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KEYWORDS:
Rabies; Dog bite; Post-exposure prophylaxis

Assessment of Animal Bite-Related Rabies Risk and Post Exposure Management in Baghdad

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ABSTRACT:

The deadly rabies virus may be transmitted by humans from the saliva of infected animals, making rabies a serious public health concern. The rabies virus is often disseminated by bites. The species most likely to transmit rabies in the United States include skunks, foxes, coyotes, bats, and raccoons. In developing countries, rabies is most frequently spread via stray dogs.

Aim of the Study:

to assess the demographic characteristics and clinical symptoms of patients presenting after animal bites in Baghdad, with particular emphasis on the species of biting animals, potential rabies exposure, and the post-exposure management provided, including wound care, rabies vaccination, rabies immunoglobulin, and other supportive treatments. The study also aimed to identify demographic patterns that may be relevant to rabies prevention and public-health interventions in Iraq .

Patients and Methods:

A retrospective hospital-based clinical study was conducted among patients presenting to Baghdad Medical City Hospital, Baghdad, following animal bites or other potential rabies exposures. Eligible patients were identified from medical records according to the documented history of animal exposure and clinical assessment at presentation. Data were reviewed regarding demographic characteristics, biting animal species, exposure circumstances, wound management, and post-exposure prophylaxis (PEP), including rabies vaccination and rabies immunoglobulin where documented. Descriptive statistics were used to summarize demographic and clinical characteristics, while the Chi-square test was applied for categorical comparisons where appropriate.

Results:

Thirty-six percent of the fifty patients presenting after animal exposure in this research were under the age of twenty. Of them, 26% were in the 20–30 age range. Twelve percent of them were in the 30–40 age range. 26%of them were older than forty. With a male to female ratio of 72% to 28%, there were more male patients than female patients.Dog bites

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were the most frequently documented animal exposure, accounting for 62% of cases, followed by cat bites (22%) and rat bites (12%).

Conclusion:

Based on the information gathered, here are key conclusions regarding the rabies virus:

- Fatal Disease:
  - Rabies is an acute, progressive viral encephalitis.
  - Once clinical symptoms appear, it is almost invariably fatal.

Transmission:

- The illness is mostly transmitted by the saliva of infected animals, typically through bites.
- Saliva can also spread by getting into mucosal membranes or open wounds.

1. INTRODUCTION

1.1-Introduction

Primarily harming people and animals, rabies is an extremely deadly zoonotic illness of significant public health relevance. Rabies is still a major public health concern despite international attempts to prevent it, especially in underdeveloped nations where it is a leading cause of death [1].The genus Lyssavirus contains negative strand RNA viruses that cause rabies, a neglected zoonotic illness. Within this genus, rabies viruses are found all over the world, circulate in a variety of mammalian reservoir hosts, and are nearly invariably lethal to unvaccinated humans. It is still believed that rabies kills about 59,000 people annually[2].

As one of the rare infections with a nearly 100% case mortality rate after the beginning of clinical illness, rabies has influenced civilization for generations. The rabies virus is propagated via the bite of an infected animal, much like all other related viruses in the Lyssavirus genus. Since lyssaviruses are highly neurotropic, they often need to penetrate the skin's protective layer in order to infect the nervous system.

The primary source of the rabies virus worldwide is domestic dogs, and 99% of human cases are caused by an infected dog's bite. Since saliva is the primary way that lyssaviruses are spread, even though bites seem to be the most effective way for them to spread, there are a few other ways, such as organ donation [3].

It is a worldwide public health concern that is brought on by a virus belonging to the genus Lyssavirus. A glycoprotein, which may include many receptors, is the primary means by which the rabies virus enters and infects cells. Antibodies that neutralize the rabies virus work by stopping the membrane fusion process or the glycoprotein from attaching to a receptor. Postexposure prophylaxis for category III exposure requires both vaccination and anti-rabies virus neutralizing antibodies [4]. Although they are ancient, lyssaviruses are not given enough credit because of a variety of factors, including ignorance and superstitions, records that span thousands of years, technological constraints, academic conservatism, and traditional biopolitical thinking.

More than 17 lyssavirus species produce rabies, which was once thought to be a single disease. Lyssaviruses are spread by wildlife, especially bats, which act as natural disease agents. The original spread of canine rabies was probably concentrated in Eurasia. Dog domestication and the wildlife rabies virus's adaption to dogs [5].

The rabies virus (RABV), which has historically contributed to the development of viral vaccines, was one of the first viruses recognized as a public health concern. The three-dimensional structure of the RABV virion is currently unknown despite these implications because it is difficult to isolate structurally homogenous virion samples in the substantial quantities needed for structural research. Here, we used the capabilities of cryogenic electron tomography (cryoET) and microscopy (cryoEM) to determine the three-dimensional structure of the wild-type RABV virion. Tomograms of RABV virions show a considerable degree of structural heterogeneity in the bullet-shaped virion particles that encapsulate the glycoprotein (G) trimer-decorated envelope and the nucleocapsid composed of RNA, nucleoprotein (N), and matrix protein (M) [6].

In contrast to most other rhabdoviruses that spread by insect vectors, the rabies virus (RABV) is a relatively rare member of the Rhabdoviridae family because it has evolved to be completely adapted to warm-blooded hosts and travels directly between

them. There are differences in the immune responses to laboratory-attenuated rabies virus and wild-type rabies virus infections. Several investigations have demonstrated that whereas laboratory-attenuated RABV elicits an innate immune response, wild-type RABV evades detection.

