RETROSPECTIVE STUDY ON THE PREVALENCE & OUTCOMES OF TRAUMATIC INJURIES IN CATS AT KOTA BAHRU, KELANTAN DARUL NAIM FROM JANUARY UNTIL MARCH 2025

By

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RETROSPECTIVE STUDY ON THE PREVALENCE & OUTCOMES OF TRAUMATIC INJURIES IN CATS AT KOTA BAHRU, KELANTAN DARUL NAIM FROM JANUARY UNTIL MARCH 2025

ABSTRACT

Traumatic injury is a common and frequent occurrence that affects the welfare and well-being of cats. Studies and research have been conducted regarding the prevalence of traumatic injuries in cats from many parts of the world. However, there have been no studies done on the prevalence and outcomes of traumatic injuries in cats in Kota Bahru, Kelantan. Hence, this retrospective study aims to investigate the prevalence, causes, injuries sustained and outcomes of traumatic injuries in cats within the district of Kota Bharu, located in Kelantan Darul Naim, Malaysia, from January 1 until March 31, 2025. The prevalence of traumatic injuries in cats in Kota Bahru was estimated to be 5.56% (95% CI: 4.39-6.73%). Road traffic accidents were identified to be the most common etiology of traumatic injury, followed by animal altercation with 34.15% (28 cases) and 30.49% (25 cases), respectively. Laceration was the most common type of traumatic injury accounting for 28.05% (23 cases) and the outcome was survival for predominantly most cases 84.15% (69 cases). Stray cats $\chi^2(1) = 9.19$, $p = 0.002$ and RTA $\chi^2(1) = 17.49$, $p < 0.001$ cases were more significantly associated with mortality in cats implicated in cases of traumatic injury.

Keywords: Traumatic injuries, prevalence, etiologies, outcomes, association, Chi square test.

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KAJIAN RETROSPECTIVE MENGENAI KEJADIAN KECEDERAAN TRAUMA SERTA HASIL KECEDERAAN TRAUMA PADA KUCING DI KOTA BHARU, KELANTAN DARUL NAIM DARI JANUARI KE MAC 2025

ABSTRAK

Kecederaan trauma merupakan kejadian biasa dan kerap berlaku yang menjejaskan kebajikan serta kesejahteraan kucing. Kajian dan penyelidikan telah dijalankan mengenai prevalens kecederaan trauma pada kucing di banyak kawasan lain di dunia. Namun begitu, tiada kajian dilakukan mengenai prevalens dan hasil kecederaan trauma pada kucing di Kota Bharu, Kelantan. Oleh itu, kajian ini bertujuan untuk menyiasat prevalens, punca, jenis kecederaan yang dialami dan hasil kecederaan trauma pada kucing di daerah Kota Bharu yang terletak dalam negeri Kelantan Darul Naim, Malaysia dari Januari 1 hingga Mac 31, 2025. Prevalen kecederaan trauma pada kucing di Kota Bharu dianggarkan pada 5.56% (95% CI: 4.39-6.73%). Kemalangan jalan raya dikenalpasti sebagai punca utama kecederaan trauma diikuti oleh pergaduhan haiwan dengan 34.15% dan 30.49% masing-masing. Luka melecet juga dikenalpasti sebagai jenis kecederaan utama dengan 28.05% (23 kes) dan hasil kecederaan trauma dikenalpasti sebagai kesembuhan dalam kebanyakan kes 84.15% (69 cases). Kucing liar $\chi^2(1) = 9.19$, $p = 0.002$ dan kemalangan jalan raya $\chi^2(1) = 17.49$, $p < 0.001$ didapati mempunyai hubungan yang significant dengan kadar kematian dalam kucing yang terlibat dengan kecederaan trauma.

Kata kunci: Kecederaan trauma, prevalen, punca, hasil kecederaan, hubungan significan, ujian Chi square

CERTIFICATION

This is to certify that we have read this research paper entitled “Retrospective Study on the Prevalence and Outcome of Traumatic Injuries in cats at Kota Bahru, Kelantan Darul Naim from January until March 2025” by Satvinder Singh A/L Amarjeet Singh and in our opinion, it is satisfactory in terms of scope, quality and presentation as partial fulfillment of the requirements of the course DVT 55204 - Research Project.

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LIST OF ABBREVIATIONS

AA - Animal altercation

RTA - Road traffic accidents

HRS - High rise syndrome

CI - Confidence interval

χ^2 - Chi-Square

CHAPTER 1

INTRODUCTION

Trauma is tissue or organ damage sustained due to any external force (Menon et al, 2010). Some of the notable causes of trauma are abuse, animal bite, avulsion, burn, crush, fall, gunshot, iatrogenic, road traffic accidents, sharp objects, and unknown factors. Road traffic accidents were noted as a significant cause of trauma, with 2052 (44.4%) cases from a total of 4626 cases for both dogs and cats in Romania (Cojocaru et al 2021). However, fall was noted to occur more commonly in cats compared to dogs, although it only accounted for 288 (6.22%) cases of the total 4246 cases in both cats and dogs in Timis, Romania, from a study in 2000 to 2020 (Cojocaru et al, 2021). Dentoalveolar injuries & maxillofacial fractures were common outcomes of trauma and associated with fighting with other animals, road traffic accidents, high rise syndrome and possibly during playtime with other cats (Soukup & Snyder, 2014). Death was the main outcome of trauma in 31 (39.2%) out of 79 cats in cases of sudden death at the Western College of Veterinary Medicine in Saskatoon, Saskatchewan Canada (Olsen & Allen, 2001). Traumatic injury was the second most common clinical presentation reported after dental disorders in primary care veterinary practices reported in England (Neill et al, 2014) and physical trauma was noted as one of the welfare concerns in cats (Rioja Lang et al, 2019). In addition, road traffic accidents are an important cause of poor welfare in cats and their owners. Behavioral changes in cats were observed such as elevated anxiousness, lesser outdoor roaming and being more fearful of going outdoors, cars and roads post road traffic accidents (Rochlitz, 2004) and this clearly notes a welfare concern.

