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**Original Research Article** 

## Awareness, prevalence, predisposing factors and review of common local remedies of bowed tendon in horses in some stables in Zaria and Kano, Nigeria

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## ABSTRACT

Horses are globally known to be used for vigorous and strenuous works such as polo games, horse racing, pleasure riding in festivities of Sallah, Durba and other traditional ceremonies (e.g. weddings). As such, horses are affected by lameness conditions due mainly to bowed tendon (tendonitis/tendon injury). Although multiple equine conditions have been reported in Nigeria, there is paucity of information about bowed tendon. The study was aimed at assessing the level of awareness of horse owners and investigating the prevalence rate, risk factors and common remedies employed in management of bowed tendon affecting horses in Polo clubs and race course in Kano and Zaria Nigeria. A total of 50 questionnaires were distributed among horsemen and equine practitioners in the study area. The overall awareness level of horse owners to bowed tendon (commonly known as "Tanda") was 64% and the prevalence rate ranged from 31% to 37% occurring very rarely. The significant predisposing factors to the condition included the breed of the horse (more in Sudanese, 43%, and less in Argentine, 18%); the use of the horse (more in polo horses, 46%); the frequency of exercise (53% in horses on 5-6 times exercise per week, 12% in horses exercised once monthly) and administration of medication (steroids) before or after exercise (67%). 62% of the horsemen manage this condition by themselves using traditional remedies (mixtures of eucalyptus oil, palm oil, ash and alum), 22% consults with the veterinarian; whereas, 14% consults with the herbal or traditional doctor. Our findings showed that drugs, particularly steroids, are indiscriminately used in stables for musculoskeletal conditions.

Keywords: Bowed tendon, Horses, Lameness, Tendon injuries, Ultrasound

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## Introduction

A bowed tendon is a horseman's term for a tendon after a horse has sustained an injury that caused the tendon fibers to be torn and then healed with a "bowed" appearance.<sup>1</sup> In veterinary medicine, this condition is referred to as a core lesion.<sup>2</sup> Unfortunately, bowed tendons are an all-too-common injury in athletic horses,<sup>3</sup> which accounts for 30 % of the wastage of young thoroughbreds in training. Treating bowed tendons can be long and complex, with a high risk of re-injury.<sup>4, 5</sup> In horses, bowed tendon can be defined as acute or chronic tendon inflammation (superficial digital tendon, SDFT, deep digital flexor tendon, DDFT). This condition is also known as tendinitis, tendonitis or tendinopathy.<sup>6</sup> This injury usually occurs when the tendon is strained beyond its limit, resulting in torn collagen fibers. Tendon injuries can arise by either intrinsic (strain or displacement) or extrinsic (bruise, penetration or laceration) mechanisms and appear to be widespread in the horse.<sup>7</sup>

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Bowed tendon, chipped bones, and other soft tissue injuries can lead to lameness in horses,<sup>8</sup> which has grave economic consequences. The best

lameness in horses,<sup>8</sup> which has grave economic consequences. The best way to ensure a successful management of the condition is through prompt ultrasonographic diagnosis, accurate treatment, and careful monitoring of the tendon by a veterinarian.<sup>2, 9</sup>

Bowed tendon diagnosis in a horse involves a veterinarian carefully palpating the affected tendon between the thumb and forefinger while it is bearing weight in order to identify any thickening of the tendon tissue.<sup>10</sup> Palpation can help identify some swelling and damage in the tendon. However, it does not show the veterinarian the extent of the damage. A diagnostic ultrasound is required to determine the tendon fibers' and collagen's integrity and alignment.<sup>6</sup> The ultrasound of the tendon is usually scheduled 5 - 10 days following the injury, as this is when tendon damage will be most apparent (a healthy tendon appears stark white on an ultrasound, whereas a damaged tendon appears gray or black). A veterinarian will need to ultrasound the horse's leg approximately every sixty days after the initial exam to determine if the tendon has healed enough to allow for an increase in exercise.<sup>11, 12</sup> Signs of bowed tendon include tendon rip, which may cause a buildup of damaged cell fluid inside the tendon.<sup>13</sup> If blood vessels are torn as well, then blood will be added to the fluid mixture. Damage to a tendon causes inflammation, pain, heat, and swelling.14 In bowed tendon, the affected horse may or may not exhibit lameness.<sup>2, 15</sup> It suffices to mention that mild strains may not always cause lameness; however, in severe damage, the limb may become very painful and swollen, and the horse may be severely lamed.