Pathogenic RABV infection avoids the immune system, prevents the production of antiviral proteins and inflammatory cytokines that may kill the virus, and halts downstream signal activation by preventing interferon generation. On the other hand, a non-pathogenic RABV infection stimulates the immune system, which prevents the sickness.

Furthermore, by drawing leukocytes into the central nervous system (CNS) and increasing the permeability of the blood–brain barrier (BBB), which are both critical for viral removal and protection, cytokines/chemokines released during RABV infection play a critical role in suppressing the disease [7].

Humans have been afflicted with rabies encephalitis for thousands of years. Access to pre- and post-exposure preventative treatment has greatly decreased the burden of illness and suffering in affluent nations. Tens of thousands of people die from rabies every year, which is still a neglected tropical disease worldwide, mostly as a result of unchecked dog rabies. Palliation is currently the accepted treatment for rabies encephalitis.

Over the past few decades, valiant efforts to treat human rabies patients have provided insights into pathogenesis and paved the way for the creation of novel antiviral medications and therapeutic approaches. Despite ongoing research into novel chemicals and therapeutic methods, the disease's intricacy presents significant obstacles. In an effort to find a salvage therapy for rabies, we examine and assess a few of the potential treatments now in development [8].

1.2-History of Rabies

1.2.1- Unmasking rabies: comprehending immune evasion methods

The neurotropic rabies virus, which causes rabies, poses a special threat to the immune system because it uses complex evasion and subversion techniques. This study explores the many ways that the rabies virus evades the host immune system's identification and neutralization. The virus uses a variety of strategies, such as compromising immune response pathways or taking advantage of the blood-brain barrier, to infect and spread throughout the central nervous system. It is essential to comprehend these evasion tactics in order to create antiviral treatments that work. This review summarizes what is currently known about the rabies virus's immunoevasive strategies, highlighting possible treatment targets and strengthening our defenses against this fatal viral infection [9].

1.2.2- The One Medicine Mission to Provide an Efficient Treatment for Rabies

Not much has been done to find a cure for rabies, despite the disease's long history. The patient's chances of recovering are still not good. Because of the high cost, clinical expertise required, and uncertain prognosis, clinicians may be hesitant or unable to provide the comprehensive necessary therapy that patients in rabies-endemic areas require to have any chance of survival.

The sporadic incidence of cases further impedes rigorous clinical investigation into combination therapies. This Perspective examines the case for a One Medicine approach that would expedite the development of a viable rabies therapy by providing veterinary care and experimental treatment to naturally infected dogs under the proper circumstances. Along with recent advancements in our understanding of the molecular origins of the severe neurological damage, the pathophysiology of the rabies virus in people and dogs is reviewed.

We propose that patients should be treated for four different disease processes: systemic compromise, inflammation, neural degeneration, and viral dissemination. The compassionate critical care and investigational treatment of naturally infected dogs receiving supportive therapy that mimics the clinical scenario in humans may facilitate the identification of biomarkers for prognosis and therapeutic response, as well as the study of combination therapies that target these processes.

We discuss the safety and ethics of this approach and introduce the Canine Rabies Treatment Initiative, a non-profit organization dedicated to applying a One Medicine approach to the study of diagnostic, prognostic, and therapeutic options for rabies in naturally infected dogs in order to accelerate the process of making rabies a treatable illness for all patients [10].

1.2.3- The background of rabies and its vaccinations

Humans, domestic animals, and wildlife are all at risk from lyssaviruses, which are constantly evolving. Rabies, a fatal disease of zoonotic importance, can now be prevented thanks to the introduction of potent biologics. The pioneering work done over the last 200 years forms the basis of research that makes it possible to diagnose, prevent, control, and selectively eradicate rabies. The huge scientific advancements in virology, molecular biology, vaccines, and delivery technologies during the past three decades have greatly helped the discipline.

Vaccines have advanced significantly from the first generation of crude nerve tissue-based immunizations to recombinant vaccines. For rabies prevention, inactivated rabies vaccines made from cell cultures and given intramuscularly (IM) and intradermally (ID) to humans are still crucial.

In both domestic and wild animals, oral and parenteral vaccinations have frequently demonstrated promise as rabies prevention measures. Innovations that are likely to cause a paradigm shift include the use of novel adjuvants to spare antigens, the development of novel delivery systems, the direct inoculation of potent vaccines without the use of rabies immune globulin (RIG), and products based on virus-like particles, which eliminate the need for a high containment facility [11].

Figure 1.1: Rabies Vaccine

1.3-Clinical features of Rabies

1.3.1-Human rabies: neuropathogenesis, symptoms, and diagnosis

Usually fatal, rabies can present as either classic furious rabies or paralytic rabies. Recovery has been observed in just a few cases, most of whom had bat rabies virus types, and has been attributed to both the host immune system's promptness and spontaneous (immune) viral clearance. Viral mechanisms that have evolved to reduce CNS damage while allowing the virus to spread may account for the survivors' generally excellent functional recovery.

People with furious rabies have shorter survival durations than those with paralytic rabies, which is directly related to their lower immune responses and greater virus loads in their central nervous systems. The rabies virus is in the central nervous system (CNS) long before symptoms show up. Days before symptoms manifest, abnormal brain MRI and preclinical anterior horn cell dysfunction are evident in patients with furious rabies. The virus's horrible effects, including how it especially harms the peripheral nerves of paralytic rabies patients and how it affects the behavior of individuals with furious rabies, are becoming more understood. To develop a practical therapeutic strategy, however, a thorough understanding of the neuropathogenetic processes is necessary [12].

