

RESEARCH ARTICLE

INCIDENCE AND RISK FACTORS OF HORSE KICKS IN HORSES AND THEIR HANDLERS IN SELECTED STABLES IN LAGOS STATE, NIGERIA: A TWO-YEAR PROSPECTIVE STUDY (2021-2023)

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ABSTRACT

Horses, with their powerful hindquarters and defensive kicking mechanisms, present a considerable risk of severe injury to both humans and fellow equines. The lack of comprehensive data on horse kicks underscores the need for increased awareness of potential hazards. We aimed to prospectively study the incidence and risk factors of horse kicks in horses and handlers in selected stables in Lagos State, Nigeria from 2021 to 2023. A total of 200 horses and 55 handlers were included. The incidence of horse kicks was 12.5% in horses and 29.1% in handlers. For horses, personal space invasion (52%) was the most common situation leading to kick incidents, while for handlers, fear (44%) and startle response (31%) were the primary triggers. Injuries sustained included skin abrasions (32% in horses, 69% in handlers), hematomas (16% in horses), muscle/nerve damage (20% in horses, 13% in handlers), and fractures (32% in horses, 19% in handlers). Significant risk factors for horse kicks in horses were old age (>15 years) and being a stallion. In handlers, significant risk factors included young age (24–44 years), occupation as a farrier, and less than 5 years of experience. Horse kicks occur in both horses and their handlers. The findings highlight the need for targeted safety measures and training, particularly for high-risk groups, to reduce the risks associated with horse kicks for both horses and handlers in Lagos State stables.

Keywords: Horse kick, horse handler, incidence, prospective study

INTRODUCTION

Horses naturally employ kicking as a defensive action. They engage in kicking behaviour for several motives, such as fear, frustration, pain, aggression, and to establish dominance (Benthien et al., 2020). The formidable strength and power of a horse's legs make a horse's kick highly perilous, capable of inflicting severe injuries on both humans and horses. Horses generate the force for their kicks through robust muscles in their hindquarters, enabling them to deliver powerful and swift kicks (Majeedkutty and Khairulanuar, 2017). A single hoof kick can generate a force of up to 9807 Newtons (equivalent to 1 tonne), and steel horseshoes can cause even greater peak forces, increasing the risk of severe injury (Kriss and Kriss, 1997; Piskoty et al., 2005).

Horses are large, robust animals, and a kick from one could have negative effects. The sequelae of horse kick encompass many physical injuries, such as skin lacerations, hematomas, muscle, tendon, or nerve damage, or bony trauma, including fractures, damage to the outer layer of bones, and bone infections (Schroeder et al., 2013). Depending on the region that receives the kick, different types of traumas may occur. For instance, areas that have muscle and soft tissues protecting them are less likely to sustain bone-related injuries. However, parts of the body like the medial radius and medial tibia, as well as the metacarpal bones, metatarsal bones, and calcaneus, only have a thin layer of skin and very little soft tissue to protect them. This means that when there is an impact, these bones are exposed to strong forces (Swinebroad et al., 2003).

To the best of the authors' knowledge, there is a dearth of information on the incidence and risk factors of horse kicks in horses and their handlers. Horse handlers, especially farriers and grooms, face the potential hazard of being kicked by horses, highlighting the importance of their awareness regarding this risk. This study will fill this knowledge gap and contribute valuable insights towards the creation of evidence-based approaches for reducing the incidence of horse kicks, thereby enhancing safety within equine environments.

The present study aimed to determine the incidence and risk factors associated with horse kicks among horses and their handlers in selected stables in Lagos State, Nigeria, over a two-year period.

MATERIALS AND METHODS

Ethical Consideration

Ethical approval for this study was obtained from The Lagos State Ministry of Agriculture, Nigeria (reference number: MOA/LS/RDE/334/12) that approved this study. All procedures adhered to established ethical guidelines and principles for research involving animals. Informed consent was obtained from the stable owners and managers for the participation of their horses in the study. Additionally, all handlers involved in the study provided written informed consent prior to their participation. The welfare of both horses and handlers was prioritized throughout the study period, and all participants were informed of their right to withdraw from the study at any time, without consequence.

