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# Prevalence of Dental Calculus, Dental Caries, Attrition Rate Among Indian Breeds of Buffaloes in Tamilnadu: A Comparative Analysis

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***Abstract*---**Aim: To assess the prevalence of dental caries, Attrition, Gingivitis, periodontitis and dental recession in various breeds of buffaloes. Materials and Method: A cross-sectional study was conducted among Buffaloes to evaluate the prevalence of oral health status among various breeds of buffaloes in Tamilnadu. The study took place for two months, from February 2021 to March 2021, until the desired sample of subjects were recruited for the study. A total of

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122 buffaloes were recruited from the blue cross, nanganallur buffalo farm and various Veterinary colleges in Tamilnadu based on the simple random sampling method. Results: The association of various breeds of buffaloes and gingivitis, periodontitis, dental recession, dental Attrition. Buffalo breeds showed a statistically significant association with gingivitis, periodontitis, dental recession, or dental Attrition. ($P<0.01$). Conclusion: The present study reported that the breed of buffaloes had a significant association with the dental recession, periodontal diseases and attrited teeth. In the modern era, oral health is a reflection of overall health.

***Keywords*---**buffaloes, oral health, dental caries, periodontal diseases, attrition.

## Introduction

Dental health is more important for human beings as well as for animals. An animal's poor oral health can cause significant problems such as discomfort, pain, or problems of greater severity, such as weakness, reduced drinking and eating habits, or systemic changes, leading to death. [1]Main oral conditions are periodontal diseases, dental Attrition, the most frequent disease, followed by fracture and dental traumatism, with or without pulpal exposure. Dental disease could affected the patients oral health and it also affected the daily routine life.[1,2] Prevention of oral diseases improves animal health and increases its lifespan and reproductive efficiency. Likewise, healthy digestive mechanisms enhance the animal's quality of life and increase its longevity.

In India, buffaloes play a pivotal role in livestock production through contributions in terms of milk, meat and draft power for agricultural operations. India inhabits one of the best riverine breeds of buffalo in the world. There are 13 well defined registered buffalo breeds, of which Murrah, Nili-Ravi, Mehsana and Jaffarabadi are notable ones having good potential for milk production. The Indo-Gangetic plains of India are fertile basins and have more than 26% buffaloes of India. [1] The Indo- Gangetic plains have only one defined breed of buffalo named Bhadawari, and the rest of the other buffaloes are considered Murrah type/grade undefined populations. The genetic structure of this vast buffalo population was not known. Microsatellite markers have been used to analyze the genetic variation in cattle, sheep, pigs, goats, buffaloes, chickens, horses, and human beings. No systematic characterization of UP buffaloes has been done in the past. It is necessary to characterize and evaluate the genetic diversity of buffaloes. [3,4,5]

More than 50% of India's estimated world population of 148 million buffaloes.[6,7] Among the most commonly found breeds are the Murrah, Nili-Ravi, Surti, Mehsana, Nagpuri, and Bhadawari. Buffaloes are responsible for 10% of global milk production, which is obtained in developing countries. [8,9] Regarding meat production, an estimated 1.6 million metric tons of buffalo meat is produced annually. Most states of Southeast Asia consider the buffalo as their tractor. They provide 20-30% of farm power in China, Thailand, Indonesia, Malaysia, and the Philippines. The buffalo plays an important role in rural livestock production,

especially in Asia, and factors affecting productivity are extremely important to agricultural economics in this world region. [10]

Ageing buffaloes by examining the teeth was an inexact science as tooth wear was affected by many factors such as nutritional status and geographic location. While eruption times are relatively uniform for each species, the wear rate may be too inconsistent for the accurate ageing of individual animals. At birth or within the first 2-weeks of life, the first two pairs of incisor teeth (central and middle) appear. The remaining two pairs, including a third (lateral) and a fourth (corner) incisor tooth, a modified canine tooth, appear within the first month. All ruminants lack maxillary incisor teeth, with the mandibular incisor teeth meeting with a maxillary cornified dental pad. Deciduous premolar teeth are usually present at or shortly after birth in the bovine[11]. The deciduous and permanent dental formulas of sheep and goats are the same as the cow. In these smaller ruminants, the deciduous premolar teeth erupt 2 to 6-weeks after birth. The permanent incisor teeth begin to appear at 12 to 18-months, 18 to 24-months, 30 to 36- months, and 3.5 to 4.5-years for the central, middle, lateral, and corner incisor teeth, respectively .Permanent incisor teeth are larger and less sharp than their deciduous counterparts. Permanent premolar and molar teeth follow the same eruption schedule as the bovine. Thus, the present study aims to evaluate the prevalence of dental caries, Attrition, plaque accumulation in buffaloes.

