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ORIGINAL ARTICLE

DEMOGRAPHICS, INJURY PATTERNS, AND MANAGEMENT PROFILE OF ANIMAL BITE CASES IN A NATIONAL INFECTIOUS DISEASE AND RESEARCH FACILITY

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ABSTRACT

Background: Rabies remains to be a neglected tropical disease in the Philippines, with the country reporting a higher number of cases compared to its counterparts in Asia.

Objective: To describe the demographics, animal bite characteristics, and post-exposure prophylaxis of animal bite patients coming in for care at the Research Institute for Tropical Medicine (RITM), a large government referral center for infectious diseases, and animal bites.

Methods: Electronic patient records from January 1, 2018 to December 31, 2019 were obtained from the National Rabies Information System (NaRIS) database of the Department of Health, and summarized using applicable descriptive statistics.

Results: A total of 14,614 patients were included over the two-year study period, and more than third of the patients were children below 15 years old, while more than half were adult males. Lower extremities were the most frequently affected area, while with children, more than a third of exposures were in the head and neck areas. Intradermal route was mostly used for the post-exposure prophylaxis, while WHO prequalified vaccines were utilized in more than 90% of the patients. Only 55.7% of patients completed the prophylaxis regimen at RITM.

Conclusion: These findings reflect the significant exposure of children from animal bites, and the non-compliance of patients to the prescribed post-exposure prophylaxis.

KEYWORDS: *Rabies, Animal Bite, Post-Exposure Prophylaxis, Rabies Vaccines*

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INTRODUCTION

Rabies is a neglected disease, and the combination of poor surveillance, occasional misdiagnosis of rabies, and inadequate coordination among the involved sectors have led to the underestimation of its true burden.[1] The World Health Organization (WHO) estimates that, each year, around 59,000 human lives worldwide are lost due to this vaccine-preventable disease.[2] The Philippines has seen an alarming rise in the number of human rabies deaths since the COVID-19 pandemic, from 235 deaths in 2020, to 261 in 2021, 284 in 2022, and 368 in 2023.[3,4] For the first half of 2024, 169 cases have already been reported, which is much higher than our Asian neighbors.[5] Rabies is endemic in the whole country, and regions 3, 4A, 5 and 12 have reported the most number of cases over the years.[6] Among rabies patients, there is predominance of adults males compared with children, and majority of the biting animal are dogs.[7]

Rabies transmission usually occurs through a bite or scratch from an infected animal; non-bite exposures, such as licking of mucosa or open wounds, are rare but can also transmit rabies. Dogs account for 99% of human rabies deaths worldwide.[8] Aside from the risk of rabies, animal bites may also lead to other health concerns, such as secondary bacterial infection, sepsis, and even psychological strain.[9] Animal bites constitute a significant public health burden not only because of the high cost of the rabies biologicals, but also because of the need to maintain the specialized facilities for post-exposure prophylaxis (PEP), and the fast turnover of trained personnel, necessitating constant training. Rabies PEP is given after a possible exposure to rabies virus from potentially rabid animals, and it consists of wound washing, rabies vaccination, and administration of rabies immunoglobulin (RIG) when indicated.[10]

In the Philippines, rabies PEP is provided by government-run Animal Bite and Treatment Centers (ABTC) and private Animal Bite Clinics (ABC), which send reports through the National Rabies Information System (NaRIS). NaRIS is an internet-based information system which records details of the animal bite cases as well as vaccine utilization, and serves as a national database for rabies exposures. It also collects the number of human rabies cases.[6]

Several international studies have described the demographics of animal bite patients, but data is scarce locally. This study aimed to understand the clinical, demographic and management profile of animal bite victims from a large government ABTC that can aid in rabies elimination strategies, specifically in the development of educational materials and in forecasting rabies vaccine and immunoglobulin needs, as well as other resources necessary for optimal control of rabies. These educational materials may also be used to target at-risk population for animal bite for pre-exposure prophylaxis (PrEP).

MATERIALS AND METHODS

This descriptive cross-sectional study involved retrospective review of ABTC records conducted at the Research Institute for Tropical Medicine (RITM), an infectious disease referral center which runs one of the largest ABTCs in the country. Analysis of the animal bite data of 14,614 patients consulting at the RITM ABTC from January 1, 2018 to December 31, 2019 was performed using the NaRIS database, where data was directly encoded in a computer by a medical staff of the ABTC using the NaRIS program. The scope of the study was limited to the information available from the NaRIS database and included the following: patient demographics (age, sex, residence), exposure (type, category, number and areas of bites), biting animal (type, status), and PEP details (vaccine, RIG, and completion). Other variables (e.g., income, occupation, time of bite, etc.) not available in the NaRIS were not included. Permission to use the NaRIS data was secured from the National Rabies Program of the Philippines Department of Health. The study was approved by RITM Institutional Review Board.

