

EVALUATION OF DIAGNOSTIC VALUE OF OTOSCOPY FOR OTITIS IN DOGS FROM SELECTED STATES OF SOUTH WEST NIGERIA

OLATUNJI-AKIOYE, Adenike Olusola and OLADEJI, Isaac Olawale

Department of Veterinary Surgery and Radiology, Faculty of Veterinary Medicine, University of Ibadan, Ibadan, Oyo State, Nigeria.

Corresponding Author: Olatunji-Akioye, A. O. Department of Veterinary Surgery and Radiology, Faculty of Veterinary Medicine, University of Ibadan, Ibadan, Oyo State, Nigeria. **Email:** aoo.akioye@mail.ui.edu.ng **Phone:** +234 8034091407

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ABSTRACT

Otitis refers to inflammation of the ear canal, the middle ear or inner ear. The shape and conformation of the ear in dogs is a factor in the development of ear inflammation. Otoscopy is the diagnostic tool of choice for ear disease to be easily diagnosed in pets. Otitis in dogs may be much more prevalent in dogs than previously thought. This study seeks to determine the usefulness of otoscopy in diagnosis of otitis in dogs in southwestern Nigeria. A total of 207 dogs were sampled in different hospitals and clinics in three states of the south west of Nigeria; Oyo, Ogun and Lagos states from October till December 2021. Questionnaires to access demographic information of the dog and obtain the consent of the dog owners were administered. Data collection following assessment of each ear visually and by otoscopy was carried out. Age, sex and breed of dogs, and prevalence of otitis were determined. Zero to one year, male and Alsatian breed was most prevalent although not significant. Prevalence of otitis ranged from 2.22 and 2.22 % in Lagos, to 10.4 and 13.0 % in Ibadan and 14.1 and 10.6 % in Abeokuta for left and right ears respectively. Both ears were also more commonly affected. Otoscopy remains an invaluable tool as 84% of the diagnosed cases had no visual ear symptoms while only 12% of the positive cases were visually correctly diagnosed.

Keywords: Otoscopy, Dog ear inflammation, Otitis prevalence

INTRODUCTION

Otitis refers to inflammation of the ear and could be the ear canal which carries sound to the ear, the middle ear that leads to the inner ear which houses sensitive organs of sound and balance. There are several predisposing and perpetuating factors of otitis in dogs and the most important remains the shape of the ear canal. Otitis could be outer, middle or inner and the examination of the ear is one of the vital means of diagnosis (Paterson, 2011).

Otoscopy is the clinical examination of the structures of the ear particularly the external auditory canal, tympanic membrane and middle ear. Otoscopy detects foreign

bodies, lesions, exudate and pathologic changes that have occurred in the ear canal. It may also be helpful in assessing the tympanic membrane of animals (Cole, 2004; Griffin, 2006). The technique for doing proper otoscopic examination is one that allows complete visualization with minimal pain or trauma. Inflammation may make it difficult to complete an otoscopic examination without sedation though in many dogs or cats, poor technique will also prevent a complete examination (Griffin, 2006).

The most prevalent ear disease of the dog and cat is otitis externa, which might be present in 10 to 20 % of the total canine population and 2 to 10 % of the total feline

population (Cole, 2004). Although the prevalence of otitis media in dogs with chronic otitis externa may range between 50 – 80 %, it often goes unrecognized (Gotthelf, 2004). The commonly observed clinical signs of otitis externa are head shaking, scratching the ears and head tilting (Cole *et al.*, 2002). When a patient with otitis externa is evaluated, it is important to find out the primary cause as well as the predisposing and perpetuating factors of the condition so as to manage the otitis properly (Bajwa, 2019). The first procedure towards diagnostic examination that should be performed on a patient presented with a complaint of otitis externa is an otoscopic examination. Otitis media, an inflammatory disease in the middle ear cavity, is a common disease process that goes unrecognized in most veterinary practices. Otitis media in dogs may be much more prevalent than previously thought (Gotthelf, 2004). Clinical signs of otitis media may include facial paralysis, Horner's syndrome, nervous keratokconjunctivitis sicca, dry nose, and hearing deficits (Strain, 2012), painful tympanic bulla on palpation or pain when opening the mouth (Linek, 2011). With an untreated otitis media there may be progression into otitis interna which may lead to a potential life threatening involvement of the central nervous system (Sturges *et al.*, 2006). Otoscopy is a noninvasive imaging tool for the assessment of the size, shape, content, color, rupture, vascularity and consistency of the ear canal of pets in veterinary medicine and will be effective in detecting inflammation and infections of the ear.

