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Occurrences of Dental Diseases in Dogs in a Teaching Animal Hospital, Morogoro, Tanzania

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Abstract

Dental diseases are common in dogs with a prevalence of more than 80% in some breeds of dogs. They cause damage to oral health and may act as a source of bacteria causing other diseases such as endocarditis, pneumonia and arthritis. A cross section study was conducted to determine the current status on the occurrence of dental diseases in dogs attended at Sokoine University of Agriculture (SUA) Teaching Animal Hospital in Morogoro, Tanzania. A total of 87 dogs were examined macroscopically for the presence of dental diseases. Dogs examined in this study ranged from medium (93.1%) to large (6.9%) sized, and up to 73.6% were mixed-breed. The minimum and maximum ages of the dogs were 6 and 72 months, respectively, with majority being females (60.9%). The proportions of intact, spayed and castrated were 92%, 5.8% and 2.3%, respectively. Of the 87 dogs examined, 62.1% had different kinds of dental diseases. The frequently observed dental diseases were; dental deposits (43.7%), missing teeth (24.1%), periodontal disease (20.7%), dental attrition (16.1%), and dental abrasion (10.3%). Further, it was noted that none of the dogs had been previous underwent routine dental check-up or anaesthetised for dental cleaning. This study indicates that dental diseases are frequent in dogs attended at SUA Teaching Animal Hospital. Therefore, it is recommended that routine dental examination should be performed in dogs presented at the Teaching Animal Hospital. Further, there is a need for educating dog breeders and owners on the importance of dental home care.

Keywords: dentistry, dental diseases, dog, oral cavity

1. Introduction

Dental diseases are common in dogs (Isogai *et al.,* 1989; Kyllar and Witter, 2005; Marshall *et al.,* 2014) with the frequency being reported to increase with the age (Kyllar and Witter, 2005; Marshall *et al.,* 2014; Wallis *et al.,* 2019; Enlund *et al.,* 2020). Several studies have been performed to determine the frequency of dental diseases in dogs (Pavlica *et al.,* 2001; Kyllar and Witter, 2005; Allmuca *et al.,* 2016). Among the dental diseases, which have been reported; dental deposits, periodontal disease and missing teeth are the most frequent encountered dental diseases in dogs (Hamp *et al.,* 1984; Isogai *et al.,* 1989; Butkovic *et al.,* 2001; Allmuca *et al.,* 2016).

Periodontal disease is an inflammatory condition that affects the periodontium of the tooth i.e. the alveolar bone, gingiva, periodontal ligament and cementum (Wallis and Holcombe, 2020). The disease is mainly caused by plaque i.e. soft deposits (Harvey, 1998; Wallis and Holcombe, 2020), however nutrition, chewing habits, ageing, stress, oral care, and genetic factors may influence the host's response to the disease (Wallis and Holcombe, 2020). It is believed that up to 80% of all dogs have some degree of periodontal disease by the age of two years (Pietraniec *et al.,* 2017). Periodontal disease in dogs is characterised by the presence of varying amounts of plaque and calculus, erythema and rounding of the gingival margins, gingival recession, mobile and missing teeth (Niemiec, 2010).

Regular dental homecare such as teeth brushing, provision of special dental diets, chew toys, oral rinses, water additives and gels is recommended for controlling dental diseases (Hamp *et al.,* 1984; Isogai *et al.,* 1989; Allmuca *et al.,* 2016; Pietraniec *et al.,* 2017; Wallis and Holcombe, 2020). Further, it is suggested that dental homecare should be coupled with professional dental examination and cleaning (Hamp *et al.,* 1984; Pietraniec *et al.,* 2017; Wallis and Holcombe, 2020). The latter, is recommended annually (Pietraniec *et al.,* 2017). The aim of this study was to establish the occurrence of dental diseases in dogs brought at SUA Teaching Animal Hospital so as to determine the current status and to recommend appropriate control measures.

2. Materials and Methods

This was a cross-sectional study conducted for two months from December 2020 to January 2021, in Morogoro Region. All dogs aged six months and above that were brought at the Sokoine University of Agriculture (SUA) Teaching Animal Hospital for dipping and routine surgical procedures, in which owners volunteered to participate in the study, were examined macroscopically for the presence of dental diseases. This study was approved by the Research, Innovations, and Publication Committee of the College of Veterinary Medicine and Biomedical Sciences.

