, which including the rephrasing of a few items.

The internal consistency of the selected tools was evaluated using Cronbach's alpha test. The reliability was 0.87 for the poisoning severity scale, which means good reliability. The reliability of the Dunbar bite scale for animals' bite patterns was 0.799, indicating good reliability.

A pilot study was conducted on 10% (10 patients) of the study subjects to assess the applicability of the study and the clarity of the designed tools, as well as to estimate the time required to complete each tool. Data obtained from the pilot study were analyzed, and no modifications were made to the data. The subjects included in the pilot study were also involved in the main study, as no changes were required.

Verbal consent was obtained from the participants after they were informed of the study's aim. The tools were completed and filled in by the researcher. This study was conducted over a three-month period, from July 2023 to September 2023. The researcher visited the study setting three days a week (Saturdays, Mondays, and Wednesdays) to collect data from patients during morning and afternoon shifts. On average, completing each assessment tool required approximately 10-15 minutes, and 2 to 3 patients were assessed daily until all 104 adult patients had been assessed.

4.6. Data Analysis

The collected data were organized, categorized, tabulated, and statistically analyzed using the Statistical Package for the Social Sciences (SPSS) version 27. Data were illustrated in tables. The statistical analysis included qualitative and quantitative data. Qualitative data were summarized using frequencies and percentages, while quantitative data were summarized using means and standard deviations (SD). The normality distribution of the data was tested using the Kolmogorov-Smirnov test. The relative influence of factors affecting clinical outcomes was analyzed using regression analysis. A probability (p-value) of ≤ 0.05 was regarded as statistically significant, whereas values > 0.05 were deemed non-significant.

5. Results

Table 1 shows that 39.5% of the studied patients were aged $30 \leq 45$ years, with a mean age of 39.34 ± 14.19 years, and 51.9% were males. Regarding the educational level, 44.2% of patients were unable to read and write, and 58.6% were married. Additionally, 68.3% reside in rural areas, and 42.3% are workers.

Table 2 shows that 42.4% of the studied patients had level 2 animal bites, while 1.9% had level 6 animal bites.

Table 3 shows that 32.7% of the studied patients had moderate poisoning severity, and 28.8% had mild poisoning severity. At the same time, 25.1% suffered severe poisoning from animal bites.

Table 4 shows that 98.1% of patients survived after animal bites and that 96.2% did not develop tissue damage. In addition, 95.2% did not experience limb loss and did not develop cellulitis or osteomyelitis. Additionally, 93.3% of them did not have contractures, and 91.3% of them did not develop shock. Meanwhile, 26.9% and 16.3% had scar and lost the function of the injured organ, respectively.

Table 5 presents the association between animal bite levels and severity in the studied patients, as determined by regression analysis, with severity as the dependent variable. In the model, levels of animal bites significantly affected biting severity (p-value = 0.050).

Table 6 reveals a statistically significant relation between the level of animal bite and the clinical outcomes of patients, in the form of infection and shock, at p-values of 0.033 and 0.037, respectively.

Table 7 shows a statistically significant relation between the severity of animal bites and the clinical outcomes of patients such as death (p-value=0.001), infection (p-value=0.000), tetanus (p-value=0.000), loss of function (p-value=0.002), scarring (p-value=0.024), tissue damage (p-value=0.002), shock (p-value=0.000), osteomyelitis (p-value=0.053).

Table (1): Frequency and percentage distribution of the studied patients' demographic characteristics (n=104).

Sociodemographic variables	No.	%
Age (in years)		
≤30	27	25.9
>30- ≤ 45	41	39.5
>45- ≤ 60	29	27.8
>60	7	6.8
Mean±SD	39.34±14.19	
Gender		
Male	54	51.9
Female	50	48.1
Educational level		
Unable to read or write	46	44.2
Basic education	21	20.2
Secondary education	28	26.9
University education or more	9	8.7
Marital status		
Single	23	22.1
Widow	11	10.6
Married	61	58.6
Divorced	9	8.7
Place of residence		
Rural	71	68.3
Urban	33	31.7
Occupation		
Office work	12	11.5
Worker	44	42.3
Housewife	39	37.5
Retired	1	1.0
Other	8	7.7

Table (2): Frequency and percentage distribution of the studied patients' level of animal bites (n= 104).