We used descriptive statistics (frequencies and proportions, median and interquartile range

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[IQR]) to summarize the characteristics of patients, in terms of their demographics, rabies exposure, clinical exposure, and prophylaxis status (both PrEP and PEP). Statistical analysis was performed in Stata/SE 17.0 (StataCorp, College Station, TX, USA). Inconsistent and incomplete records were identified and excluded.

RESULTS

During the review period, a total of 14,614 animal bite patients were seen at the RITM from 2018-2019. More than half were males (52.3%), and more than a quarter aged 19-39 years old (27.0%). Children below 15 years old comprised 36.8% of cases, while 13.4% were less than 5 years old (Table 1). Most patients (99.1%) came from the RITM catchment areas of the National Capital Region (56.6%) and Region IV-A (42.5%).

Table 1. Demographic Data of Animal Bite Victims at RITM, 2018-2019 (N=14,614)

	n	%
Gender		
Male	7647	52.3
Female	6967	47.7
Age (in years)		
< 5	1961	13.4
5 – 14	3415	23.4
15 – 18	830	5.7
19 – 39	3944	27.0
40 – 64	3592	24.6
≥ 65	866	5.9
No data	6	0.04
Place of Residence		
National Capital Region	8273	56.6
Region IV-A (CALABARZON)	6210	42.5
Other regions (Luzon)	88	0.6
Other regions (Visayas)	22	0.2
Other regions (Mindanao)	13	0.1
No data	8	0.1

Of the total 14,707 rabies exposures (14,614 primary exposures and 93 re-exposures), 66.4% belong to category II, and 33.6% to category III. Almost all category II exposures were minor/superficial scratches/abrasions without bleeding (99.9%). Transdermal bites/scratches comprised majority of the category III exposures (97.5%), while non-bite exposures such as licking of broken skin and ingestion of raw infected meat were rare occurrences (Table 2).

Bites on a single area accounted for 90.5% of the exposures and were noted on the lower extremities (48.4%), upper extremities (35.8%) and the head and neck areas (15.9%). Although most exposures seen among children less than 15 years old (n=5,376) were on the lower extremities (43.2%), it is important to note that exposures on the head and neck were higher in children (37.7%) compared with adults (17.0%). Almost all bite wounds (98.4%) were reported to have been cleansed or washed.

Table 2. Profile of Rabies Exposures of Animal Bite Victims at RITM, 2018-2019 (N=14,707)

	n	%
Categorization of exposure according to local Philippine guidelines*		
Category I	**1**	**0.1**
Feeding/Touching an animal	1	0.1
Category II	**9763**	**66.4**
Minor/superficial scratches/abrasions without bleeding, including those induced to bleed	9758	66.3
Nibbling of uncovered skin	5	0.03
Category III	**4943**	**33.6**
Transdermal bites (puncture wounds, lacerations, avulsions) or scratches/abrasions with spontaneous bleeding	4819	32.8
Contamination of mucous membranes or open skin lesions through splattering and mouth-to-mouth resuscitation	119	0.8
Licks on broken skin or mucous membrane	4	0.03
Ingestion of raw infected meat	1	0.01
Number of exposed locations		
Single area (with single or multiple bite wounds)	**13308**	**90.5**
Lower extremity	6436	48.4%
Upper extremity	4762	35.8%
Head and neck	2110	15.9%
Multiple areas	**751**	**5.1**
No data	**648**	**4.4**

** From DOH AO 2018-0013: Revised Guidelines on the Management of Rabies Exposure*

Dogs comprised majority of biting animals (61.1%), followed by cats (38.6%). Less than 1% of the bites were from other animals, such as bats, horses, and monkeys. At the time of consultation, 83.4% of the biting animals were noted to be healthy or alive, 14.7% had unknown status or were stray animals, and the rest were either killed or have died (Table 3).

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Precise data on the final outcome of the biting animal after the 14-day observation period was not recorded, since patients usually do not return for the last vaccine dose if the biting animal was still alive.