The breed, sex, and body condition of the dog was recorded. Previous history on professional dental examination and cleaning, management system, age and source of the dog were explored from the dog owners or caretakers. The body condition score of the dog was recorded as too thin, ideal and too heavy based on the Purina body condition scoring system (Purina, 2021).

Each dog was examined for the shape, colour, location and number of teeth. The number and location of missing teeth was also recorded. Dogs with a total number of 42 permanent teeth and having a dental formula of 2(I=3/3, C=1/1, Pm=4/4, M=2/3) were considered of having standard number of teeth (Niemiec, 2010). The presence of dental deposits, periodontal disease and foreign bodies was also recorded.

Data collected was entered into the Microsoft Office Excel Spread Sheet (Microsoft 2010) and analyzed using Epi InfoTM version 7.2.2.2 (Centers for Disease Control and Prevention, Atlanta, 2017). Percentages for categorical variables were calculated. The chi-square test was used for comparison and statistically significant difference was accepted at a probability of $P<0.05$.

3. Results

3.1 Information of Study Animals

A total of 87 dogs were examined for the presence of dental diseases. Majority of dogs originated from SUA (17.2%), Vibandani (11.5%), Kasanga (11.5%), Kichangani (10.3%), Chamwino (8.1%), Mafiga (6.9%), Forest Hill (6.9%), Msamvu (4.6%), Mawenzi (3.4%), Kingolwira (3.4%), Kigurunyembe (2.3), Kiwanja cha ndege (2.3%), Mji mpya (2.3%), and Nunge (2.3%) (Figure 1). The rest of the dogs (7.0%) originated from different areas within Morogoro urban District, which were Kingo, Mafisa, Manzese, Misufini, Nanenane, and LITI (Figure 1). Dogs assessed ranged from medium (93.1%) to large sized (6.9%) and up to 73.6% were mixed-breed dogs (Figure 2). The proportional of crossbred and exotic breed were 17.2% and 9.2%, respectively (Figure 2). Exotic breeds examined were the German shepherd (75%; n=6) and Doberman (25%; n=2).