Otoscopy is one of the diagnostic procedures used sparingly in regular veterinary diagnostic examination. It is a simple technique that is yet to be fully incorporated in veterinary clinical approach in Nigeria, because there is dearth of information on the use of otoscopy technique on dogs in Nigeria. According to a research by Classen *et al.* (2016), video otoscopy could not identify only one out of the 32 confirmed cases of otitis in dogs. The research depicts the accuracy of video otoscopy in diagnosing otitis from 91 to 98 % contrary to ultrasound imaging accuracy ranging from 21 to 98 %. This research validates the effectiveness

of video otoscopy as a tool for otitis diagnosis. There appears to be little information about the efficacy of otoscopy in diagnosing dogs with ear disease in Nigeria, this study was thus designed to determine the efficacy of otoscopy in clinical use in dogs in South Western Nigeria.

MATERIALS AND METHODS

Locations: Veterinary clinics located in Ibadan, Abeokuta and Lagos were chosen for the study to determine the efficacy of use of otoscopy compared with visual observation of otitis in dogs. They were: the University Veterinary Teaching Hospital, University of Ibadan, State Veterinary Hospital, Abeokuta, Ogun State, State Veterinary Hospital, Mokola, Ibadan, Oyo State, the University Veterinary Teaching Hospital Annex, Kenta, Federal University of Agriculture Abeokuta, Ogun State, Pet Care Animal Hospital, Ikeja, Lagos State, and Truth Miles Animal Hospital, Ikeja, Lagos State.

Sampling: The sample size of dogs to be screened was calculated based on the formula $n = Z^2 p (1-p) / e^2$ where n = population size, e = Margin of error (percentage in decimal form), z = z-score (found in a z-score table) and p = population proportion. A sample size of 196 was obtained.

Ethical approval was obtained from UI ACUREC (University of Ibadan Animal Care and Use Research Committee).

Questionnaire: The closed ended questionnaire was face validated, pretested and tested for reliability before administration (Roopa and Rani, 2012), and was made available at each instance of presentation of the dog at the clinic. The questionnaire was designed to provide basic information on breed, age, sex, presentations to the clinic and conditions presented for, history of otitis and suspected symptoms of otitis. The questionnaire was also used to obtain the consent of the dog owner to observe the dog for the purpose of the study. Majority of the respondents were able to communicate effectively in English and also fill the questionnaire appropriately. Others were guided on filling the questionnaire effectively

before the dogs were examined. Most dog owners came with just a dog, while few came with multiple or complete family dogs. The collation also included visual assessment on inflammation of the ears from all observed parameters. This led to diagnosis of acute otitis, chronic otitis, otitis externa, or otitis media.

Otosopic Examination: A design to assess comprehensive, detailed and concise information about each ear was developed. Some of the details were to include and exclude lesions and signs such as description of morphological findings which includes, description of the pinna, ear canal and the tympanic membrane and note the presence or absence of probable inciting causes or elements such as ticks, lice, mite, wax, suppuration, foreign bodies. These findings were used to make a holistic comment and assessment of the ears. The two ears of each dog were examined independently starting with the unaffected ear in case of suspected infection, to prevent cross infection of the other ear. The speculum was disinfected before examination of each ear. The ear was examined in sequence starting with the pinna, then the vertical ear canal, horizontal canal, tympanic membrane and the inner ear where possible. The otoscope was cleaned and disinfected after each examination and use.

