



## A Survey of the Common Small Animal Surgical Procedures at A Regional State Veterinary Clinic in Namibia

Basiamisi E. Segwagwe<sup>2</sup>, Eugene Jacobs<sup>4</sup>, Simbarashe Chinyoka<sup>1</sup>, Justin Yule<sup>3</sup>,  
Borden Mushonga<sup>4</sup>, Alaster Samkange<sup>4\*</sup>, Erick Kandiwa<sup>4</sup>

<sup>1</sup>Department of Animal Health, School of Veterinary Medicine, Katima Campus, Faculty of Agriculture and Natural Resources, University of Namibia, P. Bag 1096, Gweze, Katima Mulilo, Namibia

<sup>2</sup>Department of Biomedical Sciences, Faculty of Medicine, University of Botswana, P. Bag UB0074, Gaborone, Botswana

<sup>3</sup>Directorate of Veterinary Services, Ministry of Agriculture, Water and Forestry, P.O. Box 116, Ngweze, Katima Mulilo, Namibia

<sup>4</sup>School of Veterinary Medicine, Faculty of Agriculture and Natural Resources, University of Namibia, Namibia

### ABSTRACT

#### Key words:

Elective surgery; non-elective surgery; dog; cat; Namibia

\*Correspondence to:  
[alastersamkange@gmail.com](mailto:alastersamkange@gmail.com)

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A retrospective study to investigate the nature of surgical cases presented to Katima Mulilo State Veterinary Office in Namibia was conducted on 167 small animals between 2011 and 2016. Overall, significantly more dogs (87.4%) than cats (12.6%) were presented for surgical procedures ( $p < 0.05$ ). Significantly more non-elective (58.7%) than elective (41.3%) procedures were performed ( $p < 0.05$ ). There was no significant difference in the proportion of castrations (23.4%) and ovariohysterectomies (18.0%), the two main elective procedures performed during the study period ( $p > 0.05$ ). A greater proportion of male (58.2%) than female dogs (41.8%) were presented for surgical treatment ( $p < 0.05$ ). Significantly more non-elective (65.8%) than elective procedures (34.2%) were performed in dogs ( $p < 0.05$ ;  $n = 146$ ); however, significantly more elective (90.5%) than non-elective procedures (9.5%) were performed in cats ( $p < 0.05$ ;  $n = 21$ ). All the adult cats were presented for elective procedures ( $n = 16$ ). A significantly greater proportion of adult dogs were presented for non-elective (60%) than for elective (40%) procedures ( $p < 0.05$ ). A significantly greater proportion of pure breed dogs were presented for non-elective (71.4%) than for elective (28.6%) procedures ( $p < 0.05$ ;  $n = 14$ ). The results of the study revealed that state veterinarians in rural/semi-urban state offices should better stock their clinics more for dogs than cats. As for dogs, these clinics should be more stocked for bite wounds, castrations, bone fractures and ovariohysterectomies and to prepare for castrations and ovariohysterectomies when they prepare surgical materials for cats.

### 1. INTRODUCTION

Access to veterinary services by pet owners in resource limited communities is hindered by several factors including cost, availability of veterinarians, client communication, culture, language, client education (LaVallee et al., 2017) and transport (Berrian et al., 2016). For these reasons, communities may appreciate the need to seek veterinary medical attention but very few owners do so (McCrindle et al., 1997). Although dogs play an important role in the household and on the farm (Constable et al., 2010; Sepúlveda et al.,

2014), their nutritional needs are not always met. They can roam freely as they scavenge for their nutritional needs (Massei et al., 2017; Sparkes et al., 2014). For this reason, most of these dogs suffer from otherwise preventable conditions (Massei et al., 2017). This has welfare implications for such dogs (Stafford, 2007) and their owners as animal welfare also affects human emotion (Siegford et al., 2010). The unavailability of private veterinary services, coupled with the socioeconomic status and cultural beliefs of dog owners, often lead to dog owners resorting to remedies which may not even be licensed for dogs (Minnaar and Krecek, 2001).