**Materials and Method]**

A cross-sectional study was conducted among Buffaloes to evaluate the prevalence of oral health status among various breeds of buffaloes in Tamilnadu. The study took place for two months, from February 2021 to March 2021, until the desired sample of subjects were recruited for the study. A total of 122 buffaloes were recruited from the blue cross,nanganallur buffalo farm and various Veterinary colleges in Tamilnadu based on the simple random sampling method. Before conducting the study, permission was obtained from the head of the department of veterinary colleges and the official head of blue cross by explaining the study's objectives in a detailed manner. The buffaloes owner was asked to fulfil the consent form. The investigator was adequately trained and calibrated at the Veterinary College, nanganallur buffalo farm and Blue cross under the supervision of veterinary doctors. A single calibrated investigator recorded the data of all the criteria in the appropriate recording Performa. The demographic data, such as breed name, age, and sex, were acquired for the questionnaire. The oral health status of buffaloes such as dental caries, dental erosion, calculus, Plaque and periodontitis were recorded using DMFT index, plaque index, tooth erosion index, gingival index and oral lesions scoring system. The Normality tests, Kolmogorov-Smirnov and Shapiro-Wilks tests reveal the study followed a normal distribution. Therefore, to analyze the data, the parametric test was applied. Descriptive statistics were performed using Frequency and percentage distribution. A chi-square test was performed to find the association between oral health status and breeds. SPSS (IBM SPSS Statistics for Windows, Version 26.0, Armonk, NY: IBM Corp. Released 2019) is used to analyze the data. Significance level is fixed as 5% ($\alpha = 0.05$). P-value $<0.05$ is considered to be statistically significant. INCLUSION CRITERIA:Those individuals want their domestic animals to be a part of this study.EXCLUSION CRITERIA:The mentally disabled buffaloes

were excluded. In addition, those buffaloes owners who didn't fulfil the consent form and questionnaire were excluded from the study.

**Results**

Table 1
Types of breeds included in the study

| TYPE OF BREED | FREQUENCY | PERCENTAGE |
|---|---|---|
| Murrah buffalo | 20 | 16.4 |
| Nilli ravi buffalo | 43 | 35.2 |
| Murrah crossed with non descriptive buffalo | 21 | 17.2 |
| Non-descriptive buffalo | 38 | 31.1 |

Table 1 depicts the Frequency and percentage of various buffaloes' breeds involved in the study.

Table 2
Gender among the buffaloes in the study

| GENDER | FREQUENCY | PERCENTAGE |
|---|---|---|
| Male | 43 | 35.2 |
| Female | 79 | 64.8 |

Table 2 depicts the percentage and Frequency of gender among various breeds of buffaloes. The majority of the female was 64.8%.

Table 3
Association between breed and gingivitis

| Breeds | Gingiva | | | | Total | P-value |
|---|---|---|---|---|---|---|
| | NORMAL | MILD | MODERATE | SEVERE | | |
| Murrah buffalo | 6 | 10 | 3 | 1 | 20 | <0.01* |
| Nilli ravi buffalo | 1 | 24 | 15 | 3 | 43 | |
| Murrah crossed with non descriptive buffalo | 6 | 12 | 1 | 2 | 21 | |
| Non descriptive buffalo | 0 | 16 | 18 | 4 | 38 | |
| Total | 13 | 62 | 37 | 10 | 122 | |

Table 3 depicts the association of various breeds of buffaloes and gingivitis. A statistically significant association was found between a breed of buffaloes and gingivitis (P<0.01).

Table 4
Association between breed and calculus

| Breeds | Calculus | | | Total | P-value |
|---|---|---|---|---|---|
| | MILD | MODERATE | SEVERE | | |
| Murrah buffalo | 9 | 11 | 0 | 20 | <0.01* |
| Nilli ravi buffalo | 25 | 6 | 12 | 43 | |
| Murrah crossed with non descriptive buffalo | 13 | 1 | 7 | 21 | |
| Non descriptive buffalo | 7 | 16 | 15 | 38 | |
| Total | 54 | 34 | 34 | 122 | |

Table 4 depicts the association of various breeds of buffaloes and calculus again, a statistically significant association found between the breed of buffaloes and calculus (P<0.01).