1.1 RESEARCH PROBLEM

Traumatic injuries are a common clinical presentation in cats and the type of traumatic injury may differ from one patient to another. There are a wide range of factors that can contribute to traumatic injuries in cats. The outcome may be recovery, paralysis or even death. Despite a high prevalence of traumatic injuries in cats, there is limited data

regarding traumatic injuries in cats in Kelantan, especially the prevalence, cause of injury, damage sustained and the outcomes. Hence, this study aims to determine the prevalence, causes, damage sustained and outcome of traumatic injuries in cats in Kelantan. The data obtained may be used to guide policy-making, increase awareness amongst the public and aid clinicians in the management of traumatic injuries in cats. This would aid in improving the welfare of cats in Kelantan and possibly the rest of Malaysia

1.2 RESEARCH QUESTIONS

I. What is the prevalence of traumatic injuries in cats in Kelantan Darul Naim, Malaysia?
II. What are the causes of traumatic injuries in cats in Kelantan Darul Naim, Malaysia?
III. What are the injuries sustained by cats from traumatic injuries in Kelantan Darul Naim, Malaysia?
IV. What are the outcomes of traumatic injuries in cats in Kelantan Darul Naim, Malaysia?

1.3 RESEARCH HYPOTHESIS

I. The prevalence of traumatic injuries in cats in Kelantan Darul Naim is relatively high compared to other disorders.
II. The causes of traumatic injuries in cats in Kelantan Darul Naim are animal fighting, burns, road traffic accidents, falls and unidentified causes.
III. The injuries sustained from trauma would be pelvic fractures, multiple fracture, open wounds, diaphragmatic hernia, head trauma and spinal fracture.
IV. The outcome of traumatic injuries in cats in Kelantan Darul Naim is predominantly death rather than recovery.

1.4 RESEARCH OBJECTIVES

I. To determine the prevalence of traumatic injuries in cats in Kelantan Darul Naim, Malaysia.
II. To identify the causes of traumatic injuries in cats in Kelantan Darul Naim, Malaysia.
III. To assess the injuries sustained by cats from traumatic injuries in Kelantan Darul Naim, Malaysia.
IV. To determine the outcome of traumatic injuries in cats in Kelantan Darul Naim, Malaysia.

CHAPTER 2

LITERATURE REVIEW

2.1 Prevalence of traumatic injuries in cats

Traumatic injuries are a significant health hazard in dogs and cats, as they are commonly encountered (Felthous & Kellert, 1987). A total of 4626 out of 23,561 cases accounted for traumatic injury in both dogs and cats from 2000 to 2020 at the Surgical Department of Universite des sciences agricoles du Banat Veterinary Hospital. From these 4626 cases of traumatic injuries, 1306 (28.23%) involved cats (Cojocaru et al., 2021).

2.2 Etiologies of traumatic injuries in cats

The most common causes of trauma in cats were road traffic accidents with 421 cases (32.23%), unknown causes with 271 cases (20.75%), and animal bites with 205 cases (15.69%). Other causes included falls (176 cases, 13.47%), sharp objects (111 cases, 11.49%), crush injuries (53 cases, 4.05%), avulsion (44 cases, 3.36%), abuse (9 cases, 0.68%), gunshot wounds (9 cases, 0.69%), iatrogenic injuries (6 cases, 0.45%), and burns (1 case, 0.07%) (Cojocaru et al., 2021).

2.3 Anatomical regions of injury

The limbs were the most commonly affected anatomical sites in both cats and dogs, accounting for 1997 and 688 cases, respectively. In contrast, the tail was the least affected anatomical site in dogs with 22 cases, and the ears were the least commonly affected site in cats with 15 cases (Cojocaru et al., 2021).

2.4 Risk factors associated with outcome of traumatic injury

The weight of the cat and reproductive status were not significantly associated with trauma-related mortality. However, a lower proportion of mortality was observed in purebred cats compared to crossbred cats (Cojocaru et al., 2021). Additionally, mortality due to trauma decreased as the cat's age increased.

2.4 Risk factors associated with outcome of traumatic injury

The outcomes of traumatic injury cases included death in 12 cats and euthanasia in 51 cats. A total of 4451 animals, including both cats and dogs, survived (Cojocaru et al., 2021). Death was the outcome of trauma in 210 cases (7.7%) out of a total of 2738 deaths. Furthermore, 119 (56.7%) of these deaths were due to road traffic accidents (McDonald et al., 2017). Traumatic injury was also identified as the major cause of death in 31 (39.2%) out of 79 cases (Olsen & Allen, 2001). Other contributing factors included falls, animal attacks, and entrapment in various locations.

CHAPTER 3

MATERIALS AND METHODS

3.1 Study area

The data will be collected from two clinics in Kelantan namely, Vet O Vet Animal Medical Center and Klinik Haiwan Kota both situated in Kota Bharu, Kelantan. These were the clinics which have agreed to participate in the retrospective study and have a high case load in addition to complete data and information pertaining to the topic of this study. Clinics that met this requirement in addition to being located in Kota Bahru were only the two clinics mentioned above.

3.2 Study design

A retrospective observational study will be used in this study. Past hospital records, both hard copy and electronic files, were screened, mainly involving traumatic injuries in cats. The data were divided based on the cause of the injury, type of injury sustained and outcome of the injury.

3.3 Study population

The population in focus is the cats (*Felis catus*), both stray cats and owned cats in the locality of Kelantan Darul Naim. All the cats that were involved in the study would be brought to the clinic due to the client's complaint of traumatic injury.

3.4 Selection criteria

3.4.1 Inclusion criteria

Cats of all ages that were brought to the clinic with the client's complaint of trauma or suspected trauma.

3.4.2 Exclusion criteria

Cats that are brought to clinics for medical conditions and clients' complaints are not related to traumatic injury. Animals other than cats are excluded too, and follow-up patients are not recorded to avoid redundancy

3.5 Sampling method and procedure

The sampling method used in this study is purposive sampling. Cases with the predefined criteria relevant to this case study were chosen and recorded. Cats with a client complaint of trauma or suspected trauma were included between January 1, 2025 until March 31, 2025. The three-month study period was selected due to time constraints associated with the final year project duration and the availability of complete and accessible medical records during this period.

Although a longer study period, such as 12 months, could provide a more comprehensive representation of seasonal variations in trauma incidence, the selected duration was considered sufficient to provide preliminary insights into the prevalence, causes, injuries sustained, and outcomes of traumatic injuries in cats in Kota Bharu, Kelantan. The limitation of a shorter study period is acknowledged and addressed in the limitations section of this study.

3.6 Data collection tools

The data were tabulated in Microsoft Office Excel. All the data were extracted from the records in their respective hospitals or clinics.

