



Influence of Diet Type on Oral Health of Dogs

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Abstract

Canine dietary requirements and nutritional habits have changed since dogs were first domesticated. Therefore, periodontal diseases (PD) are the most common problem affecting dogs in all age groups. The aim of this study was to determine the relationship between diet type and oral health of dogs examined in veterinary clinic. To reveal the association between nutrition and oral health, two trials were held at the same veterinary practice in Istanbul-Turkey during 2016 and 2018. For the first trial; data coming from 100 patients examined, pre-determined questionnaire forms were filled by the owners. For the second trial, 106 dogs that came to the clinic during 2018 were examined by veterinarians for oral health and a form was filled out for each patients. It was determined that most of dogs (Trial 1: 82.0%; Trial 2: 71.7%) were fed dry food and also most of dogs older than 4 years had oral health problems ($P<0.05$). No statistically significant association was determined between oral health and type of diet, gender, and home dental care in Trial 1. Also, it was observed that oral problems in dogs fed once a day were significantly fewer than those in dogs fed two or more times a day ($P<0.05$). However, in Trial 2, statistically significant association was determined between PD and age, type of diet, oral health ($P<0.05$). These results suggest that oral health problems are more likely to be seen in older animals and feeding dogs with dry food decreases the occurrence of PD.

Keywords: Dog, Diet, Oral health, Periodontal disease

Introduction

As a strong indicator of the overall health of a patient, oral health can help to inform a veterinarian about the therapy methods most suitable to a particular patient. Studies have shown that there is a close relationship between many systemic diseases like hepatitis, glomerulonephritis, interstitial nephritis, endocarditis, chronic bronchitis, pulmonary fibrosis, and periodontitis (PD).^{1,2} Rawlinson et al.³ reported that a decrease in C-reactive protein concentration after treatment was correlated with the degree of PD. The type of diet in the formation of oral diseases is considered to be a clinical problem. However, it has not been thoroughly

researched.

Periodontal disease is one of the most common health problems in adult dogs, affecting up to 80-85% of the population.⁴⁻⁷ In a study carried out in the United States on 31,484 dogs of all ages, calculus and gingivitis were reported to be present in 21% and 20% of all dogs, respectively, with “dental disease” being the most commonly reported disease.⁴ Several authors have previously identified that wet or soft food is more detrimental to teeth than dry food.⁸⁻¹³ There is a reasonable evidence that harder foods requiring more prehension and mastication are preferable for pet animals and that soft diets are associated with increased frequency and severity of PD.¹⁴⁻¹⁶ Studies in which

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animals were fed by intubation have demonstrated that food debris in mouth is not directly indicative of dental plaque formation.¹⁷ Lindhe et al.¹⁸ reported that there was fast plaque accumulation along the gingival margin of a Beagle dog with no oral hygiene and the dog developed gingivitis within a few weeks. To prevent PD in dogs, it was commonly recommended to feed with dry dog food.¹⁹ However, dry food alone did not prove to be sufficient for improved oral health in clinical studies.²⁰

The role of diet type in periodontal disease is a topic that has not received extensive or recent attention in veterinary medicine. Many clinical veterinarians in Turkey think that raising awareness of oral health in dogs to ensure proper oral hygiene at home is very important. However, there is no available data regarding the relationship between oral health problems and the diet of pet animals in Turkey. The purpose of this study was to evaluate the relationship between diet and oral health in dogs examined at a veterinary practice.

Material and Methods

To reveal the association between the type of diet and oral health, two trials were held at the same private veterinary practice in Istanbul during 2016 and 2018.

Trial 1

For the first trial; data coming from 100 patients examined, pre-determined questionnaire forms were filled by the owners, between September-2016 and February-2017. Parameters were recorded utilizing standardized charts, and included the age of the patients, type of diet fed (dry, wet or mix), gender, feeding frequency and teeth cleaning at home. Chi-square analysis was used to determine the effect of age, gender, type of food, nutritional frequency and home dental care on oral health.

Trial 2

For the second trial, all dogs (n=106) that came to the private veterinary practice during 2018 were examined by veterinarians for oral health and a form (same form used in Trial 1) was filled out for each patients. The examination procedure consisted of three parts: 5 min of dental/periodontal examination in the patient, 5 min of interview and filling in a questionnaire, and 5 min of presentation of diagnosis to the owner, and recommendations for professional treatment. Parameters were recorded and scored, utilizing standardized charts, and included the age of the patients, type of diet fed (dry, wet or mixed -dry and wet-), size of mandibular lymph nodes on palpation, presence of dental deposits, presence of PD, and caries, broken or

missing teeth. Assessed oral health parameters modified from Gawor et al.¹³ during patient examination.