Data Analysis: The data from the questionnaire were collated, arranged and analyzed descriptively using Microsoft Excel 2017 (Microsoft cooperation, USA) and GraphPad Prism. The demographic characteristics of the dogs were first presented using figures. Otoscopic findings of the common abnormalities in the external ear (right and left) of the dogs and the prevalence of otitis among dogs were presented using frequencies and percentages.

RESULTS

Two hundred and seven (207) dogs were sampled from the selected areas. Forty-five (45) dogs' samples were identified in Lagos state, seventy-seven (77) in Oyo State and eighty-five (85) in Ogun State.

Demographic Characteristics of the Dogs

Sex of the Dogs: The demographic variables that 51 % of the dogs are female and 49 % male, broken down to region, 60 % male and 40 % female from Lagos samples, 46 % male and 54 % female from Ogun and 47 % male and 53 % female from Ibadan (Figures 1 and 2).

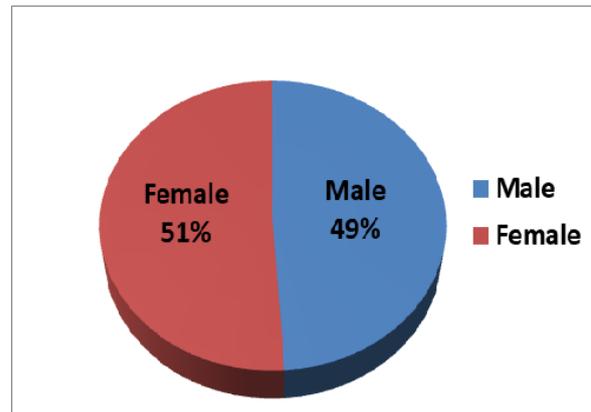


Figure 1: Percentage total distribution of dogs by sex from south west Nigeria

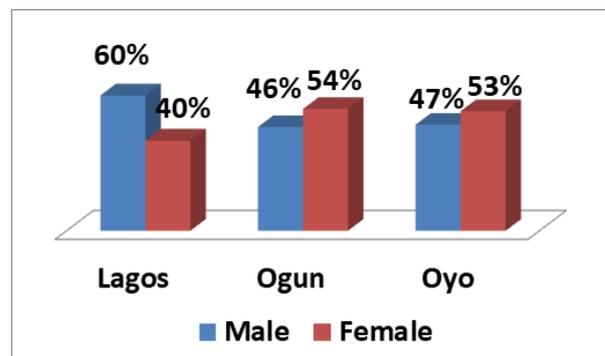


Figure 2: Percentage frequency distribution of dogs by sex from three selected states of south west Nigeria

Age of Dogs: The results reveal that 56.5 % of the dogs were within the age bracket of a day old to 1 year, 22.70 % within above 1 year to 3 years and 20.80 % greater than 3 years. A day old to 1 year old dogs have the highest percentage from all the three locations. 44 % of dogs sample from Lagos were within age a day to a year, 24 % within 1 – 3 years and 32 % within the age that is greater than 3 years and above. From Abeokuta, Ogun State, 62 % of age that is less than or equal to 1 years; 19 % respectively of age within 1 – 3 years and > 3 and above. From Ibadan, Oyo State, 57 %

within a day to a year, 26 % within > 1 and 3 years and 17 % > 3 years above (Figures 3 and 4).

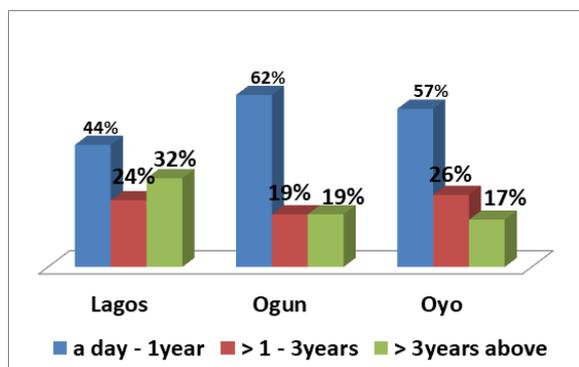


Figure 3: Percentage frequency distribution of dogs by age from three selected states of south west Nigeria

