



# ASSESSMENT OF ORAL HYGIENE AMONG THE SOVIET CHINCHILLA AND NEWZEALAND WHITE RABBIT – A CROSS-SECTIONAL SURVEY

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## ABSTRACT

Dental problems in rabbits are distinctive due to their dental anatomy and physiology. This cross-sectional study aims to assess the oral hygiene among the Soviet chinchilla and Newzealand white rabbit. The breeds taken were the soviet chinchilla and Newzealand white rabbit, and they were classified based on their age, such as 0-3 yrs, 4-6 yrs, 7-9 yrs and 10-12 yrs and gender as reported by the owner. Malocclusion, gingivitis, calculus, mobility, and osteodystrophic dental disorder were recorded. A chi-square test was performed to find the association between oral health status and breed. Prevalence of osteodystrophic disorder among the rabbit breed were grade 1 (6.3%), grade 2 (47.7%), grade 3 (37.5%), grade 4 (3.9%), grade 5(4.6%). Prevalence of malocclusion among the breeds were stage 1 (53.1%), stage 2 (24.2%), stage 3 (22.7%). Prevalence of mobility among the rabbit M-0 (37.5%), M-1 (37.5%), M-2 (18.0%), M-3 (7.0%). Association between the breeds and osteodystrophic diseases were statistically significant ( $p < 0.05$ ). Association between the breeds and malocclusion, calculus and mobility were not statistically significant. There is a statistically significant ( $p < 0.05$ ) association between the breeds and the mild form of gingivitis. This study concludes that there is a significant difference only in osteodystrophic dental diseases and gingivitis between the breeds. Furthermore, malocclusion, tooth mobility and calculus have no statistically significant difference between the breeds. However, the prevalence of oral diseases in rabbits is more common, which can be prevented by a healthy fibre-rich diet and regular dental checkups.

## INTRODUCTION

Oral cavity diseases are the most commonly documented disorders in small herbivorous mammals (1,2). Dental problems in rabbits are distinctive due to their dental anatomy and physiology (3). The permanent teeth in rabbits are elodont, which means continuously growing, "open-rooted"(4). Also known as aradicular hypsodont, teeth with a long anatomic crown erupt continuously and remain open-rooted (5,6). Although deciduous dentition in rabbits has little clinical significance, it sheds during the first few days of life. The dental formula of rabbit's dentition is  $2 \times (I 2 / 1 C 0 / 0 P 3 / 2 M 3 / 3)$ . Rabbits have six incisor teeth that are not pigmented. There are four maxillary incisors, two labially with a single vertical groove in the midline and palatally with two rudimentary "peg teeth." A large diastema separates the incisor and premolar teeth. The premolar teeth resemble the molar teeth in shape and are sometimes referred to as "cheek teeth." They are tightly pressed together and create a single functioning occlusal grinding surface.

The buccal surface of the premolars and molars has a groove produced by enamel infolding. The natural diet of rabbits, like grasses and other leafy plants, is very abrasive due to the high proportion of silicate phytoliths; there is usually fast wear of the cheek teeth, roughly 3mm per month in a wild rabbit, which is countered by the equally rapid tooth development and eruption. Mandibular incisors and cheek teeth develop and erupt more quickly than maxillary teeth (7). The pathophysiological link between orthodontic, periodontal, and endodontic lesions in rabbits with dental disease is unknown and significantly more complex than in other animals (2). The most frequent aetiological concepts for dental disease in pet rabbits are genetic/inheritance factors, trauma, iatrogenic malocclusion, lack of abrasive diet that leads to inadequate or aberrant dental wear, and underlying metabolic disorders due to calcium and vitamin D insufficiency(5,8). The genetic or inherited factors in rabbits are mandibular prognathism, hypodontia and rarely achondroplasia and osteopetrosis. Traumatic injuries include incisor, premolar or molar fracture, incisor/ molar malocclusion due to jaw or other



skull fractures, lack of tooth abrasion due to lack of chewing leading to the continued eruption and abnormal incisor and cheek teeth coronal elongation(9). Rabbits are also prone to dental abscesses. Dental abscesses can be caused by root elongation, crown abnormalities, malocclusion, dental spurs, and food impaction between teeth(10,11,12).