Treatment of bowed tendons is promoted by physical therapy modalities such as therapeutic ultrasound, low-power laser, and magnets.<sup>16</sup> In some cases, the use of intralesional medication, such as BAPTEN®, may be beneficial in improving the quality of tendon repair.<sup>17</sup> The traditional treatment during the first 2 weeks (acute and sub-acute sage) involves injecting these lesions with hyaluronic acid, which has been shown to decrease the amount of scar tissue that occurs during the healing process.<sup>9, 17</sup> Another traditional treatment involves injection with an anti-inflammatory drug and cortisone.<sup>18</sup> Current therapy however includes stem cell therapy, shock wave therapy intralesional injections with medications such have Platelet Rich Plasma, Stem Cells, and Bone Marrow.<sup>19</sup> Surgical treatments involve transecting the superior check ligament in SDFTinjuries.<sup>16, 20, 21</sup>

The prognoses of horses with bowed tendons range from good to fair. Although tendon injuries are serious, most horses can recover and return to athletic function if given enough time.<sup>2</sup> Even in the case of a severe tear, it is likely that a horse will be able to return to less strenuous activity.

Most people think tendon injuries such as "bowed tendons" only happen to racehorses. In reality, any breed or type of horse performing almost any activity can risk acquiring tendon injury. Most horse owners, however, manage this condition themselves with local remedies. In most instances, the overall effect of such local remedies predisposes the horses to further tendon problems. Horse riders are also found to be in constant use of certain drugs, particularly steroids. The abuse of steroids is considered deleterious to the health of the horse as it predisposes to invasion by opportunistic pathogens.

Although several equine diseases or clinical conditions have been reported in Nigeria,<sup>22-25</sup> information about bowed tendons in horses in Nigeria is lacking in our literature search, even though it is a common condition in horses in Nigeria. Therefore, this study aimed to assess the awareness level of horse owners, horse managers, and horse practitioners on tendon injuries to identify the risk factors (predisposing factors) to bowed tendons, to determine the prevalence rate of tendon injuries in horses in the study area, to assess the effectiveness of the typical traditional remedies employed by horse keepers within the study area in the management of bowed tendon, to examine the problems associated with conventional methods of diagnosis and therefore management of tendon injuries, to emphasize the importance of tendon scans (ultrasonography) in diagnosis and appropriate management modalities to tendon injuries.

The study will benefit future researchers who may embark on similar studies. The study will be relevant to horse owners whose horse(s) are suffering from tendon injuries by proffering beneficial advice to horse owners and equine practitioners on accurately diagnosing, preventing, controlling, and effectively managing bowed tendons in horses in Nigeria.

### **Materials and Methods**

#### Design

A closed and open-ended structured questionnaire was designed and distributed to a targeted audience, which included horse owners, horse managers or practitioners, horse riders and horse keepers working in Kano and Zaria Polo Club and Race Course, as well as owners and managers of privately owned horses within the study area.

#### Questionnaire

The questionnaire was designed and administered to the sample individuals involved in various aspects of horse management in the Kano and Zaria environments. This is necessary to sort out their understanding of horses 'bowed tendon condition and other tendon conditions. The researchers also conducted oral interviews with people involved in Horse management and horse keeping in the Kano environment and some areas in the Zaria community to obtain more clarification on some issues. Most of the questions were drafted from the questionnaire.

#### Data Collection

A random sample of 50 horse owners, managers or practitioners, and riders - 9 from the Racecourse, 17 from the Polo Club, and 24 from private/residential horse owners, managers, riders, or keepers were selected.