1.3.2- Clinical characteristics of human rabies acquired from dogs and bats

Although there have been reports of clinical variations between rabies caused by canine and bat rabies virus types, no thorough research has been published to back up these claims.Although some rabies virus variations may induce more severe dysfunction in neuronal subpopulations, clinical discrepancies between rabies acquired by dogs and bats may be due to changes in the path of viral propagation of these variants in the nervous system. The early diagnosis of rabies may be enhanced by the understanding that bat-acquired rabies may have distinct clinical signs from dog-acquired rabies [13].

1.4-Pathophysiologic studies in human rabies

- **Negri Bodies:** These are characteristic intracytoplasmic inclusions found in neurons of the hippocampus and cerebellum.
- **Perivascular Inflammation:** There is perivascular infiltration of lymphocytes and macrophages.
- **Neuronophagia:** Microglial cells phagocytose infected neurons. [14]

1.5-Rabies Diagnosis:

1.5.1- Human rabies is a disease with intricate neuropathogenetic pathways and difficult diagnostics.

Neuropathogenetic Mechanisms

- **Neurotransmitter Chaos:** The virus interferes with the delicate balance of neurotransmitters, the chemical messengers that allow neurons to "talk" to each other. This disruption leads to the bizarre and often terrifying symptoms of rabies.
- **Immune System Conundrum:** While the immune system tries to fight back, the virus seems to have ways of evading its defenses. This allows the virus to gradually spread and cause increasing damage
- **Stealthy Invasion:** The rabies virus employs a cunning strategy. It enters the body through a bite wound and then silently travels along peripheral nerves to the spinal cord and brainstem. This journey can take weeks or even months, making early detection incredibly difficult .
- **Selective Targeting:** Once in the central nervous system (CNS), the virus exhibits a preference for certain neurons, particularly those in the hippocampus and cerebellum. It doesn't outright kill these neurons but rather disrupts their communication pathways [15]

1.5.2- Laboratory Diagnosis, Treatment, and Nanomedicine for Human Rabies

Domestic dogs are the main source of human instances of rabies, a virus that is lethal worldwide and is mostly spread by the bites and scratches of infected animals.

Asia and Africa are thought to have the greatest prevalence rates. Rabies is frequently overlooked as a serious health issue, particularly in Asian nations, despite its high death rate. In order to considerably lessen the severity of the condition, avoid deadly consequences, and correctly identify suspected patients, this study highlights the vital significance of prompt, accurate diagnosis and prompt medical care [16]

1.5.3-Advancing Rabies Diagnosis

Every year, rabies, a neglected zoonosis, kills about 60,000 people worldwide. Lack of surveillance data and underreporting, which result from poor diagnostic facilities, are major obstacles to rabies control efforts, especially in low- and middle-income nations. The fluorescence antibody test (FAT) on postmortem brain samples is currently the "gold standard" for rabies confirmation in both people and animals, according to the World Health Organization. In this opinion piece, we point out a number of FAT's drawbacks and promote better substitutes to take its place as the accepted method of rabies diagnosis. We contend that molecular techniques—more especially, PCR-based methods—provide quick, precise, and practical ways to confirm rabies in a lab setting. [17]

1.5.4-Rapid Diagnostic Technique for Rabies Virus Detection

Implementing appropriate and prompt treatment techniques, particularly when dealing with life-threatening illnesses like rabies, depends on a precise diagnosis. In order to stop the virus's future spread, prompt detection of rabies is essential for preventing transmission to the patient's close contacts and medical personnel. Traditional rabies detection techniques are either labor-intensive or require costly equipment run by qualified specialists. A new quick rabies diagnostic technique is presented in this publication. [18]

1.5.5-Recent updates on laboratory diagnosis of rabies

The deadly virus that causes rabies is spread by rabid animals biting people. India has a high rabies burden and accounts for a considerable amount of the world's fatalities. However, because there is no scientific proof, the condition is frequently underreported. In order to distinguish rabies from clinical mimics, start the right treatment, put infection control measures in place, and guide disease surveillance, laboratory diagnosis is essential. An overview of the most recent developments in laboratory science is given in this review [19].

1.6-Human Rabies Treatment

The therapy section highlights the difficulties in controlling this always deadly virus and talks about the current therapeutic options available for both human and animal patients. It also provides hints of possible advancements in the treatment of rabies by illuminating new therapeutic approaches such as cytokine treatments and innovative immunization techniques. The chapter concludes with a summary of the cumulative findings, emphasizing the need for increased public awareness, heightened monitoring, and a multidisciplinary approach to the fight against rabies. By offering insights into the various aspects of rabies and promoting preventative strategies to lessen its effects on both human and animal populations, the chapter seeks to function as a thorough guide.[20]