In order to fill the void created by the lack of affordable private veterinary services, various models of providing primary veterinary services to livestock and pet owners have been devised. Such approaches have, in common, an attempt to address primary animal health care, as described by the World Health Organisation (WHO, 1981). Outreach mobile clinics have been used mainly by veterinary schools (Baines *et al.*, 2020). Whilst such settings may play a meaningful role to the education of pet owners, such services are not without their limitations. Only peri-urban communities adjacent to universities benefit from these clinics. Such clinics are of little use to distant and remote communities. Welfare and charity organizations, such as the Society for the Prevention of Cruelty to Animals play a critical role to the provision of cost-effective primary animal health care and veterinary extension benefits (Baines *et al.*, 2020). The advantage of some welfare organizations is that they may be legally empowered to impound animals and hence are invaluable for control of stray animals (McCrinkle *et al.*, 1997). However, conflict may arise where the values of welfare organizations are incongruent with those of the communities.

To address challenges of access to veterinary primary animal healthcare, some workers have proposed a community-oriented veterinary medical approach funded by Government (Hohn, 2016) and by the community (Berrian *et al.*, 2016). Pratap and co-workers have argued that government cost recovery or privatization of veterinary primary animal healthcare may be the panacea to funding challenges experienced by small scale dairy farmers in Uttarakhand in India (Pratap *et al.*, 2012). However, other workers have also proposed a third dimension, the non-governmental organizations funding of primary animal healthcare, and recommended the need for caution when a choice of funding sources for veterinary services is being considered (Gallacher and Barcos, 2012). In Asia and parts of Africa, the concept of community-based animal health worker systems is largely related to the high impact on animal health and human livelihoods resulting from improved basic veterinary care in rural communities (Cheneau *et al.*, 2004). In South Africa, Community Veterinary Clinics funded by Government have been set up in order to improve access to veterinary care by previously disadvantaged communities (Mushonga, unpublished information).

In Namibia, private veterinary consulting rooms, clinics and hospitals are restricted to the more affluent communities of Central to Southern Namibia such as Windhoek, Otjiwarongo, Walvis Bay and Swakopmund (Schneider, 2012). These hospitals, clinics and consulting rooms are well stocked and resourced. However, regional Government veterinary centers provide the form of veterinary care available to rural communities of the Northern communal areas and Katima Mulilo. In the whole of the Zambezi region, the regional veterinary office providing such veterinary care to pets is located in Katima Mulilo. The centre is manned by a veterinary surgeon who is fully employed by the government of Namibia. It is resourced with the most basic equipment and drugs enough for primary animal health care. This includes a basic consultation room, which may be used for surgery, basic surgical kit, a postmortem room and drugs. There are limited diagnostic aids.

Free primary animal healthcare services are rendered to livestock owners. However, pet owners are expected to pay for the cost of drugs only, on a cost recovery basis. The spectrum of small companion animals in most parts of Zambezi varies from well cared-for pets, stray farm dogs and cats with minimal to no contact with veterinary services. There are abundant free-roaming populations with limited or no contact with their owners. This pattern of dog ownership is typical of the lower-income areas and northern regions of Namibia (Haimbodi *et al.*, 2014).

Some workers have extensively studied and profiled small animal medical and surgical conditions in England (O'Neill *et al.*, 2013; O'Neill, 2015; D. G. O'Neill *et al.*, 2014; O'Neill *et al.*, 2016, 2014, 2014). O'Neill and co-workers carried out a study to determine the most prevalent cases presented for consultation at primary animal healthcare facilities in Central and South Eastern England in cats and dogs, respectively (D. G. O'Neill *et al.*, 2014; O'Neill *et al.*, 2014). O'Neill *et al.* reported that otitis externa, periodontal disease, anal sac impaction, and overgrown nails, in that order, were the most frequently encountered conditions in dogs (O'Neill *et al.*, 2014). The study also reported that the head and neck was the most affected body region, the skin was the most affected body system and that inflammation was the most prevalent pathophysiological process. The most frequently affected body systems after the skin were the enterohepatic and musculoskeletal systems. Other workers have also found some interesting results in their study of survey of the

surgical procedures of the structures of the stifle joint in dogs (O'Neill *et al.*, 2016; Taylor-Brown *et al.*, 2015). In cats, however, O'Neill *et al.* reported that periodontal disease, flea infestation and obesity were the major diagnosis level disorders (D. G. O'Neill *et al.*, 2014). The most prevalent disorder groups were dental conditions, traumatic injury and dermatological conditions.

Studies profiling surgical or medical conditions, for that matter, have not been reported widely in Africa, except for a few cases such as the one in Malawi (Pettersson, 2014). In Namibia, to the best of our knowledge, such studies or of a similar nature have never been reported.