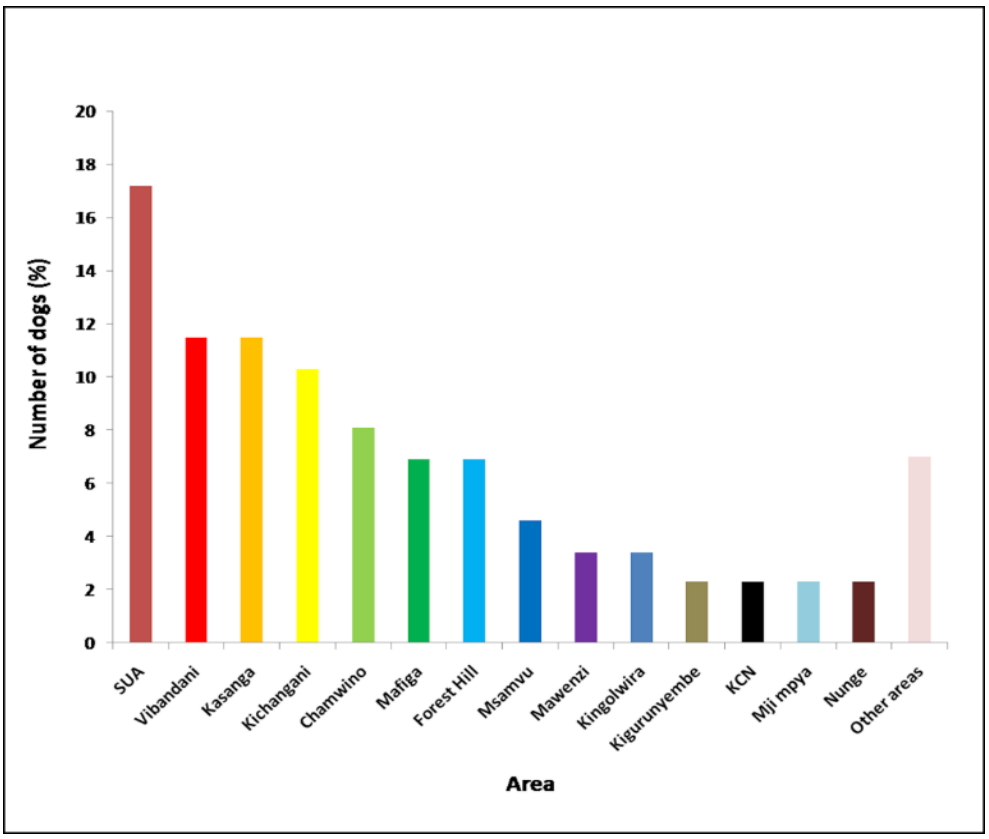

Figure 1. Source of dogs examined for the presence of dental diseases at SUA Teaching Animal Hospital

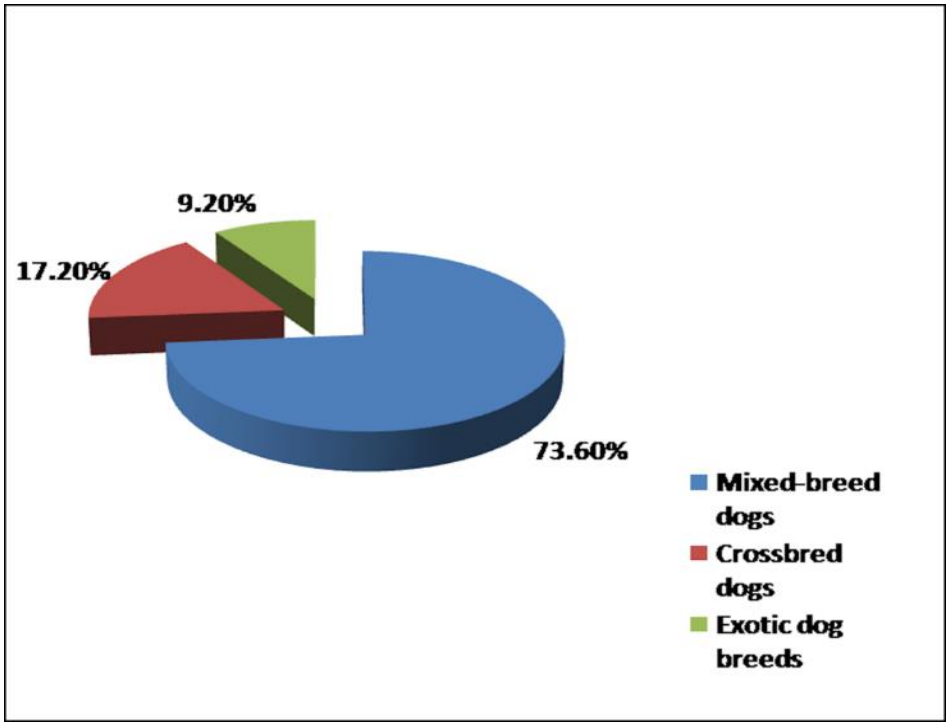

Figure 2. Proportional of mixed-breed dogs, crossbred dogs and exotic dog breeds examined for the presence of dental diseases at SUA Teaching Animal Hospital

The minimum and maximum ages of the dogs were 6 and 72 months, respectively (mean±SD: 24.5±14.8 months) and majority (60.9%) were females. There was no significant difference in the mean ages (p=0.34414) between male and female dogs. Most (90.8%; n=79) of the examined dogs had an ideal body condition score. The rest had a body condition score of either thin (6.9%; n=6) or too heavy (2.3%; n=2). The proportions of intact, spayed and castrated dogs were 92%, 5.8% and 2.3%, respectively (Figure 3). A greater proportion of the dogs were either confined during the day and night within a fenced house (46.0%) or confined during the day and left free during the night (44.8%) and rarely left free during the day and night (9.2%). Their main diet consisted of either maize flour stiff porridge mixed with sardines (86.2%) or maize flour stiff porridge mixed with bone-in meat/bones (75.9%) and rarely commercial dry dog food (6.9%). None of the dogs had been previously anaesthetised for professional dental examination and cleaning.

