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Prevalence of *Malassezia Pachydermatis* in Dogs in Jere Local Government Area of Borno State, Nigeria

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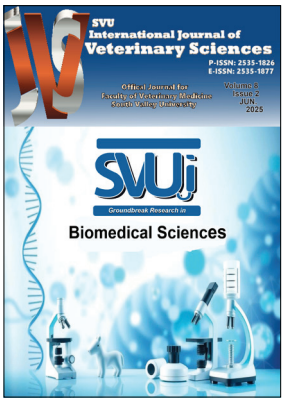

ABSTRACT

Malassezia Pachydermatis **is the predominant commensal yeast species usually found in the skin and mucosa of dogs.The aim of the study is to determine the prevalence of *Malassezia Pachydermatis* and its associated risk factors in Dogs. A total of *210* ear swab samples were randomly collected from dogs. The dogs were categorized based on; sex (male and female), age (dogs from *0-11*months were considered puppies, *>12* months were considered adult dogs). Samples were inoculated on Saboraud dextrose agar containing chloramphenicol. Samples were air-dried and stained with New methylene blue for *10* min, it was rinsed, dried and viewed under microscope at *40* × magnification. The study had an overall prevalence rate of *63*% of *malasseizia pachydermatis*. The prevalence of *malasseizia pachydermatis*, was higher in female dogs with *63* (*73*%) compared to male dogs *69* (*56*%). The study also revealed adult dogs had higher prevalence of *103*(*72*%) than young dogs *29* (*43*%). Those with clinical skin condition had higher prevalence of *111* (*70*%) in comparison to those without clinical skin condition *21* (*39*%). The strength of association between sex, age and clinical skin condition was compared for *malasseizia pachydermatis* positivity. The study revealed significant association, with female showing higher prevalence than male (p=*0.042*). Furthermore, there was a strong association between age group positivity with adult's dogs showing high prevalence than young (p=*0.000*). Similarly, dogs with skin condition were significantly more likely to test positive than those without skin condition (p=*0.0001*).**

Keywords: *Dogs, Malassezia pachydermatis, Prevalence, Jere.*

INTRODUCTION

The skin is the largest organ, and it plays a crucial role in protecting the body from external threats such as bacteria, viruses and fungi. *Malassezia* are commensal lipophilic yeast commonly found on the skin and mucosa of dogs (Daniel, 2022). These fungi are widespread commonly found in vertebrates and environment (Bond et al., 2020; Bajwa, 2023; Hobi et al., 2024). In the etiology, out of 18 species of *Malassezia* 9 species have been detected in dogs by culture and molecular methods (Hobi et al., 2022). *M. Pachydermatis* is the predominant species usually found in the skin of dogs (Bond et al., 2020; Hobi et al., 2024). Other reported species in dogs include *M. sympodialis, .furfur,M.obtusa,M.restricta,M. arunalokei,M.nana,*

M.slooffiae and *M. globosa* (Meason-Smith et al.,2020; Daniel, 2022; Bajwa, 2023; Hobi et al., 2024).

Malassezia is a common skin dermatitis, usually isolated from body parts such as the ears, face, neck,

legs, digits, lip margins, axillae, groin, perivuvar skin, perianal skin and tail folds of affected dogs (Bajwa, 2017; Guillot and Bond, 2020; Spatz and Richard, 2020; Kano et al.,2020; Daniel, 2022; Hobi et al., 2022; Hobi et al., 2024).

Clinical presentations include dermatitis, otitis externa, paronychia, keratitis, localized and generalized pruritus with unpleasant rancid odor, alopecia, scaly waxy or greasy seborrhea, crusts or papules lesions, lichenification or hyperpigmentation, lip margin hypotrichosis and intertrigo (Sihelska et al.,2017; Bajwa, 2017; Guillot and Bond, 2020; Spatz and Richard, 2020; Daniel, 2022; Hobi et al., 2022; Hobi et al., 2024).

Diagnosis and identification include direct cytologic examination, culture and molecular methods (Bond et al.,2020; Daniel, 2022; Bajwa, 2023). Treatment of *Malassezia dermatitis* depend on the severity of lesions, topical antiseptic and antifungal preparations are used for mild cases while systemic antifungal treatment is applied in severe cases not responding to topical treatment (Bajwa, 2017; Bond et al., 2020; Guillot and Bond, 2020; Hobi et al., 2022, Bajwa, 2023; Hobi et al., 2024).

In Nigeria there is paucity of information on the prevalence and distribution of *Malassezia Pachydermatis* in Dogs. More research studies are required to determine the fungal fauna among dog's population for effective parasites control measures. The aim of the study was to determine the prevalence of *Malassezia Pachydermatis* and its associated risk factors in Dogs in the study area.

Materials and Methods

Study Area

The study was conducted in Jere local government area of Borno state, Nigeria (Figure 1). it lies between latitudes 11º40 and 120º5N and longitudes 130º05 and 12º20E. The minimum temperature ranges from 15 to 20ºc and maximum ranges of 37 to 45ºc.The annual rainfall ranges from 500 to 700 mm characterized by high intensity. The rainy season usually last from the month of May to September with low humidity and then followed by long dry season. (Ezema et al., 2021).