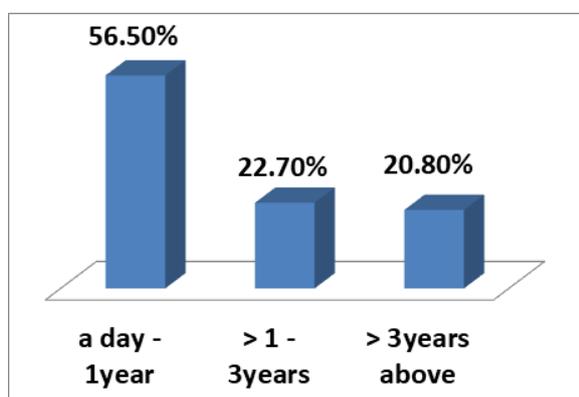


Figure 4: Percentage total distribution of dogs by age from south west Nigeria

Breed of Dog: German Shepherd Dog (GSD) is the most common and popular breeds in the selected region. 28.5 % of the breed was GSD, followed by Lhasa (12.1 %), Boerboel (10.6 %), Local breed (9.7 %) and Rot breed (9.2 %) (Table 1).

Identification of Common Abnormalities in the External Ear of the Dogs

Pinna: No observable abnormality was detected in the right and left pinna of the ear of 161(77.8%) dogs. Wax was detected in the right and left pinna of 21(10.1 %) and 23(11.1 %) dogs. Ticks were detected in the right and left pinna of 14(6.8%) and 10(4.8%) dogs and the percentage of dogs with red, dermatitis, discharge, dry, inflammation, aural hematoma and foreign body were not significant (p>0.05) (Table 2).

Table 1: Frequency distribution of breed of dogs from south west Nigeria

Breed	Frequency	Percentage (%)
GSD	59	28.5
Lhasa	25	12.1
Boerboel	22	10.6
Local breed	20	9.7
Rot	19	9.2
Caucasian	14	6.8
Eskimo	13	6.3
Cross breed	11	5.3
Pitbull	6	2.9
French bull dog	3	1.4
Samoyed	2	1.0
Shitzu	2	1.0
Chow	2	1.0
Labradol	2	1.0
Pug	2	1.0
Golden retriever	1	0.5
Metropolitan mastiff	1	0.5
Doberman	1	0.5
Siberian husky	1	0.5
Spitz	1	0.5
Total	207	100.0

Table 2: Visual assessment of pinna for otitis in dogs from south west Nigeria

Characteristics	Right Ear	Left Ear
	F (%)	F (%)
No observable abnormality	161(77.8)	161(77.8)
Wax	21(10.1)	23(11.1)
Ticks	14(6.8)	10(4.8)
Jaundice	2(1.0)	2(1.0)
Redness	1(0.5)	1(0.5)
Presence of much hair	1(0.5)	1(0.5)
Dermatitis	1(0.5)	1(0.5)
Discharge	2(1.0)	2(1.0)
Dryness	1(0.5)	1(0.5)
Inflammation	2(1.0)	1(0.5)
Aural hematoma	1(0.5)	0(0.0)
Foreign body	0(0.0)	4(1.9)

F = frequency

Ear Canal: No abnormalities were observed in the right and left canal of 34.3 and 32.9 % of the dogs respectively, 26.1 and 23.7 % of the dogs had clean and clear right and left ear canals. Wax was detected in the right and left canal of 32.4 and 35.7 % of the dogs. 2.4 % of the dogs had ticks and suppuration in their right and left ear canals respectively (Table 3). Ear abnormalities such as redness, jaundice, mild

redness, dry wax and foreign body detectable in the dogs were highly not significant ($p>0.05$) as only 1(0.5 %) dog was detected with these abnormalities.