The objective of this study was therefore to describe the common surgical procedures that were recorded at a typical rural regional state veterinary clinic which was set up for providing this primary animal health care. Results from this study can be used by Government veterinary authorities in prioritizing and optimizing both human and financial resources in order to improve the quality of veterinary care of dogs and cats.

## 2. MATERIALS AND METHODS

### 2.1. Study Area

This study was conducted at Katima Mulilo state veterinary clinic. This clinic is in the Zambezi region of Namibia. Zambezi region covers an area of approximately 20,000 km<sup>2</sup>. It has the highest rainfall in Namibia, receiving 600–700 mm of rain a year. It lies at an altitude of 930–1100m (Mendolsohn *et al.*, 1997; Madzingira *et al.*, 2018). It is a tropical area, bordered by Botswana, Zimbabwe and Zambia. Its terrain is mostly made up of swamps, floodplains, wetlands and woodland. The ambient temperatures range from 30°C in January to around 2.5°C in winter. The indigenous people in this area depend on fishing and livestock production (Tvedten, 2002; Madzingira *et al.*, 2020). The region is one of the poorest in Namibia, due to previous wars and civil unrest (Stanley, 2002).

### 2.2. Study Design and Data Collection

This was a cross-sectional, retrospective survey of all surgical procedures conducted on small animals at the Katima Mulilo state veterinary clinic, between 2011 and 2016. Data was collected from all patient surgical case records of small animals presented at the Katima Mulilo state veterinary clinic. Information obtained included, age of animal, sex, reason for presentation, breed, procedure undertaken and the date when the surgical procedure was done as well as the type of the surgical procedure performed.

### 2.3. Statistical Analysis

The generated data was entered in. Statistical analysis was performed in. The Z-test was used for comparison of proportions and  $p < 0.05$  was considered significant. Data was entered and managed into Microsoft Excel 2010 spreadsheets (Microsoft Professional Office 2010) and analysed using the Statistical Package for Social Sciences (SPSS) version 16 (SPSS Inc., Chicago, USA). Descriptive statistics were used for analysis. Categorical variables were described using percentages. The Z-test was used for comparison of proportions and  $p \leq 0.05$  were considered significant.

### 2.4. Ethical Considerations

There were no ethical violations during the execution of this study. Data from Katima Mulilo state veterinary office was used with the full consent of the custodian of the records therein.

## 3. RESULTS

Between 2011 and 2016, a total of 167 animals were presented to Katima Mulilo state veterinary office for surgical procedures. Analysis of the results in Table 1 showed that significantly more dogs (87.4%) than cats (12.6%) were presented for surgical procedures ( $p < 0.05$ ). Significantly more male dogs (58.2%) than female dogs (41.8%) were presented for surgical treatment during the period under review ( $p < 0.05$ ). There was no significant difference in the proportion of male cats (57.1%) and female cats (42.9%) presented for surgical treatments during this period ( $p > 0.05$ ). Overall, significantly more non-elective (58.7%) than elective (41.3%) procedures were performed during the study period ( $p < 0.05$ ). Significantly more non-elective (58.7%) than elective procedures (41.3%) were performed in dogs ( $p < 0.05$ ). However, significantly more elective (90.5%) than non-elective procedures (9.5%) were performed in cats ( $p < 0.05$ ). All the cats presented during the period under study were cross breeds and there were no pure breed cats presented. A significantly greater proportion of crossbreed dogs were presented for non-elective (65.2%) than for elective (34.8%) procedures ( $p < 0.05$ ;  $n = 132$ ). A significantly greater proportion of pure breed dogs were presented for non-elective (71.4%) than for elective (28.6%) procedures ( $p < 0.05$ ;  $n = 14$ ). A significantly greater proportion of adult cats (76.2%) than adolescent (9.5%) and kittens (14.3%) were presented during the period under study ( $p < 0.05$ ). There were no geriatric cats presented for surgical procedures to the veterinary office during this period. All the adult cats were presented for elective procedures.