Table 3. Profile of exposures to animals, 2018-2019 (N=14,707)

Status of biting animal at consult	N	%	Dog		Cat		Others	
			n	%	n	%	n	%
Alive and healthy?	**12261**	83.4	8279	92.2	3967	69.8	15	37.5
Unknown / Stray	**2154**	14.7	485	5.4	1655	29.1	14	35.0
Dead due to unknown reasons	**223**	1.5	168	1.9	53	0.9	2	5.0
Killed	**55**	0.4	48	0.5	7	0.1	0	0.0
Dead due to rabies	**14**	0.1	4	0.04	1	0.02	9	22.5
TOTAL	**14707**	100.0	**8984**	**100.0**	**5683**	**100.0**	**40**	**100.0**

Of the 14,707 animal bite exposures, 12,179 (82.8%) were assessed to need a full course of primary PEP. Patients who received their rabies vaccine elsewhere were only given rabies immunoglobulin (RIG) (1.3%), while those who were previously immunized received booster doses (15.9%) (Table 4). The median interval from the date of bite exposure to the first day of consult was 2 days (IQR 1-4).

Table 4. Post exposure Prophylaxis of Animal Bite Patients at RITM, 2018-2019 (N=14,707)

	n	%
Received Rabies Vaccine	12179	82.8
Without RIG	*7901*	*64.9*
With RIG	*4278*	*35.1*
RIG only (vaccines given outside)	193	1.3
Received booster	2335	15.9
TOTAL	**14707**	**100.0**

The intradermal (ID) administration of rabies vaccine was given in 98.7% of cases, while the intramuscular (IM) regimen was rarely used (1.3%).

At the RITM ABTC, WHO prequalified vaccines Purified Vero Cell Rabies Vaccine (Verorab and Vaxirab N), and Purified Chick Embryo Cell Vaccine (Rabipur), were used in 93.4% of cases while non-WHO prequalified vaccines Purified Vero Cell Rabies Vaccine (Speeda and Abhayrab) were given in 6.5%. Mixed route (IM, ID) administration was noted in 0.5%, while mixed vaccine product usage (WHO prequalified, non-WHO prequalified vaccines) was seen in 1.6%.

Of the 12,179 patients who needed a full course of PEP, only 55.7% were documented to have completed the regimen at RITM. It was not known whether the remaining 44.3% of patients who did not complete the regimen at RITM received the rest of the vaccine doses elsewhere.

DISCUSSION

Over the years, there has been increasing cases of both animal bites and rabies nationwide. In 2013, animal bites and human rabies were noted at 522,420 and 205 cases, respectively. However in 2023, these cases increased to 2,161,569 animal bite patients, and 368 human rabies deaths.[11]

Our study showed that adult males were more frequently affected in over half of the cases, a finding shared by other studies on animal bite exposures.[9,12,13] In relation to this, WHO raised the concern of animal bite injuries in children since they comprise over half of the victims.[14] Children below 15 years old make up more than half (58.4%) of animal bite patients in Uganda,[15] around a third in Kenya[9] and Australia,[16] and more than a third (42%) in the Philippines.[6] Our study revealed similar results, where children below 15 years comprised more than a third (36.8%) of the bitten population.

Rabies is endemic nationwide, and human rabies related deaths ranges from 200-300 annually, in which a third of these deaths occur in children < 15 years old.[17] Thus, it is important to identify ways to protect children from animal bite exposures. Among the preventive measures to decrease incidence of animal bites in children include education of both children and parents that any dog, regardless of breed, can inflict a bite and/or a scratch. Furthermore, all child and pet interactions should be closely supervised to prevent bite exposures. In addition, policies that help environmental changes may be developed, such as breeding of pets for temperament and appropriate socialization, leading to less biting incidence and/or less severe bites.[18] As dogs account for majority of animal bites in children,

the review of Duncan-Sutherland found moderate to high evidence that dog control strategies that significantly reduce the dog population through sterilization, euthanasia, or re-homing, decrease dog bite injuries.[19] However, euthanasia is no longer acceptable in most countries. Majority of human rabies are transmitted by dogs, and one effective way to prevent rabies, both in children and adults, is through mass dog vaccination. Furthermore, education of children and adults on responsible pet ownership, dog behavior, and emphasis on getting PEP after an animal bite exposure are important means to preventing rabies.[20]

Rabies vaccination is effective, however, not all patients are aware of the proper management after exposure (i.e., bite or scratch) to a potentially rabid animal such as a dog or cat. In the study of Dizon et al. of households in Central Luzon, 85.4% (n=621) have heard of rabies, but only a third knew the ABTC in their place. Furthermore, among the 84 animal bite victims in 64 households, 12.4% consulted traditional healers, and 13.6% did not seek medical help.[21] This shows the need to educate more individuals regarding the importance of getting rabies PEP to prevent rabies.