3.7 Plan for data analysis

The data obtained were screened, and data cleansing was conducted to ensure the data is relevant, valid, and error-free. Data cleansing was necessary to eliminate redundant data resulting from duplicates or missing values. The data were analyzed with the Statistical Package for the Social Sciences (SPSS). Descriptive statistics is used for the prevalence rate of trauma in this study while analysis of inferential statistics will involve Chi square as the nature of data obtained is categorical. In addition, Chi square will be used to determine if the association between demographical factors and outcome are statistically significant or otherwise.

3.8 Ethical consideration

Since the study only requires accessing hospital records, there are no ethical considerations involved in this study. However, all data collected are private and confidential and not disclosed to any third parties. In addition, the data collected were only to be used for the purpose of the study.

CHAPTER 4

RESULTS

4.1 Prevalence of trauma

Data were collected from January 1, 2025, to March 31, 2025 illustrated in Figure 4.1(a). There were a total of 1,474 cases within that period from all the clinics involved in this study. Trauma accounted for 82 cases out of the total 1474 cases. The prevalence of trauma from January 1, 2025 to March 31, 2025 was 5.56% (95% CI: 4.39-6.73%) (Figure 4.1).

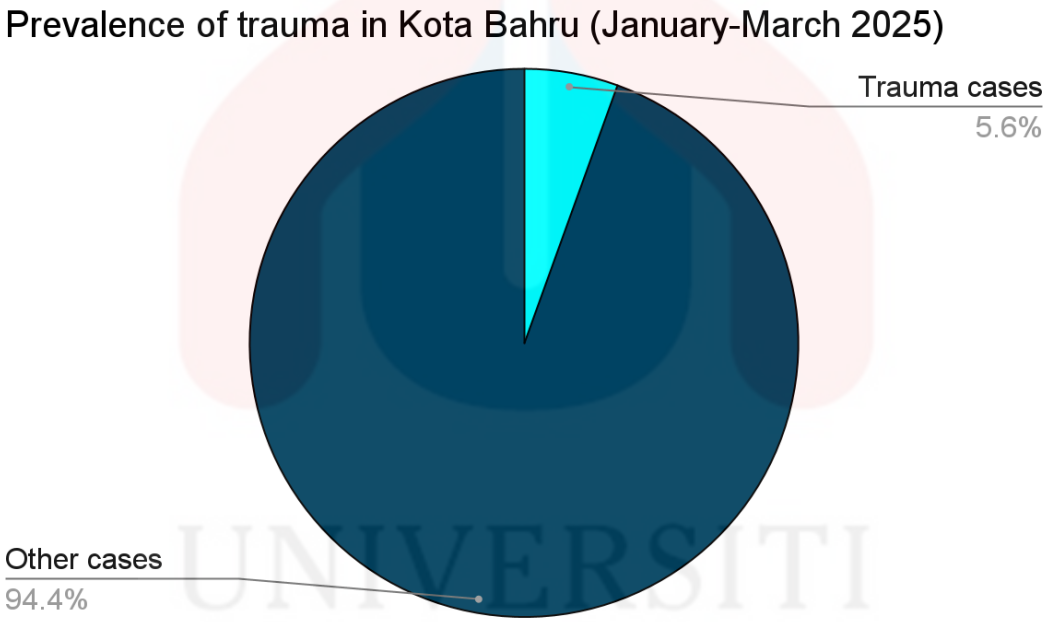

Figure 4.1(a): Pie chart depicting the prevalence of trauma in Kota Bahru from January to March 2025

There were 492 cases in January, 523 cases in February, and 459 cases in March 2025, illustrated in Figure 4.1(b). Traumatic injuries accounted for 28 cases in January, 30 cases in February, and 24 cases in March 2025, respectively. The prevalence of trauma in January was 5.69% (95% CI: 3.64-7.74%), in February it was 5.74% (95% CI: 3.74-7.73%), and in March it was 5.23% (95% CI: 3.19-7.27%).

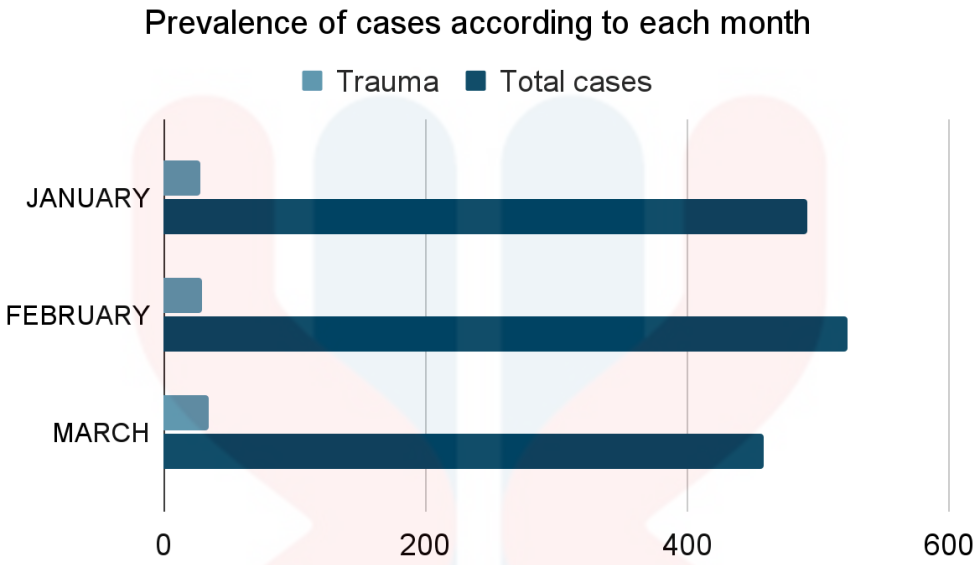

Figure 4.1(b): Bar chart depicting the prevalence of trauma in Kota Bahru according to each month.

4.2 Demographics of the trauma patients

4.2.1 Sex

From the total of 82 cases of trauma within January 1, 2025, to March 31, 2025 illustrated in Figure 4.2.1, male cats accounted for 59.76% (49 cases) while female cats accounted for 40.24% (33 cases).