Study Area

This study was conducted in Lagos State, located in southwestern Nigeria. Lagos is the most populous city in Nigeria and is known for its vibrant equestrian scene. The city hosts various polo tournaments throughout the year, attracting both local and international participants. This active polo culture contributes to the presence of numerous stables and a significant population of polo horses in the area, making it an ideal location for this study on horse kicks in stable environments.

Study Design

A 2-year prospective study on horse kicks was conducted between August 2021 and September 2023, involving horses and horse handlers in selected stables in Lagos State.

Horse Management and Care

All horses were kept in individual stalls measuring approximately 3.6 x 3.6 meters (12 x 12 feet). The stalls were constructed of concrete blocks with metal bars, allowing visual contact between

horses. Each stall was bedded with wood shavings and saw dust, which were changed daily. Horses were turned out in paddocks for 2-4 hours daily in small groups of 3-5 horses, allowing for socialization and free movement. The groupings were kept consistent to minimize stress.

The horses were primarily used for polo, with training sessions occurring 5-6 days per week. Exercise regimes included daily riding (1-2 hours), stick-and-ball practice, and weekly practice chukkas. During the polo season, horses participated in tournaments and matches. Horses were fed two times daily, with a diet consisting of high-quality grass hay (approximately 1.5-2% of body weight per day), concentrated feed (0.5-1% of body weight), and free access to fresh water. Feeding times were consistent, occurring at 8:00 AM and 6:00 PM. All horses underwent regular health checks by para-veterinarians and veterinarians every two weeks. These checks included physical examinations, dental care, and hoof inspections. A farrier visited every 4-6 weeks for routine hoof care and shoeing. The preventive health management program included: annual vaccinations against tetanus, equine influenza, and African horse sickness; bi-annual deworming with rotating anthelmintics; and daily temperature checks to monitor for early signs of illness. At the start of the study, all horses were deemed healthy and fit for polo. Any horses developing health issues during the study period were noted, and their participation in the study was re-evaluated based on the nature and severity of the condition.

Inclusion Criteria

Horses: Horses stabled in the selected facilities in Lagos State during the study period (August 2021 - September 2023).

Handlers: Those employed as farriers or grooms in the selected stables during the study period (August 2021–September 2023).

Exclusion Criteria

Horses: Those expected to be moved out of the selected facilities in Lagos State during the study period (August 2021–September 2023).

Handlers: Temporary or casual workers not regularly employed as farriers or grooms in the selected stables during the study period (August 2021–September 2023).

Data Collection

Baseline data was collected on all 200 horses included in the study, comprising 146 Argentine Polo Ponies and 54 Sudan Country-Bred Horses with ages ranging from 5 to 20 years. Of these, 166 were mares, and the remaining 34 were stallions. Baseline data was also collected on all 55 handlers included in the study, consisting of farriers (18) and grooms (37). The farriers were exclusively male, aged between 25 and 60 years, while the grooms included 7 females and 30 males, also aged between 25 and 60 years.

An observation form to document all incidents of horse kicks involving horses and handlers was made, which included details such as the situation at the time of incidence, body regions affected, and sequelae. For each reported incident, the research team conducted an initial assessment within 24–48 hours, during which the kicked body regions, for both horses and handlers, were categorised into head, neck, chest, abdomen, and limbs; also, the sequelae of horse kicks were classified as skin abrasion, hematoma, muscle or nerve damage, and fractures. The situation at the time of the incident was noted and recorded. Pictures were also taken using a digital camera.

Risk factors for horse kicks in both horses and handlers were separately observed using on-the-spot assessment forms. For horse kicks in horses, potential risk factors considered included age, breed, and sex. Age was classified as adult (5–15 years old) and old (>15 years old) (Akinniyi et al., 2023). The horse breeds were Argentine Polo Pony and Sudan Country-Bred, and sex was classified as stallion and mare. For horse kicks in the horse handlers, considered risk factors included occupation, age, and sex. Occupations considered were farriers and grooms. Age was categorised as young (25–44 years old) and middle age (44–60 years old) (Dyussenbayev, 2017), and sex was classified as male and female. Years of experience

were grouped into less than 5 years and 5 years and above.

