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Factors associated with body condition and ocular pathologies in draft horses in the Rufisque department, Senegal.

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Abstract

Background: Horses play a fundamental role in transport and production systems in sub-Saharan Africa. They are subjected to draft work that directly impacts their body condition and general health.

Objective: This study was conducted in the Rufisque department to identify factors associated with body condition and ocular pathologies in draft horses.

Methods: A cross-sectional study was carried out on a sample of 200 horses. Data collected covered individual characteristics, working conditions, feeding practices, and health management. Bivariate and multivariate statistical analyses were performed to identify associated factors.

Results: The results show that a significant proportion of horses exhibited poor body condition (40%). Age and type of work were significantly associated with the body condition score (BCS); animals aged 10–15 years were at higher risk of poor condition (OR = 4.15; $p < 0.001$), as were those involved in water transport (OR = 3.46; $p = 0.002$). Regarding ocular pathologies, significant associations were found with age, body condition, changes in physiological parameters, veterinary consultation, and vaccination.

Conclusion: This study highlights the critical role of age, working conditions, and health management practices in the health of draft horses. It underscores the need to promote the welfare of draft horses in Senegal to ensure better performance during their use.

Keywords: Draft horses; Ocular pathologies; Body condition; Animal welfare; Epidemiology; Senegal.

1. Introduction

Draft horses play a significant role in transport systems and socio-economic activities across various regions of Africa and beyond. Indeed, they make a substantial contribution to the service sector for many households in sub-Saharan countries. They facilitate the transport of people, water, materials, and other goods, and are also involved in certain agricultural activities. The WOAHA acknowledges that working equids contribute directly or indirectly to household livelihoods and that their welfare can be compromised by harsh working conditions, nutritional constraints, health issues, or inadequate access to veterinary care (WOAHA, 2023). Studies conducted in Senegal and other African countries also highlight the socio-economic importance of draft equids and the persistent constraints affecting their health and welfare (Nteme-Ella et al., 2026; Traoré, 2015; Yena, 2017; Sarr, 2023).

In Senegal, and particularly in the Dakar region, draft horses are integrated into various urban and peri-urban activities. The Rufisque department, characterized by dynamic construction and commercial activity, provides a setting conducive to their use. Previous research conducted in Dakar and other parts of Senegal has documented the range of ailments affecting these horses and the health-related challenges associated with their use (Djimadoun, 1994; Diouf, 2013; Diouf, 2016). However, data specifically addressing the factors associated with the body condition and ocular pathologies of draft horses in the Rufisque department remain limited. This study is situated within this context, with the overall objective of identifying factors associated with body condition and ocular pathologies in draft horses, while taking into

account individual characteristics, operating conditions, and health management practices. Specifically, the study aims to:

- analyze the association between individual characteristics and both body condition and the presence of ocular pathologies in draft horses;
- determine the association between types of activities, working conditions, and the horses' body condition;
- evaluate the association between health management practices and the presence of ocular pathologies.

The results of this study could help improve health management and welfare strategies for draft equines in urban and peri-urban areas of Senegal.

2. Materials and Methods

2.1 Study Area

The study was conducted in the Rufisque department, located in the Dakar region of Senegal (Figure 1). This department possesses significant livestock potential, particularly regarding draft horses, which play a central role in socio-economic activities. However, their health and general well-being are often compromised by arduous working conditions, inadequate nutrition (in terms of both quantity and quality), and limited access to veterinary care. Against this backdrop, a study assessing the ocular health and body condition of draft horses in the Rufisque department is fully justified. It enables the identification of welfare-related factors and the proposal of solutions aimed at improving the animals' productivity and quality of life.