**Table 1:** Distribution of type of surgical procedure performed at Katima Mulilo State Veterinary Office according to specie, breed and sex of animal

| Category    | Elective Procedures | Proportion (%) | Non-elective Procedures | Proportion (%) | Total | Proportion (%) |
|-------------|---------------------|----------------|-------------------------|----------------|-------|----------------|
| <i>Cats</i> |                     |                |                         |                |       |                |
| Male        | 10                  | 83.3           | 2                       | 16.7           | 12    | 57.1           |
| Female      | 9                   | 100.0          | 0                       | 0.0            | 9     | 42.9           |
| Crossbreed  | 19                  | 90.5           | 2                       | 9.5            | 21    | 100.0          |
| Pure breed  | 0                   | 0.0            | 0                       | 0.0            | 0     | 0.0            |
| Overall     | 19                  | 90.5           | 2                       | 9.5            | 21    | 100.0          |
| <i>Dogs</i> |                     |                |                         |                |       |                |
| Male        | 29                  | 34.1           | 56                      | 65.9           | 85    | 58.2           |
| Female      | 21                  | 34.4           | 40                      | 65.6           | 61    | 41.8           |
| Crossbreed  | 46                  | 34.8           | 86                      | 65.2           | 132   | 90.4           |
| Pure breed  | 4                   | 28.6           | 10                      | 71.4           | 14    | 9.6            |
| Overall     | 50                  | 34.2           | 96                      | 65.8           | 146   | 100.0          |
| Grand Total | 69                  | 41.3           | 98                      | 58.7           | 167   | 100.0          |

**Table 2:** Distribution of type of surgical procedure performed at Katima Mulilo State Veterinary Office according to specie and age of animal

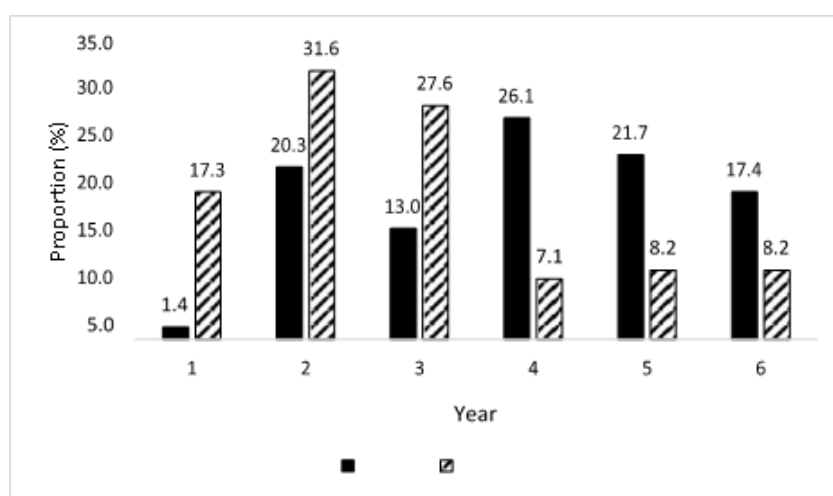
| Category    | Elective procedures | Proportion (%) | Non-elective procedures | Proportion (%) | Total | Proportion (%) |
|-------------|---------------------|----------------|-------------------------|----------------|-------|----------------|
| <i>Cats</i> |                     |                |                         |                |       |                |
| Adult       | 16                  | 100.0          | 0                       | 0.0            | 16    | 76.2           |
| Adolescent  | 1                   | 50.0           | 1                       | 50.0           | 2     | 9.5            |
| Kitten      | 2                   | 66.7           | 1                       | 33.3           | 3     | 14.3           |
| Overall     | 19                  | 90.5           | 2                       | 9.5            | 21    | 100.0          |
| <i>Dogs</i> |                     |                |                         |                |       |                |
| Geriatric   | 4                   | 33.3           | 8                       | 66.7           | 12    | 8.2            |
| Adult       | 36                  | 40.0           | 54                      | 60.0           | 90    | 61.6           |
| Adolescent  | 2                   | 33.3           | 4                       | 66.7           | 6     | 4.1            |
| Puppy       | 8                   | 21.1           | 30                      | 78.9           | 38    | 26.0           |
| Overall     | 50                  | 34.2           | 96                      | 65.8           | 146   | 100.0          |
| Grand Total | 69                  | 41.3           | 98                      | 58.7           | 167   | 100.0          |

There was no significant difference in the proportions of adolescent cats and kittens presented for elective (66.7%) and non-elective (33.3%) procedures ( $p>0.05$ ). Overall, the greatest proportion of dogs presented (61.6%) were adults, followed by puppies (26%), geriatrics (8.2%) and lastly adolescents (4.1%). A significantly greater proportion of adult dogs were presented for non-elective (60%) than for elective (40%) procedures ( $p<0.05$ ). A significantly greater proportion of puppies were presented for non-elective (78.9%) than for elective (21.1%) procedures ( $p<0.05$ ). There was no significant difference in the proportions of geriatric and adolescent dogs presented for elective (33.3% and 33.3%, respectively) or non-elective (66.7% and 66.7%, respectively) procedures ( $p>0.05$ ).