Levels of animal bites	No.	%
Level 1	19	18.3
Level 2	44	42.4
Level 3	16	15.3
Level 4	14	13.4
Level 5	9	8.7
Level 6	2	1.9

Table (3): Frequency and percentage distribution of the studied patients according to the severity of animal bites (n= 104).

Level of severity of animal bites	N	%
None	12	11.5
Mild	30	28.8
Moderate	34	32.7
Severe	26	25.1
Fetal	2	1.9

Table (4): Frequency and percentage distribution of the studied patients according to clinical outcomes (n= 104).

Clinical outcomes	Yes		No	
	N	%	No.	%
Death	2	1.9	102	98.1
Infection	10	9.6	94	90.4
Tetanus	10	9.6	94	90.4
Loss of function	17	16.3	87	83.7
Loss of limb	5	4.8	99	95.2
Scarring	28	26.9	76	73.1
Contractures	7	6.7	97	93.3
Cellulitis	5	4.8	99	95.2
Tissue damage	4	3.8	100	96.2
Shock	9	8.7	95	91.3
Osteomyelitis	5	4.8	99	95.2

Table (5): Multivariate regression model for levels of animal bites affecting the severity of animal biting among patients under study.

Clinical data of animal bite	Unstandardized Coefficients		Standardized Coefficients	T test	P-value	95% confidence interval	
	Beta	Std. Error	Beta			Lower	Upper
Constant	1.678	0.235		7.129	0.000	1.211	2.145
Level of animal bites	0.539	0.082	0.061	0.616	0.050	0.112	0.213

$R=0.061$ $R^2=0.004$ $F=0.379$

Table (6): Binary logistic regression model between the level of animal bites and the patients' clinical outcomes.

Clinical outcomes	Unstandardized Coefficients		Standardized Coefficients	T-test	P-value
	Beta	Std. Error	Beta		
Death					
Constant	-0.019	0.036		-0.538	0.592
Level of animal bites	-0.014	0.010	-0.134	-1.431	0.156
Infection					
Constant	0.002	0.073		0.025	0.980
Level of animal bites	-0.045	0.021	-0.194	-2.167	0.033
Tetanus					
Constant	-0.115	0.075		-1.527	0.130
Level of animal bites	0.003	0.021	0.011	0.123	0.902
Loss of Function					
Constant	-0.099	0.097		-1.019	0.311
Level of animal bites	0.026	0.027	0.090	0.958	0.341
Loss of limb					
Constant	0.042	0.059		0.708	0.480
Level of animal bites	-0.012	0.017	-0.071	-0.722	0.472
Scarring					
Constant	0.049	0.120		0.410	0.683
Level of animal bites	0.019	0.034	0.054	0.557	0.578
Contractures					
Constant	-0.048	0.068		-0.706	0.482
Level of animal bites	0.016	0.019	0.080	0.822	0.413
Cellulitis					
Constant	0.026	0.059		0.445	0.657
Level of animal bites	-0.012	0.016	-0.074	-0.749	0.455
Tissue Damage					
Constant	-0.006	0.050		-0.123	0.903
Level of animal bites	-0.022	0.014	-0.145	-1.539	0.127
Shock					
Constant	-0.011	0.070		-0.151	0.881
Level of animal bites	-0.042	0.020	-0.189	-2.118	0.037
Osteomyelitis					
Constant	0.025	0.058		0.431	0.668
Level of animal bites	-0.019	0.016	-0.111	-1.144	0.255

$R=0.337$, $Adjusted R^2=0.096$, $F=6.452$

6. Discussion

Globally, animal bites and stings pose significant environmental health threats, affecting millions of people each year and contributing substantially to morbidity and mortality rates (Kandeel & Abouhatab, 2023). Envenomation from animal bites remains one of the leading causes for emergency department visits and hospital admissions worldwide (Abdelhamid, 2021). Accordingly, investigating clinical outcomes and determining contributing factors is essential to minimizing bite-related mortality (Reda et al., 2023). Therefore, this study aimed to assess the relationship between factors affecting animal bite poisoning and patients' clinical outcomes.

Regarding patient age, the results of the present study reveal that about two-fifths of the patients fall in the age group 30-45 years, with a mean age of 39.34±14.19 years.

This finding may be explained by the fact that individuals within this age group in Egypt are typically engaged in active employment, involving both indoor and outdoor tasks, which increases the likelihood of exposure to animal bites.