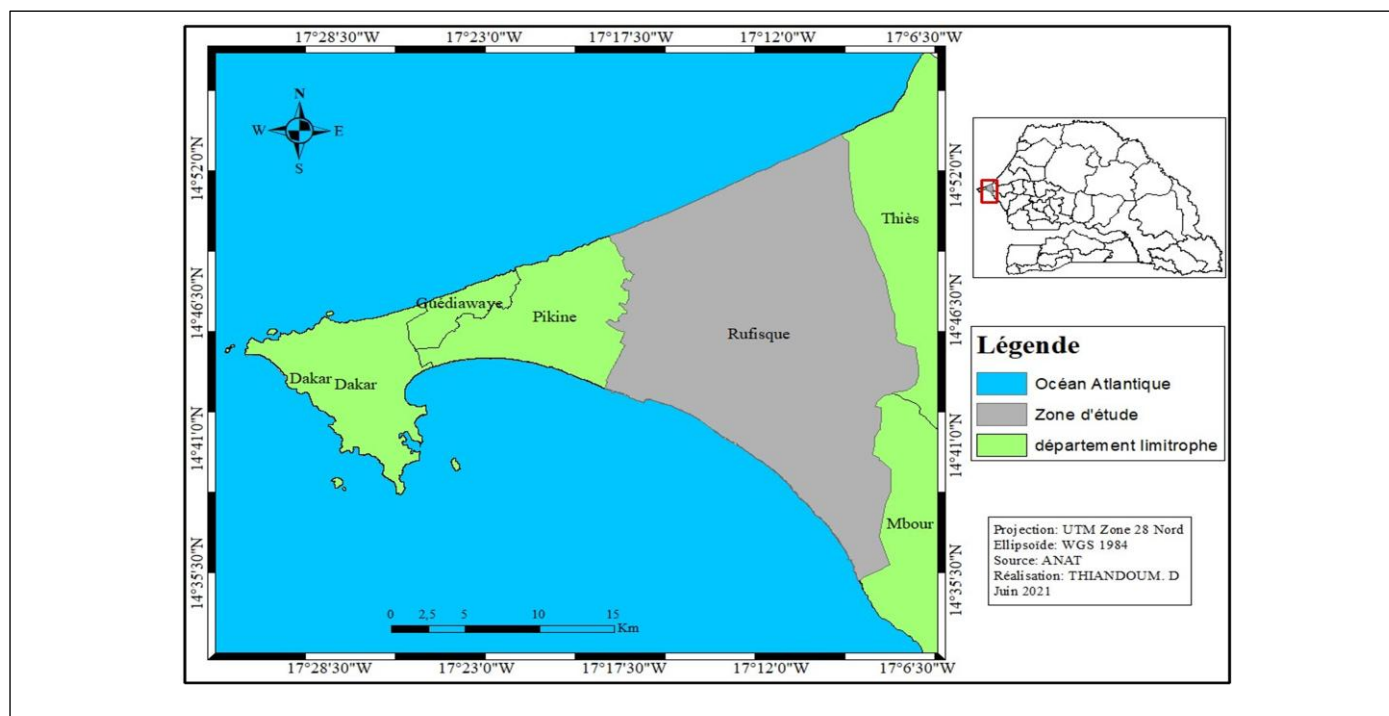


Figure 1: Map of the departments in the Dakar region (ANAT, 2021)

2.2 Materials

The animal subjects for the study consisted of 200 draft horses of various breeds and both sexes. Practical fieldwork required the following equipment: a slit lamp, an ophthalmoscope, a thermometer, a weight tape, fluorescein strips, a flashlight, a stethoscope, a notepad, a vehicle for transport, a camera for

documentation, and protective clothing (lab coats, safety shoes, and masks).

2.3 Methods

2.3.1 Sampling

The study was conducted in the Rufisque department and focused on a target population of draft horses used for transport and traction, owned by local proprietors and cart drivers. The sample

size was set at 200 horses. A non-probabilistic, purposive sampling method was adopted, given logistical constraints and the absence of a comprehensive sampling frame for draft horses in the study area. This approach aimed to include a sufficient number of animals to ensure adequate variability in individual and health characteristics, particularly regarding ocular conditions. Inclusion criteria covered draft horses belonging to owners and cart drivers residing in the Rufisque department. Inclusion also extended to horses available at the time of the survey and accessible for clinical examination, whether healthy or diseased. The simultaneous inclusion of healthy and diseased animals served an analytical purpose: to compare the characteristics of the two groups and identify factors associated with the occurrence of ocular pathologies. Horses were recruited directly at their work sites (parking areas, transport routes, markets) after obtaining informed consent from the owners or cart drivers. No specific exclusion criteria were applied, other than the animal's unavailability or a refusal to participate. Horse identification was carried out using a traditional descriptive profile based on species, sex, breed, age, height, coat color, type of work, markings on the limbs, and distinctive markings.