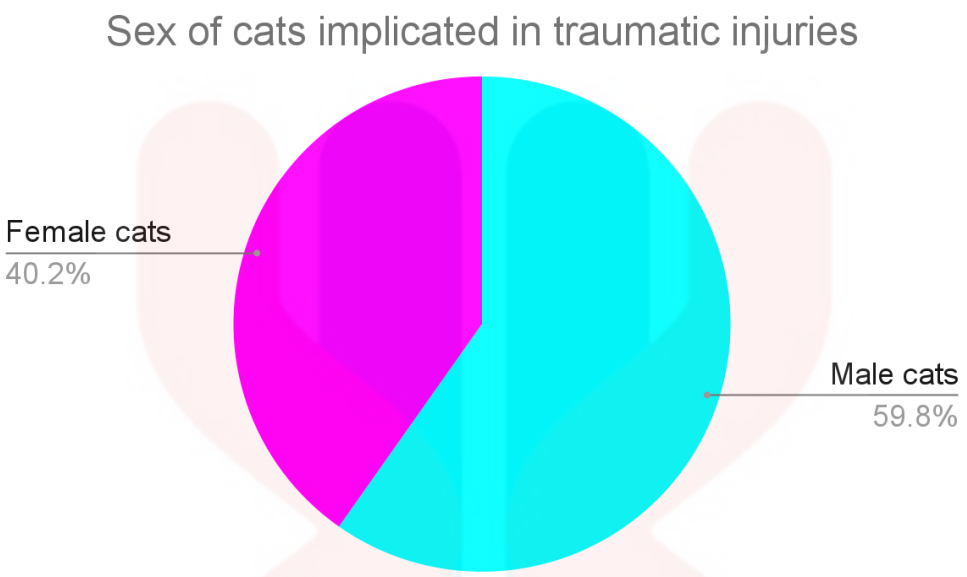

Figure 4.2.1: Pie chart depicting the sex of cats implicated in traumatic injuries

4.2.2 Ownership

From the total 82 cases of trauma within January 1, 2025 to March 31, 2025 illustrated in Figure 4.2.2, owned cats accounted for 78.05% (64 cases) while stray cats accounted for 21.95% (18 cases).

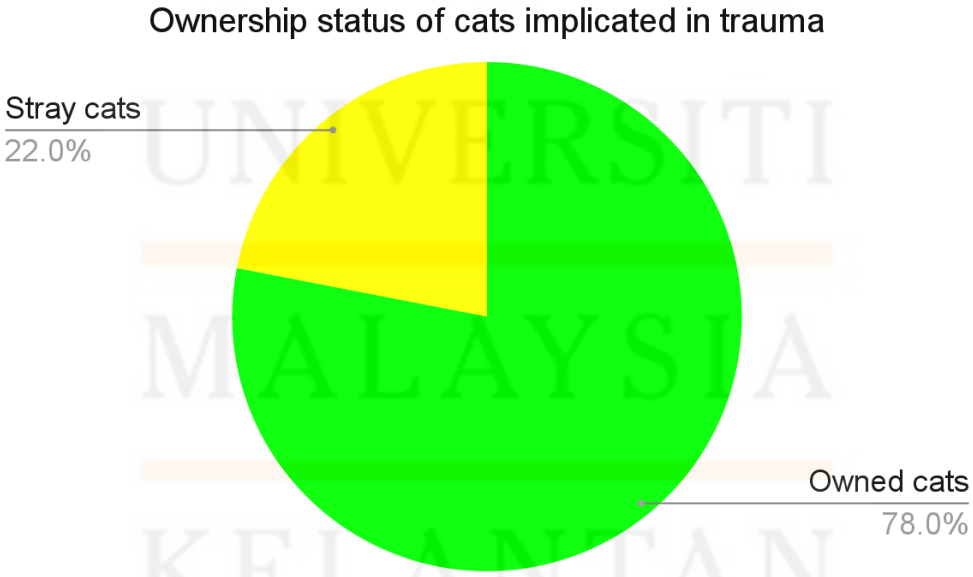

Figure 4.2.2: Pie chart depicting the ownership status of cats implicated in traumatic injuries

4.3 Injuries sustained by trauma patients

4.3.1 Etiology of trauma

From the total of 82 cases of trauma within January 1, 2025, to March 31, 2025 illustrated in Figure 4.3.1(a), road traffic accident (RTA) accounted for 34.15% (28 cases), animal altercation (AA) accounted for 30.49% (25 cases), unknown causes accounted for 25.61% (21 cases), missing accounted for 3.66% (3 cases), self-inflicted for 2.44% (2 cases), high rise syndrome 2.44% (2 cases) and burn 1.22% (1 case) respectively.

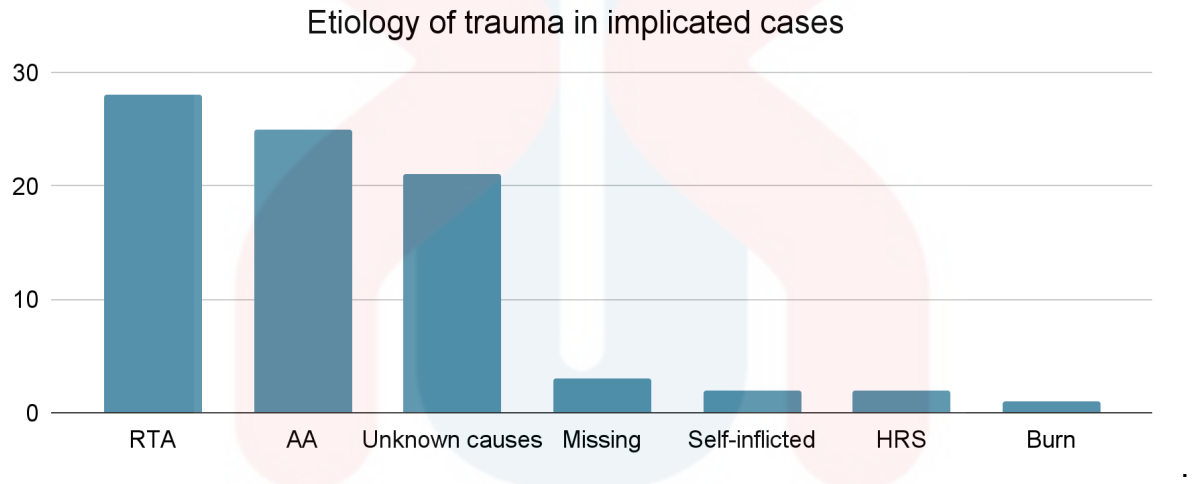

Figure 4.3.1(a): Bar chart depicting the ownership status of cats implicated in traumatic injuries

