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Epidemiological studies on otitis externa in dogs

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Abstract
The aim of the present epidemiological study was to investigate the occurrence of otitis externa in dogs in Jabalpur. A total of 651 dogs with visible signs of dermatological disorders were suspected of otitis externa and screened. Among these 92 dogs were found positive for otitis externa resulting in an overall occurrence of 14.13 percent. Highest occurrence was recorded in dogs of 3-6 years of age. Breed wise occurrence was highest in Labrador Retrievers and gender wise occurrence was higher in males as compared to the females. The highest no. of cases were recorded during the monsoon season (July and August). The percent occurrence of bilateral and unilateral otitis externa was 61.04 and 38.06, respectively. Various clinical signs associated with otitis externa were pruritis, erythema, pain, ear exudates, head shaking, malodour, swelling, head tilt, scaling/crusting and hyperpigmentation.

Keywords: Occurrence, age, breed, sex, season

Introduction
The ears are a very significant component of a dog's sensory system since they enable them to perceive even the smallest noises with almost unparalleled clarity. Ear infections are excruciatingly painful among which otitis externa is a common disorder in dogs that can significantly impact the welfare of the affected animals. In the clinics, cases of otitis externa in dogs are presented more commonly than otitis media and interna (McKeever and Torres, 1997) [16]. Prevalence of the most common ear infection otitis externa i.e., 5-20 percent globally, is notably higher (30-40 percent) in the tropical environment (Fernandez *et al*., 2006) [9]. In otitis externa, the inflammatory process promotes erythema of the pinnae, external meatus and lining of the external canal of varying magnitude. Subsequently, a wide range of clinical signs, namely head shaking, ear scratching, ceruminous or purulent otic discharge, self-trauma and aural hematomas and acute moist dermatitis near the base of ear, foul odour, swelling, and pain are observed (Rosser, 2004) [24]. Diagnostic protocol involves identification of the bacterial and fungal isolates, based on the cultural, morphological and biochemical parameters (Engelen *et al*., 2010) [8]. Aseptically collected samples from the external auditory canal are heat fixed and stained with methylene blue or Diff-Quik stain (Saridomichelakis *et al*., 2007) [26].

Materials and Methods
The present study was conducted in Veterinary Clinical Complex (VCC), College of Veterinary Science and A.H., Nanaji Deshmukh Veterinary Science University (NDVSU), Jabalpur. Dogs presented at VCC, C.V.Sc & A.H., NDVSU, Jabalpur during the period from 1st May, 2022 to 31st October, 2022 were considered for the present study. Dogs suggestive of dermatological disorders were screened for otitis externa on the basis of clinical signs *viz.* local pain perception, head tilt to one side, pruritus, erythema, ear discharge, malodour and crusting and were further subjected to cytological examination to identify the specific infectious agent.

Results and Discussion
In the present study, out of 651 dogs screened for otitis externa, 92 dogs were found positive and thus, the overall occurrence of otitis externa in dogs stood at 14.13 percent (92/651) which was in close agreement with 14.77 percent (39/264) reported by Babji *et al.* (2021) [1]

and 15 percent recorded by Rosser (2004) [24]. However, the perusal of the published reports revealed both markedly higher as well as the lower prevalence of otitis in dogs, compared to the observations recorded in the present study: Higher values: 18.14 percent (Roy *et al.*, 2018) [25] and 21.27 percent (Kumar *et al.*, 2014) [14], and lower values: 5.32 percent (Khan *et al*., 2019) [12], 6.88 percent (Reddy, 2017) [23] and 10.20 percent (Neill *et al.*, 2014) [20]. Marked variation in the occurrence of otitis externa in the above reports might be attributed to the wide variation in the number of samples tested by the different workers under varying geo-climatic conditions and managerial practices followed by pet owners.