This finding aligns with Li et al. (2021) in China, who reported a mean age of 39.72±15.93 in a study on the wound severity of animal bite victims visiting rabies prevention clinics and the influencing factors. At the same time, the finding is contradicted by Daigle et al. (2023), who stated that the higher percentage of victims (about two-fifths) was in the age group of 18-30 years in a study about dog bites in indigenous northern communities.

Regarding patient gender, the findings reveal that more than half of the patients were male. This finding may be because males are more engaged in outdoor activities, such as agricultural practices, and others

Table (7): Binary logistic regression model between the severity of animal bites and patients' clinical outcomes.

Clinical outcomes	Unstandardized Coefficients		Standardized Coefficients	T-test	P-value
	Beta	Std. Error	Beta		
Death					
Constant	-0.019	0.036		-0.538	0.592
Severity of animal bites	0.043	0.013	0.316	3.364	0.001
Infection					
Constant	0.002	0.073		0.025	0.980
Severity of animal bites	0.118	0.026	0.407	4.549	0.000
Tetanus					
Constant	-0.115	0.075		-1.527	0.130
Severity of animal bites	0.115	0.027	0.396	4.33	0.000
Loss of Function					
Constant	-0.099	0.097		-1.019	0.311
Severity of animal bites	0.110	0.035	0.302	3.197	0.002
Loss of limb					
Constant	0.042	0.059		0.708	0.480
Severity of animal bites	0.021	0.021	0.099	1.004	0.318
Scarring					
Constant	0.049	0.120		0.410	0.683
Severity of animal bites	0.097	0.043	0.221	2.284	0.024
Contractures					
Constant	-0.048	0.068		-0.706	0.482
Severity of animal bites	0.042	0.024	0.171	1.749	0.083
Cellulitis					
Constant	0.026	0.059		0.445	0.657
Severity of animal bites	0.030	0.021	0.144	1.462	0.147
Tissue Damage					
Constant	-0.006	0.050		-0.123	0.903
Severity of animal bites	0.057	0.018	0.300	3.187	0.002
Shock					
Constant	-0.011	0.070		-0.151	0.881
Severity of animal bites	0.116	0.025	0.419	4.688	0.000
Osteomyelitis					
Constant	0.025	0.058		0.431	0.668
Severity of animal bites	0.040	0.021	0.190	1.955	0.053

occupation-related activities and may work at night; therefore, they are at greater risk of animal bite poisoning than females.

This finding aligns with *Nour Eldin et al. (2022)*, who reported that more than three-quarters of their patients were male in a study titled "Study of hematological parameters in patients with scorpion envenomation presented to the poison control center of Ain Shams University Hospitals." While *Acar et al. (2022)* disagreed and reported that more than half of the studied victims were females. This variation in findings could be due to differences in women's activities and habits across these communities, as well as unsafe housing conditions.

Regarding patient education, the current results indicate that more than two-fifths of the patients studied were unable to read or write. These findings could be attributed to higher poverty levels, lower standards of living, and limited employment opportunities, which may force families to prioritize immediate living needs over education, leading to higher dropout rates and lower literacy levels.

This finding was agreed with *Schneider et al. (2021)*, who found that the majority of the studied patients were illiterate in a study entitled "Snakebites in rural areas of

Brazil by race: Indigenous the most exposed group." At the same time, this finding contrasted with *Lobojo (2019)*, who studied patients in Juba City, South Sudan, and found that two-fifths of the patients had a primary level of education.

Regarding the patient's marital status, the present study finds that more than half of the patients were married. This finding could be attributed to the study's inclusion of only adult patients, who are of marriageable age.

This finding aligns with *Torrez et al. (2020)*, who demonstrated that three-fifths of the patients studied in Brazil were married, in a study that explained the clinical manifestations of scorpion envenomation. Also, the finding was consistent with that of *Vural and Avşaroğulları (2023)*, who reported that more than three-fifths of the studied patients were married. The similarity in findings could be due to that the age of victims in these studies was within the range of marriage.

Regarding patients' place of residence, the present study reveals that more than two-thirds of the studied patients were from rural areas. The researcher believes that this finding could be due to the widespread presence of animals and agricultural activities where scorpions are abundant. Moreover, the bad sleeping habits of victims in open and unsecured places increase the incidence of snakebites in rural areas.