2.3.2 Body Condition Score Assessment

The horses' body condition score (BCS) was assessed using a method involving visual inspection and palpation, based on fat deposits at seven anatomical sites: the crest (upper edge of the neck), withers, topline (line of the spinous processes), croup, tail head, rear of the shoulder, and ribs. These criteria allowed the animals to be assigned a score ranging from 1 to 5. The more palpable the spinous processes and the easier it is to slide one's fingers beneath the transverse processes the lower the score. Conversely, if the spinous processes are not palpable, the score is high, approaching 5. Additionally, a weight tape was used to estimate the horses' live weight, supporting the interpretation of the BCS and enhancing the accuracy of the overall nutritional status assessment. In this study, horses with a score of 2 or less were considered to have a poor BCS, while those with a score strictly greater than 2 were considered to have a good BCS.

2.3.3 Assessment of ocular conditions

Ophthalmological examinations were systematically performed on the horses in the sample, regardless of whether they exhibited apparent clinical signs. The assessment comprised three main stages. An initial observation was made from a distance to detect potential visible abnormalities such as trauma, lacrimation, blepharospasm, corneal opacity, or abnormal discharge. Next, a detailed examination of ocular structures (eyelids, conjunctiva, cornea, anterior chamber) was conducted using a flashlight,

supplemented by an ophthalmo-otoscope for better visualization of internal structures. Finally, a slit lamp was used (conditions permitting) to refine the examination of the eye's anterior structures and detect subtle lesions (ulcerations, opacities, foreign bodies). Additionally, fluorescein strips were used to identify corneal ulcers.

2.3.4 Data collection and analysis

The study was conducted from March to October 2025, involving 200 horse owners within the study area. Data were collected via a questionnaire administered through interviews with participants, using KoboTool Collect software. The questionnaire was administered through direct interviews in French and, where necessary, indirect interviews in Wolof (the local language). It gathered information on animal identification using traditional descriptive characteristics and the type of activities performed by the horse. The concept of welfare was addressed through aspects such as nutrition, housing, prophylaxis, body condition score, and the presence or absence of anatomical or physiological ocular changes. A clinical examination of the animals was conducted to verify the owners' statements and identify any observed conditions. A multidimensional descriptive analysis of the data was performed using RStudio software. Subsequently, variations in body condition and the presence of ocular pathologies were analyzed using the chi-square (χ^2) test or Fisher's exact test. For these tests, the dependent variables were body condition score and the presence of ocular pathologies in the horses. The independent variables were breed, age, type of work, feeding frequency, duration of work, changes in physiological parameters, vaccination practices, and veterinary consultations. To investigate factors associated with body condition and the presence of ocular pathologies, a univariate logistic regression was initially performed to calculate unadjusted odds ratios (ORs). Variables with a p-value of 0.05 or less were included in a multivariate logistic regression model to calculate adjusted ORs. A significance threshold of 0.05 was used for all analyses.

3. Results

3.1 Zootechnical characteristics of the horses

The study population consisted predominantly of the Mpar breed (58.5%; n = 117), followed by the Fleuve breed (22.5%; n = 45), as shown in Table I. The sex distribution showed a very strong predominance of males (99.5%; n = 199). Regarding age, the 5-to-10-year bracket was the most represented (65%; n = 130), followed by the 10-to-15-year bracket (25%; n = 50). Finally, the transport of materials (construction materials, goods) was the horses' primary activity (67%; n = 134).