3.2 Occurrences of Dental Diseases

Out of 87 dogs examined for the presence of dental diseases, 62.1% (n=54) had different kinds of dental diseases. Further, it was observed that out of 54 dogs with dental diseases, 42 (77.8%) had more than one dental disease. Dental diseases observed in this study were dental deposits, missing teeth, periodontal disease, dental attrition, dental abrasion, retained deciduous teeth, supernumerary teeth, foreign body and extrinsic stain (Table 1). There was no significant difference (p=0.8575) in the occurrence of dental diseases between male (64.7%) and female dogs (60.4%). The proportional of dental diseases in exotic, crossbred and mixed-breed dogs were 100%, 66.7% and 56.3%, respectively. Significant difference (p=0.04458) in the occurrence of dental diseases was observed between exotic and mixed-breed dogs. Further, it was observed that 83.3% (n=5) of dogs fed on commercial dry food had dental diseases.

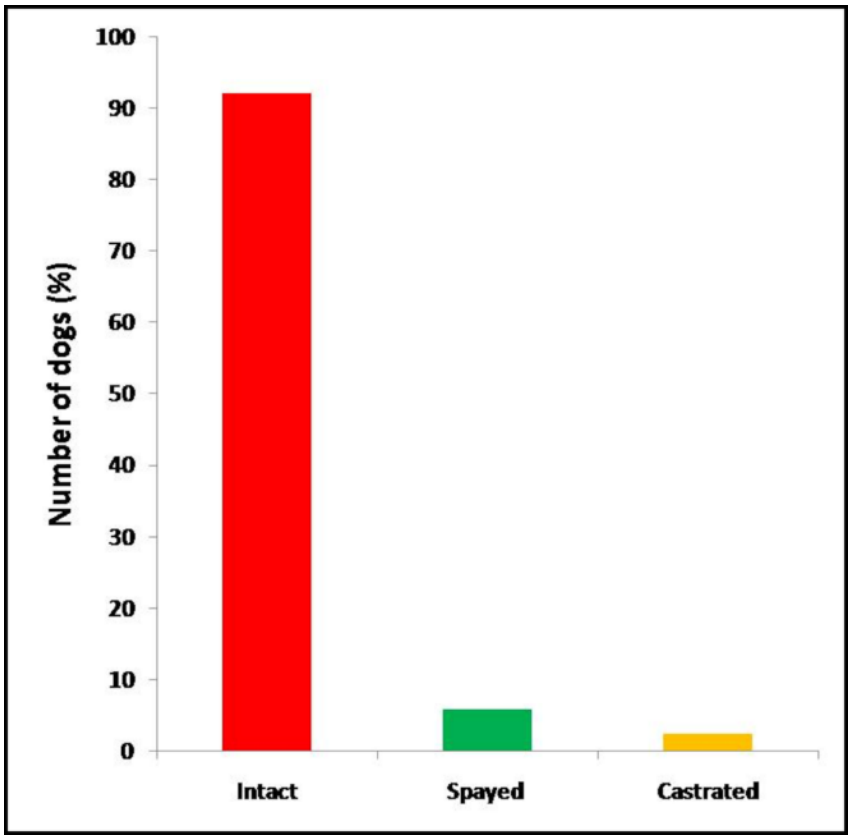

Figure 3. The proportional of intact, spayed and castrated dogs examined for the presence of dental diseases at SUA Teaching Animal Hospital

Table 1. Frequency of occurrence of different types of dental diseases in dogs examined at SUA Teaching Animal Hospital

Dental disease	**Number (%) of animals with dental disease (n=87)**
Dental deposits	38 (43.7)
Missing teeth	21 (24.1)
Periodontal disease	18 (20.7)
Dental attrition	14 (16.1)
Dental abrasion	9 (10.3)
Retained deciduous teeth	3 (3.4)
Supernumerary teeth	2 (2.3)
Foreign body	1 (1.1)
Extrinsic stain	1 (1.1)

Dental deposits (Figure 4) were seen in 43.7% (n=38) of the dogs examined for the presence of dental diseases. Of the 38 dogs with dental deposits, the premolar (89.5%; n=34) and canine (68.4%; n=26) regions were more frequently seen to be affected (Figure 4) than the incisor (7.9%; n=3) and molar (2.6%; n=1) regions. Periodontal disease was seen in 20.7% (n=18) of the dogs examined in this study (Figure 4). All dogs with periodontal disease had dental deposits (Figure 4).