The Chi-square analysis of the results in Figure 1 showed that significantly more elective than non-elective cases were presented in 2014, 2015 and 2016 ( $p<0.05$ ). The results, however, also showed that the proportional presentation of elective cases in 2011 (1.4%) was significantly less than those from 2012 to 2016 (20.3%, 13%, 26.1%, 21.7% and 17.4%, respectively) ( $p<0.05$ ) but there was no significant difference in the proportional presentation of elective cases from 2012 to 2016 ( $p>0.05$ ). Chi-square analysis of the results in table also showed that significantly more non-elective than elective cases were presented in 2011, 2012 and 2012 than in

2013, 2014 and 2015 ( $p<0.05$ ). There was, however, no significant difference in the proportion of non-elective cases presented in 2014, 2015 and 2016 ( $p>0.05$ ). There was also no significant difference in the proportion of non-elective cases presented between 2012 and 2013 ( $p>0.05$ ) though significantly more non-elective cases were presented in 2012 than in 2011 ( $p<0.05$ ). The results in Table 3 showed that the overall proportion of castrations (23.4%) and ovariohysterectomies (18.0%), the only elective procedures, performed were not significantly different ( $p>0.05$ ). Overall, bite wounds (27.5%) and fracture repairs (15%) were significantly the most performed non-elective surgical procedures ( $p<0.05$ ). Aural hematoma (0.6%) and joint dislocation (0.6%) were the only non-elective procedures performed in cats during the study period.

As shown in Table 4, Boerboels had significantly the greatest proportion of bite wounds surgically treated amongst the pure breed dogs ( $p<0.05$ ). Two Pitbulls, a Chihuahua and a Boxer were the other pure breeds that were presented for surgical procedures on bite wounds. The other pure breeds presented were a Jack Russell (ovariohysterectomy), German shepherd dog (castration) and a Doberman (castration).



**Figure 1:** Annual proportional presentation of elective and non-elective cases at Katima Mulilo State Veterinary Office

**Table 3:** The overall proportional distribution elective and non-elective procedures in dogs and cats presented at Katima Mulilo State Veterinary Office between 2011 and 2016

| Type and Name of procedure | Number of Cats | Overall proportion (%) | Number of Dogs | Overall proportion (%) | Total | Overall proportion (%) |
|----------------------------|----------------|------------------------|----------------|------------------------|-------|------------------------|
| <i>Elective</i>            |                |                        |                |                        |       |                        |
| Castration                 | 10             | 6.0                    | 29             | 17.4                   | 39    | 23.4                   |
| OVH*                       | 9              | 5.4                    | 21             | 12.6                   | 30    | 18.0                   |
| Overall                    | 19             | 11.4                   | 50             | 29.9                   | 69    | 41.3                   |
| <i>Non-elective</i>        |                |                        |                |                        |       |                        |
| Aural hematoma             | 1              | 0.6                    | 6              | 3.6                    | 7     | 4.2                    |
| Bite wound                 | 0              | 0.0                    | 46             | 27.5                   | 46    | 27.5                   |
| Bone stuck in throat       | 0              | 0.0                    | 1              | 0.6                    | 1     | 0.6                    |
| Dental disorder            | 0              | 0.0                    | 1              | 0.6                    | 1     | 0.6                    |
| Dystocia                   | 0              | 0.0                    | 2              | 1.2                    | 2     | 1.2                    |
| Fracture repair            | 0              | 0.0                    | 25             | 15.0                   | 25    | 15.0                   |
| Hip dysplasia              | 0              | 0.0                    | 1              | 0.6                    | 1     | 0.6                    |
| Joint dislocation          | 1              | 0.6                    | 3              | 1.8                    | 4     | 2.4                    |
| Mastectomy                 | 0              | 0.0                    | 2              | 1.2                    | 2     | 1.2                    |
| Ocular infection           | 0              | 0.0                    | 1              | 0.6                    | 1     | 0.6                    |
| Third eyelid prolapse      | 0              | 0.0                    | 1              | 0.6                    | 1     | 0.6                    |
| Tongue surgery             | 0              | 0.0                    | 1              | 0.6                    | 1     | 0.6                    |
| Tumor removal              | 0              | 0.0                    | 1              | 0.6                    | 1     | 0.6                    |
| Vaginal prolapse           | 0              | 0.0                    | 4              | 2.4                    | 4     | 2.4                    |
| Wound sterilization        | 0              | 0.0                    | 1              | 0.6                    | 1     | 0.6                    |
| Overall                    | 2              | 1.2                    | 96             | 57.5                   | 98    | 58.7                   |
| Grand Total                | 21             | 12.6                   | 146            | 87.4                   | 167   | 100.0                  |