Table 5
Association between breed and dental caries

| BREEDS | DENTAL CARIES | | | | Total | P-value |
|---|---|---|---|---|---|---|
| | NORMAL | MILD | MODERATE | SEVERE | | |
| Murrah buffalo | 6 | 11 | 2 | 1 | 20 | |
| Nilli ravi buffalo | 4 | 39 | 0 | 0 | 43 | |
| Murrah crossed with non descriptive buffalo | 6 | 15 | 0 | 0 | 21 | 0.01* |
| Non descriptive buffalo | 3 | 26 | 2 | 7 | 38 | |
| Total | 19 | 91 | 4 | 8 | 122 | |

Table 5 depicts the association of various breeds of buffaloes and gingivitis again; a statistically significant association was found between the breed of buffaloes and gingivitis (P<0.01).

Table 6
Association between breed of buffaloes and plaque

| BREEDS | Plaque | | Total | P-value |
|---|---|---|---|---|
| | MILD | MODERATE | | |
| Murrah buffalo | 8 | 12 | 20 | <0.01* |
| Nilli ravi buffalo | 6 | 37 | 43 | |
| Murrah crossed with non descriptive buffalo | 9 | 12 | 21 | |
| Non descriptive buffalo | 0 | 38 | 38 | |
| Total | 23 | 99 | 122 | |

Table 6 depicts the association of various breeds of buffaloes and Plaque. Again, a statistically significant association was found between a breed of buffaloes and Plaque (P<0.01).

Table 7
Association between breed and erosion

| BREEDS | Erosion | | | | Total | P-value |
|---|---|---|---|---|---|---|
| | NORMAL | MILD | MODERATE | SEVERE | | |
| Murrah buffalo | 7 | 4 | 9 | 0 | 20 | |
| Nilli ravi buffalo | 6 | 33 | 4 | 0 | 43 | |
| Murrah crossed with non descriptive buffalo | 6 | 11 | 2 | 2 | 21 | <0.01* |
| Non descriptive buffalo | 1 | 24 | 13 | 0 | 38 | |
| Total | 20 | 72 | 28 | 2 | 122 | |

Table 7 depicts the association of various breeds of buffaloes and erosion again, a statistically significant association found between a breed of buffaloes and erosion (P<0.01).

Table 8
Association between breed and dental recession

| BREEDS | Recession | | | | Total | P-value |
|---|---|---|---|---|---|---|
| | NORMAL | MILD | MODERATE | SEVERE | | |
| Murrah buffalo | 1 | 16 | 3 | 0 | 20 | <0.01* |
| Nilli ravi buffalo | 10 | 19 | 6 | 8 | 43 | |
| Murrah crossed with non - descriptive buffalo | 11 | 5 | 2 | 3 | 21 | |
| Non-descriptive buffalo | 12 | 26 | 0 | 0 | 38 | |
| Total | 34 | 66 | 11 | 11 | 122 | |

Table 8 depicts the association of various breeds of buffaloes and dental recession. A statistically significant association was found between a breed of buffaloes and dental recession (P<0.01).

Table 9
Association between breed and dental attrition

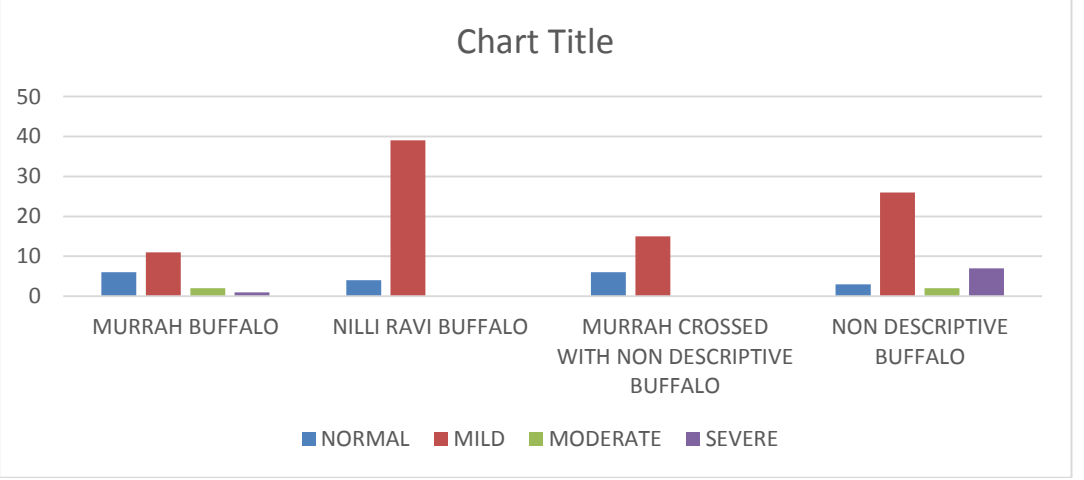
| BREEDS | ATTRITION | | | | Total | P-value |
|---|---|---|---|---|---|---|
| | NORMAL | MILD | MODERATE | SEVERE | | |
| Murrah buffalo | 1 | 12 | 7 | 0 | 20 | |
| Nilli ravi buffalo | 2 | 34 | 5 | 2 | 43 | |
| Murrah crossed with non descriptive buffalo | 2 | 11 | 2 | 6 | 21 | 0.04* |
| Non descriptive buffalo | 3 | 24 | 10 | 1 | 38 | |
| Total | 8 | 81 | 24 | 9 | 122 | |