In rabbits, there is also a progressive state of acquired dental disease and malocclusion defined by elongation of the tooth roots. Reduced calcification of the bones of the skull, particularly the alveolar bone that surrounds and supports the teeth, is a characteristic of acquired dental disease in rabbits. The loss of alveolar bone at the tooth's apex permits the constantly developing roots to extend and finally pierce the periosteum(13,14). Hence this cross-sectional study aims to assess the oral hygiene among the Soviet chinchilla and Newzealand white rabbit.

### MATERIALS AND METHODS

This study was conducted during the period of 3<sup>rd</sup> February 2021-25<sup>th</sup> April 2021. A total of 128 rabbits,

presented at a Madras Veterinary government Hospital OPD, Veppery and Blue cross of India, Guindy, were analyzed for the alterations in the oral cavity. The ethical clearance was obtained from the Department of Public Health Dentistry, SRM Dental College, Ramapuram, Chennai. The study's methodology and purpose were properly explained to the head of the Veterinary College department and the owner of the rabbits. The informed consent was obtained from them before conducting the research. The breeds taken were the soviet chinchilla and Newzealand white rabbit, and they were classified based on their age, such as 0-3 yrs, 4-6 yrs, 7-9 yrs and 10-12 yrs and gender as reported by the owner. The standard tooth formula for the permanent dentition of rabbits, which was used to determine pathological changes in the dentition, is 2 x (I 2 / 1 C 0 / 0 P 3 / 2 M 3 / 3). The tooth numbering system used for the rabbit is the Triadan system.[<https://www.rvc.ac.uk/review/dentistry/basics/triadan/other.html>]

**TABLE 1: AGE, GENDER AND BREED DISTRIBUTION OF THE EXAMINED RABBITS (number of the rabbits)**

Age groups	Frequency n (%)
0-3 YEARS	18 (14.1)
4-6 YEARS	37(28.9)
7-9 YEARS	39(30.5)
10-12 YEARS	34(26.6)
<b>BREED</b>	
Soviet chinchilla rabbit	64 (50.0)
Newzealand white rabbit	64 (50.0)
<b>GENDER</b>	
Female	83(64.8)
Male	45(35.2)

### CLINICAL EXAMINATION AND CLASSIFICATION OF ORAL DISORDERS

Each rabbit was examined clinically. Malocclusion, gingivitis, calculus, mobility, and osteodystrophic dental disorder were recorded. Calculus was recorded by the Modified Ramfjord calculus index, which is characterized as (CI-0) No calculus; (CI-1) Minimal calculus deposition; (CI-2) Moderate calculus deposition; (CI-3) Heavy calculus deposits on the crown and subgingivally. Gingival diagnostic criteria recorded gingivitis by Ramfjord, (Score 1) Absence of signs of inflammation; (Score 2) Mild to moderate inflammatory gingival changes, not extending around the tooth; (Score 3) Mild to moderately severe gingivitis extending all around the tooth; (Score 4) Severe gingivitis characterized by marked redness, swelling, tendency to bleed and ulceration. Malocclusion of the cheek teeth was recorded as (Stage 1) Curvature of the second, third and fourth lower cheek teeth, resulting in spurs that grow into the tongue and lacerate it; (Stage 2) Curvature of the first and second maxillary cheek teeth that can grow into the cheek. This appears to be less painful than a tongue laceration but still causes eating difficulties. In addition, abscesses on the cheek can result from these penetrating wounds; (Stage 3). Rotation, curvature and elongation of the lower fourth or fifth mandibular cheek teeth. This can result in spurs that grow into the cheek or in a rostral

direction across the occlusal surfaces of the lower cheek teeth. Tooth mobility which can lead to periodontal disease, root fracture and neoplasia, was also recorded as (M-1) Slight tooth mobility; (M-2) Moderate tooth mobility <1mm; (M-3) Severe tooth mobility >1mm.

Osteodystrophic dental diseases were recorded as (Grade 1) normal; (Grade 2) subclinical dental disease; (Grade 3) acquired crown abnormalities and occlusal defects; (Grade 4) major abnormalities of tooth crowns and cessation of tooth growth; (Grade 5) Osteomyelitis and abscess formation.