This finding aligns with a previous study by *Mohamed et al. (2020)*, who reported that the majority of cases occurred in rural areas in a study titled "Evaluation of poisoning patterns in Aswan governorate in the period from June 1, 2017, to December 31, 2017 (prospective study)." At the same time, the results were contradicted by *Vural and Avşaroğulları (2023)*, who found that the majority of the studied patients resided in urban areas.

Regarding patients' occupations, the present study indicates that more than two-fifths are workers. The researchers believe this finding may be due to the fact that more than half of the studied patients were male, who are typically the primary breadwinners in their families. Furthermore, it may be because more than two-fifths of patients cannot read and write, which prevents them from being hired for more advanced jobs. The majority of them live in rural areas where agricultural lands and craft businesses are prevalent.

This finding was consistent with that of *Torrez et al. (2020)*, who showed that most of the patients studied were workers. However, this result contrasted with the findings of *Vural and Avşaroğulları (2023)*, who reported that more than half of their study participants were unemployed or housewives in a study titled "Acute poisoning cases admitted to a tertiary hospital emergency department: A prospective and descriptive study." This dissimilarity in findings could be due to differences in the age and gender of victims, as young individuals and those of retirement age are often unemployed. Also, female patients are usually housewives.

Regarding the level of animal bites, the present study reveals that more than two-fifths of the patients experienced level 2 bites. This finding may be due to patients' exposure to semi-domesticated snakes and scorpions that cause minor scratches or abrasions without bleeding, which is less severe than level three, where the bite causes shallow wounds. In addition, nearly two-thirds of those patients live in rural areas where they frequently encounter snakes and scorpions that inhabit agricultural lands, leading to repeated exposure and increasing the risk of level 2 bites.

Regarding the severity of animal bites, the results revealed that approximately one-third of patients experienced moderate poisoning, and more than one-quarter had mild poisoning. At the same time, one-quarter of them had severe degrees of poisoning. These findings may be due to patients' exposure to potent venom from domestic snakes, resulting in severe poisoning, or to delayed access to health care and a lack of awareness of how to avoid provoking reptiles or scorpions.

This finding was contradicted by *Schneider et al. (2021)*, who found that more than half of the victims had mild severity of snakebites and more than one-third of them had moderate severity in a study entitled "Snakebites in rural areas of Brazil by Race: Indigenous the most exposed group." Also, it aligns with the report by *Vural et al. (2024)*, which found the highest percentage of level 2 injuries among the victims.

Moreover, *Nour Eldin et al. (2022)* found that over half of the patients studied exhibited moderate or severe envenomation. This finding indicates that their symptoms

were not life-threatening because they included local pain, swelling, and mild systemic symptoms like nausea. In addition, mild-severity cases did not require intensive medical intervention but still needed proper care to avoid complications. Additionally, more than one-third of them had moderate severity, indicating more pronounced symptoms, such as significant swelling, severe pain, and possibly systemic symptoms like vomiting, low blood pressure, or clotting issues. Their cases required hospitalization and more intensive medical treatment to manage the symptoms and prevent complications. Their findings underscore that, although many snakebites were categorized as mild, a substantial number (more than one-third) are moderate in severity, highlighting the need for medical facilities to be prepared to handle a range of severities.

Regarding the clinical outcomes of animal bites, the present findings indicated that most of the studied patients survived without tissue damage, limb loss, cellulitis, or osteomyelitis, and without contractures or shock. These may be due to regular monitoring and follow-up care, which can detect early signs of complications, allowing for prompt treatment and better outcomes. Additionally, vaccination reduces the risk of severe infections and complications from animal bites.

These results align with those of *Greene and Fritz (2021)*, who reported that nearly all of their studied patients survived. In addition, most of them did not experience tissue damage, did not develop cellulitis or osteomyelitis, did not experience contractures, and shock in a study titled "Infectious complications of bite injuries" in the USA. While these results showed partial concordance with the observations of *Konoeda et al. (2023)*, who reported that their entire studied sample survived, most did not experience complications such as limb loss or shock. Additionally, the majority of them did not develop cellulitis, contractures, or osteomyelitis, and one-third of them developed infections, as reported in a study titled "Outcomes after primary closure of animal bite wounds, in Japan."

Regarding the level of animal bites and their relation to the severity of biting problems, the present study found that bite level significantly affected the severity of animal bite poisoning. This finding might be due to the type of injury, as the nature of the wound (e.g., puncture vs. laceration) can affect the severity of the bite and increase the risk of infection. Additionally, the type of animal can influence the severity of the bite, as different animals possess varying levels of bite force and venom potency.