Data Analysis

The collected data were summarised and presented in tables using descriptive statistics. The odds ratio was determined through multivariate logistic regression to assess the strength of the identified risk factors. Confidence values of 95% were calculated, and $P \leq 0.05$ was considered significant. The Statistical Package for Social Sciences (SPSS®, version 26) was employed for data analysis.

RESULTS

Study Population

Baseline data was collected on all 200 horses included in the study, comprising 146 (73%) Argentine Polo Ponies and 54 (27%) Sudan Country-Bred Horses with ages ranging from 5 to 20 years. Of these, 166 (83%) were mares, and the remaining 34 (17%) were stallions. Baseline data was also collected on all 55 handlers included in the study, consisting of 18 (32.7%) farriers and 37 (67.3%) grooms. The farriers were exclusively male (100%), aged between 25 and 60 years, while the grooms included 7 (18.9%) females and 30 (81.1%) males, also aged between 25 and 60 years.

Incidence of Horse Kicks

During the two-year study period (2021-2023), we observed a total of 200 horses and 55 horse handlers. The incidence of horse kicks was 12.5% (25/200) among horses and 29.1% (16/55) among handlers (Table 1).

Situations leading to kicks, the body regions affected, and the sequelae for both horses and handlers

For horses, the most common situation leading to kicks was personal space invasion (52%, 13/25), followed by mating and hierarchy situations (24% each, 6/25). For handlers, fear was the primary cause (44%, 7/16), followed by startle response (31%, 5/16) and pain procedures (25%, 4/16) (Table 2).

The body regions most frequently affected in horses were the limbs (40%, 10/25), followed by the abdomen (33%, 8/25) and head (28%, 7/25). In handlers, the head and neck were equally affected (31% each, 5/16), followed by limbs (25%, 4/16) and chest (13%, 2/16) (Table 3).

The most common sequelae in horses were skin abrasions and fractures (32% each, 8/25), followed by muscle or nerve damage (20%, 5/25) and hematoma (16%, 4/25). In handlers, skin abrasions were predominant (69%, 11/16), followed by fractures (19%, 3/16) and muscle or nerve damage (13%, 2/16) (Table 4).

Risk Factors for Horse Kicks

Among horses, significant risk factors for being kicked included older age and being a stallion. Old horses (>15 years) were 6 times more likely to be kicked than adult horses (5–15 years) (32.5% vs. 7.5%, OR 6, $P < 0.05$), while stallions were 5.2 times more likely to be kicked than mares (32.4% vs. 8.4%, OR 5.2, $P < 0.05$). Although not statistically significant, Sudan Country-Bred Horses showed a higher likelihood of being kicked compared to Argentine Polo Ponies (18.5% vs. 10.3%, OR 2, $P > 0.05$).

For handlers, significant risk factors included younger age, being a farrier, and having less experience. Handlers aged 24-44 years were 4.6 times more likely to be kicked than those aged 45-60 years (53.3% vs. 20%, OR 4.9, $P < 0.05$). Farriers faced a notably higher risk, being 16.7 times more likely to be kicked than grooms (66.7% vs. 10.8%, OR 16.7, $P < 0.05$). Additionally, handlers with less than 5 years of experience were 9.8 times more likely to be kicked compared to those with 5 or more years of experience (61.9% vs. 14.7%, OR 9.8, $P < 0.05$). While not statistically significant, male handlers showed a higher likelihood of being kicked compared to female handlers (31.3% vs. 14.3%, OR 2.7, $P > 0.05$).

Detailed data for all risk factors analysed can be found in Tables 5 and 6.

Table 1 A prospective study spanning two years (2021-2023) on the incidence of horse kicks in both horses and horse handlers

Horse kicked			Horse handlers kicked		
No. of horses	No. of horses kicked	Incidence (%)	No. of horse industry professionals	No. of horse handlers kicked	Incidence (%)
200	25	12.5	55	16	29.1

Table 2 Situation at the time of incidence of horse kick in horses and their handlers

Horses kicked			Horse handlers kicked		
Situation	Number	Percentage (%)	Situation	Number	Percentage (%)
Mating	6	24	Painful procedure	4	25
Personal space invasion	13	52	Startle response	5	31
Hierarchy	6	24	Fear	7	44
Total	25	100	Total	16	100

Table 3 A two-year (2021-2023) prospective study summarizing the body regions affected by horse kicks in both horses and horse handlers