Figure 4. Photographs (A and B) of the right side of the oral cavity of a male Doberman dog with periodontal disease. Note the presence of varying amounts of plaque and calculus affecting mainly the premolar and canine regions. Note also the reddening and rounding of the gingival margins, gingival recession and furcation exposure.

The number of teeth observed in this study ranged from 29 to 44 (mean: 41.5±1.7). The majority (71.3%; n=62) of dogs had 42 number of permanent teeth (I=3/3, C=1/1, Pm=4/4, M=2/3) and were considered having standard number of teeth. Missing teeth were seen in 24.1% (n=21) of dogs examined for the presence of dental diseases (Figure 5). Of the 21 dogs with missing teeth, 52.4% (n=11) had more than one missing tooth (Figure 5), whereas 47.6%

(n=10) had one missing tooth. Further, of the 11 dogs with more than one missing tooth, a greater proportion 72.7% (n=8) had two missing teeth (Figure 5). Moreover, premolars (52.4%; n=11) and incisors (47.6%; n=10) teeth were frequently seen missing followed by canines (9.5%; n=2) and molar (4.8%; n=1) teeth. Maxillary premolars (Figure 5) were the most commonly seen missing (72.7%; n=8) than the mandibular premolars (27.3%; n=3). Among the missing premolars the first premolar tooth was frequently seen missing (50.0%; n=6) than the second (33.3%; n=4), third (8.3%; n=1) and fourth (8.3%; n=1) premolars (Figure 5). Mandibular incisors were often found missing (61.5%; n=13) than the maxillary incisors (38.5%; n=5). Further, the central incisors were the most commonly seen missing (53.8%; n=7) than the intermediate (30.8%; n=4) and corner (15.4%; n=2) incisors. All missing canine and molar teeth were from the maxilla and mandible, respectively. Among 21 dogs with missing teeth 61.9% (n=13) were females and 38.1% (n=8) were males.

Figure 5. Photograph of the oral cavity of a female German shepherd crossbred dog with missing teeth. Note the absence of the first right (thick white arrow) and the second left (thin white arrow) maxillary premolar teeth.

Dental attrition (Figure 6A,B) was observed in 16.1% (n=14) of the dogs examined for the presence of dental diseases. The mean age of dogs with dental attrition was 2.7 ± 1.5 years (mean±SD). Dental abrasion was detected in 9 (10.3%) dogs (Figure 6C). It was seen in male dogs and canine and premolar teeth were involved (Figure 6C). Retained deciduous teeth (Figure 7) were seen in three (3.4%) female mixed-breed dogs. Of the three dogs with retained deciduous teeth, the canine (Figure 7A) and incisor (Figure 7B) teeth were involved in two and one dog, respectively. In retained deciduous canine teeth, the right maxilla and mandible (Figure 7A) were involved. For retained deciduous incisor teeth the left and right maxillae were involved (Figure 7B). Supernumerary teeth (Figure 8A) were observed in two

female mixed-breed dogs. In one dog the premolar region of the left maxilla was involved (Figure 8A). In the remaining one the premolar region of the right mandible was affected. A wooden foreign material was seen between the second and third incisor teeth of the upper jaw (Figure 8B) in a female mixed-breed dog. One female crossbred dog had extrinsic stains affecting the canine and incisor teeth.

Figure 6. Photographs of the oral cavity of a male German shepherd dog with dental attrition (A and B) and a mixed-breed male dog with dental abrasion (C). The brown spots in the centre of the wear facets of the incisor teeth indicate a tertiary dentine (A and B). Note the thinner appearance of the third upper incisor tooth (B) with a sharp occlusal ridge (small white arrow) and wear facets (black arrows) on the mesial surface of the mandibular canine teeth (A and B), which indicate dental attrition as a result of mesiocclusion. Note also the presence of a crescent-shaped wear lesion on the distal surface of the maxillary canine tooth (thick white arrow), which indicates dental abrasion most likely due to biting or pulling cage doors or chain link fences.