Age wise occurrence of otitis externa in dogs

Age wise occurrence was highest in age group between 3 to 6 years i.e., 21.91 percent (39 out of 178) followed by age group more than 6 years i.e., 15.70 percent (19 out of 121), then age group 1-3 years i.e., 10.52 percent (22 out of 209) and the minimum occurrence was recorded in dogs upto 1 year i.e., 8.39 percent (12 out of 143). A significant difference was observed in age wise occurrence of otitis externa in dogs at VCC, Jabalpur (Table 1).

The higher susceptibility in dogs to otitis in the 3-6 years age group (present study) is in close agreement with the earlier reports (Laxmi, 2006 and Kumar *et al.*, 2014) [15, 14]. Barua *et al.* (2021) [2] also observed higher prevalence of ear disorders in dogs of 4-6 years age. However, the results are at variance with the findings of several investigators who reported maximum cases in 1-5 years age group (Dixit, 2005 and Babji *et al.*, 2021) [7, 1], and over 5 years of age (Subapriya *et al*., 2015 and Reddy, 2017) [28, 23]. Zur *et al.* (2011) [32] observed no age predisposition in the dogs suffering from otitis externa.

The higher occurrence of otitis in the companion dogs in the 3-6 years age group is presumably attributable mainly to the pathophysiological factor: wax (esters of higher fatty acids) formation in the ear canal of middle age group dogs. Further, these more energetic dogs often get more exposure to external environment as well as the etiological agents: microbial and fungal which are apparently a major contributing factor for ear infection.

Breed wise occurrence of otitis externa in dogs

Significantly higher occurrence was recorded in Labrador Retrievers i.e., 20.83 percent (25 out of 120) followed by German Shepherd i.e., 17.59 percent (19 out of 108), Pug i.e., 14.45 percent (12 out of 83), non-descript i.e. 14.28 percent (16 out of 112), Beagle i.e. 13.89 percent (10 out of 72), Golden Retriever i.e. 10.29 percent (5 out of 49), other breeds (Rottweiler, Pitbull, Doberman, Akita etc.) i.e. 5.19 percent (4 out of 77) and Spitz i.e. 3.22 percent (1 out of 31) (Table 2).

The findings in the present study are similar to the reports of several investigators who recorded highest occurrence of otitis externa in Labrador retrievers (Sharma *et al*., 2016; Reddy, 2017 [23]; Parmar *et al*., 2020 [21]; Babji *et al.*, 2021 [1] and Barua *et al*., 2021) [2]. Kumar *et al.* (2014) [14] reported that German shepherd dogs were the most affected with otitis externa, followed by Labrador retrievers. Notably, compared to the other breeds Labrador Retrievers possess more apocrine tubular gland rendering them more susceptible to otitis externa (Bass, 2004) [3] and other factors such as humidity, age, pendulous ears, season, comorbidities (Babji *et al.*, 2021) [1].

Gender wise occurrence of otitis externa in dogs

Out of total screened dogs, 380 were males and 271 were females. 55 male dogs i.e. 14.47 percent (55 out of 380) and 37 female dogs i.e. 13.65 (37 out of 271) were found affected with otitis externa. No significant difference was observed in gender wise occurrence of otitis externa in dogs at VCC, Jabalpur (Table 3).

Relatively higher occurrence of otitis externa in the male dogs compared to the females (present study) is corroborated by the published reports (Saridomichelakis *et al*., 2007 [26]; Reddy, 2017 [23]; Parmar *et al.*, 2020 [21]; Babji *et al.*, 2021 [1] and Barua *et al.*, 2021) [2], contrary to the report of Fernandez *et al*. (2006) [9] who noticed larger number of females affected with otitis externa, compared to the males. However, other investigators (Topala *et al.*, 2007 and Zur *et al.*, 2011) [31, 32] reported no sex predisposition in dogs suffering from otitis.

Many reports attribute the higher occurrence of otitis in male dogs to the greater number of male dogs presented in clinics as compared to females. It is possible that the higher occurrence recorded in male dogs is due to the suitable selective preference since dog owners prefer male dogs more as consociate animals.