Table 9 depicts the association of various breeds of buffaloes and dental Attrition. A statistically significant association was found between a breed of buffaloes and dental Attrition (P<0.01).

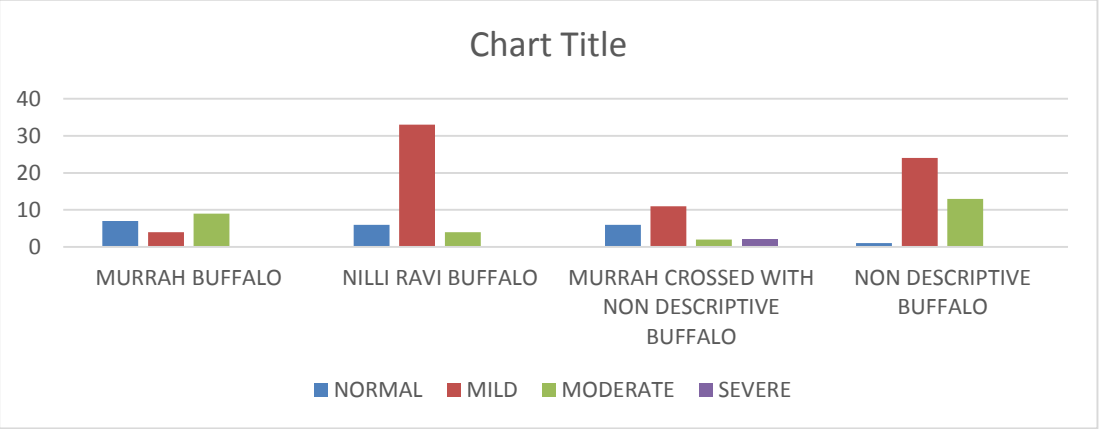
Table 10
Association between breed and periodontal disease

| BREEDS | periodontal disease | | | | Total | P-value |
|---|---|---|---|---|---|---|
| | NORMAL | MILD | MODERATE | SEVERE | | |
| Murrah buffalo | 3 | 12 | 5 | 0 | 20 | 0.022* |
| Nilli ravi buffalo | 0 | 26 | 13 | 4 | 43 | |
| Murrah crossed with non descriptive buffalo | 1 | 15 | 2 | 3 | 21 | |
| Non descriptive buffalo | 0 | 24 | 13 | 1 | 38 | |
| Total | 4 | 77 | 33 | 8 | 122 | |

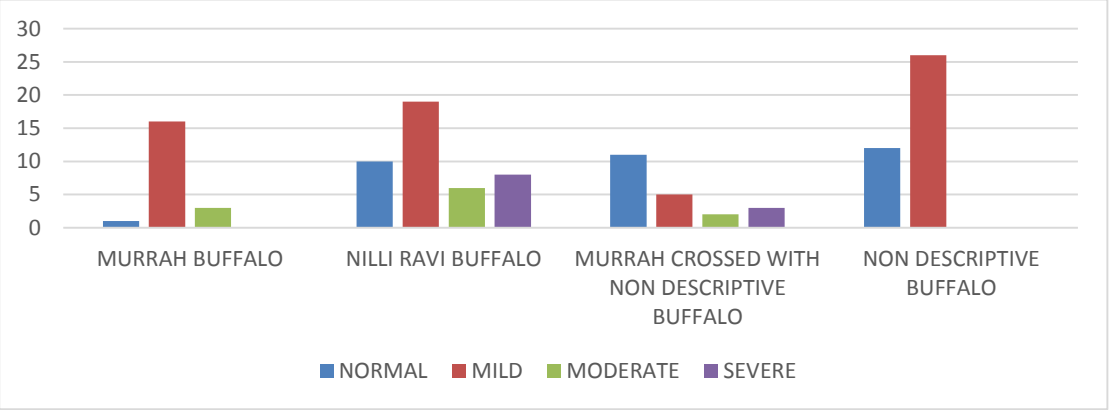
Table 10 depicts the association of various breeds of buffaloes and Periodontal diseases. There was a statistically significant association found between a breed of buffaloes and Periodontal diseases (P<0.022).