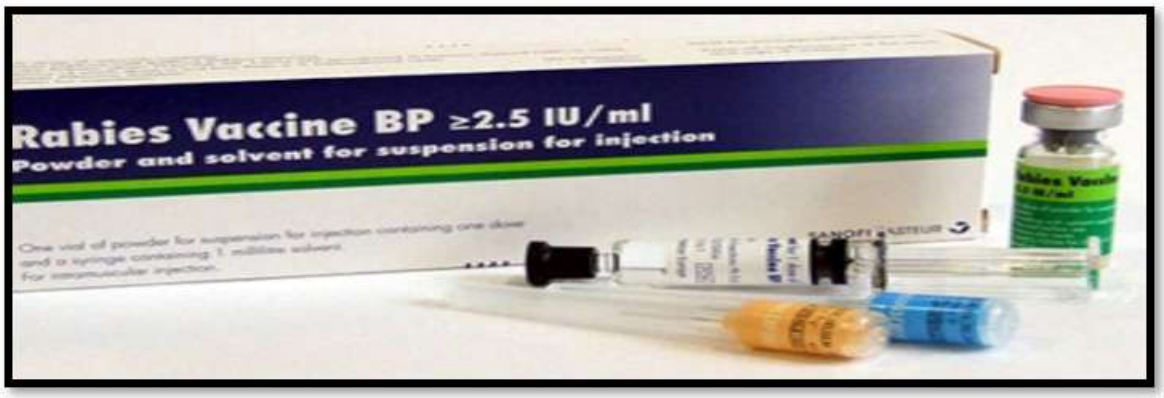

Figure 1.2: Rabies Vaccine Injection

1.7- A Narrative Review of the Rabies Vaccine for Rabies Prevention and Treatment

Vaccination is currently the main preventative approach, however there are still issues, such as varying safety profiles and immunogenicity among vaccine kinds. A three-dose vaccination series is essential for pre-exposure prophylaxis, particularly in high-risk situations. Inactivated rabies virus vaccine and human rabies immunoglobulin are used in post-exposure prophylaxis. Genetically modified and viral vector-based methods are being investigated in the search for the next generation of vaccines; promising new therapies include gene therapy, virus-like particles, and monoclonal antibodies. Rabies control is hampered by low knowledge, education, and financial hurdles to post-exposure prophylaxis. For rabies to be successfully eradicated, broad awareness efforts and affordable remedies are essential. If preventative measures are not taken, further research and cooperative efforts will be essential in the continuous effort to eradicate rabies, one of the deadliest infectious illnesses known to man. [21]

1.7.1- Rabies vaccine potency, immunogenicity, and effectiveness: an in vitro and in vivo approach

According to the study, Bangladeshi-made rabies vaccinations are strong enough to provide enough immunogenicity. For medical professionals who want to eradicate rabies, our research is evidence-based. [22]

1.7.2- A Narrative Review of Rabies Vaccine for Rabies Prevention and Treatment

Inactivated rabies virus vaccine and human rabies immunoglobulin are used in post-exposure prophylaxis. Genetically modified and viral vector-based methods are being investigated in the search for the next generation of vaccines; promising new therapies include gene therapy, virus-like particles, and monoclonal antibodies. Rabies control is hampered by low knowledge, education, and financial hurdles to post-exposure prophylaxis. For rabies to be successfully eradicated, broad awareness efforts and

affordable remedies are essential. If preventative measures are not taken, further research and cooperative efforts will be essential in the continuous effort to eradicate rabies, one of the deadliest infectious illnesses known to man. [23]

2. MATERIALS AND METHODS

2.1. Aim of the Study

The aim of this study is to assess the demographic characteristics and clinical symptoms of patients presenting after animal bites in Baghdad, with particular emphasis on the species of biting animals, potential rabies exposure, and the post-exposure management provided, including wound care, rabies vaccination, rabies immunoglobulin, and other supportive treatments. The study also aimed to identify demographic patterns that may be relevant to rabies prevention and public-health interventions in Iraq .

2.2 Patients and Methods:

2.1: DESIGN AND SETTINGS OF THE STUDY

A retrospective hospital-based clinical study was conducted at Medical City Hospital in Baghdad, Iraq. The study involved patients who presented to the hospital following animal bites or other documented animal exposures with potential risk of rabies transmission. The study was based on the review of routinely recorded medical information available in the patients' medical records during the study period from October 2025 to may 2026 .

2.2: POPULATION FOR STUDY

The study population consisted of patients who presented to Baghdad Medical City Hospital following animal bites or other animal exposures considered potentially relevant to rabies risk. Patients were identified through the available hospital medical records. The study included records containing sufficient information regarding demographic characteristics and the circumstances of animal exposure and/or subsequent management.

2.3 Patient Selection Criteria

Patients were selected based on the availability of medical records documenting presentation following an animal bite or potential rabies exposure. Records were included when relevant demographic and clinical information was available for analysis. Patients were excluded when the medical record lacked sufficient information regarding the exposure or clinical management required for the study variables.

2.4 Definition and Classification of Potential Rabies Exposure

Potential rabies exposure was defined on the basis of a documented history of an animal bite or other exposure that could involve contact with saliva from a potentially rabid animal. The assessment was based on the information available in the medical records in hospital , including the species of the biting animal and the circumstances of exposure. Because this was a retrospective hospital-based study, classification of exposure reflected the clinical documentation available at the time of presentation.

Animal Exposure Classification

The biting animals were classified according to the species documented in the medical records. The principal categories analyzed in the study were dog, cat, and rodent bites. Other animal exposures(snake , scorpion) , when documented, were recorded separately and were not combined with the principal rabies-exposure categories unless they met the predefined criteria for inclusion.

Post-Exposure Prophylaxis and Wound Management

Post-exposure management was assessed from the documented treatment provided at the Baghdad medical hospital. Management variables included wound care, administration of rabies vaccine, administration of rabies immunoglobulin , tetanus prophylaxis, and antimicrobial or supportive treatment when documented. The available records were reviewed to determine whether these interventions were administered following animal exposure. Where the medical record did not contain sufficient information regarding the timing, dose, or completion of PEP, the information was considered unavailable rather than assumed to have been provided.