Table 1: Distribution of zootechnical factors for the horses

Variable	Categories	Count	Proportion (%)
Race	Fleuve	45	22.5
	Foutanke	22	11
	Mbayar	16	8
	Mpar	117	58.5
Sexe	Female	1	0.5
	Male	199	99.5
Age	< 5 years	17	8.5

	[5 - 10] years	130	65
	]10 – 15] years	50	25
	> 15 years	3	1.5
Type of work	Water hauling (chore)	33	16.5
	Waste hauling (sanitation)	14	7
	Materials transport	134	67
	Personal transport	17	8.5
	Agricultural work	2	1

3.2 Management characteristics and health status of the horses

A significant proportion of the sample 61% (n = 122) worked more than 8 hours a day, while 38% (n = 76) had a workday of between 6 and 8 hours. Very short work durations were exceptional (0.5% for 1 hour and 0.5% for 4 to 6 hours). Regarding feeding, a frequency of two meals per day predominated (71%; n = 142),

whereas a frequency of one meal per day applied to 16.5% of the horses studied (n = 33). Body condition assessment indicated that 40% of the animals (n = 80) had a body condition rated as poor (Table II). Furthermore, 26% of the sample (n = 52) exhibited alterations in certain physiological parameters. Furthermore, although veterinary consultations were frequently reported (90%; n = 180), vaccination was performed on only 36.5% of the horses (n = 73).

Table II: Distribution of management factors and health status of the horses

Variable	Categories	Count	Proportion (%)
Working time	< 4 hour	1	0.5
	[4 – 6] hours	1	0.5
	]6 – 8] hours	76	38
	> 8 hours	122	61
Feeding frequency per day	Once	33	16.5
	Twice	142	71
	Three times	25	12.5
Body condition score	Good	120	60
	Bad	80	40
Alteration of physiological parameters	No	148	74
	Yes	52	26
Veterinary consultation	No	20	10
	Yes	180	90
Vaccination practice	No	127	63.5
	Yes	73	36.5

3.3 Association between husbandry and management factors and body condition

No statistically significant association was observed between horse breed and body condition (p = 0.21), although some variations were noted among the groups shown in Table III. In contrast, age was significantly associated with body condition ($p = 6.297 \times 10^{-5}$). Specifically, within the 5–10 year age group, 70% exhibited good body condition, whereas in the 10–15 year group, 64% were in poor condition. All horses over 15 years of age were in poor

body condition. Additionally, the type of work was significantly associated with body condition (p = 0.02). Animals used for water transport were more likely to be in poor condition (n = 21) than good condition (n = 12), unlike those involved in transporting materials, where good body condition predominated (n = 89 vs. 45). No significant association was found between sex (p = 0.4), work duration (p = 0.18), or feeding frequency (p = 0.47) and body condition.

Table III: Factors associated with the body condition of horses

Variable	Good (%)	Bad (%)	Sample size	P-value
Race				

Fleuve	31 (68.89)	14 (31.11)	45	0.21
Foutanke	11 (50.00)	11 (50.00)	22	
Mbayar	12 (75.00)	4 (25.00)	16	
Mpar	66 (56.41)	51 (43.59)	117	
Sex				
Female	(0.00)	1 (100.00)	1	0.4
Male	120 (60.30)	79 (39.70)	199	
Age				
< 5 years	11 (0.65)	6 (0.35)	17	6.297.10 ⁻⁰⁵
[5 - 10] years	91 (0.7)	39 (0.3)	130	
]10 – 15] years	18 (0.36)	32 (0.64)	50	
> 15 years	0 (0.00)	3 (100.00)	3	
Type of work				
Water hauling (chore)	12 (36.36)	21 (63.64)	33	0.02
Waste hauling (sanitation)	7 (50.00)	7 (50.00)	14	
Materials transport	89 (66.42)	45 (33.58)	134	
Personal transport	11 (36.36)	6 (63.64)	17	
Agricultural work	1 (50.00)	1 (50.00)	2	
Working time				
< 4 hour	1 (100.00)	0 (0.00)	1	0.18
[4 – 6] hours	1 (100.00)	0 (0.00)	1	
]6 – 8] hours	40 (52.63)	36 (47.37)	76	
> 8 hours	78 (63.93)	44 (36.07)	122	
Daily feeding frequency				
Once	17 (51.52)	16 (48.48)	33	0.47
Twice	89 (62.68)	53 (37.32)	142	
Three times	14 (56.00)	11 (44.00)	25	