### STATISTICAL ANALYSIS

The Normality tests, Kolmogorov-Smirnov and Shapiro-Wilks tests reveal that the study followed a normal distribution. Therefore, to analyse 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 breed. SPSS (IBM SPSS Statistics for Windows, Version 26.0, Armonk, NY: IBM Corp. Released 2019) is used to analyse the data. Significance level is fixed as 5% ( $\alpha = 0.05$ ). P-value <0.05 is considered to be statistically significant.



## RESULTS

One hundred twenty-eight rabbits were evaluated for oral hygiene status. 64 rabbits in each breed (Soviet chinchilla rabbit and Newzealand white rabbit). The age distribution of the rabbit breed ranged between 0-3 yrs (14.1%), 4-6 yrs (28.9%), 7-9 yrs (30.5%), and 10-12 yrs (26.6%). Gender distribution among the rabbits was Female (64.8%) and Male (35.2%) [TABLE 1]. Prevalence of osteodystrophic disorder among the rabbit breed were grade 1 (6.3%), grade 2 (47.7%), grade 3 (37.5%), grade 4 (3.9%), grade 5(4.6%). Prevalence of malocclusion among the breeds were stage 1 (53.1%), stage 2 (24.2%), stage 3 (22.7%) [TABLE 2]. The prevalence of

gingivitis among the rabbit breeds is normal (83.6%), mild (16.4%), moderate and severe (0%). The prevalence of calculus among the rabbits was normal (23.4%), mild (71.9%), moderate (3.1%), and severe (1.6%). Prevalence of mobility among the rabbit M-0 (37.5%), M-1 (37.5%), M-2 (18.0%), M-3 (7.0%) [TABLE 3]. Association between the breeds and osteodystrophic diseases were statistically significant ( $p < 0.05$ ). Association between the breeds and malocclusion, calculus and mobility were not statistically significant. There is a statistically significant ( $p < 0.05$ ) association between the breeds and the mild form of gingivitis. [TABLE 4]

**TABLE 2: PREVALENCE OF OSTEODYSTROPHIC DENTAL DISORDER AND MALOCCLUSION OF CHEEK AMONG THE RABBIT**

Osteodystrophic Disorder	n(%)	MALOCCLUSION	n(%)
GRADE 1	8 (6.3)	STAGE 1	68(53.1)
GRADE 2	61(47.7)	STAGE 2	31(24.2)
GRADE 3	48(37.5)	STAGE 3	29(22.7)
GRADE 4	5(3.9)		
GRADE 5	6(4.6)		

**TABLE 3: PREVALENCE OF GINGIVITIS, CALCULUS AND TOOTH MOBILITY AMONG THE RABBIT**

GINGIVITIS	n(%)	CALCULUS	n(%)	MOBILITY	n(%)
Score 0	107 (83.6)	CI-0	30(23.4)	M-0	48(37.5)
Score 1	21(16.4)	CI-1	92(71.9)	M-1	48(37.5)
Score 2	0(0)	CI-2	4(3.1)	M-2	23(18.0)
Score 3	0(0)	CI-3	2(1.6)	M-3	9(7.0)

**TABLE 4: ASSOCIATION BETWEEN BREEDS AND OSTEODYSTROPHIC DENTAL DISEASES, MALOCCLUSION, GINGIVITIS, CALCULUS AND TOOTH MOBILITY**

BREED	SOVIET CHINCHILLA RABBIT	NEWZEALAND WHITE RABBIT	P-value
Osteodystrophic dental diseases	59	64	0.018*
Malocclusion	64	64	0.054
Gingivitis	64	64	0.027*
Calculus	64	64	0.094
Tooth mobility	64	64	0.903

## DISCUSSION

This study aimed to assess oral hygiene among the two breeds of rabbits. (Soviet chinchilla rabbit and Newzealand white rabbit). Oral health plays a role in maintaining people's overall health, including animals. Nutrition has a major impact on oral health due to the intake of unhealthy foods and lifestyle habits. About 305 breeds of domestic rabbits are available in several countries, out of which two breeds have been taken in our study. (Data export: Global Rabbit Breeds by Country"(15).