Natural Resources for Human Health
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2.5 Method and Data Collection

The data was collected from medical city

Each patient's information was examined as follows:

- The patients' demographics include their age and gender.
- Co-morbid conditions.
- The duration of infection.
- The quantity of infections.
- Vaccinated individuals and vaccination kind.
- The treatment procedure for rabies patients.

2.5 Ethical Consideration

The ethical guidelines governing medical research involving human subjects were followed in the conduct of this investigation.Approval was obtained from the relevant institutional authority before data collection. Patient confidentiality and privacy were strictly maintained, and all personal identifiers were removed from the records.

As this was a retrospective study based on medical records, no direct contact or intervention with patients was performed. The data were used solely for scientific and research purposes. All procedures followed the ethical standards of the institutional and national research committee and were consistent with the principles of the Declaration of Helsinki.\

2.6 Statistical Analysis

Statistical analysis was performed using IBM SPSS Statistics, version 26. Descriptive statistics were used to summarize the study variables. Categorical variables were presented as frequencies and percentages, while continuous variables were summarized using mean ± standard deviation (SD), where applicable. The Chi-square test was used to assess associations between categorical variables when the assumptions of the test were satisfied. A two-sided P-value of <0.05 was considered statistically significant.

3. RESULTS AND DISCUSSION

3.1 Results

Table 1

Thirty-six percent of the fifty rabies-recovered patients in this research were under the age of twenty. Of them, 26% were in the 20–30 age range. Twelve percent of them were in the 30–40 age range. 26% of them were older than forty.With a male to female ratio of 72% to 28%, there were more male patients than female patients. Table 1 presented all of these results.

Table 1: Distribution of Patients by Age

	No. of Patients	**Percentage**
<20 years	18	36%
20–30 years	13	26%
30–40 years	6	12%
>40 years	13	26%
Total	**50**	**100%**
Gender	**No. of Patients**	**Percentage**
Male	36	72%
Female	14	28%
Total	**50**	**100%**

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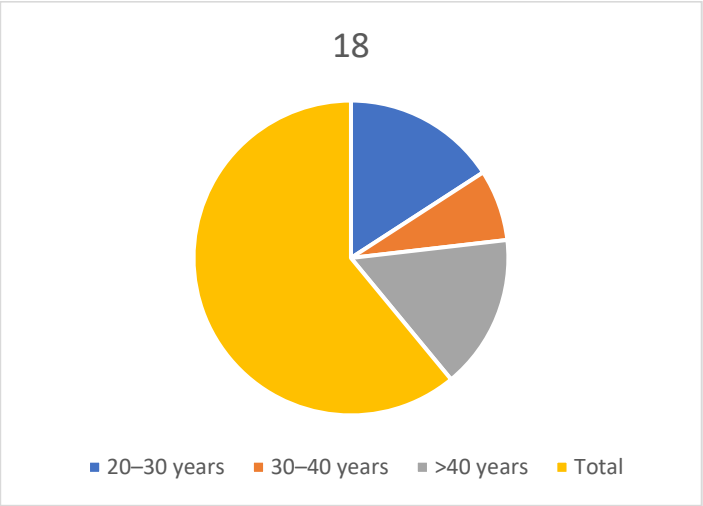
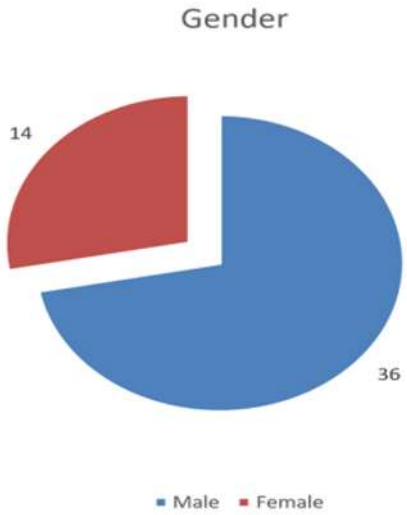


Figures 3.1: The exploded pie charts show that most patients were males (72%) and the highest proportion were under 20 years of age (36%).

The figures represent two exploded pie charts illustrating the demographic distribution of the study participants. The gender chart shows that males constitute the majority of cases (36 patients, 72%), while females account for 14 patients (28%). The predominance of younger patients and males in this study may provide useful information for targeting rabies-prevention education; however, these findings should be interpreted within the context of the hospital-based study design. The observed demographic distribution may reflect patterns of healthcare-seeking behavior and hospital attendance rather than the true distribution of animal-bite exposures within the general population. Therefore, the findings cannot be generalized to all animal-bite incidents in Baghdad without confirmation from larger, population-based or multicenter surveillance studies.



The age chart demonstrates that the highest proportion of patients are under 20 years (36%), followed by those aged 20–30 years (26%), 30–40 years (12%), and over 40 years (26%). These findings indicate that younger age groups and males were more frequently affected in this study.

Table 2

Sixty-two percent of these patients had contracted the infection from a dog bite, twenty-two percent from a cat bite, twelve percent from a rat bite, two percent from a snake bite, and two percent from a scorpion bite and a snake bite. All of these results were displayed in Table 2.