Regarding age, animals aged 10-15 years presented a significantly higher risk of having an unfavorable body condition score compared to those aged 5–10 years (OR = 4.15; 95% CI [2.11–8.4]; $p = 5.14 \times 10^{-5}$). In contrast, no significant association was observed for 5-year-old animals ($p = 0.66$). Regarding the type of work, water transport was significantly associated with an

unfavorable BCS (OR = 3.46; 95% CI [1.59–7.86]; $p = 0.002$) compared to material transport. Other types of activities specifically waste transport ($p = 0.23$), passenger transport ($p = 0.89$), and agricultural work ($p = 0.63$) were not significantly associated with BCS, as shown in Table IV.

Table IV: Multivariate regression of factors influencing body condition

Variables	Odds Ratio	95% CI	p-value
Age			
[5 - 10] years	Ref.	-	-
< 5 years	1.27	4.14.10 ⁻⁰¹ – 3.6	0,66
]10 – 15] years	4.15	2.11 – 8.4	5.14.10 ⁻⁰⁵
> 15 years	1.34.10 ⁺⁰⁷	-	0.98
Type of work			

Materials transport	Ref.	-	-
Waste hauling (sanitation)	1.98	0.64 – 6.11	0.23
Water hauling (chore)	3.46	1.59 – 7.86	0.002
Personal transport	1.08	0.35 – 3.03	0.89
Agricultural work	1.98	0.08 – 50.79	0.63

3.4 Prevalence of ocular pathologies

The questionnaire survey and formal diagnosis identified 52 cases among the 200 horses in the study sample. Observed cases

included corneal ulcers (37%), conjunctivitis (39%), keratitis (2%), habronemiasis (4%), and trauma (18%) (Figure 2).



Figure 2: Corneal ulcer in an Mpar horse (A); conjunctivitis in an Mpar horse (B); keratitis in an Mpar horse (C); ocular trauma in an Mbayer horse (D); habronemiasis wound in an Mpar horse (E); foreign body in a Fleuve horse (F).

3.5 Association between zootechnical, management, and health factors and the presence of ocular pathologies

Regarding the association of factors linked to the presence of ocular pathology (Table V), no statistically significant association was observed with breed ($p = 0.38$), sex ($p = 1$), or type of work ($p = 0.93$). However, age was significantly associated with the occurrence of ocular pathologies ($p = 0.01$). The youngest horses (< 5 years old) showed a higher proportion of cases (41%) compared to older age groups, where the proportion decreased markedly (19% in the 5-10 age group and 8% in the 10-15 age

group). Body condition was also significantly associated ($p = 0.004$), with a higher frequency of pathologies in animals in poor condition ($n = 73$) compared to those in good condition ($n = 90$). Furthermore, the presence of alterations in physiological parameters was linked to ocular pathology ($p = 0.006$); animals exhibiting these alterations were proportionally more affected (94.23%). Veterinary consultation showed a significant association ($p = 0.0007$). Animals that had received a veterinary consultation showed a higher proportion of cases (85%) compared to those that had not (50%). Vaccination status was also associated ($p = 0.01$), with a higher frequency of ocular pathologies in unvaccinated animals ($n = 97$) compared to vaccinated ones ($n = 66$). Animals under 5 years of age showed a tendency toward a higher risk of developing ocular pathology compared to those aged 5 to 10 years (OR = 2.94; 95% CI [0.98–8.44]; $p = 0.05$), bordering on statistical significance. Conversely, animals aged 10 to 15 years appeared to

be at lower risk (OR = 0.37; 95% CI [0.10–1.00]; $p = 0.08$), without reaching the threshold of significance. Body condition score was significantly associated with the occurrence of ocular pathologies ($p = 0.005$). Animals in good body condition showed a higher risk (OR = 3.48; 95% CI [1.52–9.02]) of developing ocular pathology. Furthermore, the absence of changes in physiological parameters appeared to be associated with an increased risk (OR = 4.87; 95% CI [1.65–20.89]), suggesting a significant relationship

with ocular pathology. Failure to consult a veterinarian was strongly associated with the presence of ocular pathologies (OR = 5.67; 95% CI [2.14–15.12]; $p = 0.0004$). Finally, the absence of vaccination was also significantly associated (OR = 2.92; 95% CI [1.27–7.58]; $p = 0.02$), indicating a higher risk of ocular pathologies in unvaccinated animals. The odds ratios for the various variable categories are presented in Table VI.