From a total of 25 cases of AA, cats were implicated for 88% (22 cases) of AA, dogs were implicated for 8% (2 cases) of AA, and monkeys were implicated for 4% (1 case) of AA illustrated in Figure 4.3.1(b)

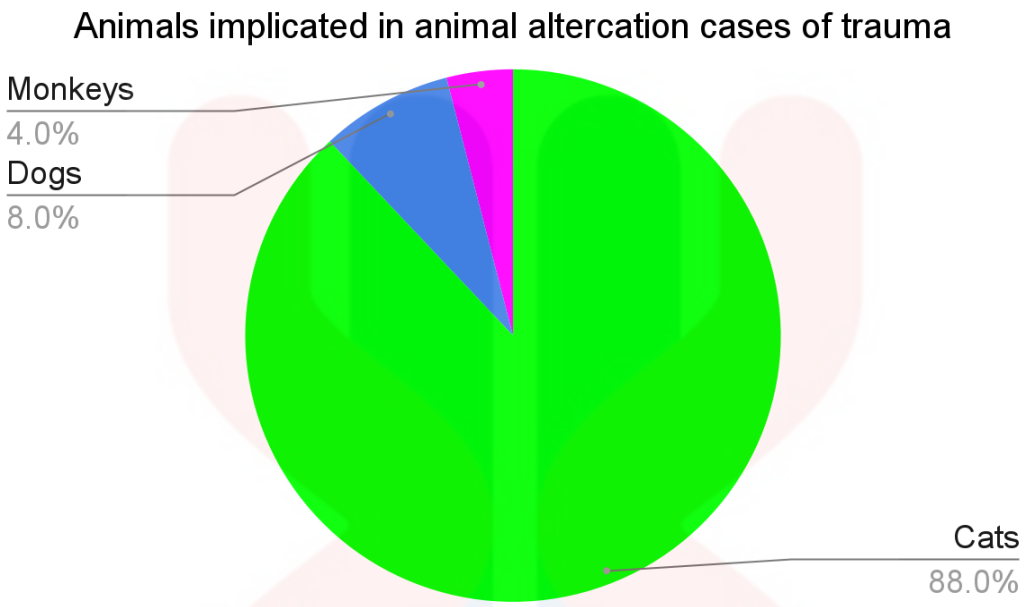

Figure 4.3.1(b): Pie chart depicting animals implicated in animal altercation

4.3.2 Types of trauma

From the total of 82 cases of trauma within January 1, 2025, to March 31, 2025, laceration accounted for 28.05% (23 cases), bite and claw wound accounted for 17.07% (14 cases), fracture accounted for 13.41% (11 cases), cases with trauma not stated accounted for 10.98% (9 cases), multiple types of trauma accounted for 6.10% (5 cases), luxation accounted for 3.66% (3 cases), maggot wound accounted for 3.66% (3 cases), swelling accounted for 2.44% (2 cases), avulsion accounted for 2.44% (2 cases), abscessation accounted for 2.44% (2 cases), while lameness, head trauma, abrasion, pruritus, bleeding, bite & claw wound, paralysis, and nonspecific wound each accounted for 1.22% (1 case) respectively as illustrated in Figure 4.3.2.

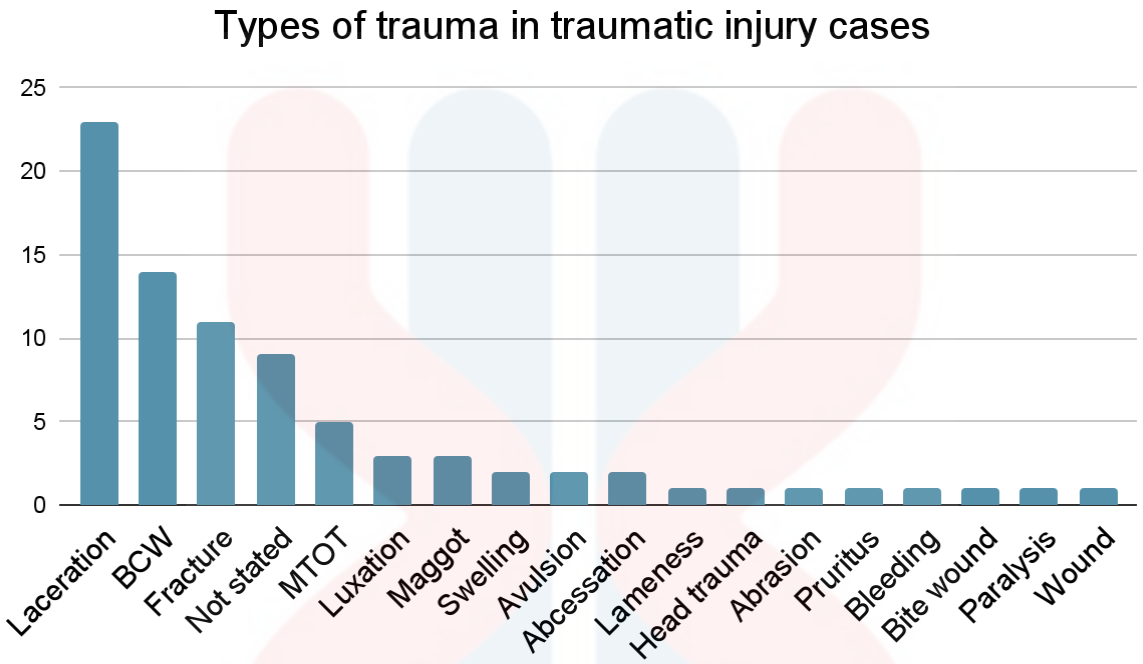

Figure 4.3.2: Bar chart depicting the types of trauma in traumatic injury cases

4.3.3 Anatomical region affected

From the total of 82 cases of trauma within January 1, 2025, to March 31, 2025, hindlimbs accounted for 19.51% (16 cases), forelimbs accounted for 13.41% (11 cases), multiple body regions injuries accounted for 10.98% (9 cases), not stated anatomical region accounted for 10.98% (9 cases), abdomen accounted for 8.54% (7 cases), cranium accounted for 6.10% (5 cases), mandible accounted for 6.10% (5 cases) as illustrated in Figure 4.3.3.