Majority of animal bite patients coming to RITM for PEP come from NCR and Region IV-A. In 2020, the population density of NCR was 21,765 persons per square kilometer, and Region IV-A with 977 persons per square kilometer.[22] In July 2017, there were 517 government-run ABTC across the country. In NCR, there were 30 ABTCs (0.23 ABTC/100,000 population), while Region IV-A had 242 ABTCs (3.53/100,000 population).[23] There are other ABTC/ABC surrounding RITM, but due to the occasional scarcity of vaccines and/or RIG in these facilities, majority of patients go to RITM for free rabies PEP.

Similar to other studies,[12,13] the lower extremities were the most frequent bite sites noted in our study, but it is important to note that in children below 15 years old, more than a third suffered exposures on the head and neck. Likewise, Ngugi et al. showed that there was an increased chance of having head and face injuries in children below 15 years (OR 5.8 [95% CI 3.3, 10.2]) compared to older individuals.[9] In the study of Schalamon et al., in 357 children with animal bite injury, the face, head, and neck were mostly involved in 50% of the time. Children have more bites on the head and neck compared with other age groups because of their small stature. The biting animal (e.g., dog) targets mostly the area above the shoulders, signifying the closeness of the child's head to the attacking animal.[24] This is important since animal bite exposures on the head and neck are considered high-risk. The close proximity of the bite injury to the central nervous system has greater risk for progression to rabies if the biting animal is rabid.[9,15] Although majority of the exposures involved only one body area, some were noted to involve multiple body areas, and even multiple bites in one body area.

As part of the PEP regimen, WHO recommends thorough washing and flushing of the wound with soap and water for 15 minutes.[25] In the studies of Sivagurunathan et al. and Manasi et al. on animal bite patients, only 37.5% (131/350) and 66.9% (241/360), respectively, washed their wounds with soap and water.[26,27] This is in contrast to our study where almost all patients reported cleaning/washing of the bite wounds at the time of consult. Prompt washing of the bite wound area with soap and water, and application of antiseptic solution decreases the risk of rabies transmission.[28]

Our study showed predominance of category II animal bite exposures, similar to the studies of Dwivedi et al. and Yusuf et al.,[29,30] but is in contrast with other studies for which category III exposure was more prevalent.[31–33] In the local guidelines, the WHO rabies exposure categorization was adapted to the local situation wherein, category II exposures are defined as minor/superficial scratches/abrasions without bleeding, but also includes superficial wounds that were induced to bleed. Induced bleeding is a common practice in the country and may lead a health worker to assess the wound to a higher category if not specifically mentioned. In the local guidelines, ingestion of raw infected meat and

unprotected handling of infected carcass fall under category III on the basis of mucous membrane contamination classified as category III by WHO.[25]

The predominant biting animals in our study were dogs, followed by cats which is also similar to other reports.[12,29,31,33] It is important to emphasize that cats comprised more than a third of the biting animals (38.64%), compared to 11.2% in an earlier study at RITM by Quiambao et al.[34] Similar to our study, there have been reports of exposures from monkeys[13,29] and domestic animals like cattle and cows.[12,31] In the Philippines, there have been documented cases of rabies from caprine (goats), porcine (pigs), bovine (cattle), and bubaline (buffalo).[6]

The most common vaccine route for PEP in the study was ID, which is more cost-effective and caters to a greater number of people, since it allows the sharing of a vaccine vials among patients. When WHO recommended the 1-week, 2-site ID regimen (also called the Institut Pasteur du Cambodge or IPC regimen) in 2018,[10] there was limited experience on other rabies vaccines using that regimen. Thus, following the local guidelines, the RITM ABTC used only the WHO prequalified vaccines for the IPC regimen, whereas non-WHO prequalified vaccines were given using the 1-month, 2-site ID regimen (also called the Thai Red Cross or TRC regimen).