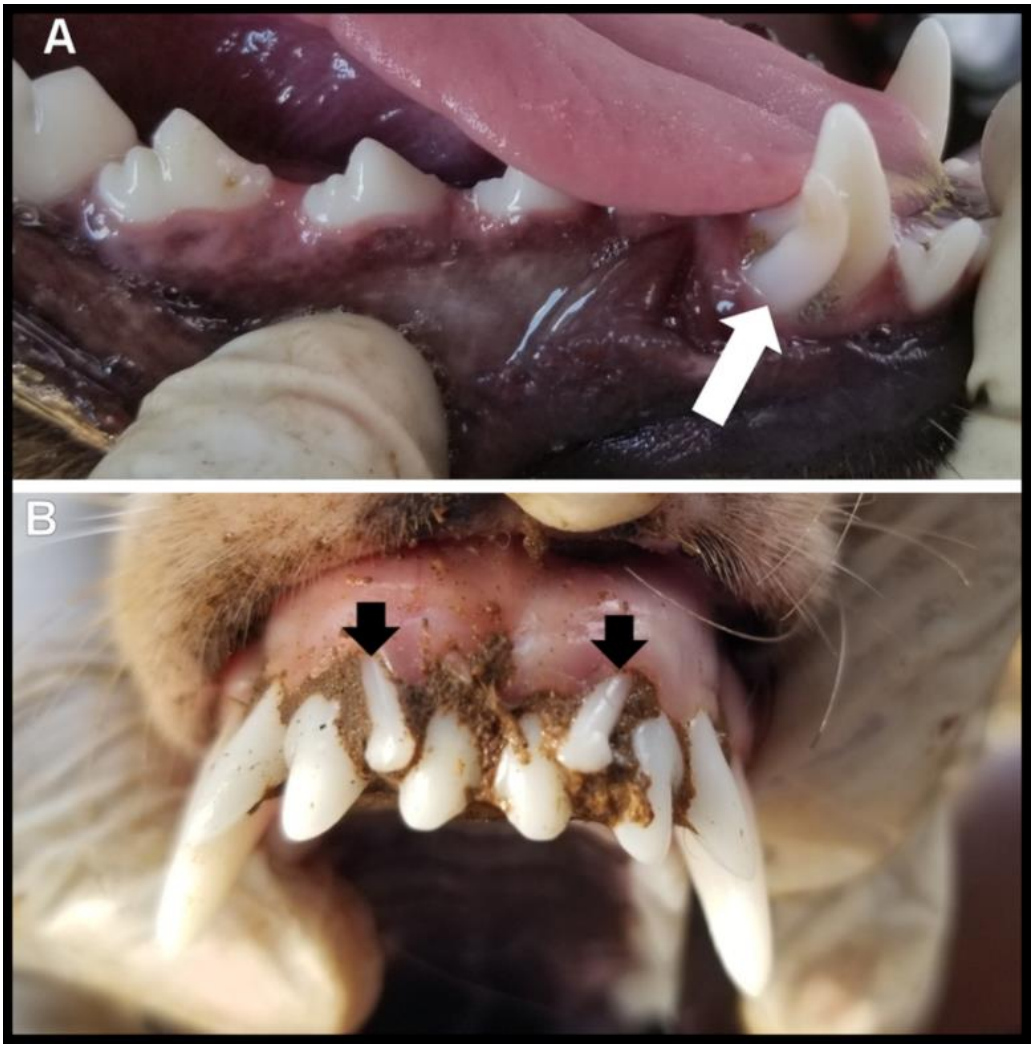

Figure 7. Photographs of the oral cavity of female mixed-breed dogs with retained right canine mandibular deciduous tooth (A), and maxillary deciduous incisor teeth (B). Note the labial displacement of retained deciduous teeth in A (white arrow) and B (black arrows).

Figure 8. (A) Photograph of the oral cavity of a female mixed-breed dog with supernumerary teeth affecting the left maxillary premolar teeth (thin white arrows). (B) Photograph of the oral cavity of a female mixed-breed dog with a wooden foreign body between the second and third maxillary incisor teeth (white arrow). Note also the presence of dental attrition affecting the maxillary incisor teeth in B.