Figure 1: ***Map of Jere Local Government area showing samplingareas***

Study Population

A cross-sectional study was conducted between the month of July to August 2024 and a total of 210 ear swab samples were randomly collected from Nigeria indigenous breed of dogs in Jere local government area of Borno state. Dogs were categorized based on; sex, male and female. Age, Dogs from 0-11months are considered puppies, >12 months are considered adult dogs.

Sample Collection

Samples were collected from dogs' ears with clinical signs and those without clinical signs using sterile swab stick with random sampling method. The samples were transported in dry sterile container to Department of Veterinary Medicine research laboratory / Microbiology (Bacteriology), Faculty of Veterinary Medicine University of Maiduguri.

Culture, Slides Preparation and Microscopy

Culture and slide preparation was performed as described by (Babic et al., 2020; Dohre et al., 2021; Rakesh et al., 2023). Samples were inoculated on

saboraud dextrose agar containing chloramphenicol, while other samples were rolled on to a clean class slides, allowed to dry, alcohol was used to fixed for 1 min. The sample was air-dried and stained with New methylene blue for 10 min, it was rinsed, dried and viewed under microscope at ×40 magnification (Figure 2)

Data Analysis

Data were represented using table, charts and Chi-Square test for association was used to check for association between disease and risk factors using Statistical Package for Social Sciences (SPSS, Version 20, USA). Values of $p < 0.05$ were considered significant.

RESULTS

A total of 210 dogs were examined for the prevalence of *Malasseizia pachydermatis* in dogs, with an overall prevalence rate of 63%. The prevalence of *Malasseizia pachydermatis*, was higher in female dogs with 63 (73%) compared to male dogs 69 (56%) as illustrated in Table 1 (Figure 3). The study also revealed adult dogs have higher prevalence of 103 (72%) than young dogs that shows 29 (43%) as illustrated in Table 2 (Figure 3). Those with clinical skin condition have higher prevalence of 111 (70%) compared to those

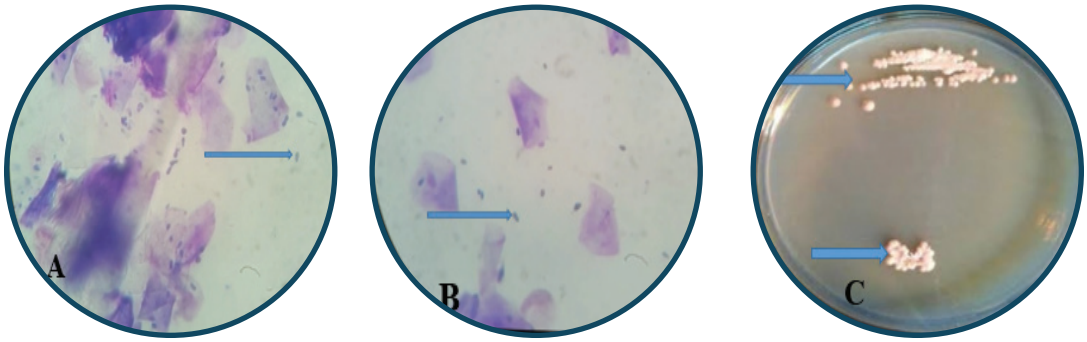

Figure 2:A and B, *Malasseizia pachydermatis* under microscope at ×40 (Blue arrow). **C,** *Malasseizia pachydermatis* on saboraud dextrose agar (Blue arrow).

Table 1: Prevalence of *Malasseizia pachydermatis* based on sex

Risk Factors	No of samples	Positive samples	Percentage%
Male	124	69	56
Female	86	63	73
Total	210	132	63

Table 2: Prevalence of *malasseizia pachydermatis* based on Age

Risk Factors	No of samples	Positive samples	Percentage%
Adults	124	103	72
Young	68	29	43

Table 3: Prevalence of *malasseizia pachydermatis* based on clinical skin condition

Clinical skin condition	No of samples	Positive samples	Percentage
Those with skin condition	157	111	70
Those without skin condition	53	21	39

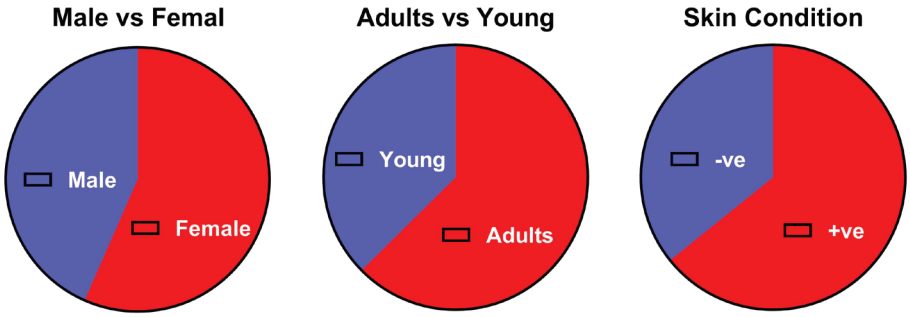

Figure 3: Prevalence of *malasseizia pachydermatis* based on Sex, Age and clinical skin condition

Table 4: Population proportion and measures of strength of association between risk factors

Risk Factors	No of samples	P-Value
Female vs Male	6	0.042
Adult vs Young	16	<0.00005
Skin condition	15	0.0001

without clinical skin condition 21 (39%) as illustrated in Table 3 (Figure 3).