Horses kicked			Horse handlers kicked		
Body region	Number	Percentage (%)	Body region	Number	Percentage (%)
Head	7	28	Head	5	31
Neck	0	0	Neck	5	31
Chest	0	0	Chest	2	13
Abdomen	8	33	Abdomen	0	0
Limbs	10	40	Limbs	4	25
Total	25	100	Total	16	100

Table 4 A two-year (2021-2023) prospective study summarizing the sequelae of horse kicks in both horses and horse handlers

Sequelae	Horse kicked		Horse handlers kicked	
	Number	Percentage (%)	Number	Percentage (%)
Skin abrasion	8	32	11	69
Haematoma	4	16	0	0
Muscle or nerve damage	5	20	2	13
Fracture	8	32	3	19
Total	25	100	16	100

Table 5 A two-year (2021-2023) prospective study on the risk factors associated with horse kicks in horses

Risk factor	No. of horses	No. of horses kicked	Incidence (%)	OR (95% CI)	P value
AGE					
Adult (5-15 years old)	160	12	7.5	Reference	
Old (> 15 years old)	40	13	32.5	6.0 (2.5, 14.4)	< 0.001*
BREED					
Argentine Polo Pony	146	15	10.3	Reference	
Sudan Country-Bred	54	10	18.5	2 (0.8, 5.0)	0.145
SEX					
Stallion	34	11	32.4	5.2 (2.1, 13.1)	< 0.001*
Mare	166	14	8.4	Reference	

*= Statistically significant

Table 6 A two-year (2021-2023) prospective study on the risk factors associated with horse kicks in horse handlers

Risk factor	No. of horse handlers	No. of horse handlers kicked	Incidence (%)	OR (95% CI)	P value
AGE					
Young age (25-44 years old)	15	8	53.3	4.6 (1.3, 15.5)	0.015*
Middle age (45-60 years old)	40	8	20	Reference	
OCCUPATION					
Farrier	18	12	66.7	16.7 (4.2, 66.4)	< 0.001*
Groom	37	4	10.8	Reference	
SEX					
Male	48	15	31.3	2.7 (0.31, 24.4)	0.362
Female	7	1	14.3	Reference	
HANDLER EXPERIENCE					
< 5 years	21	13	61.9	9.8 (2.7, 35.1)	0.001*
5 years and above	34	5	14.7	Reference	

DISCUSSION AND CONCLUSION

The aim of this study was to assess the incidence and factors contributing to horse kicks among horses and handlers in Lagos State stables during a two-year period. Our findings highlight the significant risk of horse kicks for both equines and humans in stable environments, with notable differences in incidence, contributing factors, and consequences.

The higher incidence of horse kicks among handlers (29.1%) compared to horses (12.5%) underscores the elevated risk for humans working closely with these animals. This aligns with previous studies identifying kicks as a primary cause of equine-related injuries to humans (Hawson et al., 2010). The incidence rate among handlers is comparable to that reported in equestrians (21%) by Exadaktylos et al. (2002), suggesting a consistent level of risk across different equine-related activities.

Our study revealed distinct situations leading to kicks in horses versus handlers. For horses, incidents primarily occurred on pasture, often due to personal space invasion, mating, or hierarchy disputes. This corroborates Derungs et al.'s (2004) findings and highlights the importance of proper pasture management and understanding equine social dynamics. For handlers, fear and startle responses in horses were primary triggers, emphasizing the need for handlers to recognize and mitigate potential stressors, as suggested by Hausberger et al. (2008).

The distribution of affected body regions differed between horses and handlers, with implications for protective measures. In horses, limb injuries were most common, consistent with Derungs et al.'s (2004) observations. Handlers experienced more upper body injuries, aligning with findings from Iba et al. (2001), Exadaktylos et al. (2002), and Jagodzinski and DeMuri (2005). This suggests that protective gear and handling techniques should be tailored differently for horses and humans.

Regarding sequelae, our findings of skin abrasions and fractures as common outcomes in both horses and handlers are consistent with previous research. Derungs et al. (2004) reported similar patterns in horses, while Williams and Ashby (1992) noted comparable injury types in humans. The higher proportion of skin abrasions compared to fractures in handlers may be attributed to kicks often occurring in muscle-covered areas, as suggested by Schroeder et al. (2013).