The facial region accounted for 4.88% (4 cases), neck accounted for 4.88% (4 cases), perineal region accounted for 4.88% (4 cases), tail accounted for 4.88% (4 cases), lumbar vertebrae accounted for 1.22% (1 case), pelvic bone accounted for 1.22% (1 case), sacroiliac junction accounted for 1.22% (1 case), tongue accounted for 1.22% (1 case).

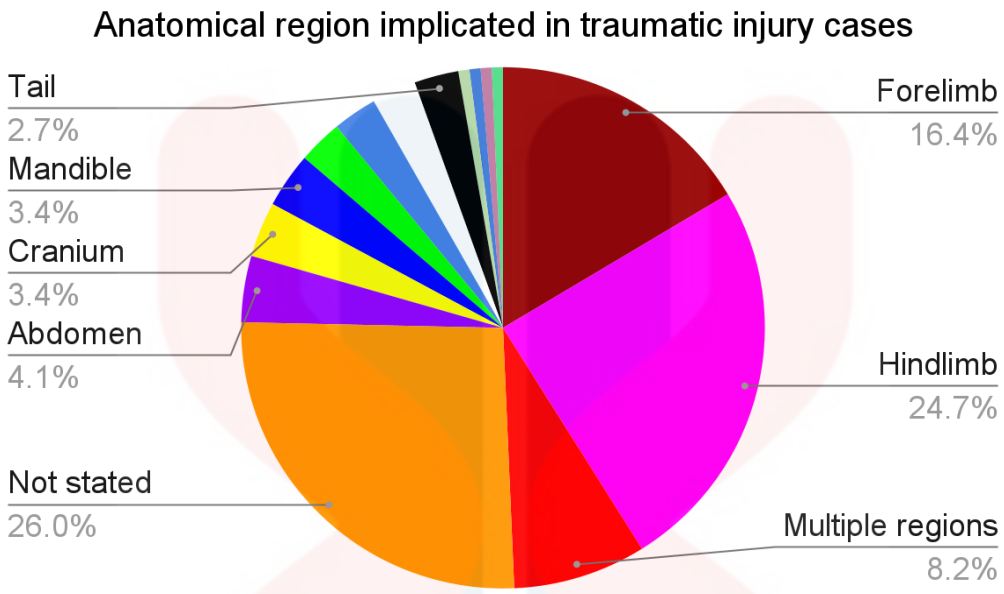

Figure 4.3.3: Pie chart depicting anatomical region implicated in traumatic injury cases

4.4 Outcomes of trauma in patients

From the total of 82 cases of trauma within January 1, 2025, to March 31, 2025 as illustrated in Figure 4.4, the number of cats that survived accounted for 84.15% (69 cases) while the number of cats that died or were euthanised accounted for 16.85% (13 cases).

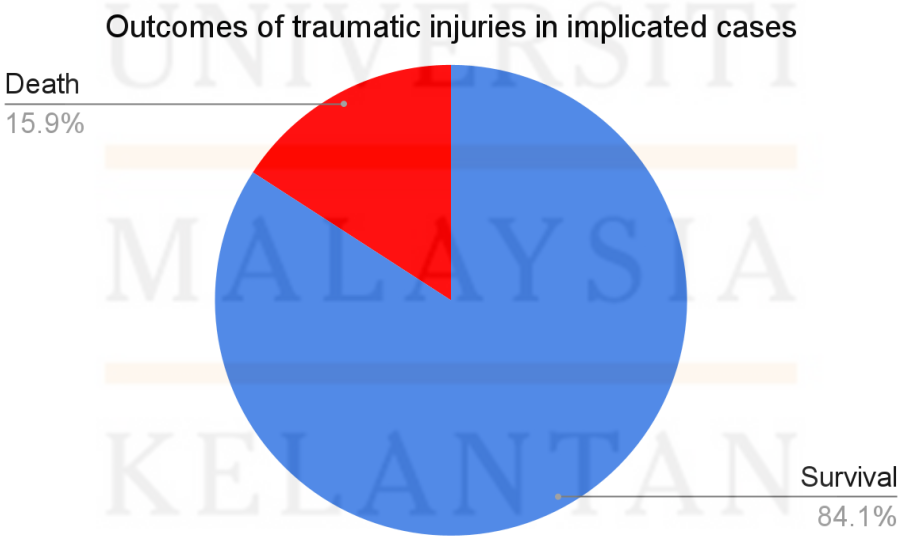

Figure 4.4: Pie chart depicting outcome of traumatic injury cases

4.4.1 Outcomes of trauma in relation to sex

From a total of 69 cases of cats that survived, survival of male cats accounted for 62.32% (43 cases) while survival of female cats accounted for 37.68% (26 cases). On the other hand, from a total of 13 cases of cats that died or were euthanised, death or euthanasia of females accounted for 53.85% (7 cases) while death or euthanasia of males accounted for 46.15% (6 cases) as illustrated in Table 4.4.1.

	Male cats	Female cats	TOTAL
Survived	43 cases	26 cases	69 CASES
Died/Euthanized	6 cases	7 cases	13 CASES
TOTAL	49 CASES	33 CASES	82 CASES

Table 4.4.1: Table depicting the outcome of traumatic injury cases in relation to sex

Chi-square test was used to determine the association between sex and outcomes from the total 82 cases of trauma. The Chi square test indicated that sex of cats was not significantly associated with outcome of traumatic injuries in cats, $\chi^2(1) = 0.61$, $p = 0.43$. Although male cats had slightly higher survival outcomes 62.32% (43 cases) compared to female cats 37.68% (26 cases) and lesser death or euthanasia outcomes in male cats 46.15% (6 cases) compared to female cats 53.85% (7 cases), the difference were not statistically significant.

4.4.2 Outcomes of trauma in relation to ownership status

From a total of 69 cases of cats that survived, the survival rate of owned cats accounted for 84.06% (58 cases), while the survival rate of stray cats accounted for 15.94% (11 cases). On the other hand, out of a total of 13 cases of cats that died or were euthanized, the death or euthanasia of stray cats accounted for 53.85% (7 cases), while owned cats accounted for 46.15% (6 cases) as illustrated in Table 4.4.2.