Table 3: Percentage otoscopic assessment of the ear canal in dogs from south west Nigeria

Characteristics	Right	Left
	F (%)	F (%)
No observable abnormality	71(34.3)	68(32.9)
Clean and clear	54(26.1)	49(23.7)
Wax	67(32.4)	74(35.7)
Ticks	5(2.4)	5(2.4)
Suppuration	5(2.4)	5(2.4)
Redness	1(0.5)	1(0.5)
Jaundice	1(0.5)	1(0.5)
Mild redness	1(0.5)	1(0.5)
Dry wax	1(0.5)	1(0.5)
Foreign body	1(0.5)	2(1.0)

F = frequency

Tympanic Membrane: No abnormalities were observed in the right and left tympanic membrane of 94.2 and 92.3 % of the dogs respectively. Tympanic membrane was not visualized by otoscopy in the right and left ear of 3.4 and 4.8 % the dogs. Wax was detected in 1.4 % of the dogs and the percentage of dogs with abnormalities in their tympanic membrane was highly not significant ($p>0.05$) (Table 4).

Table 4: Otosopic findings of the tympanic membrane of dogs from south west Nigeria

Characteristics	Right	Left
	F (%)	F (%)
No observable abnormality	195(94.2)	191(92.3)
Dry wax	1(0.5)	0(0.0)
Wax	3(1.4)	3(1.4)
Wet wax	0(0.0)	2(1.0)
Inflammation	1(0.5)	1(0.5)
Not visualized	7(3.4)	10(4.8)

F = frequency

Prevalence of Common ear conditions among the dogs in the selected locations

Left Ear: Table 5 showed that 37.8 % of the dogs observed in Lagos had wax in their left ear, and 49.4 % of the dogs from Ibadan and 37.6 % dogs from Abeokuta had similar condition. No

lice, mites, ticks and foreign body were detected in the dogs observed from Lagos. From the dogs observed in Ibadan, only 0, 1.3, 6.5, 13.0, 16.9 and 20.8 % had mites, lice, suppuration, otitis, ticks and foreign body respectively. Likewise, only 0, 0, 2.4, 8.2, 14.1 and 20.0 % of the dogs observed from Abeokuta had lice, mites, suppuration, ticks, otitis and foreign body.

Furthermore, it was deduced that the abnormalities of the ear with highest prevalence in dogs was wax and only few percentage of the dogs from all the three locations were detected to have other left ear abnormalities.

Right Ear: In the right ear of the dogs, 35.6, 36.5 and 55.8 % of the dogs from Lagos, Abeokuta and Ibadan had wax, of which the highest prevalence was recorded from Ibadan. Lice and mites were not detected in the right ear of the dogs observed from the three locations. Ticks were not detected in dogs from Lagos while, 8.2 and 15.6 % of the dogs from Abeokuta and Ibadan had ticks. Suppuration was not detected in the dogs from Lagos, while 2.4 and 5.2 % respectively of dogs from Abeokuta and Ibadan had suppuration. Foreign body not detected in the right ears of dogs from Lagos, while 14.3 and 16.5 % respectively were detected in dogs from Ibadan and Abeokuta. Finally, 2.2 % dogs from Lagos were detected to have otitis, 10.4 and 10.6 % of the dogs from Ibadan and Abeokuta had otitis respectively (Table 6).

Prevalence of Otitis among the Dogs in the Selected Locations

Left Ear: The highest prevalence of otitis in the left ear of dogs was observed from Abeokuta, Ogun (14.1%), followed by Ibadan (13.0 %) and prevalence of otitis in dogs from Lagos was highly not significant as only 2.2 % was found to have otitis (Figure 5).

Right Ear: The highest prevalence of otitis in the right ear of dogs was observed from Abeokuta (10.6 %), followed by Ibadan (10.4 %) and prevalence of otitis in dogs from Lagos was highly not significant as only 2.2 % of the dogs had otitis (Figure 6).

