Potential Risk Factors Associated with Sole Hemorrhages Causing Lameness in Egyptian Water Buffaloes and Native Breed Cows

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Abstract

Sole hemorrhages are considered as a main cause for sub clinical laminitis. In this study we aimed at discussing the most prominent risk factors associated with sole hemorrhages causing lameness in Egyptian water buffaloes and native breed cows. The final multivariate logistic regression model showed, a significant association between sub acute ruminal acidosis ($P < 0.05$), limb affected ($P < 0.05$) and weight ($P < 0.05$) and sole hemorrhages causing lameness in Egyptian water buffaloes and native breed cows.

According to our knowledge, this is the first paper to discuss the risk factors associated with sole hemorrhages causing lameness in Egyptian water buffaloes and native breed cows

Keywords: *Lameness; Buffalo; Sole hemorrhages*

Introduction

Lesions of hoof are common in dairy cattle and buffalo managed in a variety of different management systems. They cause milk production loss, reduced fertility and increased risk of culling. In addition to the economic impact; hoof disease is extremely painful, making lameness in dairy cattle a serious animal welfare issue [1].

There are many different lesions associated with the bovine hoof, but it is useful to divide them into three primary groups: infectious digital disease, laminitis and associated claw horn lesions, and lesions caused by excessive hoof wear and/or trauma. In the last decade, a variety of practical field tools have been developed that can differentiate lameness conditions in a specific herd and identify primary risk factors for laminitis [2].

According to our knowledge, this is the first paper that discusses potential risk factors associated with sole hemorrhages causing lameness in Egyptian water buffaloes and native breed cows.

Materials and Methods

Study area

This study was carried out during the period from October 2012 to February 2014 at the Dakahlia governorate, Egypt (N 29º and E 25.48º) according to GPS reading (Garmin's eTrex Legend personal navigator). Dakahlia governorate is present in the east of the Delta of the Nile and covers about 3.459 km². It locates in a very strategic location overlooking Damietta branch of the River Nile and the Mediterranean Sea coast and boarded with El- Sharkia governorate from the east, El-Kharbeya governorate from the west and Damietta governorate to the North West. The weather in this area is moderate through out the year and the rate of rains is quite higher than that of Cairo.

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Study Animals and Design

The study was conducted on 36 animals belonging to 5 villages kept under different managemental systems in Dakahlia Governorate. Villages were selected with simple random technique. Animals were selected according to (1) case history, (2) clinical signs including lameness, anorexia and decreased milk yield and (3) clinical examination.

Clinical examination

Thorough and complete clinical examination of buffaloes and cows under investigation was performed according to the method described by Kelly, [3].

Statistical analysis

All data analyses were performed by using statistical software program (SPSS for Windows, Version 15.0, SPSS Inc., Chicago, USA). Association between the occurrence of sub-solar hoof hemorrhages causing lameness in Egyptian water buffaloes and native breed cows and the hypothesized risk factors was firstly carried out by univariate analysis using chi square (χ^2-test). Variables with significant association at $P \leq 0.1$ (two-sided) were subjected to the multivariate logistic regression model. With multivariate logistic regression, Hosmer and Lemeshow's goodness of fit statistic test greater than 0.05 was used to imply that the model's estimates fit the data at an acceptable level in multivariate analysis. The results were each expressed as p value and odds ratio (OR) with a 95% confidence interval (CI 95%). On multivariate logistic regression model, variables are considered significant at $p < 0.05$.

Results

Variable	Levels
Species	Buffalo=0; cows=1; buffalo and cows=2
Age	1day-1year=0; 1year- 2 year=1; 2year-5 year= 2
Lameness	Not present=0; present=1
Sub acute ruminal acidosis	Not present=0; present=1
Stage of lactation	Non lactating=0; early lactation=1; mid lactation=2; late lactation=3
Milk yield	No yield=0; 1/2 -1kg=1; 1-2kg=2; 2-3kg=3
Presence of foreign body	Not present=0; present=1
Weight	Less than 100kg=0; 100-200kg=1; 200-400kg=2
	Right forelimb=0; left forelimb=1; right hind limb=2; left hind limb=3
Limb affected	Right and left hind limb=4; all limbs=5
Congenital hoof anomaly	Not present=0; present=1
Pregnancy	Not present=0; present=1
Season	Summer=0; winter=1; autumn=2; spring=3
Regular hoof trimming	Not present=0; present=1
Flooring alley	Slatted=0; solid=1; slatted/solid=2
Floor at feeding table	Slatted=0; solid=1; slatted/solid=2
Heel horn erosions	Not present=0; present=1
Sole ulcers	Not present=0; present=1
Inter digital dermatitis	Not present=0; present=1
Herd size	1-3=0; 4-8=1; 8-20=2; more than 20=3
Type of beds	Older rubber material=0; cow mattress=1; concrete=2; deep straw bedding=3
Litter for farms	Straw=0; wood shavings/saw dust=1; peat=2; other/ combination=3

Table 1: Classification and levels of risk factors suggested affecting prevalence of sole haemorrhages causing lameness in Egyptian water buffaloes and native breed cows.