\*Ovariohysterectomy

### 3. DISCUSSION

Although our study concentrated on surgical cases, information gathered can be used to gain an impression of the non-infectious conditions that beset cats and dogs in a rural setting like Katima Mulilo. The novelty of our study is that it is the first study to profile and document surgical problems presented at a rural Government veterinary clinic facility in Namibia. Information provided may be used as baseline epidemiological data that is useful for management planning for veterinary hospitals and other Government animal healthcare facilities. It has previously been argued that cohort studies provide valuable information in dogs (Pugh *et al.*, 2014). Schmidt and co-workers demonstrated that companion animals may act as sentinels for both infectious and non-infectious conditions including environmental contamination (Schmidt, 2009).

Our results show that more dogs (87.4%) than cats (12.6%) were presented at Katima Mulilo Government Veterinary Clinic from 2012 to 2016 (Table 1). The reasons why fewer cats

were presented have not been established in this study. However, these figures should not be surprising as one would normally expect to find more dogs than cats, given the important roles of the former in rural households. Our findings may be explained by the demographics of the domestic cat in Katima Mulilo. Similar findings of more dogs than cats in rural settings were reported by in other studies (Risselado *et al.*, 2008; Baines *et al.*, 2020).

This study showed that fractures (27.6%), fracture repairs (15%), aural hematomas (4.6%) and dystocia (1.2%) were the most prevalent non-elective surgical procedures performed at Katima Mulilo state veterinary clinic over the 5-year period. Although this study was mainly focusing on surgical cases, the conditions reported for England (D. G. O'Neill *et al.*, 2014; O'Neill *et al.*, 2014) are quite different from our study except for trauma (as in bite wounds and fractures) which was also prevalent in the studies cited above.

Table 4: Procedures performed on pure breed dogs presented to Katima Mulilo State Veterinary Office from 2011 to 2016

| Procedure on pure breed    | Number of animals | Proportion (%) |
|----------------------------|-------------------|----------------|
| <i>Boerboel</i>            |                   |                |
| Bite wound                 | 4                 | 28.6           |
| Dystocia                   | 1                 | 7.1            |
| Fracture                   | 1                 | 7.1            |
| Overall                    | 6                 | 42.9           |
| <i>Boxer</i>               |                   |                |
| Bite wound                 | 1                 | 7.1            |
| Overall                    | 1                 | 7.1            |
| <i>Chihuahua</i>           |                   |                |
| Bite wound                 | 1                 | 7.1            |
| Castration                 | 1                 | 7.1            |
| Overall                    | 2                 | 14.3           |
| <i>Doberman</i>            |                   |                |
| Castration                 | 1                 | 7.1            |
| Overall                    | 1                 | 7.1            |
| <i>German shepherd Dog</i> |                   |                |
| Castration                 | 1                 | 7.1            |
| Overall                    | 1                 | 7.1            |
| <i>Jack Russell</i>        |                   |                |
| Ovariohysterectomy         | 1                 | 7.1            |
| Overall                    | 1                 | 7.1            |
| <i>Pitbull</i>             |                   |                |
| Bite wound                 | 2                 | 14.3           |
| Overall                    | 2                 | 14.3           |
| Grand Total                | 14                | 100.0          |