Table 5: Common ear conditions detected in left ear of dogs from three locations in south west Nigeria

Ear Abnormalities	Lagos		Ibadan		Abeokuta	
	Absent	Present	Absent	Present	Absent	Present
	F (%)	F (%)	F (%)	F (%)	F (%)	F (%)
Wax	28(62.2)	17(37.8)	39(50.6)	38(49.4)	53(62.4)	32(37.6)
Lice	45(100.0)	0(0.0)	76(98.7)	1(1.3)	85(100.0)	0(0.0)
Mites	45(100.0)	0(0.0)	77(100.0)	0(0.0)	85(100.0)	0(0.0)
Ticks	45(100.0)	0(0.0)	64(83.1)	13(16.9)	78(91.7)	7(8.2)
Suppuration	45(100.0)	0(0.0)	72(93.5)	5(6.5)	83(97.6)	2(2.4)
Foreign body	45(100.0)	0(0.0)	61(79.2)	16(20.8)	68(80.0)	17(20.0)
Otitis	44(97.8)	1(2.2)	67(87.0)	10(13.0)	73(85.9)	12(14.1)

F = frequency

Table 6: Common ear conditions detected in right ear of dogs from three locations in south west Nigeria

Ear Conditions	Lagos		Ibadan		Abeokuta	
	Absent	Present	Absent	Present	Absent	Present
	F (%)	F (%)	F (%)	F (%)	F (%)	F (%)
Wax	29(64.4)	16(35.6)	43(55.8)	34(44.2)	54(63.5)	31(36.5)
Lice	45(100.0)	0(0.0)	77(100.0)	0(0.0)	85(100.0)	0(0.0)
Mites	45(100.0)	0(0.0)	77(100.0)	0(0.0)	85(100.0)	0(0.0)
Ticks	45(100.0)	0(0.0)	65(84.4)	12(15.6)	78(91.8)	7(8.2)
Suppuration	45(100.0)	0(0.0)	73(94.8)	4(5.2)	83(97.6)	2(2.4)
Foreign body	45(100.0)	0(0.0)	66(85.7)	11(14.3)	48(56.5)	14(16.5)
Otitis	44(97.8)	1(2.2)	69(89.6)	8(10.4)	76(89.4)	9(10.6)

F = frequency

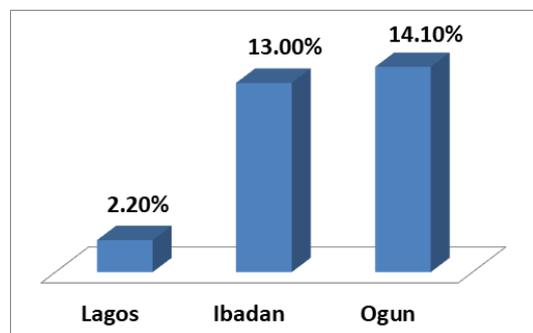


Figure 5: Otitis prevalence in the left ear among dogs from three locations in south west Nigeria

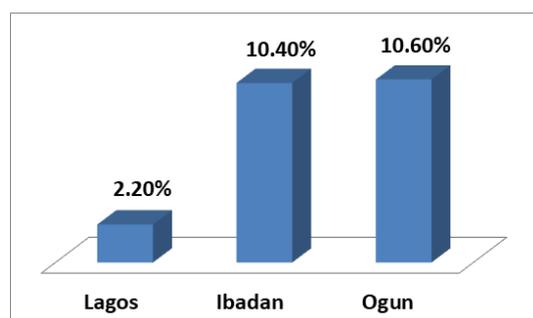


Figure 6: Otitis prevalence in the right ear of dogs from three locations in south west Nigeria

Prevalence of Otitis in Dogs by Sex: Figure 7 indicated that 60 % of the male dogs had otitis in one of their ear or both, and 40 % of the female dogs had otitis in either one ear or both of the ear.