The methodology adopted for acquiring the data necessary for this research work was primary sources collected through the use of a questionnaire and interview, which comprised two (2) parts – part 1, which is the client consent, is a formal note of soliciting for participation and maximum cooperation from respondents. Part 2 was divided further into three sections: Section A (Horse owner's information), i.e., personal data of the respondent; Section B (Horse's information), i.e., data describing the type of horse(s) and usage; Section C (Research information). The sampled questionnaire is available as a supplementary document from the researchers.

#### Data Analysis

Data Analysis was performed using Statistical Package for Social Science (SPSS) version 16.0. Statistical methods employed include the Chi-square test of independence and frequencies. P values less than 0.05 were considered significant. The values were expressed in absolute and relative terms and presented in tables and graphs.

#### Management of the Horses in the study area

Most horses were managed under traditional husbandry, tethered in a stable or an open field using sand as bedding with or without shade. They were fed on hay, millet, wheat bran, and crop residues, and water was provided *as ad libitum*. Some horses have medical records of deworming and vaccination against African horse sickness and tetanus. The horses were kept for racing, durbar, companion, polo, and ceremonial activity.

#### Diagnosis of Bowed tendon in the study area

The diagnosis was accomplished via the history of trauma or physical assault/injury to the tendon and also via physical examination of the affected region by carefully palpating the affected tendon between the fingers. At the same time, the horse bears weight (to identify swollen or thickened tendons). A diagnostic ultrasound was carried out for a confirmatory diagnosis using an Edan color ultrasound scanner, Brand YSENMED (YSB-L5PRO), with a 7.5MHz transcutaneous linear-phased array probe as shown in plate one and Figure 1, respectively. We scanned both limbs (right and left) to appreciate the distinct pathological defect in the standard and injured tendon.



**Figure 1:** Sonograph showing a healthy tendon (right forelimb) and a superficial tendinitis (left forelimb). The healthy tendon, A appearing echogenic (white), whereas the pathologic tendon, B appears hypoechoic/anechoic gray (grayish - black) on ultrasound.

## **Results and Discussion**

## Awareness level of horse owners of bowed tendon

In Nigeria, most horses in the northern region are kept mainly for leisure or cultural purposes,<sup>26</sup> especially used in durbar, royalty purposes, recreational activities, companionship, racing, polo, and for traction (Agricultural purposes).<sup>27</sup> we also discovered 64 % of the study population is aware of bowed tendon condition in horses with 36% less aware, as depicted in table 1.

 Table 1: Tendon injury awareness assessment score

	Frequency	Percent	
Unaware	18	36.0	
Aware	32	64.0	
Total	50	100.0	

## Prevalence level of bowed tendon in horses

It was discovered in the present study that bowed tendon condition is prevalent among horses (as seen in plates 1 and 2), affecting 66 % of the study population (table 2). A study by <sup>4</sup> reported over 70% prevalence in race and thoroughbred horses. The prevalence rate in this present study ranges from frequently (37%), especially among polo and race horses, to very rarely (10%), especially among pleasure horses, as depicted in Figure 2. This finding aligns with the report of.<sup>28</sup> The condition occurs more acutely than chronically (66.7% as against 22.2%) as depicted in Table 12; this finding concord with reports of.<sup>5, 29</sup>



Figure 2: Frequency of occurrence of tendon injury among investigated horses

Response	Frequency	Percent
No	17	34.0
Yes	33	66.0
Total	50	100.0

#### Predisposing Factors to a bowed tendon

Some of the predisposing factors to bowed tendons from this study included

*The breed of the horse*: the condition is mainly seen more in the Sudanese (43%) and the talon (21%) (Figure 3), which contradicts reports of <sup>4, 5</sup> who showed that the condition is more frequent in the Thoroughbreds. The disparity between our findings and theirs may be because the Sudanese and Talon dominated the proportion of the horses mainly engaged in strenuous activities such as polo and racing in the study area. Our results also showed that the Arewa, Argentine, and Thoroughbreds are less commonly affected (18%, 6%, and 18%, respectively).