Natural Resources for Human Health
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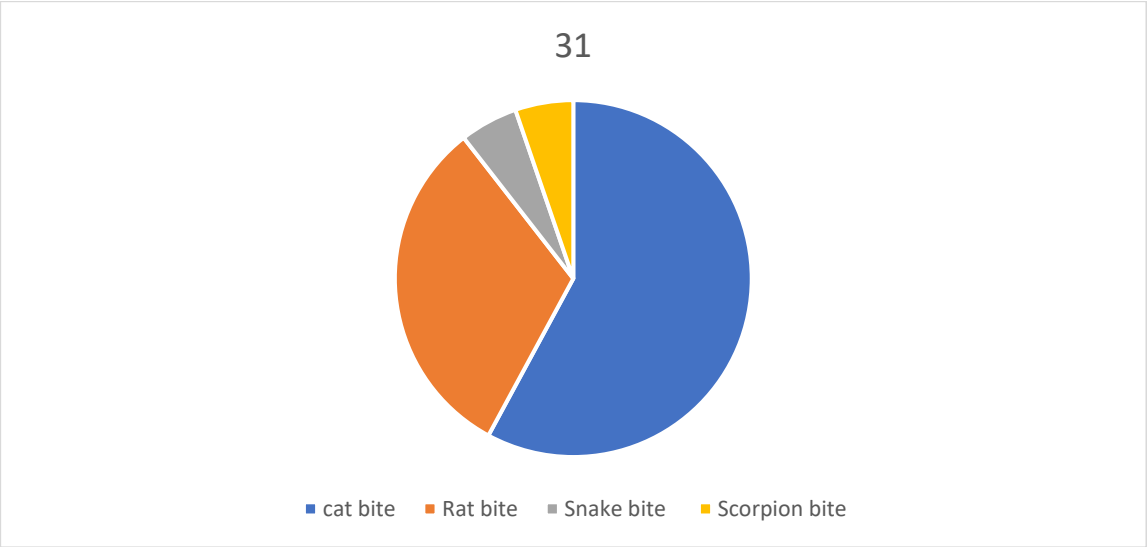
Tablet 2: Shows how the vectors of infection

		No of Patients%
dog bite	31	62%
cat bite	11	22%
Rat bite	6	12%
Snake bite	1	2%
Scorpion bite	1	2%

Figures 3.2: Distribution of Infection Sources Among Patients



The pie chart illustrates the distribution of infection cases caused by different types of animal bites. Dog bites represent the largest proportion of cases, accounting for approximately 62% of the total infections ,Dogs represented the largest proportion of animal exposures recorded in the study. However, the rabies status of the biting animals was not consistently confirmed through laboratory testing in the available records. Therefore, the high proportion of dog bites should be interpreted as a distribution of reported animal exposures rather than as evidence that all dog bites represented confirmed rabies transmission. Integration of human clinical surveillance with veterinary and laboratory surveillance would improve the assessment of the actual rabies risk associated with animal exposures.. Cat bites are the second most common cause, making up about 22% of cases. Rat bites contribute the smallest percentage, representing around 12% of the infections.

Overall, the chart clearly shows that dog bites are the primary source of infection among the reported cases, significantly exceeding infections caused by cat and rat bites.

Table 3

Illustrates the different management strategies commonly used in hospitals for patients exposed to rabies or animal bites. The most frequently administered treatment was the antirabies vaccine (43%), reflecting its essential role in post-exposure prophylaxis (PEP) and prevention of disease progression. ATS (Anti-Tetanus Serum) was used in 23% of cases to prevent tetanus infection, which may occur in contaminated wounds following animal bites.

Antirabies immunoglobulin (13%) was also administered in a significant proportion of patients, particularly in high-risk exposures, as it provides immediate passive immunity before the vaccine-induced immune response develops. Supportive and adjunctive treatments were also used, including antibiotics such as Ceftriaxone, Augmentin, Amoxicillin, and Flagyl to prevent or treat secondary bacterial infections resulting from bite wounds.

Additionally, medications like Paracetamol and Dolipran were given for pain and fever control, while hydrocortisone (H.C) and antihistamines (Allermine) were used to manage inflammatory or allergic reactions. Intravenous fluids (N/S) were administered to maintain hydration and support general patient condition. A small percentage of cases required antiscorpion treatment, indicating management of non-rabies-related envenomation cases.

Overall, the table demonstrates that hospital management of animal bite cases involves a combination of rabies-specific prophylaxis and supportive therapies aimed at preventing complications, controlling infection, and improving patient outcomes.

Table 3: Management Approaches Used in Hospitals for Rabies-Related Cases

Management	No. of Patients	Percentage
Antirabies vaccine	44	43%
Tetanus antitoxin	24	23%
Antirabies immunoglobulin	14	13%
Chlorpheniramine maleate	4	4%
Metronidazole vial	1	1%
Ceftriaxone vial	4	4%
Sodium chloride 0.9%	4	4%
Amoxicillin + Clavulanic acid	2	2%
Paracetamol vial	1	1%
Hydrocortisone	2	4%
Scorpion antivenom	1	1%

The recorded use of rabies vaccine and rabies immunoglobulin demonstrates the role of post-exposure prophylaxis in the management of animal-bite exposures. Nevertheless, because the study relied on retrospective medical records, the available data may not fully capture whether patients completed the recommended vaccination schedule or received all components of PEP at the appropriate time. Accordingly, the treatment frequencies should be interpreted as documented interventions rather than definitive measures of treatment adherence or completion.

3.2 Discussion

1-Antibiotics to treat secondary bacterial infections because they directly target the bacteria, killing them or preventing their growth.Antibiotics help prevent the spread of bacterial infections in the body, reducing the risk of serious complications. Antibiotics can help speed up the healing process of a bacterial infection, relieving symptoms and improving overall health.

Natural Resources for Human Health
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2-The rabies vaccine is used after exposure to a bite from an animal suspected of having rabies, such as a dog, for the following reasons:

Rabies prevention:

A dangerous and potentially lethal virus that damages the central nervous system is rabies.