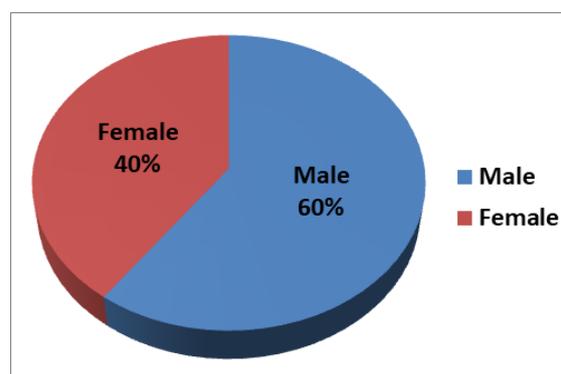


Figure 7: Otitis prevalence by sex in the dogs from south west Nigeria

Otitis Prevalence in Dogs by Age Range: From the dogs observed to have otitis, 32 % of the dogs within the age range of a day – 1 year were detected to have otitis, 26 % within the

age bracket > 1 – 3 years and 32 % of dogs that were > 3 years of age had otitis (Figure 8).

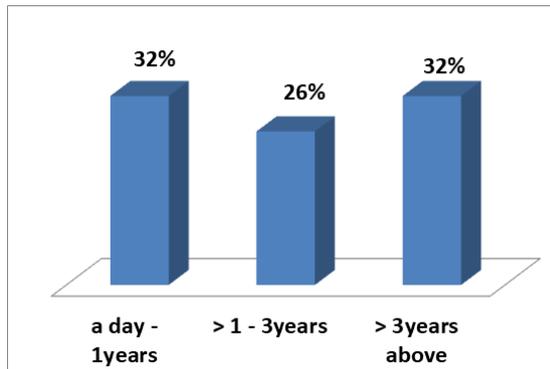


Figure 8: Otitis prevalence by age in the dogs from south west Nigeria

Dogs Observed under Otoscopy: From all the dogs observed under otoscopy, 16 % of the dogs were detected to have one form of common ear abnormalities or the other, while no abnormalities was detected 84 % of the dogs observed (Figure 9).

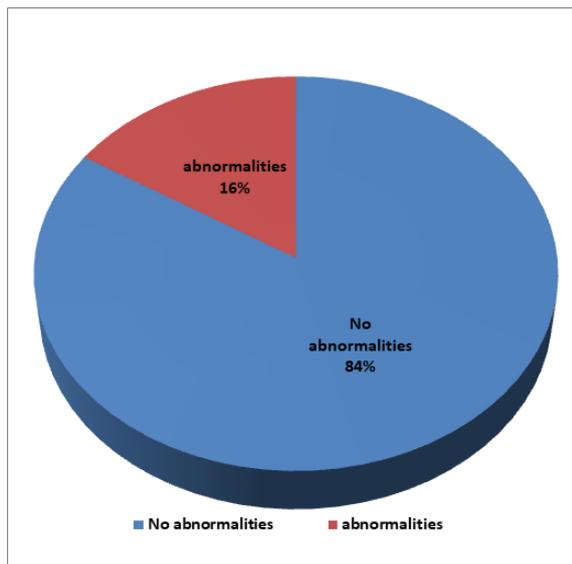


Figure 9: Percentage total abnormalities observed by age in dogs under otoscopy

DISCUSSION

The study evaluated the usefulness of otoscopy in diagnosing otitis in dogs and determined the prevalence of otitis among the dog population in the selected states of the south west Nigeria. The three locations (Ibadan, Abeokuta and Lagos) were selected for the study and a total of 207 dogs were sampled using visual assessment and otoscopy to diagnose some common abnormalities in the pinna, the vertical

ear canal, horizontal canal, tympanic membrane and where possible, the inner ear.

There was an even distribution between the sexes of the dogs sampled in the selected locations. The largest percentage of dogs evaluated was within the age of a day to one year and is probably because puppies are usually the more frequently acquired age of dogs and presented to clinic early. The study showed that the most common and prevalent breed of dogs was German shepherd, followed by Lhasa and Boerboel. This finding was similar to the report of Eyarefe and Adetunji (2018) on dogs' breeds, where German shepherd was reported to be the most popular and highest breed (39.37 %), followed by Rottweiler (14.11 %) and Boerboel (7.87 %). According to them, more people preferred the German shepherd breed compared to other exotic breeds and clients are conversant with these breeds due to their use (mainly for security purposes). According to Eyarefe and Dei (2014), the German shepherd, Boerboel and Rottweiler breeds are highly valued for their intelligence, strength, size, coat colour, and protective companionship. These characteristics may have contributed to their influx into many African countries, including Nigeria.