*Use of the horse*: it was observed that the condition occurs more in horses that are engaged in vigorous activities and exercise (figure 4), such as polo (46%) and for both polo and racing (24%), agreeing with the reports of.<sup>3, 13</sup> However, our findings also showed that 30 % of pleasure horses in the study population are affected with bowed tendons, even though they are engaged in less vigorous activities or exercise. This could be because these pleasure horses are not conditioned for strenuous activities and, therefore, cannot withstand the exhaustive exertion they are put through during festive activities of Durba, Sallah, and other traditional ceremonies. During these periods, they are exercised more and ridden less gently, as explained by.<sup>4, 16</sup>

The frequency of exercise: the condition was observed more in horses engaged in vigorous exercise during training before they are properly conditioned for strenuous activities or in poorly conditioned horses. As depicted in Figure 5, horses trained 5-6 times weekly are more affected (53%), as seen in polo and race horses, whereas those trained once monthly are less commonly affected (12%). This also agrees with the findings of <sup>3</sup> and has been further buttressed by the findings of.<sup>30</sup>

Administration of drugs (particularly steroids) before or after exercise or work also predisposes to bowed tendon, aligning with reports by.<sup>18</sup> This is as shown in Figure 6, where 67% of horses with the bowed tendon condition were reported to be on some form of steroids before and/or after exercise. Steroids increase the activity of the horse's musculoskeletal system, thereby enhancing its chances of being exposed to tendon injury. The duration of exercise, evenness or unevenness of trimmed hoof, and improper shoeing were not significant predisposing factors to a tendon injury, according to this research (depicted in Table 3).



Figure 3: Breed of horses with tendon injury



**Plate 1:** Some cases of bowed tendon seen in some horses in the study area. Legs of a horse with bowed tendon; A indicating "high bow", B indicating "a low bow"



**Plate 2:** Photo shot showing transcutaneous ultrasound procedure for diagnosis of bowed tendon in horses



Figure 4: The use of horse among horses with tendon injury



Figure 5: Frequency of exercise among horses with tendon injury



**Figure 6:** Administration of drugs before or after exercise/work among horses with tendon injury

 Table 3: Chi-square Test of independence between tendon injury and investigated factors

Variables	P values
Breed of horses verses tendon injury	0.024*
Use of horse if not lay-off verses tendon injury	0.005*
Frequency of exercise verses tendon injury	0.000*
Duration of exercise verses tendon injury	0.462
Administration of medication before or after	0.000*
exercise/work verses tendon injury	
Signs of contusion/bruise verses tendon injury	0.638
Evenness of trimmed hoof verses tendon injury	1.000

\* = Indicates significant relationship at 5% significant level.

Table 4: The duration of the exercise/work verses Tendon injury

		Has any of your horse(s) suffered from any tendon injury		Total
		No (%)	Yes (%)	
What is the	1-2	11(64.7)	26(78.8)	37(74.0)
duration of the exercise/wo	hrs 3-4 hrs	6(35.3)	7(21.2)	13(26.0)
rk Total		17(100.0)	33(100.0)	50(100.0)

 Table 5: Presence of sign(s) of contusion/bruise among horses

 with Tendon injury

		Has any of your horse(s) suffered from any tendon injury		Total
		No (%)	Yes (%)	
Are there sign(s) of	No	1(100.0)	4(50.0)	5(55.6)
contusion/ bruise	Cont usion	0(0)	1(12.5)	1(11.1)
	Bruis	0(0)	3(37.5)	3(33.3)
Total	е	1(100.0)	8(100.0)	9(100.0)

This finding is similar to reports from the work of <sup>31</sup> in which they reported these factors as having a variable effect on tendon pathologies. However, the findings by <sup>3</sup> indicated that these factors always significantly predispose to tendon injuries. Our study noticed that most of the participants in the study population do routine hoof trimming and shoeing handled by experienced horsemen (tables 5, 6 and 7).