However, trauma and bone fractures were not the most prevalent in this study. Castrations and ovariohysterectomies constituted the majority of the surgical procedures performed. Castrations (23.4%) and ovariohysterectomies (18.0%) were the only elective procedures undertaken, giving gonadectomy an overall proportion of 41.4% of all surgical procedures performed at the clinic during the period under study (Table 1). Overall, the proportion of cats presented for castration and ovariohysterectomy were 6.0% and 5.4%, respectively (Table 3). This pattern in cats is like that reported in other African communities (Eyarefe and Dei, 2014). The importance of reproductive control in rural communities cannot be overemphasized. Kustritz summarized the beneficial effects of gonadectomy which include reduction in unwanted and uncontrolled breeding, aggression, roaming behavior, sexually

transmitted infections and gonadal neoplasms (Kustritz, 2007). Furthermore, Petterson highlighted the importance of castration and spaying in the control of diseases such as rabies (Petterson, 2014). According to Kustritz ovariohysterectomy and castration were the most common surgical procedures performed in small animal practice (Kustritz, 2007). Recently, Muraro and White also reported that ovariohysterectomy was the most common surgical procedure in small animal practice (Muraro and White, 2014). The high prevalence of gonadectomy may be explained by the reasons given in the studies cited above.

The results also show that significantly more non-elective (65.8%) than elective procedures (34.2%) procedures were performed. This could be attributable to the fact that a rural community like Katima Mulilo would not prioritize spending on elective procedures.

However, life threatening non-elective conditions would tend to have a higher priority. The situation in cats is however reversed and there were more elective (90.5%) than non-elective procedures (9.5%) were performed. Explanation for this observation may lie in the low numbers of cats in this study, given this outlying result.

This study was, however, unable to profile the pet owners who presented their pets for this elective surgery. The study did not bring to light the public awareness of sterilization of pets in Katima Mulilo. However, awareness of sterilization as a form of population control was high in other similar communities (Pettersson, 2014; Baines *et al.*, 2020). There are various methods that have been applied to improve public awareness of sterilization of pets. A Trap-Neuter-Release system has been successful in controlling free roaming dogs in some developing countries (Reece and Chawla, 2006). In Canada, a participatory approach was used in a remote and resource-limited village to raise public awareness of the benefits of sterilization (Schurer *et al.*, 2015). In conjunction with local authorities, the veterinary authorities in Namibia ought to enhance their extension work in order to raise awareness of the public on the benefits of pet sterilization.

The dog population demographic results show that (61.6%) were adults, followed by puppies (26%), geriatrics (8.2%) and lastly adolescents (4.1%). Dog bite wounds accounted for 31.5% (n=46) of all dogs presented for surgery. This is the highest occurrence of all surgical conditions recorded at Katima Mulilo state veterinary clinic. This agrees with other studies in other areas where dogs are not confined therefore likely to be involved in dog fights (Eyarefe and Dei, 2014). This high prevalence of dog bite wounds may be due to the ownership practices of dog owners in this community.

Most homesteads in Katima Mulilo are fenced and yet dogs are allowed to roam the streets freely. Similar management practices were observed in resource-limited communities in Gauteng and North West provinces of South Africa (Minnaar and Krecek, 2001). The communal nature of these dogs puts them at higher risk of being bitten by other dogs. According to one study, 10% of all trauma is

from bite wounds inflicted by other dogs (Cabon *et al.*, 2015). The finding of the current study that more male dogs presented with dog bite wounds than females is consistent with other studies (Shamir *et al.*, 2002). We did not establish if the bitten dogs were intact or sterilized. However, it can be assumed that the majority of these dogs were intact since sterilization of dogs is not a common practice in similar resource-limited communities (Minnaar and Krecek, 2001). It has previously been suggested that the over-representation of male dogs in the bitten population is because of sex hormones. Intact male dogs are more likely to exhibit aggressive behavior (Minar *et al.*, 2013). This aggressive behavior by male dogs is more likely to be intense during sexual interactions as they compete for a female (Kustritz, 2007). No cats were presented with bite wounds. It has been reported that cats are less likely to be bitten than dogs (Shamir *et al.*, 2002). However, the low population of cats presented to Katima Mulilo clinic might contribute to the absence of bitten cats presented for surgery.

Bone fracture repairs were the third most common surgical procedures performed. Significantly more fractures were recorded in male dogs (84%) than in female (16%) dogs. Similar, though not identical, observations have been reported elsewhere. Minar *et al* (2013) conducted a study to determine the patterns of fractures in dogs referred to a University Veterinary Medical Center in Korea and reported a higher miniature breed predisposition, a higher male prevalence, a higher juvenile prevalence, a higher summer autumn prevalence and higher femoral prevalence. According to Minar *et al* (2013) most fractures were caused by automobile accidents. Other studies have also cited dog fights and gunshot wounds (Scott, 2005).