	Owned cats	Stray cats	TOTAL
Survived	58 cases	11 cases	69 CASES
Died/Euthanized	6 cases	7 cases	13 CASES
TOTAL	64 CASES	18 CASES	82 CASES

Table 4.4.2: Table depicting the outcome of traumatic injury cases in relation to ownership status

Chi-square test was used to determine the association between ownership and outcomes from the total 82 cases of trauma. The Chi square test indicated that ownership of cats was significantly associated with the outcome of traumatic injuries in cats, $\chi^2(1) = 9.19$, $p = 0.002$. Owned cats appeared to have higher survival rates 84.06% (58 cases) compared to stray cats 15.94% (11 cases) although the mortality rate appears to be similar at 46.15% (6 cases) for owned cats and 46.15% (6 cases) for stray cats.

4.4.3 Outcomes of trauma in relation to etiology

From a total of 69 cases of cats that survived, animal altercation accounted for 34.78% (24 cases), unknown causes accounted for 28.98% (20 cases) road traffic accident accounted for 24.64% (17 cases), missing accounted for 4.35% (3 cases), self-inflicted accounted for 2.90% (2 cases), high-rise syndrome accounted for 2.90% (2 cases), burn accounted for 1.45% (1 case). On the other hand, from a total of 13 cases of cats that had died or were euthanized, road traffic accidents accounted for 84.62% (11 cases), animal altercation accounted for 7.69% (1 case), and unknown causes accounted for 7.69% (1 case).

	RTA	Non-RTA	TOTAL
Survival	17	52	69
Death	11	2	13
TOTAL	28	54	82

Table 4.4.3: Table depicting outcome of traumatic injury cases in relation to etiology of trauma

Since the death cases of etiologies other than RTA were too small, around less than 1, other etiologies of trauma were categorized into non-RTA etiologies (Table 4.3). Chi square test was used to determine the association between etiology and outcome. The Chi square test indicated that there was a significant association between etiologies of traumatic injuries and outcome of traumatic injuries in cats $\chi^2(1) = 17.49$, $p < 0.001$. Cats implicated in RTA had a higher mortality rate at 39.3% (11 cases) compared to cats implicated in non-RTA etiologies 3.7% (2 cases) as illustrated in Table 4.4.3 above.

CHAPTER 5

DISCUSSION

The prevalence of this study was determined to be 5.6% out of the total number of cases. Other disorders aside from traumatic injuries were not noted in this study. The prevalence of trauma in this study was slightly higher than another study conducted in England by O'Neill et al. (2014). The prevalence of traumatic injury in England was noted to be 4.6%. The study in England involved 91 clinics and the entire country in a period of almost 5 years, in comparison to this study in Kelantan, Malaysia that involved only 2 clinics and a district in a period of 3 months. This was attributed to a shortage of time. However, it is important to note that there was a narrow 95% confidence interval ranging from 4.39-6.73% indicating that the data obtained was more precise. This may be attributed to the large sample size of 1474 cases in total.

It is important to note that the prevalence of traumatic injuries in each month was relatively consistent with 5.69% in January, 5.74% in February, and 5.23% in March. The 95% confidence interval ranged from 3.64-7.74% in January, 3.74-7.73% in February and 3.19-7.27% in March. There was a wider range of confidence intervals noted in each month's prevalence compared to the overall prevalence. This may be attributed to the smaller number of sample sizes each month in comparison to the larger overall sample size. A more precise prevalence may be obtained by increasing the sample size and time frame of the study. However, this study still provides valuable baseline data regarding the prevalence of traumatic injuries in cats, as limited studies on traumatic injuries have been conducted in Malaysia and its surrounding regions. This study will be able to guide the direction of future research and aid in policy-making to improve the welfare and well-being of cats. The data obtained from this study can be utilized to promote improved welfare policies of cats, such as mandatory neutering, microchipping, and indoor confinement of owned cats.

There was a higher percentage of male cats implicated in traumatic injuries (59.76%) in comparison to female cats implicated in traumatic injuries (40.24%). This may be attributed to the nature of male cats, which roam to find a mate and mark their

territory, in comparison to female cats. However, the reproductive status of cats was not noted in this study. This should be done in future studies to determine if neutered cats are less likely or more likely to be implicated in traumatic injuries.

There were more owned cats implicated in traumatic injuries compared to stray cats implicated in traumatic injuries in this study. This, however, does not suggest that owned cats are more prone to traumatic injuries than stray cats. Cats have an owner who is responsible for caring for them, hence it is more likely for them to receive medical attention in comparison to stray cats, which have no owner to care for them. There is a possibility that many stray cats implicated in traumatic injuries may not receive medical attention, as there is nobody to care for them, and it is less likely for someone to bring them to receive medical attention. Hence, this suggests that there is a possibility that owned cats implicated in traumatic injuries in these studies are overrepresented in comparison to their stray cat counterparts, as an individual who is the owner is directly responsible for the well-being of the owner while there is no individual directly responsible for the well-being of a stray cat.

The three most common etiologies of traumatic injuries in cats based on this study were road traffic accidents, animal altercation, and unknown causes. This was similar to a study conducted in Romania, whereby road traffic accidents, unknown causes, and animal altercation were also noted as the most common etiologies of trauma in a study by Cojocaru et al. (2021). Kota Bahru is an urban and the most developed district in Kelantan Darul Naim. There is a high density of vehicles that travel throughout Kota Bharu, as it is the main economic hub of Kelantan. This could contribute to the high prevalence of road traffic accidents in this region. Other regions in Kelantan are likely to have a lower prevalence of road traffic accidents, as they are less developed and have a lower traffic density.

Animal altercations were also noted as a common cause of traumatic injuries in cats in this study, at 25 cases (30.49%) out of 82 cases. Cats were implicated in most animal altercation etiologies of trauma, while dogs accounted for only 2 cases, and

monkeys accounted for 1 case of trauma. The low incidence of dogs implicated in animal altercation cases may be attributed to the demographic population of the region, which consists of Muslims mainly who do not usually keep dogs as pets. The case that involves a monkey in an animal altercation is an unexpected finding obtained from this study. Although Kota Bharu is an urban region, some parts of Kota Bharu are still underdeveloped and agriculture is the main economic activity in these areas. Monkeys, specifically Southern pig-tailed macaque (*Macaca nemestrina*), are commonly used for coconut plucking in Malaysia.