Most horses were exercised moderately (1-2 hours), constituting 78% of those with tendon injuries. In contrast, horses that were exercised for a relatively prolonged duration of 3-4 hours contributed to 21.2 % of the cases of bowed tendons (as depicted in Table 4). This indicates that a moderate irregularly short exercise duration predisposes to tendon injury upon exposure to sudden exercise for a relatively prolonged time, which agrees with one of the theorems postulated by the work.<sup>30</sup> Similarly, 75% of the horses with tendon injury had an even hoof; and only 25 % were noticed with an uneven hoof; 100% of the horses with tendon injury had no signs of incorrect tethering or incorrect shoeing; these findings are similar to the findings in the works of. <sup>31, 32</sup>

**Table 6:** Presence of signs of incorrect tethering/incorrect shoeing among horses with tendon injury

		Has any of your horse(s) suffered from any tendon injury		Total
		No	Yes	
Are there signs of incorrect tethering/incorr ect shoeing	No	1(100.0)	8(100.0)	9(100. 0)

**Table 7:** Evenness or unevenness of trimmed hoof amonghoses with Tendon injury

		Has any of y suffered from injury	our horse(s) n any tendon	Total
		No (%)	Yes (%)	
Evenness of	Even	1(100.0)	6(75.0)	7(77.
trimmed hoof				8)
	Unev	0(0)	2(25.0)	2(22.
	en			2)
Total		1(100.0)	8(100.0)	9(10
				0.0)

## Management of Bowed tendons in horses

It was also discovered in the present study that most horsemen and equine practitioners alike (62%) manage bowed tendon conditions in their horses by themselves, and only 22% consult with a veterinarian, whereas 14% consult with herbal doctors (table 8). Plate 3 is a pictural presentation of some local management procedures for bowed tendons in some horses in the study area. The most common therapy adopted by both the horsemen and the herbal doctors is mainly local remedies ointments prepared locally by:

A mixture of milled wheat-like seed with lemon, alum, ash, palm oil, common salt 'bagaruwa,' etc., is applied to the affected region. In some practices, the swelling is initially bled (blistering using a razor blade) or burnt with white fire (a form of thermotherapy) and then robbed with liniments or other ointments such as eucalyptus oil. However, this kind of healing is characterized by severe scar tissue formation.



**Plate 3**: The front legs of some horses on local management following tendinitis. (A) Aftermath of blistering following bowed tendon, (B) application of cryotherapy (cold pack) following bowed tendon; (C) Pressure bandage applied to distal foot of a horse suffering from tendinitis; and (D) is horses front leg post healing with scaring after bowed tendon

Some others use ice packs (a form of cryotherapy) in combination with various concoctions. Alternatively, they bandage the affected swollen area after applying the liniments and ointments. As part of management modalities, horses with bowed tendons are rested until recovery (in about 33.3 % of the reported cases) or rested for weeks or months (44.4% and 22.2%, respectively), as depicted in Table 9. This conforms to global practices of tendon injury management. <sup>18, 20</sup>

The drugs that are routinely used by horse owners located in the study area for the management of musculoskeletal conditions in their stables were mainly dexamethasone (solely, 50%) and in combinations, e.g., with Phenylbutazone (14%), with Phenylbutazone + dexaphenylarthrite (8%). Other drugs that are less commonly used are Phenylbutazone (4%) and dexaphenyarthrite (2%), as shown in Table 10. Most of these drugs are administered once or at most twice daily (64% and 26%, respectively), as shown in Table 11.

 Table 8: Actions carried out by horse owners in management

 of bowed tendon in horses

Response	Frequency	Percent
I managed it myself	31	62.0
Consulted a Vet	11	22.0
Consult a herbal doctor	7	14.0
Total	49	98.0
No response	1	2.0
	50	100.0

Table 9: Period of Rest among horses with tendon injury

Response	Frequency	Percent
Until recovery/ improvement is	3	33.3
noticed		
Rest for weeks	4	44.4
Rest for months	2	22.2
Total	9	100.0

 Table 10: Drugs routinely used in stables for musculoskeletal system conditions

Frequency	Percent
1	2.0
2	4.0
1	2.0
25	50.0
7	14.0
4	8.0
1	2.0
4	8.0
2	4.0
1	2.0
1	2.0
1	2.0
50	100.0
	Frequency 1 2 1 25 7 4 1 4 2 1 1 1 50

 Table 11: Frequency of drug administration

Response	Frequency	Percent	
Once daily	32	64.0	
Twice daily	13	26.0	
Weekly	1	2.0	
Others	2	4.0	
Total	48	96.0	
No response	2	4.0	
•	50	100.0	