Almost half (44.3%) of the patients did not complete their PEP regimen at RITM. Because of the retrospective nature of the data, the reasons for non-completion were not known. Other studies noted the following reasons for non-completion of vaccination - refusal of dog owners to pay for the treatment cost of the victims, lack of financial means to purchase the vaccines,[35] vaccine cost, and healthy status of the biting animal.[36] Completion of the recommended rabies PEP regimen is important in order to provide optimized protection. If rabies PEP is not given or inadequately given, there is increased risk for rabies disease. In the study of Dimaano et al. from San Lazaro of 1,839 rabies patients over a span of 19 years, only one patient completed the vaccine regimen. This means that almost all other rabies patients (99.9%) from the study were not able to complete the recommended rabies vaccine schedule.[7]

Interchanging vaccine routes or brands were noted in a small percentage of patients and reflects the reality of animal bite management. Possible reasons for changes in the vaccine route may include cost considerations or identification of an existing hematologic problem (for which ID route is recommended over IM route). The ID regimen, however, is not optimum for patients who are immunocompromised, have chronic liver disease, are receiving systemic steroids and chloroquine; hence, these patients are recommended to receive the IM regimen.[28] In 2018, the Rabies Program of the Department of Health released its revised guidelines for rabies exposures based on the 2018 WHO recommendations.[25,28] The guidelines made a distinction between WHO prequalified rabies vaccines and non-WHO prequalified vaccines. WHO prequalified rabies vaccines are preferred for all animal bite exposures, since the data supporting their use have undergone detailed scrutiny as part of the WHO prequalification process. However, the reality of frequent stock-outs of these vaccines had to be addressed. Thus, according to the local guidelines, in instances where WHO prequalified vaccines are scarce or unavailable, non-WHO prequalified vaccines may be used.[37] In relation to this, the possible reasons for mixed-brand usage may include unavailability of the initial rabies vaccine brand, or the occurrence of an allergic reaction from a specific brand previously used. Prior to the 2018 WHO recommendations,[25] there were no clear guidelines on what to do in the event of interchanging routes or vaccine brands, leading to the restarting of the vaccination schedule. The 2018 WHO recommendations now state that restarting is not needed for these instances.

Rabies can be prevented by PEP, but this constitutes a financial burden that is difficult to sustain indefinitely. Avoidance of animal bites is an important lesson that can be taught to the public. Vital information from this study include the

propensity of bites from dogs and cats, the increasing number of cat bites, the danger of bites in the head and neck in children, the commonness of bites among adult males and the frequent non-completion of the PEP regimen. All these can be utilized to develop a focused educational program with specific messages about animal bites, its avoidance, and treatment.

LIMITATIONS

The data used in the study were limited to the information provided in the NaRIS. NaRIS is a promising surveillance program that can be further improved by ensuring more accurate data entry, and inclusion of additional information such as patient demographics (e.g., occupation, civil status, income bracket, etc.), presence of comorbidities (e.g., cancer, HIV, etc.), status of the biting animal during consultation (e.g., vaccination record, health status, provoked or not, etc.), wound status (e.g., infected or not, applied with antiseptics or not, etc.), tetanus immunization history, and others. Incorporation of adverse event reporting is also recommended to improve data completeness and usability. This supplementary information will be helpful to provide data for future researches. Surveillance is important since it provides vital information for disease prevention and control programs.[38] Since NaRIS is an electronic system database, among possible challenges of surveillance include limited data, incomplete data, delayed reporting, lack of manpower, and system errors. Implications of incomplete animal bite surveillance include inability to see the whole picture, and thus cannot be used optimally in planning for interventions or forecasting needed vaccines/RIG. Suggestions to improve the NaRIS database system include inclusion of more parameters in the data set, proper encoding of data, double checking of data, data reconciliation, and analysis of data by each ABTC. Furthermore, certification for timely reports may also be done.

CONCLUSION AND RECOMMENDATIONS

Animal bite cases, mainly from dogs and a significant number from cats, continue to rise every year, thus the need to raise more awareness on proper precautions to prevent bite exposures. The study demonstrated that slightly more males were affected than females, some patients came from rural areas, and a significant number of children were involved animal bite cases, indicating the need to educate children and adults, in both urban and rural areas, regarding the prevention of animal bite exposures. Some patients did not complete the post-exposure prophylaxis regimen, and knowing that rabies is 100% fatal once symptoms set in, there should be a strong emphasis for patients to complete their PEP regimen.

Since many children are victims of animal bites, recommendations to integrate prevention of bite exposures and getting post-exposure prophylaxis in school subjects or curriculum may be done. Surveillance of animal bite exposures through NaRIS should be continued and further improved, to be more encompassing and accurate for better data generation and analysis, leading to proper management and timely intervention. Future studies can include expanded data on the profile of animal bite patients, with longer study duration, and inclusion of more areas such as the surrounding ABTCs of RITM, and eventually involving other cities or regions. Furthermore, studies may also explore doing community education regarding animal bites and rabies, and compare if the intervention resulted in improved outcomes.

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CONFLICT OF INTEREST

None declared.

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