Our study identified age and sex as significant risk factors for horses, with older horses and stallions at higher risk. This may reflect changes in temperament with age and hormonal influences on behaviour, as noted by Rios and Houpt (1995) regarding stallion aggression. For handlers, younger age, being a farrier, and less experience was associated with higher risk. The increased risk for farriers aligns with Exadaktylos et al.'s (2002) observation that those cleaning horses' hooves are at elevated risk of kicks.

While our findings on breed-related risk were not statistically significant, they contrast with

Knubben et al.'s (2008) results, suggesting the need for further investigation into breed-specific risks.

The study's main limitation is the small sample size, especially for horse handlers, which impacts statistical power and generalizability. Future research should expand the sample size and explore specific circumstances surrounding kick incidents in greater detail.

In conclusion, our results emphasize the intricate interaction of various factors leading to horse kick accidents. To reduce risks, it is suggested to create detailed safety training programs, particularly targeting at-risk individuals like young handlers, farriers, and inexperienced staff. It is essential to implement tactics for effective pasture management and enhance knowledge of equine social behaviour. It is crucial to create specific protective measures according to the various injury patterns seen in horses and handlers. Furthermore, raising awareness of possible stress factors and triggers for horses in stables can greatly help in prevention. By comprehensively addressing these areas, we can aim to decrease the incidence and severity of horse kick incidents, ultimately improving safety for both horses and humans in stable environments. Additional investigation with larger sample sizes and a deeper look into specific circumstances of kicking incidents will help improve our understanding and prevention tactics.

CONFLICT OF INTEREST

The authors declared that there is no conflict of interest.

AUTHOR CONTRIBUTIONS

Concept – NR; Design – OOA; Supervision – NR; Resources – TRL; Materials – PWH, REE; Data Collection and Processing – OOA, TRL; Analysis and Interpretation – OOA, TRL, PWM, REE; Literature Search – OOA, NR; Writing Manuscript – OOA, REE; Critical Review – PWM, NR.

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INCIDENCA I FAKTORI RIZIKA RITANJA KONJA ZA KONJE I VODIČE U ODABRANIM ŠTALAMA U DRŽAVI LAGOS U NIGERIJU: DVOGODIŠNJA PROSPEKTIVNA STUDIJA

SAŽETAK

Konji sa svojim snažnim stražnjim dijelovima i defanzivnim mehanizmima ritanja predstavljaju znatan rizik od teških povreda za ljude i ostale konje. Nedostatak sveobuhvatnih podataka o ritanju kod konja naglašava potrebu za boljim poznavanjem potencijalnih opasnosti. Imali smo za cilj prospektivno istražiti incidencu i rizične faktore ritanja na ostale konje i vodiče u odabranim štalama u državi Lagos u Nigeriji, u periodu od 2021. do 2023. godine. U istraživanje je uključeno ukupno 200 konja i 55 vodiča. Incidenca ritanja i udaranja drugih konja je iznosila 12.5%, a vodiča 29.1%. Najčešća situacija koja je dovela do ritanja i udaranja drugih konja je bila invazija privatnog prostora (52%), dok su kod udaranja vodiča primarni okidači bili strah (44%) i odgovor na prepad (31%). Nastale povrede su uključivale abrazije kože (32% kod konja i 69% kod vodiča), hematome (16% kod konja), oštećenje mišića/živaca (20% kod konja, 13% kod vodiča) i frakture (32% kod konja i 19% kod vodiča). Signifikantni rizični faktori za udaranje konja su bili starost (>15 godina) i status pastuha. Za vodiče su signifikantni rizični faktori uključivali mladost (24–44 godine), zanimanje potkivača i manje od 5 godina radnog iskustva. Ritanjem su udarani i drugi konji i vodiči. Dobiveni rezultati naglašavaju potrebu za postojanjem ciljanih mjera sigurnosti i obukom, posebice visoko rizičnih grupa, kako bi se smanjili rizici povezani sa ritanjem i udaranjem drugih konja i vodiča u štalama u državi Lagos.

Ključne riječi: Ritanje, incidence, prospektivna studija, voditelj konja