Table 12:	Chronicity	of injury	among	horses	with	tendon
njury						

Response	Frequency	Percent
Immediately after exercise	6	66.7
24 hours after exercise	2	22.2
Total	8	88.9
No response	1	11.1
-	9	100.0

## Conclusion

Bowed tendon in horses is prevalent in Nigeria irrespective of the horse's use. It, however, affects polo and racing horses more, and also pleasure horses following vigorous exertions during festive or ceremonial periods. The awareness level of bowed tendon condition is reasonably high among horse riders. Quite a good proportion of them manage the condition by themselves employing the use of local remedies (herbal preparations). However, sometimes they consult veterinarians or traditional herbalists to manage the condition. Most affected horses are rested for weeks or until recovery/improvement. Some of the predisposing factors to the condition included the breed of horse (more in the Sudanese and talon than other breeds); the use of the horse (seen more in polo and race horses and horses used for strenuous activities); the frequency of exercise (affecting horses exercised moderately for 1-2 hours, 5-6 times weekly more); and administration of drugs before or after exercise or work. Drugs, particularly steroids, are indiscriminately used in stables for musculoskeletal conditions in horses, predisposing horses to tendon injury conditions such as bowed tendons. Some of the commonly used steroids in the study area included dexamethasone, Phenylbutazone, dexaphenylarthrine, and a few others, and are either singly used, especially dexamethasone or in combinations. The drugs are usually administered once or twice daily.

## **Conflict of Interest**

The authors declare no conflict of interest.

#### **Author's Declaration**

The authors hereby declare that the work presented in this article is original. Any liability for claims relating to this article will be borne by us.

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## References

- 1. Ivers T. The bowed tendon book. Prevention, Treatment and Rehabilitation. The Russell Meerdink Co. 2006
- Gall K. "The Care and Prevention of Horse-Bowed Tendons". 2005. Accessed on 28/09/2020, 08:25:21. Available from: https://www.*EzineArticles.com*/The Care and Prevention of Horse-Bowed tendon
- Heather ST. Bowed Tendons: The Farrier's Role in Prevention and Treatment. International Association of Professional Farriers, in Am. Farriers J. 2012; 27 (7), 12-14
- Kasashima Y, Takahashi T, Smith RKW, Goodship AE, Kuwano A, Ueno T, and Hirano S. "Prevalence of superficial digital flexor tendonitis and suspensory desmitis in japanese thoroughbred flat racehorses in 1999". Eq Vet J. 2004;36(4), 346-350.
- Takahashi T, Kasashima Y and Ueno T. "Association between race history and Risk of superficial digital flexor tendon injury in thoroughbred race horses", J. Am Vet Med Assoc. 2004;225(1), 90-93.
- McNeill C. Bowed Tendons in Horses: Tendinitis Clinical Signs and Treatment. Reviewed by: Gilbert, E. MB MadBarn articles. 2023. Accessed 06hrs, 12/01/2024. Available from: http://www.madbarm.com/bowed-tendon-in-horses/
- Smith R and Schramme M. Tendon injury in Horse: current theories and therapies. In Practice/ vol 25 (9). 529-539. https://doi.org/10.1136/inpract.25.9.529
- Eze CA, Ogbanya KC, Eze DC, Okonkwo N. Incidence of Hoof Lameness and Associated Staphylococcal Wound Contaminants among Horses at Obollo-Afor Market in Enugu State, Nigeria. An Res Int. 2014; 11(2): 1982 – 1986
- 9. Ross MW and Dyson SJ. Diagnoses and Management of Lameness in Horses. Edt. Saunders Elsevier, St. Louise, Missouri. 2003
- 10. O'Sullivan CB. Injuries of the Flexor Tendons: Focus on the Superficial Digital Flexor Tendon. Clin Tech Eq Prac. 2007.
- 11. Smith RKW. Tendon and Ligament Injury. Am Assoc Eq Pract (AAEP). 2008.
- Dowling BA, Dart AJ, Hodgson DR, Smith RKW. Superficial digital flexor tendonitis in the horse. Eq Vet J. 2010. Vol 32 (5): 369-378. https://doi.org/10. 2746/042516400777591138
- American Association of Equine Practitioners. Definition and Classification of Lameness. In: Guide for Veterinary services and Judging of equestrian events. Lexington, KY, USA; AAEP; 1991
- 14. James MC. "Equine Sports Medicine, Dentistry, and Surgery". 2008. Accessed on 28/09/2020, 08:40:08 Available from: www.equinehorsevet.com
- 15. Mcilwraith CW. Tendinitis in Horses. Merck Veterinary Manual. 2015
- Mahla JK, Parikh PV, Barot HM, Patel KD, Patel BM and Bodala JY. Bowed tendon in horses and their management: A review of 18 cases. Int J. Vet Sci Husb. 2024; 9(2): 400-403 DOI: https://doi.org/10.22271/veterinary.2024.v9.i2f.1228
- 17. Dyson S. Can lameness be reliably graded? *Eq Vet J.* 2011; 43:379–382.
- Ross M. Movement. In: Ross M, Dyson S, editors. *Diagnosis* and Management of Lameness in the Horse. 2nd edition.St Louis: Elsevier Science; 2010:64–80.
- 19. Dahlgren, L.A. "Review of Treatment Options for Equine Tendon and Ligament Injuries: What's New and How Do They Work?.". J. Am Assoc Eq Pract. 2005;51.
- 20. Dyson SJ. Superficial digital Flexor Tendon Injuries in Teenage and Older Horses. Eq Vet Edu. 2007;19: 187-188.