Table V: Factors associated with the prevalence of ocular pathologies

Variable	Yes (%)	No (%)	Total	P-Value
Race				
Fleuve	34 (75.56)	11 (24.44)	45	0.38
Foutanke	17 (77.27)	5 (22.73)	22	
Mbayar	15 (93.75)	1 (6.25)	16	
Mpar	97 (82.91)	20 (17.09)	117	
Sex				
Female	1 (100.00)	0 (0.00)	1	1
Male	162 (81.41)	37 (18.59)	199	
Age				
< 5 years	7 (0.41)	10 (0.59)	17	0.01
[5 - 10] years	25 (0.19)	105 (0.81)	130	
]10 – 15] years	4 (0.08)	46 (0.92)	50	
> 15 years	1 (0.33)	2 (0.67)	3	
Type of work				
Water hauling (chore)	26 (78.79)	7 (21.21)	33	0.93
Waste hauling (sanitation)	12 (85.71)	2 (14.29)	14	
Materials transport	108 (80.60)	26 (19.40)	134	
Personal transport	15 (88.24)	2 (11.76)	17	
Agricultural work	2 (100.00)	0 (0.00)	2	
Body condition score				
Good	90 (75.00)	30 (25.00)	120	0.004
Bad	73 (91.25)	7 (8.75)	80	
Alteration of physiological parameters				
No	114 (77.03)	34 (22.97)	148	0.006
Yes	49 (94.23)	3 (5.77)	52	
Veterinary consultation				
No	10 (50.00)	10 (50.00)	20	0.0007
Yes	153 (85.00)	27 (15.00)	180	
Vaccination practice				
No	97 (76.38)	30 (23.62)	127	0.01
Yes	66 (90.41)	7 (9.59)	73	

Table VI: Multivariate regression of factors influencing the prevalence of ocular pathologies

Variables	Odds Ratio	95% CI	p-value
Age			
[5 - 10] years	Ref.	-	-
< 5 years	2.94	0.98 – 8.44	0.05
]10 – 15] years	0.37	0.10 – 1.00	0.08
> 15 years	2.10	0.1 – 22.77	0.55
Body condition score			
Good	Ref.	-	-
Bad	3.48	1.52 – 9.02	0.005
Alteration of physiological parameters			
No	Ref.	-	-
Yes	4.87	1.65 – 20.89	2.53
Veterinary consultation			
No	Ref.		
Yes	5.67	2.14 -15.12	0.0004
Vaccination practice			
No	Ref.	-	-
Yes	2.92	1.27 -7.58	0.02

4. Discussion

4.1 Zootechnical and management characteristics and health status of the horses

The predominance of the Mpar breed (58.5%), followed by the Fleuve breed (22.5%), may reflect the local composition of the horse population used for traction and transport activities. However, caution is advised before attributing this distribution to superior genetic adaptation, as the present study did not evaluate the performance or comparative hardiness of the different breeds. Research conducted in Senegal also highlights the diversity of equine populations used in working systems (Diouf, 2013; Sarr, 2023). The near-exclusive use of males (99.5%) is consistent with the high prevalence of males in working roles reported in several studies on draft equids. In Senegal, Sarr (2023) and Nteme-Ella et al. (2026) also reported a predominance of males among draft horses. The majority of horses were aged between 5 and 10 years (65%), indicating a population composed primarily of animals of working age. International recommendations state that workload must be adapted to the age and general condition of equids, with young and old animals requiring special attention (WOAH, 2023). Transporting materials was the primary activity for 67% of the horses, and 61% worked more than 8 hours a day. Work duration and intensity are key factors in assessing the welfare of working equids, particularly because excessive loads can lead to fatigue, injuries, and a decline in general condition (WOAH, 2023; Yena, 2017).