They are Soviet Chinchilla and New Zealand White breeds. Acquired dental disease is a chronic condition caused by malocclusions, trauma, and poor diet (16). It harms rabbit welfare, causing dermatitis, conjunctivitis, gastrointestinal problems, and dehydration (17). Pathology of the cheek teeth may be underdiagnosed because rabbits may not exhibit

clinical indications until the disease has progressed to an advanced stage (18,19). Dental diseases were originally thought to be congenital. However, it is now clear that other variables such as metabolic bone disease, dietary texture, and genetic susceptibility have a role, even if congenital malocclusion does occur (6,20,13,21). In a study conducted by Jekl et., 2008 dental problems were reported in 38.1% of the rabbits (19). In our study, the prevalence of dental diseases such as osteodystrophic dental diseases, malocclusion, calculus, gingivitis, and tooth mobility was 100%. All rabbits were reported to the OPD with a problem. A study conducted by Bahman Mosallanejad et al. in 2010 reported that the malocclusion and root elongation was 6.7% in pet rabbits(22).

The rabbit diet plays a major role in preventing dental diseases in rabbits. The study conducted by A.L. Meredith J.L et al. reports that dental diseases (tooth curvature) developed



due to the museli diet for the rabbit. In our study, the dietary patterns have not evaluated for the rabbits.(23)

## CONCLUSION

This study concludes that there is a significant difference only in osteodystrophic dental diseases and gingivitis between the breeds. Furthermore, malocclusion, tooth mobility and calculus have no statistically significant difference between the breeds. However, the prevalence of oral diseases in rabbits is more common, which can be prevented by a healthy fibre-rich diet and regular dental checkups.

## LIMITATION OF THE STUDY

The limitation of this study is that only a small number of samples was obtained; further longitudinal studies should be conducted to get more appropriate results. In addition, dietary pattern analysis can also be done for a more precise outcome.