Data and statistical analysis

Kruskal-Wallis and Mann-Whitney U tests were used to determine the effects of type of diet and feeding frequency on oral health, lymphadenopathy, dental deposits, PD and caries, broken or missing teeth. Mann-Whitney U tests was also used, in order to determine the effects of age, gender, type of food, nutritional frequency and home dental care on oral health. For statistical calculations, SPSS 10.0 software was used. The significance level was set at $P < 0.05$.

Results

Trial 1

It was determined that most of dogs (82.0%) were fed dry food and also most of dogs older than 4 years (23.7%) had oral health problems ($P < 0.05$). No statistically significant association was determined between oral health and type of diet, gender, and home dental care. Also, it was observed that oral problems in dogs fed once a day were significantly fewer than those in dogs fed two or more times a day ($P < 0.05$) (Table 1).

Table 1. Association of different parameters with oral health in dogs (Trial 1; n=100)

		n	Dogs with problems in oral health		P Value
			Frequency	%	
Age	≤ 3.0	24	0	0.0 ^b	0.008
	4.0 ≥	76	18	23.7 ^a	
Diet	dry	82	17	20.7	0.304
	wet	3	0	0.0	
	mix	15	1	6.7	
Gender	female	47	7	14.9	0.446
	male	53	11	20.8	
Feeding frequency	1/day	22	0	0.0 ^b	0.007
	2/day	64	12	19.0 ^a	
	always	15	6	40.0 ^a	
Teeth Cleaning at Home	yes	57	10	17.5	0.891
	no	43	8	18.6	

^{a,b}: The diversity between different letters in the same column is significant ($P < 0.05$).

Trial 2

At the end of this study, 71.7% of the surveyed dogs consumed dry food. According to the veterinarian findings, the effect of age, type of food, sex, feeding frequency, dental hygiene and oral health problem on the enlargement of

lymph nodes, which is one of the first signs of oral health problems, is given in Table 2. There was a tendency to be significance for diet type effect ($P= 0.077$); however no parameters showed any statistically significant effect.

Table 2. Size of mandibular lymph nodes on palpation (Trial 2; n=106)

		Mean	SD	Medium	Min	Max	P Value
Age	≤ 3.0	0.12	0.332	0	0	1	0.448
	4.0 ≥	0.20	0.433	0	0	2	
Diet	dry	0.13	0.380	0	0	2	0.077
	wet	0.25	0.500	0	0	1	
	mix	0.32	0.475	0	0	1	
Gender	female	0.13	0.344	0	0	1	0.317
	male	0.22	0.460	0	0	2	
Feeding frequency	1/day	0.06	0.236	0	0	1	0.247
	2/day	0.18	0.421	0	0	2	
	always	0.33	0.485	0	0	1	
Teeth Cleaning at Home	yes	0.21	0.509	0	0	2	0.991
	no	0.18	0.382	0	0	1	
Problems in oral health	yes	0.24	0.431	0	0	1	0.166
	no	0.15	0.339	0	0	2	

^{a, b}: The diversity between different letters in the same column is significant ($P<0.05$).

The relationship between dental deposits and plaque formation, age, type of diet, sex, feeding frequency, dental hygiene and oral health problem which are important findings in oral health problems are given in Table 3. There was a significant relationship between dental stone plaque formation and oral health ($P < 0.05$), but no statistically significant relationship was found with other parameters.

The association between periodontitis (PD), which is the most important finding in oral health problems, and age, type of diet, sex, frequency of feeding, dental hygiene and oral health problems is given in Table 4. There was a significant association between PD and age, type of diet and oral health ($P < 0.05$).

According to the veterinarian findings, the relationship between caries, fractures or missing teeth and age, type of diet, sex, feeding frequency, dental hygiene and oral health problems are given in Table 5. It was found that the rates of fracture and caries in the teeth increased in advanced ages and evidence of caries, broken or missing teeth was very important finding for oral health ($P < 0.05$).

Table 3. Evidence of dental deposits (Trial 2; n=106)

		Mean	SD	Medium	Min	Max	P Value
Age	≤ 3.0	0.84	0.473	1	0	2	0.090
	4.0 ≥	1.18	0.605	1	0	2	
Diet	dry	1.05	0.613	1	0	2	0.321
	wet	1.25	0.500	1	1	2	
	mix	1.28	0.542	1	0	2	
Gender	female	1.07	0.580	1	0	2	0.358
	male	0.16	0.616	1	0	2	
Feeding frequency	1/day	1.11	0.583	1	0	2	0.807
	2/day	1.06	0.596	1	0	2	
	always	1.33	0.594	1	0	2	
Teeth Cleaning at Home	yes	1.04	0.624	1	0	2	0.433
	no	1.14	0.590	1	0	2	
Problems in oral health	yes	1.33 ^a	0.570	1	0	2	0.001
	no	0.97 ^b	0.572	1	0	2	

^{a, b}: The diversity between different letters in the same column is significant ($P < 0.05$).