4. Discussion

Previous studies on dental diseases in other countries have reported a prevalence of more than 80% (Hamp *et al.*, 1984; Kyllar and Witter, 2005; Kortegaard *et al.*, 2008), which showed that dental diseases are common in dogs. The prevalence of dental diseases obtained in this study, 62.1% indicates that dental diseases are common in Tanzanian dogs. The high frequency of occurrence of dental deposits compared to other dental diseases obtained in this study is similar to previous reported studies (Hamp *et al.*, 1984; Kyllar and Witter, 2005). Hamp *et al.* (1984) reported a frequency of occurrence of 83.3% for dental deposits in dogs. The higher frequency of dental deposit reported in a study by Hamp *et al.* (1984) compared to this study (43.7%) is most likely due to all dogs examined in this study were medium to large sized. In a study performed by Hamp *et al.* (1984) small, medium and large breed dogs were included. Small breed dogs have been reported to be more susceptible to dental deposits

compared to large breed dogs (Wallis *et al.*, 2019; Wallis and Holcombe, 2020). Further, a greater proportion of dogs in this study were fed with sardines or bone in meat. A soft diet has been reported to cause accumulation of dental plaques i.e. soft deposit (Kyllar and Witter, 2005). Moreover, it has been reported that a significant correlation exists between lower serum ionised calcium levels and more advanced stage of periodontal disease (Wallis and Holcombe, 2020). In this study, all dogs with periodontal disease had dental deposits. Periodontal disease has been documented to be caused mainly by accumulation of dental deposits (Fernandes *et al.*, 2012; Wallis *et al.*, 2019; Wallis and Holcombe, 2020).

In this study missing teeth was among the top three dental conditions affecting dogs, which is similar to other reported studies (Hamp *et al.*, 1984; Kyllar and Witter, 2005). Further, Niemiec (2010) reported that premolars followed by incisors teeth are frequently seen missing than other teeth, which is similar to observation of this study. Among the premolars, it was observed that the first maxillary premolar was frequently seen missing, which is comparable to other reported studies (Isogai *et al.*, 1989; Kyllar and Witter, 2005). In human (Sivarajan *et al.*, 2021), the maxilla is commonly involved with missing teeth and females are more affected, which is similar to observation of this study. Teeth may be truly absent due to congenital defects or acquired causes such as extraction and exfoliation (Niemiec, 2010). Dental radiography is necessary to confirm truly absent teeth, to rule out impacted teeth and fractured teeth with retained roots.

The mean age of dogs with dental attrition observed in this study (31.9 ± 18.4 months) indicates that the major cause of attrition was malocclusions. In dogs with normal occlusion, dental attrition usually become apparent as they get older (Kyllar and Witter, 2005; Niemiec, 2010). Previous study (Kyllar and Witter, 2005) reported canine and premolar teeth to be severely affected with abrasion. Similarly, in this study abrasion was observed in canine and premolar regions. In dogs retention of canines and incisors teeth has been reported to be the most common (DeBowes, 1995; Niemiec, 2010), which is similar to observation of this study. Further, Niemiec (2010) documented that among the two types of teeth, canines are frequently affected than incisors, which is analogous to result of this study. The exact aetiology of supernumerary teeth is unclear although genetic predisposition and environmental factors have been reported to play a role (Ata-Ali *et al.*, 2014; Mallineni, 2014). In a previous study by Butkovic *et al.*, (2001), 85% of cases of supernumerary teeth in dogs involved the first and second premolars. Further, the upper and lower jaws were equally affected, which is more or less similar to this study.

Diagnosis of dental diseases based on macroscopic findings only and the smaller sample size are the limitations of this study.

5. Conclusion

This study indicates that dental diseases are frequent in dogs attended at SUA Teaching Animal Hospital. Therefore, it is recommended that routine dental examination should be performed in dogs presented at the Teaching Animal Hospital. Further, there is a need for educating dog breeders and owners on the importance of dental home care such as tooth brushing, proper diet, and use of appropriate chew toys.

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Authors contributions

Dr. IJ performed macroscopic examination of the oral cavity, analysis, interpretation, and wrote the manuscript. Dr. MM designed the study, supervised research, critical review and editing of the manuscript. All authors read and approved the final manuscript.

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Competing interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Informed consent

Obtained.

Ethics approval

The Publication Ethics Committee of the Macrothink Institute.

The journal's policies adhere to the Core Practices established by the Committee on Publication Ethics (COPE).

Provenance and peer review

Not commissioned; externally double-blind peer reviewed.

Data availability statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Data sharing statement

No additional data are available.

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