The prevalence of a two-meal-per-day regimen (71%) characterizes the dominant feeding practice within the study population. However, meal frequency alone is insufficient to assess the nutritional adequacy of a ration. Factors such as quality, quantity, water availability, and the ration's suitability for the animal's

workload must also be considered (WOAH, 2023). The proportion of horses with poor body condition (40%) is a significant finding, given the role of body condition as an indicator of health and welfare in working equids. High proportions of horses in poor body condition have also been reported by other authors in Ethiopia (Fsaye et al., 2018; Mekuria *et al.*, 2013). The presence of physiological abnormalities in 26% of the horses indicates a notable frequency of signs or anomalies identified during the study. The high rate of veterinary consultation reported in this study (90%) contrasts with data from other authors, notably Traoré (2015) in Mali. This discrepancy may reflect the specific characteristics of the study area, owner practices, or the influence of local animal welfare initiatives.

4.2 Factors associated with body condition

The lack of a significant association between breed and body condition ($p = 0.21$) suggests that, in the study population, BCS was not statistically linked to breed. However, the body condition of working horses depends on several management-related factors, including nutrition, workload, rest, and preventive care. Indeed, the WOAH considers body condition a directly relevant indicator of working equid welfare (WOAH, 2023). Age emerges as a significant factor in this study ($p < 0.001$), with a higher proportion of poor body condition observed in horses aged 10–15 years and those over 15 years. This trend aligns with the concept that nutritional needs and recovery capacity may change with age and that workload must be adapted to the animal's general condition (WOAH, 2023). The absence of an observed association with sex, duration of work, and feeding frequency should be interpreted within the context of this specific population and the categorization used.

The association between the 10–15 age group and poor BCS (OR = 4.15) reinforces the role of age as a factor associated with body condition in this population. However, aging alone is not a sufficient explanation; work history, nutrition, disease, and the care received may also play a role. The association between water transport and poor BCS (OR = 3.46) warrants particular attention. The WOAHP emphasizes that workload must be adapted to the animal's general condition and that the demands of traction and transport can pose welfare risks when excessive (WOAH, 2023). The findings of Yena (2017) and Sarr (2023), obtained in West African contexts, also support the view that working and management conditions significantly influence the well-being of draft equids.

4.3 Factors associated with the presence of ocular pathologies

Age was significantly associated with the presence of ocular pathologies ($p = 0.01$), with a higher proportion of cases among horses under 5 years of age. Ocular conditions are among the health issues observed in working equids; notably, a study by Fsayaye et al. (2018) in Ethiopia reported a 17.2% prevalence of eye problems in draft donkeys. In Senegal, research by Diouf (2013) and Diouf (2016) also highlights the diversity of conditions found in horses. However, the association observed in the present study does not establish a causal relationship between age and ocular pathologies. The association with body condition was also significant ($p = 0.004$). Importantly, the model presented in this study indicates an association between good body condition and a higher risk of ocular pathology (OR = 3.48) a result that contradicts the intuitive hypothesis that animals in poor condition are more vulnerable. This observation must therefore be interpreted with caution; it may reflect structural differences between groups, detection bias, unmeasured confounding factors, or the cross-sectional nature of the study. Finally, the association between veterinary consultation, vaccination, and ocular pathologies should be interpreted as a statistical association rather than proof of a direct protective effect.

Conclusion

This study highlights a significant prevalence of poor body condition and ocular pathologies among draft horses in the Rufisque department of Senegal. The results indicate that age, type of work, and health management practices are key determining factors. Older animals and those engaged in the most strenuous activities particularly water transport face an increased risk of poor body condition, while a lack of veterinary care and vaccination is strongly associated with ocular pathologies. These findings underscore the need to strengthen preventive measures, improve access to veterinary care, and promote more appropriate working practices to ensure the welfare and sustainability of draft horse use in this context.

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