The findings revealed that otoscopy was able to detect different abnormalities and predisposing factors in the ear of the dogs. Some of the ear abnormalities identified in the pinna, ear canal and tympanic membrane of the dogs include wax, jaundice, redness, lice, ticks, dermatitis, discharges, dryness, inflammation and aural hematoma. In a study by Cole (2004), otoscopy detected foreign bodies, lesions, exudates and pathologic changes that have occurred in the ear canal. Cole (2004) recommended that otoscopy may also be helpful in assessing the tympanic membrane of animals.

Otoscopy was highly effective in diagnosis of otitis in all the three locations. The quality of health care system and protection in Lagos may be the reason for the least prevalence of otitis in the dogs. Clinicians must evaluate involvement of various primary, predisposing, and perpetuating factors that may be contributing to ear disease while evaluating

each individual patient affected (Bajwa, 2019). Otoscopy is hardly utilised for visualization of pinna abnormalities as these can be visually observed. The otoscopic observation of the ear canal revealed that wax was the largest percentage. This may be because wax is normally present in the ear canal. Otosopic diagnosis of otitis in Veterinary care in Nigeria may require a boost and the use of video otoscopy is still in its infancy. This study looked at otoscopic diagnosis of otitis as a condition without the several different classifications to gain an overview. There exists a need to evaluate otitis diagnosis by evaluating different classifications using even more advanced imaging diagnostic methods like video otoscopy, radiography and ultrasonography.

Researchers such as de Oliveira *et al.* (2006), Classen *et al.* (2016), Cole *et al.* (2002) and Cole (2004) had earlier detected otitis in dogs diagnosed under otoscopic examination. Cole (2004) reported that otoscopic examination should be the first diagnostic procedure to be performed in the animals with otitis externa. The findings of this study was in agreement with Cole (2004) that the most prevalent ear disease of the dog and cat was otitis externa, which may be present in 10 to 20 % of the total canine population and 2 to 10 % of the total feline population. In a similar study, out of a total of 62 dogs observed by de Oliveira *et al.* (2006), 30(46.8 %) of the dogs were positive for otitis media. Most of the cases were recurrent (chronic) with evidence of pus, while others were unnoticed until the course of the study. Accuracy of video otoscopy in diagnosing otitis has been reported to be between 91 to 98 % contrary to ultrasound imaging accuracy ranging between 21 to 98 % (Cole, 2004). Evaluating the diagnostic value of otoscopy with visual observation of the clients, 84 % of the positive cases using otoscopy with dogs presented by the owners were with no observable ear conditions/abnormalities, while about 16 % of the positive cases were observed with one form of ear conditions/abnormalities.

Conclusion: This study concluded that otoscopy examination is an effective and useful tool for diagnosing otitis in the ear of dogs.

From the dogs observed under otoscopic examination, about 16 % of the dogs were discovered to present with one form of ear conditions/inflammation. The prevalence of Otitis from dogs examined under otoscopic was found in Abeokuta and Ibadan and the least was found in Lagos; more otitis were detected in the left ear of the dogs than in the right ear; there was no significant difference in the prevalence of otitis within the different age groups and finally, male dogs were observed to be more susceptible to inflammation of the ear than their female counterpart. Based on the findings of this study, the following were recommended: (i) Otoscopy should be incorporated as part of normal routine physical examination in small animal practice to aid early diagnosis of otitis. (ii) Cleaning of the ear should be incorporated as normal routine treatment in general small animal practice. (iii) Video otoscope can be used for a better visualization of the ear for clinicians. (iv) Since most of the cases of otitis are recurrent, clinicians should always advise clients about this risk when treating otitis to aid adequate management. (v) Clinicians should be aware of the possibility of trauma to the ear canal and ear drum during otoscopy.

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