Graph 1. various breed of buffaloes depicts had a moderate form of dental caries




Graph 2. depicts that different breed varieties in buffaloes had a moderate form of dental erosion.




Graph 3. depicts that various breeds of buffaloes had a moderate form of dental recession

**Discussion**

Oral health plays an important role in maintaining people's overall health, including animals. The body mass index had a major impact on oral health due to unhealthy foods and lifestyle habits. Various studies had conducted regarding the oral health status of buffaloes. This study focused on the association of various breeds and the oral health status of buffaloes. The major dental health problems among buffaloes are periodontal diseases and dental caries. The previous study conducted by Easley et al. in the year 2016 had discussed the dental prophylaxis for various removed the sharp enamel edges of teeth that caused soft-tissue irritation and any occlusal surface elongations. [12,13]. This odontoplasty procedure was often referred to as floating the teeth.

In the current study, the overall prevalence of periodontitis among breeds of buffaloes was 63.4%. This might be due to improper feeding habits and irregular oral health maintenance. Periodontitis attacks the deeper structures that support the teeth, damaging the surrounding bone and periodontal ligament, resulting in

tooth loss. Buffaloes' periodontal disease usually starts with impaction of food, gingival inflammation, diastema formation and due to periodontal pocket formation. This process proceeds toward the dentoalveolar space, causing detachment of tooth-supporting periodontal fibres. In the current study, the prevalence of gingivitis among various breeds of buffaloes was 50.8%. The unhealthy inflammatory precedes the development and rapid progression of periodontal problems. The deepening of the periodontal pocket paves the pathway for food impaction, which rapidly increases the progression of periodontal problems among various breeds of buffaloes. Diet plays a crucial role in maintaining oral health among buffaloes. The various breeds of buffaloes were statistically significant with gingivitis and periodontitis.

Buffaloe's peripheral caries (PC) was an increasingly recognized disorder that causes premature wear of teeth and dental fractures and thus has major welfare implications. [14] Little information was available on its prevalence or severity, and there are no proven associations with any risk factors. In the current study, the dental caries prevalence among buffaloes was 74.6%. The dental caries was found to be statistically significant with various breeds of buffaloes (P=0.001). The dental caries prevalence was higher in the present study, which might be due to improper intake of diet and lack of proper oral hygiene measures. There may be indications of maxillary sinusitis, local cellulitis, periostitis, alveolar periodontitis, and fistula formation, depending on the location of the infected tooth. Dental caries had a wide range of pathologic characteristics. As a result, the pus was drained in the area of mandibular fistula in various buffalo breeds may be unknown. [14]

Many animals were not examined until the infection was advanced, and tooth fractures were secondary rather than primary. It had been suggested that, in some species, the initiating feature of the establishment of apical osteitis and pulpitis was an abnormal eruption. When dental decay was advanced, extraction of the affected tooth was recommended. This usually had been achieved in buffaloes by surgical exposure of the decayed tooth and then repulsion into the mouth. A recent study had demonstrated that oral extraction might be performed safely and effectively using the precise technique, sedation, and nerve blocks, avoiding the major difficulties associated with aversion and the use of general anaesthesia.[14] The socket should be properly cleaned after extraction to eliminate all unhealthy bone and tooth pieces. When considering root-end resection and endodontic therapy in large animals, the age of the animal and the peculiarities of local disease should be taken into account.

**Limitations**

The limitation of the present study regarded the diagnosis of non-dental diseases. Some of these (e.g., Cushing's disease, Addison's disease, hypothyroidism) were likely based on the actual diagnosis, but other medical problems (e.g., skin disease/allergy, osteoarthrosis).

## Conclusion

The present study reported that the breed of buffaloes had a significant association with a dental recession, periodontal diseases and attrited teeth. In the modern era, oral health is a reflection of overall health. Therefore, there should be a daily regimen for oral hygiene for all breeds of buffaloes, and owners need to be advised on the best ways to improve the oral health status of buffaloes.

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