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Variable	Diseased		Normal	
	Number (31)	%	Number (5)	%
Species				
Buffalo	20	1	83.87	26
Cows	80	4	6.45	2
buffalo and cows	0	0	9.7	3
Age				
1day-1year	2	6.45	0	0
1- 2 year	3	9.67	2	50
2-5 year	26	83.87	2	50
Lameness				
Not present	3	9.67	5	100
Present	28	90.322	0	0
Sub acute ruminal acidosis				
Not present	7	22.58	5	100
Present	24	77.41	0	0
Stage of lactation				
Non lactating	9	29.03	1	20
Early lactation	1	3.22	1	20
Mid lactation	9	29.03	2	40
Late lactation	12	38.7	1	20
Milk yield				
No yield	13	41.93	2	40
1/2- 1kg	18	58.06	3	60
1-2 kg	0	0	0	0
2-3 kg	0	0	0	0
Presence of foreign body				
Present	22	70.96	5	100
Not present	9	29.03	0	0
Weight				
Less than 100kg	2	6.45	2	40
100-200 kg	6	19.35	2	40
200-400 kg	23	74.19	1	20
Limb affected				
No lameness	0	0	5	100
Right forelimb	7	22.58	0	0
Left forelimb	1	3.22	0	0
Right hind limb	10	32.25	0	0
Left hind limb	2	6.45	0	0
Right and left hind limb	2	6.45	0	0
All limbs	9	29.03	0	0

Citation: Waleed El-Said Abou El-Amaiem., *et al.* "Potential Risk Factors Associated with Sole Haemorrhages Causing Lameness in Egyptian Water Buffaloes and Native Breed Cows". *EC Veterinary Science* 2.3 (2016): 145-150.

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Congenital hoof anomaly				
Not present	29	93.54	5	100
Present	2	6.45	0	0
Pregnancy				
Present	12	38.7	3	60
Not present	19	61.29	2	40
Season				
Summer	3	9.67	1	20
Autumn	15	48.38	1	20
Winter	7	22.58	2	40
Spring	6	19.35	1	20
Regular hoof trimming				
Present	0	0	3	60
Not present	31	100	2	40
Flooring alley				
Slatted	6	19.35	2	40
Solid	15	48.38	2	40
Slatted/solid	10	32.25	1	20
Floor at feeding table				
Slatted	6	19.35	1	20
Solid	15	48.38	2	40
Slatted/solid	10	32.25	2	40
Heel horn erosions				
Present	10	32.25	3	60
Not present	21	67.74	2	40
Sole ulcers				
Present	21	67.74	3	60
Not present	10	32.25	2	40
Inter digital dermatitis				
Present	10	32.25	2	40
Not present	21	67.74	3	60
Herd size				
1-3	8	25.8	2	40
4-8	13	41.93	0	0
8-20	8	25.806	2	40
more than 20	2	6.4	1	20
Type of beds				
Older rubber material	2	6.4	1	20
Cow mattress	2	6.4	0	0
Concrete	17	54.83	3	60
Deep straw bedding	10	32.25	1	20

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Litter for farms				
Straw	13	41.93	4	80
Wood shavings/ saw dust	10	32.25	1	20
Peat	3	9.67	0	0
Other/ combination	5	16.12	0	0

Table 2: *Distribution of risk factors of sole haemorrhages causing lameness in Egyptian water buffaloes and native breed cows.*

Variable	[1]β	[2]SE	P	Odds	[3]CI
Sub acute ruminal acidosis	19.263	6.018E3	0.997	2.322	0.00
Weight	19.263	6.018E3	0.997	2.322	0.00
Limb affected	-19.308-	6.018E3	0.997	0.000	0.00

[1]*β: Regression coefficient*

[2]*SE: Standard error*

[3]*CI: Confidence interval at 95%*

Table 3: *Final multivariate logistic regression model for positive risk factors associated with sole haemorrhages causing lameness in Egyptian water buffaloes and native breed cows.*

Discussion

While the causes of laminitis and associated claw horn lesions are multi-factorial in nature, our current understanding of the etiology of the disease syndrome focuses primarily on the environment and diet. Monitoring laminitis risks in the cow environment include assessment of factors that affect the time that cows stand on concrete and lie down in stalls, the quality of walking surfaces, and factors which impact the period of acclimation for heifers first introduced into confinement housing. Dietary risk factors include ration composition, as well as feeding management factors that may be related to ruminal acidosis [4].

From the previous study; it was clear that there were three main positive risk factors associated with sole hemorrhages causing lameness in Egyptian water buffaloes and native breed cows: (1) sub acute ruminal acidosis, (2) weight and (3) limb affected.

Sole hemorrhages are considered as one of the primary causes of lameness in buffalo and cattle. Correlation between sub acute ruminal acidosis and sole hemorrhages is still obscure but one theory discussed the correlation between them as SARA-induced damage to the ruminal epithelium, allowing for the absorption of histamine and endotoxins. These and possibly other compounds disrupt normal circulation and cause inflammation within the hoof then bleeding [5].

There were a significant correlation between high weight and Sole hemorrhages in buffalo and cattle as highly weighted cattle and buffalo carry more weight on their claws leading to damage [4].

It was clear that hind limb lameness was prevalent. Theses results were in concern with those obtained by [5] owing that to poor management.

Conclusion

From the previous mentioned data there were three main positive risk factors associated with sole hemorrhage: (1) sub acute ruminal acidosis, (2) weight and (3) limb affected. Further studies are needed to investigate more risk factors on wide scale.

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