Season wise occurrence of otitis externa in dogs

Non-significantly higher occurrence was recorded in the monsoon season (July and August) i.e., 16.46 percent followed by pre-monsoon (May and June) i.e., 13.94 percent and post-monsoon (September and October) i.e., 11.50 percent (Table 4).

The results were consistent with the published reports of Baxter (2011) [4], Kumar *et al.* (2014) [14] and Barua *et al.* (2021) [2] who reported higher prevalence of otitis in dogs during the monsoon season. This contention is supported by the earlier report of Chaudhary and Mirakhur (2002) [5] who stated that the increased relative humidity arising from rainfall and elevated atmospheric temperature promote the growth of pathogenic bacteria and fungi exponentially.

Ears affected in dogs with otitis externa

The dogs during the study of otitis externa were examined for unilateral or bilateral ear infections. Out of the total dogs positive for otitis externa, bilateral ear infection was recorded in 57 out of 92 dogs i.e., 61.96 percent and the unilateral ear infection was recorded in 35 out of 92 dogs i.e., 38.04 percent of dogs as summarized in Table 5.

These observations agree to the earlier reports of investigators (Saridomichelakis *et al*., 2007 [26] and Taszkun, 2009) [30] who recorded that dogs affected with bilateral otitis were more compared to unilateral otitis. On the contrary, Reddy (2017) [23] and Khan *et al.* (2019) [12] reported that unilateral ear infection was more prevalent in dogs suffering from otitis. No plausible explanation could be offered for greater vulnerability of dogs towards bilateral otitis externa.

Infectious causes for otitis externa externa in dogs

Out of all the 92 dogs positive for otitis externa, Malassezia alone was identified in 39 dogs i.e. (42.39 percent), the combination of bacteria and Malassezia were observed in 31

dogs i.e. (33.70 percent) and bacteria alone was identified in 22 dogs i.e. (23.91 percent) (Table 6).

The observations were in line with the findings of Saridomichelakis *et al.* (2007) [26], Nardoni *et al.* (2014) [19], Swiecicka *et al.* (2014) [29] and Reddy (2017) [23] who recorded *Malassezia* (yeast) as the most common infectious organism associated with canine otitis externa.

The present findings almost coincided with the observations of Nardoni *et al.* (2014) [19] and Reddy (2017) [23] who stated that mixed bacterial and yeast infection were seen in 23.30 percent and 36.84 percent of cases respectively, in their study. Taszkun (2009) [30] and Kumar *et al.* (2014) [14] reported bacterio-fungal etiology as the most common finding in cerumen from the ears of dogs. This phenomenon might be related to the ability of these microorganisms to utilize each other's metabolic products i.e., the proteolytic products of *Malassezia* or the nicotinic acid produced by *Staphylococci* spp. (Kiss *et al*., 1997) [13]. In contrast, Rosser (2004) [24] and Dixit (2005) [7] opined that bacterial etiology was the most common cause of otitis in dogs.

Clinical manifestations

During the study of otitis externa in dogs, various clinical signs were observed among the affected dogs. The affected dogs exhibited clinical signs such as pruritus in 98.91 percent dogs (91 out of 92) followed by erythema in 88.04 percent dogs (81 out of 92), pain in 79.36 percent dogs (73 out of 92), ear exudates in 75 percent dogs (69 out of 92), head shaking in 73.91 percent dogs (68 out of 92), malodour in 53.26 percent dogs (49 out of 92), swelling in 36.95 percent dogs (34 out of 92), head tilt in 27.17 percent dogs (25 out of 92), scaling/crusting in 23.91 percent dogs (22 out of 92), hyperpigmentation in 17.39 percent dogs (16 out of 92) (Table 7).

The results observed coincided with the findings of authors (Kale and Aher, 2004 [10]; Dixit, 2005 [7]; Laxmi, 2006 [15]; Mactaggart, 2008 [17]; Penna *et al.*, 2009 [22]; Reddy, 2017 [23] and Barua *et al.*, 2021) [2] who opined that aural pruritis, head shaking, erythema, swelling of the lining of the aural canal, otic discharges, and various degrees of pain are the most frequent clinical signs found in association with otitis externa in dogs.