Laceration was identified as the most common injury sustained as a result of trauma in cats at Kota Bahru followed by bite and claw wound which is exclusively caused by animal altercations that involves cats. These findings suggest that soft tissue injuries are relatively common in cats and wound treatment and management is of great importance in cases of trauma and are more likely to be expected in cases of trauma compared to other types of injuries. Fracture on the other hand although less common than lacerations and bite and claw wounds are also significant as it was the third most common injury sustained as a result of trauma. Advances in technology, especially orthopedic surgery, can aid in better treatment of fracture cases.

Other injuries sustained as a result of trauma that were noted in this study were bleeding, lameness, head trauma, abrasion, pruritus, and wounds. Although these injuries are less common in comparison to lacerations, bite and claw wounds and fracture, they should still be noted as possible injuries as a result of trauma. This study provides valuable information to clinicians that while certain injuries sustained are more predominantly common than others, trauma can result in the possibility of a large number of injuries sustained. Hence, clinicians must always be prepared for any possibility of an injury while prioritizing and checking if the most common injury sustained also occurs in cases of trauma or otherwise.

The most common anatomical region affected by traumatic injuries in cats was hindlimbs, followed by the forelimbs and multiple body regions in this study. This was

consistent with the study of traumatic injuries conducted in Romania, which identified limbs in general as the most commonly affected body region in cats for traumatic injuries(Cojocaru et al 2021). The pelvic bone and spine were the second and third most common anatomical regions affected by trauma; however, in this study lumbar vertebrae and pelvic bone only accounted for one case of trauma in the period of time this study was conducted. This may be due to the duration and number of cases difference in this study, where the retrospective study in Romania was conducted for a period of 20 years, while this retrospective study was only conducted for a period of three months due to insufficient funds and time.

In addition, The differences observed between the findings of this study and the retrospective study conducted in Romania may be better explained by anatomical and behavioural factors in cats rather than the duration of the study period. Cats are naturally agile and inquisitive animals that frequently climb, jump, and explore their surroundings, which predisposes them to falls from heights and injuries to the limbs and axial skeleton. In addition, the territorial and aggressive behaviour of cats, particularly among free-roaming or unneutered individuals, increases the risk of bite wounds and trauma to the head, neck, and thoracic regions. The head and neck region is especially vulnerable during inter-animal conflicts, while the limbs are commonly affected during falls or road traffic accidents due to impact forces being transmitted through the extremities. Furthermore, cats have relatively flexible spines and lightweight skeletal structures, which influence both the pattern and severity of traumatic injuries sustained. Therefore, the anatomical structure and behavioural tendencies of cats play a more significant role in explaining the observed injury patterns than the relatively short study duration.

Most traumatic injury cases had a survival outcome while a few cases had death. In general, this is to be expected, as the animal receives the necessary medication and attention that can aid in recovery. However, the outcome obtained in this study may not represent the true outcome due to several factors. Some cats may not receive medical attention on time, leading to death before reaching the veterinary clinics and these

cases are not accounted for in this study. This suggests that the outcome obtained in this study may have overestimated the likelihood of survival in cases of traumatic injuries in cats. Both owned and stray cats were more likely to survive traumatic injuries, however, the number of stray cats in this study was relatively low in comparison to owned cats. However, it is essential to note that severity of injury will likely significantly influence survival and death outcomes in cats.

Although there were more male cats in cases of traumatic injuries compared to female cats, there was no statistical significance noted between the sex of the cat and the outcome of trauma in cats based on Chi square test. This suggests that trauma occurs in male cats and female cats indiscriminately. Owners should pay equal attention to both male cats and female cats in terms of prevention measures as both genders appear to be equally prone to traumatic injuries. On the other hand, there was a statistically significant association between ownership and outcome of trauma. Stray cats appeared to have a poorer outcome of trauma with lesser cases of recovery when compared to their owned cats counterparts. This may be contributed due to a lack of care for these cats on the streets. They will have to search for their own food and are less likely to receive medical attention. There may be more underlying diseases in stray cats that contribute to their poorer prognosis in traumatic injury cases. Hence, this once again signals the importance of enforcing good pet ownership compliance in order to promote the welfare of cats in general. Certain policies such as not providing outdoor access to cats should also be considered for the well-being of cats in general.

Road traffic accidents accounted for the most outcomes of deaths with 13 cases. This suggests that there is a higher risk of death outcomes in cases where the etiology is road traffic accidents. Other studies, such as the study of traumatic injuries in cats in Romania, also noted a similar outcome (Cojocaru et al 2021). This is likely due to the high impact exerted on the cats, which contributes to the high mortality rate. Despite the high number of RTA cases leading to death in this study, this figure is believed to be underestimated, as it does not account for cases where cats die on the scene and are unable to receive medical attention. Hence, this once again emphasizes the importance

of improved policy making, such as neutering cats to reduce roaming and the increased population of stray cats and not allowing roaming of cats without the supervision of the owner.

CHAPTER 6

CONCLUSION

This study regarding the prevalence and outcome of traumatic injuries in cats at Kota Bharu, Kelantan has provided valuable information regarding the status of traumatic injury cases. The prevalence of traumatic injuries in cats was estimated to be around 5.6%. RTA, AA and unknown causes were identified as the most common etiologies of traumatic injuries in cats. Stray cats and RTA were identified to be associated with poorer outcomes of traumatic injuries. Hence, prevention measures must be set out to overcome these etiologies in order to minimize the occurrence of traumatic injuries in cats. This study also identified lacerations, BCW and fractures to be the common injuries sustained from cases of trauma. Hence, this provides valuable insight to veterinary clinicians regarding what to expect when dealing with cases of traumatic injuries. Hindlimbs were noted to be the most commonly affected anatomical regions followed by forelimb and the outcome of traumatic injuries were generally recovery rather than death.

Several recommendations are to conduct the retrospective study for a longer period of time and increase the sample size and number of participating veterinary clinics to obtain more accurate data that would more truly represent the entire population. Increasing the sample size is crucial as stray cats were underrepresented in this study. The unknown causes of trauma should be explored as the determination of etiology of trauma would significantly aid in setting prevention measures. Targeted studies on stray cat populations are recommended to better understand their trauma patterns and welfare needs. Lastly, evaluation of the treatment outcome in the long term would provide better information regarding the outcome of trauma instead of relying on the outcome solely during the period of discharge of the patient.

CHAPTER 7

APPENDICES

Figure 10.0: Vet O Vet Animal Medical Center, Kota Bahru

Figure 11.0: Klinik Haiwan Kota, Kota Bahru

CHAPTER 8

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