This finding aligns with *Abdelhamid (2021)*, who reported that the level of animal stings and bites significantly affects the severity of poisoning. Additionally, this result was consistent with that of *Farag et al. (2023)*, who demonstrated a direct, proportional relationship between the intensity of animal bites and the severity of the grading. They found that the severity grade of poisoning was directly proportional to the level of animal biting. This finding means that bites from more dangerous animals, such as highly venomous snakes or scorpions, often result in more severe cases in critical areas of the body, such as

the head or neck. These findings emphasize the importance of understanding the level of the bite to accurately assess and manage the severity of poisoning. These findings highlighted the factors affecting the clinical outcomes of patients with animal bite poisoning and found that the number and severity of bites are major determinants of patient outcomes.

Regarding the relationship between the level of animal bites and patients' clinical outcomes, the present study identifies a statistically significant association between the level of animal bites and infection and shock. These results may be due to the fact that approximately two-fifths of the patients in the study presented with a higher level of animal bites, including levels three to six. These levels typically involve deep-tissue punctures and tears, which disrupt the skin's barriers and create favorable conditions for bacterial entry and growth. Additionally, the amount of venom excreted by snakes and scorpions into the bite sites may increase the risk of infection. Moreover, it may be due to improper wound cleansing by healthcare providers or patients themselves.

Regarding the relation between the level of animal bites and shock, it may be attributed to the fact that approximately two-fifths of the patients experienced higher levels of animal bites that involve level three to level six which could result in deep tissue damage, injury to major blood vessels, or multiple wounds, these can lead to significant blood loss, a common cause of hypovolemic shock. Furthermore, deep, untreated wounds from high-level bites can rapidly become infected. If the infection spreads systemically, it can progress to septic shock, especially in immunocompromised patients or those who receive delayed treatment.

These results partially agreed with *Li et al. (2021)*, who demonstrated a statistically significant relationship between the level of animal bites and clinical outcomes, such as infection. Also, they found a statistically significant relation between the level of animal bites and shock.

Regarding the relationship between the severity of animal bites and patients' clinical outcomes, the present study finds a statistically significant association between bite severity and outcomes such as death, infection, tetanus, loss of function, scarring, tissue damage, shock, and osteomyelitis. These findings may be due to more severe injuries causing greater physiological disruption, thereby increasing the risk of complications. As shown in the present study, severe bites cause deep and extensive tissue injury, including damage to muscles, tendons, vessels, and bones. This outcome increases the risk of scarring, tissue necrosis, which can result in permanent damage or loss of function, and osteomyelitis if the bite penetrates to bone.

Additionally, severe bites can cause penetrating wounds and introduce more bacteria from the animal's mouth, which can result in infection, sepsis, osteomyelitis, and tetanus in deep or contaminated wounds. In addition, severe bites may damage vital organs such as airways or blood vessels, which can lead to shock and death due to the rapid spread of infection, especially in unvaccinated victims.

These results partially agreed with *Li et al. (2021)*, who found a statistically significant association between the

severity of animal bites and clinical outcomes, such as infection. Additionally, they found a statistically significant relation between the severity of animal bites and tetanus, loss of function, shock, and osteomyelitis.

7. Conclusion

Based on the findings of the current study, it can be concluded that the level and severity of animal bites are two factors that affect the clinical outcomes of patients with animal bite poisoning. Almost all patients survived, and most did not develop tissue damage, experience limb loss, or develop cellulitis or osteomyelitis.

The results reveal a statistically significant relationship between the severity of animal bites and clinical outcomes, including death, infection, tetanus, loss of function, scarring, tissue damage, shock, and osteomyelitis. Additionally, a statistically significant relationship was found between bite severity and clinical outcomes, including infection and shock.

8. Recommendations

Based on the results of the current study, the following recommendations are suggested:

- Establishment of an appropriate case management protocol is strongly recommended for healthcare providers at Assuit General Hospital to manage animal bite cases.
- Increasing the accessibility and availability of anti-venoms in all general hospitals for different animal bites.
- Designing an appropriate educational training program for the public, including farmers, about animal bites and their first aid practices and methods to prevent animal bite-related poisoning, and how to save the lives of people.
- A similar study could be replicated on a larger probability sample in other settings to disseminate the findings.

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