In the present study, the development of pruritus could be attributed to the local bacterial proliferation on the skin with the subsequent release of bacterial toxins and enzymes resulting in inflammation and pruritus (Marak, 2019) [18]. Signs like erythema, pain, hyperpigmentation, purulent secretion, excessive wax secretion might be due to the release of chemical mediators such as serotonin, prostaglandins, peptides and leukotrienes at the site of inflammation (Barua *et al.*, 2021) [2].

Table 1: Age wise occurrence of otitis externa in dogs

Age group	No. suspected	No. affected	Occurrence (%)	Percentage (%)
Upto 1 year	143	12	08.39	13.04
>1 to 3 years	209	22	10.52	23.91
>3 to 6 years	178	39	21.91	42.39
>6 years	121	19	15.70	20.65
χ^2= 15.242** **significant at p<0.01				

Table 2: Breed wise occurrence of otitis externa in dogs

Breed	No. suspected	No. affected	Occurrence (%)	Percentage (%)
Labrador Retriever	120	25	20.83	27.17
GSD	108	19	17.59	20.65
Pug	83	12	14.45	13.04
ND	112	16	14.28	17.39
Beagle	72	10	13.89	10.87
Golden Retriever	49	05	11.11	5.43
Others (Rottweiler, Pitbull, Doberman, Akita etc.)	76	04	05.19	4.35
Spitz	31	01	03.22	1.09
χ^2= 14.107* *significant at p<0.05				

Table 3: Gender wise occurrence of otitis externa in dogs

Gender	No. suspected	No. affected	Occurrence (%)	Percentage (%)
Male	380	55	14.47	59.78
Female	271	37	13.65	40.22
χ^2= 0.088^{NS} non-significant at p>0.05				

Table 4: Season wise occurrence of otitis externa in dogs

Season	No. suspected	No. affected	Occurrence (%)	Percentage (%)
Pre-monsoon	208	29	13.94	31.52
Monsoon	243	40	16.46	43.48
Post-monsoon	200	23	11.50	25.00
χ^2=1.822^{NS} non-significant at p>0.05				

Table 5: Ears affected in dogs with otitis externa (n=92)

Ears affected	No. affected	Percentage (%)
Unilateral	35	38.04
Bilateral	57	61.96

Table 6: Infectious causes for otitis externa in dogs (n=92)

Causative agent	No. affected	Percentage (%)
Malassezia	39	42.39
Mixed (Malassezia and bacteria)	31	33.70
Bacteria alone	22	23.91

Table 7: Clinical manifestations associated with otitis externa in dogs (n=92)

Clinical signs (Ear)	No. affected	Percentage (%)
Pruritus	91	98.91
Erythema	81	88.04
Pain	73	79.36
Ear exudates	69	75.00
Head shaking	68	73.91
Malodour	49	53.26
Swelling	34	36.95
Head tilt	25	27.17
Scaling/crusting	22	23.91
Hyperpigmentation	16	17.39

Conclusion

The overall occurrence of otitis externa in dogs was found to be 3.50 percent. However, among dogs suspected for otitis externa, it was 14.13 percent. Age wise occurrence was significantly higher in dogs of 3-6 years of age group (1.40 percent), breed wise occurrence was significantly higher in Labrador Retrievers (5.88 percent) while no significant difference was noted in gender wise occurrence of otitis externa in dogs. Comparatively, higher occurrence of otitis externa was observed in the monsoon season (16.46 percent). Bilateral otitis externa was most common with pruritis (98.91 percent) and erythema (88.04 percent) being the most prevalent clinical signs followed by pain, exudate, shaking of head, malodour, swelling, head tilt, scaling/crusting and hyperpigmentation in dogs with otitis externa. Cytological examination revealed *Malassezia* (42.39 percent) as the commonest cause of otitis externa in dogs.

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