Table 4. Evidence of periodontal disease (PD) (Trial 2; n=106)

		Mean	SD	Medium	Min	Max	P Value
Age	≤ 3.0	0.44 ^b	0.583	0	0	2	0.004
	4.0 ≥	0.87 ^a	0.680	1	0	2	
Diet	dry	0.68 ^b	0.681	1	0	2	0.034
	wet	1.25 ^a	0.500	1	1	2	
	mix	1.00 ^a	0.645	1	0	2	
Gender	female	0.69	0.701	1	0	2	0.199
	male	0.86	0.661	1	0	2	
Feeding frequency	1/day	0.78	0.647	1	0	2	0.856
	2/day	0.72	0.666	1	0	2	
	always	1.00	0.767	1	0	2	
Teeth Cleaning at Home	yes	0.75	0.737	1	0	2	0.919
	no	0.79	0.669	1	0	2	
Problems in oral health	yes	1.12 ^a	0.633	1	0	2	0.001
	no	0.55 ^b	0.619	0	0	2	

^{a, b}: The diversity between different letters in the same column is significant ($P < 0.05$).

Discussion and Conclusion

The type of diet and home oral hygiene are important factors that influence oral health status in dogs^{11,13,16,21-23} Gawor et al.¹³ observed minor occurrences of mandibular lymphadenopathy (18% vs 45%), dental deposits (56% vs 83%) and PD (22% vs 55%) in dogs that were fed dry and wet food respectively. In line with findings of Vandendriessche et al.,²⁴ it was determined that most of the

dogs (Trial 1: 82.0%; Trial 2: 71.7%) were fed dry food. Out of the dogs which were fed dry food, 65% in Trial 1 and 52.2% in Trial 2 were found to have no problems with their oral health. Evidence of periodontal disease (PD) is sig-

Table 5. Evidence of caries, broken or missing teeth (Trial 2; n=106)

		Mean	SD	Medium	Min	Max	P Value
Age	≤ 3.0	0.16	0.374	0	0	1	0.030
	4.0 ≥	0.47	0.663	0	0	2	
Diet	dry	0.40	0.615	0	0	2	0.837
	wet	0.50	0.577	0.50	0	1	
	mix	0.40	0.645	0	0	2	
Gender	female	0.38	0.614	0	0	2	0.604
	male	0.41	0.622	0	0	2	
Feeding frequency	1/day	0.22	0.428	0	0	1	0.233
	2/day	0.43	0.630	0	0	2	
	always	0.50	0.707	0	0	2	
Teeth Cleaning at Home	yes	0.38	0.647	0	0	2	0.546
	no	0.41	0.610	0	0	2	
Problems in oral health	yes	0.57 ^a	0.668	0	0	2	0.014
	no	0.29 ^b	0.555	0	0	2	

^{a, b}: The diversity between different letters in the same column is significant ($P < 0.05$).

nificantly lower in dogs that were fed dry food than dogs that were fed wet or mixed food in Trial 2 ($P < 0.05$) (Table 4). One reason is that chewing the dry kibbles cleans their teeth, mitigating plaque and tartar accumulation. In contrast to these results, in an extensive survey about diseases, dogs consuming only dry food did not show improved oral health when compared with dogs eating soft-moist foods.²⁰ It has been accepted that a dry food diet is better for oral health than a wet or canned food diet for pets, but this perspective has been confronted.²⁵ The only diets which have been documented to be effective as a dietary preventive oral health measure are veterinary dental diets.¹¹ One limitation is the cost of feeding such diets. However, more importantly, these diets do not meet NRC (2006) standards for all life stages, for example during pregnancy and the lactation.²⁶

As previously reported in companion dogs, increasing age was associated with increased risk of PD.^{27,28} Harvey et al.²⁸ examined more than 1,000 dogs under anesthesia in veterinary hospitals in America and found that most of the companion dogs had calculus, gingivitis, and periodontal attachment loss and the diseases increased in severity with age. They also reviewed studies conducted from 1968 to 1987 and reported a positive relationship between increas-

ing prevalence of PD and increasing age. The results of the present study are in line with these studies. Because, it was determined most of dogs older than 4 years (Trial 1: 23.7%; Trial 2: 32.1%) had oral health problems ($P < 0.05$). It has been shown by several studies that the most effective way of removing plaque and thus counteracting periodontal disease is regular tooth brushing.^{8,18} The frequency of tooth brushing in the animals should be daily, to constantly avoid the formation of dental plaque and to establish a routine between the owner and the animal.²⁹ However, less than 10% of the owners agree with these recommendations for the dental care of their dogs.³⁰ In the current study, no statistically significant association was determined between teeth cleaning at home and PD (Table 1 and Table 4). These results indicate that feeding a dry food diet has a positive influence on oral health, decreasing the occurrence of PD dogs. Diet modifications have the potential to influence periodontal disease management improving clinical outcomes; however, further research will be required in order to fully elucidate mechanisms and potential benefits for dogs.

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