The strength of association between sex, age and clinical skin condition has been compared for *Malasseizia pachydermatis* positivity. The study revealed a p- value of 0.042 shows significant association, with female showing higher prevalence than male as illustrated in Table 1 (Figure 3). Furthermore, the p- value of <0.00005 reveals a strong association between age group positivity with adult's dogs showing high prevalence than young as illustrated in Table 3 (Figure 3). Similarly, the p-value of 0.0001 reveals dogs with skin condition are significantly more likely to test positive than those without skin condition as illustrated in Table 3 (Figure 3).

DISCUSSION

Prevalence studies are very critical in determining the distribution of disease in population. The result of this study showed an overall prevalence rate of 63% of Malasseizia pachydermatis which is high in comparison to 49 (25.5%),76 (25.3%), 255 (2.4%) and 106 (03.5%) reported by (Sihelska et al.,2017; Babic et al., 2020; Dohre et al.,2021; Rakesh et al., 2023) respectively.

The prevalence of Malasseizia pachydermatis, was higher in female dogs with 63 (73%) compared to male dogs 69 (56%) this agrees with the report of Babic et al. (2020) were females has 26 (100%) and males 23 (92%), Sihelska et al. (2017) females 32 (25.4%) and males 44 (25.3%) Rakesh et al. (2023) females 46 (17.4%) and Males 60 (12.6%) this findings disagreed with studies of Seetha et al. (2018); Dohre et al. (2021) who reported higher prevalence in Males 153 (60%) than females 102 (40%). This high prevalence of Malasseizia pachydermatis in females suggest likelihood of fungal colonization due to behavioural or hormonal differences. Hormonal influences such as oestrogen and progesterone alter the skin microenvironment thereby increasing susceptibility to fungal colonization in females (Vanderwolf et al., 2021; Simoes et al., 2023)

Adult dogs had higher prevalence of 103 (72%) than young dogs 29 (43%) this is similar to findings of Babic et al. (2020) adult 28 (111%) and young 21 (81%), Sihelska et al. (2017) adult 58 (26.4%) and young 13 (24.1%) Dohre et al. (2021) adult 10 (3.9%) and young 1 (0.3%) Rakesh et al. (2023) adult 35 (16.1%) and young 4 (3.3%). Age and sexual maturity is a major risk factor for fungal colonization this is associated with increase sebaceous gland activity in matured dogs due to higher lipid secretion, which facilitate the growth of malasseizia pachydermatis (Burgess et al.,2022; Laniri et al., 2022).

Those with clinical skin condition had higher prevalence of 111 (70%) compared to those without clinical skin condition 21 (39%) this is similar to findings of Rakesh et al. (2023) who reported that those with clinical skin condition have higher prevalence of 106 (14.4%) than those without skin condition 106 (03.5%). Prevalence increases among dogs with clinical skin conditions reaching up to 80% especially those with otitis externa or dermatitis (Naveen, 2024).

Malasseizia pachydermatis can appear as a localized or generalized disease regardless of dogs, sex, age and breed (Babic et al., 2020). it occurs secondary to ectoparasites, allergies such as flea bites hypersensitivity, environment induced atopic dermatitis, endopathies such as hyperadrenocortism, hypothyroidism, diabetes mellitus, superficial pyoderma, keratinization disorders or autoimmune disease. These diseases favour the development of Yeast which is the causative agent (Bond et al.,2020; Guillot and Bond, 2020; Hobi et al., 2022; Bajwa 2023). Other factors predisposing to malasseizia pachydermatis include genetics, environmental temperature and humidity, skin fold formation and immunomodulatory drugs (Daniel, 2022; Hobi et al., 2024).

The difference in the Prevalence rate of *Malasseizia pachydermatis* may be associated with sample size tested and varying geo-climatic conditions and immunological status of the dogs (Rakesh et al., 2023). In epidemiology, prevalence studies are very critical in determining the distribution of disease in population. Input about prevalence in terms of host factors, environment factors and pathogen factors are important in determining the impact of disease in a community. They provide data for designing prevention strategies. The predisposing factors that make *Malasseizia pachydermatis* from a commensal to a pathogen are poorly understood. Thus, insights on the factors affecting spread, breed and age susceptibility must be regionally deduced to understand the prevalence of *Malassezia* (Dohre et al., 2021). Serious efforts should be made in terms of dog's hygiene and sanitation to prevent recurrent infection and reduce prevalence.

CONCLUSION

Prevalence of *Malasseizia pachydermatis*, was higher in female and adult dogs compared to male and young dogs. Those with clinical skin condition are more likely to test positive than those without skin condition. These findings are essential for improving the diagnosis, prevention, and management of fungal infections in dogs.

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