Rabies is nearly usually lethal once symptoms start to show.

By encouraging the production of antibodies to the rabies virus, the vaccination seeks to stop the disease from spreading.

3-Immunoglobulin is used after a dog bite for several important reasons, especially when there is a risk of rabies:

- **Provides immediate immunity:**

Immunoglobulin contains antibodies that are ready to fight the rabies virus. These antibodies provide immediate protection before the body can produce its own antibodies through vaccination

4-Acetaminophen is a pain reliever and fever reducer, but it is not a direct treatment for a dog bite. Here are the reasons why a doctor might use paracetamol in the case of a dog bite:

- Pain relief: A dog bite can be painful, so paracetamol can be used to relieve the pain from the wound.
- Reducing fever: If the bite causes an infection, the body temperature may rise. Paracetamol is used to reduce fever.
- Relieving general discomfort: The person who has been bitten may feel general discomfort, and paracetamol can help relieve this feeling.

5-Metronidazole is used to treat dog bites for several reasons, the most important of which are:

Combating anaerobic bacteria:

- Dogs' mouths contain many types of bacteria, including anaerobic bacteria that thrive in the absence of oxygen. These bacteria can cause serious infections in deep wounds from dog bites.
- Flagel is an antibiotic that is effective against these types of anaerobic bacteria, helping to prevent or treat infections

6-Diphenhydramine amp (antihistamine) and hydrocortisone are used in cases of dog bites for several reasons, related to the immune and inflammatory response that occurs after the bite:

Diphenhydramine amp (antihistamine)

- It is used to reduce the allergic reaction that may occur as a result of a bite. A dog bite may cause the body to release histamine, which leads to symptoms such as swelling, redness, and itching. An antihistamine works by blocking the effect of histamine, thus relieving these symptoms.

Hydrocortisone (corticosteroid):

- It is used to reduce inflammation and swelling at the site of the bite. Hydrocortisone works by suppressing the immune system's response, which reduces inflammation.
- It is used in some cases to relieve local allergic reactions.

7-Fear of water, or hydrophobia, is a classic symptom of rabies, a serious viral disease that affects the central nervous system.

Why is a rabies patient afraid of water?

- Effect of the virus on the nervous system:

Rabies virus affects the nervous system, especially the part responsible for swallowing.

- The virus causes painful spasms in the throat and larynx muscles when trying to swallow.
- Even just the sight or thought of water can trigger these painful spasms, leading to an intense fear of water.

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How do we treat rabies?

Post-exposure prophylaxis:

• Spend at least fifteen minutes carefully cleaning the wound with soap and water if you are bitten by a suspected animal.

• Get the rabies vaccination and rabies immunoglobulin right away at the closest health facility

.• The only method to stop rabies from developing after being exposed to the virus is post-exposure prophylaxis.

4. CONCLUSION

4.1 Conclusion

This retrospective study provides an overview of animal-bite exposures and post-exposure management among patients presenting to a major medical hospital in Baghdad. Dog bites represented the largest proportion of documented animal exposures, while younger patients and males constituted substantial proportions of the study population. Rabies vaccine, tetanus prophylaxis, and rabies immunoglobulin were among the principal documented management interventions.

The findings emphasize the importance of timely assessment and appropriate post-exposure management following animal exposure. However, the results should be interpreted in light of the small sample size, retrospective hospital-based design, possible selection bias, incomplete documentation of PEP, and limited availability of confirmed rabies status among the biting animals. Multicenter studies integrating human healthcare records with veterinary and laboratory surveillance are warranted to provide a more comprehensive assessment of rabies risk and prevention in Baghdad.

- **• Rabies continues to pose a serious risk to public health:**
  - Despite being preventable, rabies causes tens of thousands of deaths globally each year, particularly in resource-limited settings.
  - The disease disproportionately affects vulnerable populations, including children and those in rural areas.
- **Effective post-exposure prophylaxis (PEP) is crucial:**
  - Timely and appropriate PEP, including wound cleaning, rabies immunoglobulin (RIG), and vaccination, is essential for preventing rabies after exposure.
  - Adherence to WHO guidelines for PEP is vital.

4.2 Recommendations

- **1. Foundational Knowledge:**

- **Virology:**
  - Understand the structure and replication cycle of the rabies virus (Lyssavirus).
  - Learn about the virus's neurotropism and the mechanisms of its spread within the nervous system.
  - Study the different rabies virus variants and their geographic distribution.

2. Clinical Aspects:

- **Pathogenesis:**
  - Learn about the progression of rabies infection, from the initial bite to the development of clinical symptoms.
  - Understand the pathological changes that occur in the nervous system.

3. Public Health and Prevention:

- **Rabies Control Strategies:**
  - Study the importance of mass dog vaccination programs in rabies prevention.

- Learn about the One Health approach to rabies control, which emphasizes collaboration between human and animal health sectors.
- Understand the role of public education and awareness campaigns.

4.3 Limitations

- Limited study time.
- the retrospective hospital-based design depended on the accuracy and completeness of routinely recorded medical records. Consequently, some clinical or treatment-related information may not have been consistently documented.
- the relatively small sample size limits the statistical power of the study and the generalizability of the findings to the wider population of Baghdad.
- confirmation of the rabies infection status of the biting animals was not consistently available in the retrospective medical records. Therefore, the study findings should be interpreted as describing potential rabies exposures and post-exposure management rather than laboratory-confirmed animal rabies transmission.