- Whitcomb MB. "Ultrasonographic evaluation of the Distal extremity". 2009. 29 (1); 47-59 https://doi.org/10.1016/j.jevs.2008.11.010 Accessed 2018-10-26.
- 22. Kwanashie G and Abdullahi SU. African horse sickness in imported horses in Kaduna and Kano States of Nigeria, 2nd International Symposium on Bluetongue, African horse sickness and Related Orbiviruses. 1991. Paris, France.
- 23. Mshelia WP, Abdussamad AM, Atuman YJ., Samdi SM and Kwanashie GA. Pictorial review of injuries and disease conditions in foreign and part-barb horses in northern Nigeria: Part I. *Res J. Vet Sc*, 2010; 3: 1-12.
- Umar YA, Maikaje DB, Garba UM and Alhassan MAF. Prevalence of gastrointestinal parasites of horses used for cadet training in Nigeria. J. Vet. Adv. 2013; 3(2): 43-48.
- Mayaki AM, Adeyefa CAO and Aiki-Raji CO. Detection of IgG and/or IgM antibodies against equine infectious anaemia virus (EIAV) in Nigerian race and polo horses. Sok J. Vet Sci, 2014; 12(3):32-36.
- FAOSTAT (2013): FAO statistic databases. Food and agriculture organization of the united nations, rome. Italy. Www.faostat.fao.org/site/573/default.aspx.
- Sa'ad A. Prevalence of equine colic and its associated risk factors in Sokoto. Undergraduate project. UsmanuDanfodiyo University, Sokoto. 2015; Pp 56.
- Kalisiak O. Parameters influencing prevalence and outcome of tendonitis in Thoroughbred and Arabian racehorses. Pol J. Vet Sci. 2012;15(1):111-118. Doi:10.2478/v10181-011-0121-9. PubMed
- Ortved KF. Regenerative medicine and Rehabilitation for Tendinous and Ligamentous Injuries in Sport Horses. Vet Cli N. Am Eq Prac. 2018;PMID: 29803299 Review
- Perkins NR, Reid SWJ, Morris RS. Risk Factors for Musculoskeletal Injuries of the Lower Limbs in Thoroughbred Racehorses in New Zealand. NZ Vet J. 2005;53:171-183.
- Merkens HW. and Schamhardt HC. Evaluation of Equine Locomotion during different degrees of experimentally induced lameness I. Lameness model and Quantification of Ground Reaction force Patterns of Limbs. Eq Vet j..1988;Supplement 6:99-106
- 32. Ovnicek G, Page B and Trotter GW. Natural Balance Trimming and Shoeing: It's theory and application. The Vet Clin N. Am Eq Pract. 2003; 19