## CONFLICT OF INTEREST: NONE

## REFERENCES

- Wiggs, R. B. & Lobprise, H. B. (1997) *Basics of orthodontics*. In: *Veterinary Dentistry Principles and Practice*. Eds R. B. Wiggs and H. B. Lobprise. LippincotRaven, Philadelphia, PA, USA. pp 435-481. (<https://agris.fao.org/agris-search/search.do?recordID=US9715978>)
- Verstraete, F. J. M. & Osofsky, A. (2005) *Dentistry in pet rabbits*. *Compendium on Continuing Education for the Practicing Veterinarian* 9, 671-684. ([http://www.medirabbit.com/EN/Dental\\_diseases/Rabbit\\_dentistry1.pdf](http://www.medirabbit.com/EN/Dental_diseases/Rabbit_dentistry1.pdf))
- Lobprise HB, Wiggs RB. *Dental and oral disease in lagomorphs*. *Journal of Veterinary Dentistry*. 1991; 8(2):11-7. (<https://doi.org/10.1177%2F089875649100800205>)
- Kertesz P. *Colour atlas of veterinary dentistry and oral surgery*. Wolfe Publishing; 1993. (<https://agris.fao.org/agris-search/search.do?recordID=US201300722858>)
- Crossley DA. *Clinical aspects of lagomorph dental anatomy: the rabbit (Oryctolagus cuniculus)*. *Journal of Veterinary Dentistry*. 1995; 12(4):137-40. (<https://doi.org/10.1177%2F089875649501200402>)
- Wiggs RB, Lobprise H. *Dental anatomy and physiology of pet rodents and lagomorphs*. *Manual of Small Animal Dentistry*, 2nd edn, Cheltenham. 1995; 15:68-73
- Meredith A. *Rabbit dentistry*. *European Journal of Companion Animal Practice*. 2007;17(1):55-62.
- Harcourt-Brown, F. (2007a) *Radiographic signs of renal disease in rabbits*. *Veterinary Record* 160, 7877-7894 (<https://doi.org/10.1136/vr.160.23.787>)
- Jekl V, Redrobe S. *Rabbit dental disease and calcium metabolism—the science behind divided opinions*. *Journal of Small Animal Practice*. 2013; 54(9):481-90. (<https://doi.org/10.1111/jsap.12124>)
- Aiken S. *Part II surgical treatment of dental abscesses in rabbits*. In: *Quesenberry KE, Carpenter JW, eds. Part II surgical treatment of dental abscesses in rabbits*. 2nd ed. Philadelphia: WB Saunders Co, 2004; 379–382.
- Harcourt-Brown FM. *Dental disease*. In: *Harcourt-Brown FM, ed. Dental disease*. Oxford, England: Butterworth Heinemann, Elsevier Science, 2002; 165–205.
- Harcourt-Brown FM. *The progressive syndrome of acquired dental disease in rabbits*. *J Exot Pet Med* 2007b; 16:146–157 (<https://doi.org/10.1053/j.jepm.2007.06.003>)
- Harcourt– Brown, F. (2002) *Textbook of Rabbit Medicine*, Publisher: Butterworth- 115 *Iranian Journal of Veterinary Science and Technology*, Vol. 2, No. 2 Heinemann, Oxford. First published.
- Caelenberg, A.V., Rycke, L.D., Hermans, K., Verhaert, L., Bree, H.V. and Gielen, I. (2008) *Diagnosis of dental problems in pet rabbits (Oryctolagus cuniculus)*. *Vlaams Diergeneeskundig Tijdschrift* 77. (<http://hdl.handle.net/1854/LU-600517>)
- Data export: *Global Rabbit Breeds by Country*". DAD-IS (Domestic Animal Diversity Information System). FAO (Food and Agriculture Organization of the United Nations). 21 November 2017. Retrieved 30 March 2018.
- Mullan SM, Main DC. *Survey of the husbandry, health and welfare of 102 pet rabbits*. *Veterinary record*. 2006; 159(4):103-9. (<https://doi.org/10.1136/vr.159.4.103>)
- Böhmer E. *Dentistry in rabbits and rodents*. John Wiley & Sons; 2015 Feb 26. ([https://www.google.co.in/books/edition/Dentistry\\_in\\_Rabbits\\_and\\_Rodents/tyzaBgAAQBAJ?hl=en&gbpv=1&dq=2.%09B%C3%B6hmer+E.+Dentistry+in+rabbits+and+rodents.+John+Wiley+%26+Sons%3B+2015+Feb+26.&pg=PA107&printsec=frontcover](https://www.google.co.in/books/edition/Dentistry_in_Rabbits_and_Rodents/tyzaBgAAQBAJ?hl=en&gbpv=1&dq=2.%09B%C3%B6hmer+E.+Dentistry+in+rabbits+and+rodents.+John+Wiley+%26+Sons%3B+2015+Feb+26.&pg=PA107&printsec=frontcover))
- Crossley DA. *Oral biology and disorders of lagomorphs*. *Veterinary Clinics: Exotic Animal Practice*. 2003 ;6(3):629-59 ([https://doi.org/10.1016/S1094-9194\(03\)00034-3](https://doi.org/10.1016/S1094-9194(03)00034-3))
- Jekl V, Hauptman K, Knotek Z. *Quantitative and qualitative assessments of intraoral lesions in 180 small herbivorous mammals*. *Veterinary Record*. 2008; 162(14):442-9. (<https://doi.org/10.1136/vr.162.14.442>)
- McDonald, P., Edwards, R.A., Greenhalgh, J.F.D. and Morgan, C.A. (1996) *Animal nutrition*, 5th edn. Longman. Singapore Publishers.
- Johnson, K.A. and Watson, A.D.J. (2005) *Skeletal diseases*. In: *Ettinger, S.J. and Feldman, E.C. Textbook of veterinary internal medicine*. 5th edn, W.B. Saunders Company, Philadelphia. pp 1887– 1916
- Mosallanejad B, Moarrabi A, Avizeh R, Ghadiri A. *Prevalence of dental malocclusion and root elongation in pet rabbits of Ahvaz, Iran*. *Iranian Journal of Veterinary Science and Technology*. 2010 1;2(2):109-16. (<https://dx.doi.org/10.22067/veterinary.v2i2.8375>)
- Meredith AL, Prebble JL, Shaw DJ. *Impact of diet on incisor growth and attrition and the development of dental disease in pet rabbits*. *Journal of Small Animal Practice*. 2015; 56(6):377-82. (<https://doi.org/10.1111/jsap.12346>)