In addition, information regarding the completeness and timing of post-exposure prophylaxis, including vaccination schedules and rabies immunoglobulin administration, may have been incomplete in some records. Finally, the absence of linked animal-health surveillance data limits the ability to correlate human exposures with confirmed rabies cases among animals. Future studies involving multiple hospitals, larger populations, and integrated human and animal surveillance data would provide a more comprehensive assessment of rabies exposure and prevention in Baghdad.

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For our team authors

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Conceptualization, Investigation, Methodology, Laboratory Analysis., Data Curation, Formal Analysis. Supervision, Writing Review & Editing.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

ETHICS STATEMENT

The ethical guidelines governing medical research involving human subjects were followed in the conduct of this investigation.Approval was obtained from the relevant institutional authority before data collection. Patient confidentiality and privacy were strictly maintained, and all personal identifiers were removed from the records.

As this was a retrospective study based on medical records, no direct contact or intervention with patients was performed. The data were used solely for scientific and research purposes. All procedures followed the ethical standards of the institutional and national research committee and were consistent with the principles of the Declaration of Helsinki.

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DATA AVAILABILITY STATEMENT

The data supporting the findings of this study are available from the corresponding author upon reasonable request, subject to applicable ethical, privacy, and institutional restrictions

REFERENCES

[1] Rita Kanneng Duwong, Usman Adekanye, Asabe Adamu Dzikwi-Emennaa. Retrospective Study on the Spatio-Temporal Distribution of Rabies in Animals in Plateau State, 2019–2023. Nigerian Veterinary Journal 45 (2), 11-25, 2024

[2] Kanika D Nahata. On the use of phylogeographic inference to infer the dispersal history of rabies virus: a review study. Viruses 13 (8), 1628, 2021
[3] Ashley C Banyard, Anthony R Fooks. Rabies life cycle, transmission and pathogenesis. Rabies and Rabies Vaccines, 1-10, 2020
[4] Chenjuan Shi, Peilu Sun. Research progress on neutralizing epitopes and antibodies for the Rabies virus. 2022
[5] Charles E Rupprecht. history of rabies—The foundation for global canine rabies elimination. Rabies, 1-42, 2020
[6] Structural Heterogeneity of the Rabies Virus Virion. Viruses 2024, 16, 1447. Structural Heterogeneity of the Rabies Virus Virion. Viruses 2024, 16, 1447
[7] Abraha Bahlbi Kiflu. The Immune Escape Strategy of Rabies Virus and Its Pathogenicity Mechanisms. Viruses 16 (11), 1774, 2024
[8] Marian Lacy, Nonthapan Phasuk. Human Rabies Treatment-From Palliation to Promise. Marian Lacy et al. Viruses. 2024.
[9] Monique Lafon. Evasive strategies in rabies virus infection. Monique Lafon. Adv Virus Res. 2011.
[10] Darryn L Knobel, Alan C Jackson. One Medicine Mission for an Effective Rabies Therapy Darryn L Knobel et al. Front Vet Sci. 2022.
[11] Thirumeni Nagarajan, Charles E Rupprecht. History of rabies and rabies vaccines. Rabies and Rabies Vaccines, 11-43, 2020
[12] Thiravat Hemachudha. Human rabies: neuropathogenesis, diagnosis, and management. The Lancet Neurology 12 (5), 498-513, 2013
[13] Sean J Udow, Ruth Ann Marrie, Alan C Jackson. Clinical infectious diseases 57 (5), 689-696, 2013
[14] David A Warrell, Neil McD Davidson. Pathophysiologic studies in human rabies. The American journal of medicine 60 (2), 180-190, 2019
[15] Thiravat Hemachudha, Jiraporn Laothamatas, Charles E Rupprecht. Human rabies: a disease of complex neuropathogenetic mechanisms and diagnostic challenges. The Lancet Neurology 1 (2), 101-109, 2022
[16] Thulani Pattiyakumbura, Rohitha Muthugala. Human Rabies: Laboratory Diagnosis, Management and Nanomedicine. Current Treatment Options in Infectious Diseases 17 (1), 3, 2024
[17] Thulani Pattiyakumbura, Rohitha Muthugala. Human Rabies: Laboratory Diagnosis, Management and Nanomedicine. Current Treatment Options in Infectious Diseases 17 (1), 3, 2024
[18] Lonika Lodha, Ashwini Manoor Ananda. Advancing Rabies Diagnosis. Molecular Diagnosis & Therapy, 1-7, 2024
[19] MA Ashwini, Amrita Pattanaik. Recent updates on laboratory diagnosis of rabies. Indian Journal of Medical Research 159 (1), 48-61, 2024
[20] Mudasir M Rather, Koppu Vasavi. Unleashing the Truth: Understanding Rabies in Humans and Animals. Emerging Human Viral Diseases, Volume II: Encephalitic, Gastroenteric, and Immunodeficiency Viral Infections, 289-306, 2024
[21] Alan D Kaye, Dominique M Perilloux. Rabies Vaccine for Prophylaxis and Treatment of Rabies: A Narrative Review. Cureus 16 (6), 2024
[22] Fahima Akter, Md Shamimuzzaman. Potency, immunogenicity, and efficacy of rabies vaccine: In vitro and in vivo approach. Immunity, Inflammation and Disease 12 (2), e1198, 2024
[23] Alan D Kaye, Dominique M Perilloux. Rabies Vaccine for Prophylaxis and Treatment of Rabies: A Narrative Review. Cureus 16 (6), 2024