Incidentally, in the current study, one dog had acquired a fracture following a gunshot incident. Free roaming dogs are of international concern, particularly in low to medium Human Development Index Countries (Dalla Villa *et al.*, 2010; Massei *et al.*, 2017). Since our study observed more fractures in male than female dogs, it is not unreasonable to surmise that the fractures might have been caused by fights since Katima Mulilo does not have a high



traffic volume. There was no seasonal effect on the number of dogs and cats subjected for surgical procedures. This is not surprising as the trauma procedures in this study, do not follow a seasonal pattern.

About 91.1% (n=146) of the dogs were of mixed genetic background. These results are like other studies of communities with comparable socio-economic background (Eyarefe and Dei, 2014; Massei *et al.*, 2017). In contrast, the predominant breeds presented to primary-care veterinary clinics in England were purebred (Asher *et al.*, 2009; O'Neill *et al.*, 2014, 2014). Purebred dogs are susceptible to significantly high occurrence of inherited disorders (Asher *et al.*, 2009; Wangdee *et al.*, 2014) and are more likely to live 1.2 years less than crossbred dogs (O'Neill *et al.*, 2013). The welfare implications of keeping purebred dogs despite the increase in recorded inherited diseases is currently being debated in various fora (Farrell *et al.*, 2015). The keeping of these dogs with diverse genetic background in the resource-limited communities of Katima Mulilo should therefore be encouraged to prevent the inherited surgical conditions and the welfare implications associated with purebred dogs.

The high number of puppies and adolescent/juvenile in a dog population suggests a low survival rate. Crossbred dogs are known for their hybrid vigor (Farrell *et al.*, 2015; Fleming *et al.*, 2011; O'Neill *et al.*, 2013). The causes of mortalities in young dogs and adolescent/juvenile are usually gastrointestinal infections (Fleming *et al.*, 2011). This is in slight contrast to other reports from developed and middle-income countries where dogs were more likely to die from infectious diseases, parasitic diseases, diseases caused by physical agents and neoplasia (Trapp *et al.*, 2010). This study, however, was not designed to evaluate the causes of mortalities in small animals in Katima Mulilo. Reports from similar communities, however, show that standard vaccinations are not practiced in resource poor communities (Pettersson, 2014).

Schneider (2012) has reported the vibrancy of small animal healthcare in the more affluent centres of central and southern Namibia. Sadly, the same cannot be said for the more rural northern centres like Katima Mulilo. In northern Namibian communities, although pet owners

were aware of the importance of pet primary healthcare, few had their dogs vaccinated, citing various reasons such as priorities and travelling logistics to veterinary centres (Haimbodi *et al.*, 2014). It is clear from the foregoing discussion that the Government veterinary centres tend to concentrate on educating farmers on issues of importance to production animal care, small animal primary health care education appears to be “the second best” issue for most Government veterinary centres. Katima Mulilo is on the forefront of addressing primary animal healthcare deficits in Namibia, in addition to production animal healthcare. It is therefore suggested that rigorous primary animal health promotion campaigns be conducted so as to improve the health of small animals in order to increase the survival rates and hence their longevity.

#### 4. CONCLUSION

This study provides the first baseline account of the surgical cases recorded at a typical Namibian rural setting. The surgical cases presented are representative of primary surgical cases attended at Katima Mulilo State Veterinary Clinic. Significantly more dogs than cats were presented for surgery. The crossbreed dog was the prevalent breed. The most prevalent surgical procedures recorded in dogs and cats attending Katima Mulilo state veterinary clinic between 2011 and 2016 were dog bite wounds, castrations, bone fractures and ovariohysterectomies. Cats were mainly presented for castrations and ovariohysterectomy. The traumatic conditions may have arisen from the free roaming nature of the Katima Mulilo dogs. In order to address these preventable conditions, local authorities ought to enforce appropriate legislation to control these free roaming dogs. The presentation of pets by their owners for sterilization is encouraging. More work needs to be done to raise public awareness on the benefits of sterilization and pet health care in general.

Considering the remoteness of Katima Mulilo, and the distance to any referral centres, Katima Mulilo state veterinary clinic must be adequately equipped to handle these primary surgical cases for the betterment of the welfare of pets within the catchment area.

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### COMPETING INTERESTS

The authors declare that they have no financial or personal relationships which may have inappropriately influenced them in writing this article.

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