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https://dx.doi.org/10.4314/nvj.v44i1.3 **ORIGINAL ARTICLE**

EVALUATION OF HOOF MORPHOMETRY IN NORMAL AND LAME POLO HORSES AT IBADAN POLO CLUB.

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ABSTRACT

This study evaluated the changes in hoof morphometric parameters between normal and lame polo horses. Cross-sectional survey of hoof morphometric parameters of polo horses was conducted at the Ibadan Polo club. Also, each horse was physically examined and severity of lameness scored based on the criteria by American Association of Equine Practitioners. Differences in morphometric parameters between sex, lameness status and shoeing status were analyzed using Student's t test and values were considered significant at p< 0.05) higher in females (118.8 ± 9.3mm; 117.1 ± 8.3mm) than male horses (109.8 ± 6.1 mm; 106.8 ± 12.1 mm). Hoof wall angles did not differ significantly (p > 0.05) between the sexes. Majority of the hoof morphometric parameters were significantly (p< 0.05) higher in shod horses compared to unshod horses. In addition, the dorsal hoof wall angle of the right hind limb was significantly (p < 0.05) higher in lame (61.3 ± 11.50) than normal horses (53.6 ± 8.30). It was concluded that shoeing conditions and lameness significantly alters hoof morphometric parameters of polo horses.

Keywords: Hooves, lameness, Morphometry, horses, shod, unshod, musculoskeletal

INTRODUCTION

Lameness is defined as an alteration in the gait of a horse which may be mild and only noted at high intensity levels of exercise or may be severe and noted when walking or standing (Moorman *et al.*,2013). It represents the single largest cause of equine morbidity, loss of use, early retirement, and loss of value in their athletic careers, breeds, ages, disciplines and genders (Kane *et al.*,2000; Ross 2003). In general, equine musculoskeletal injuries from training and racing are multifactorial and involve complex interaction of a number of risk factors including biological (horse-related) factors and non-biological (extrinsic or environmental) factors. Biological risk factors include subclinical/undiagnosed pre-existing bone and suspensory apparatus pathology (Parkin *et al.*,2006), biomechanical failure of the cortical bone due to loading at strain rates during galloping, anatomical range of movement of the carpal joint, inherent leg conformation, hoof conformation, pre-race physical inspection, age, gender and endocrine pathology (Maeda *et al.*,2016). Non-biological risk factors include training regimen, shoe type, racetrack effect, track surface type, racetrack surface condition etc. (Wood *et al.*,2000; Anthenil *et al.*,2007; Cogger *et al.*,2008). Most lameness are found in the fore limb and of these, 95% occur from the knee (carpus) to the hoof (Mubarek *et al.*,2017) and the hoof being an important structure of the equine locomotor system is involved in one third of chronic forelimb lameness in horses of different equestrian specialties (Murray *et al.*,2006). Meanwhile, hind limb lameness involved approximately 40% of the lameness diagnosis (Mubarek *et al.*,2017). Equine distal limb lameness is commonly associated with poor foot conformation and hoof imbalance (van Heel *et al.*,2005; Oosterlinck *et al.*,2013) with hoof-related lameness being a key cause of poor performance and early retirement in the sport or pleasure horse (Kummer *et al.*,2006; Moleman *et al.*,2006). Lameness identification and scoring is a skill that requires an understanding of normal gaits and how they may be modified under a variety of circumstances. The purpose of grading the severity of lameness is to provide a subjective characterization of the lameness, so that it can be documented. Though there are several subjective scales for lameness grading in horses, the most widely used grading scale is that of the American Association of Equine Practitioners (AAEP) which uses 5 grades (Dyson and Nagy, 2011). The size of the horse should be proportionate to the horse hooves irrespective of differences in shape, hoof wall slope and size of horse hooves; otherwise, the performance of the horse in certain tasks will be more or less hampered. Based on the idea that the bearing border of the foot should be trimmed perpendicular to the longitudinal axis, correlations between limb shape and static foot balance are explored in the resting horse by observing the foot from the lateral, dorsal, and solar aspects. (Dyson *et al.*,2011). Hoof morphometry is a key tool used to determine hooves conformation and balance (Dyson *et al.*,2011). The anatomy and conformation of equine hooves plays an immensely important role in biomechanics of movement. Any kind of hoof pathologies disturb normal functioning of limbs, impair motor skills, and may cause lameness (Dzierzęcka *et al.*, 2016). The equine foot has a specific conformation (shape) that provides maximum biomechanical efficiency. Biomechanical efficiency allows the foot to withstand, accept, absorb, dissipate and transmit loading weight bearing forces in a manner that offers the greatest protection to the horse. This principle implies that there is some combination of foot size, foot shape, wall length and angles that make the foot an ideal shock absorbing, weight-bearing structure (Wilson *et al.*, 2014). Current search of literatures on the prevalence, pattern and distribution of lameness among polo horses in Nigeria showed that there is dearth of published work which could assist the key players in the industry in important management decision. The exact prevalence of lameness in polo horses in Southwest Nigeria is unknown, while the risk factors associated with lameness are also not known. This work therefore aims to evaluate the prevalence of lameness and the effect of hoof morphometry on lameness in polo horses.

MATERIALS AND METHODS

Animals

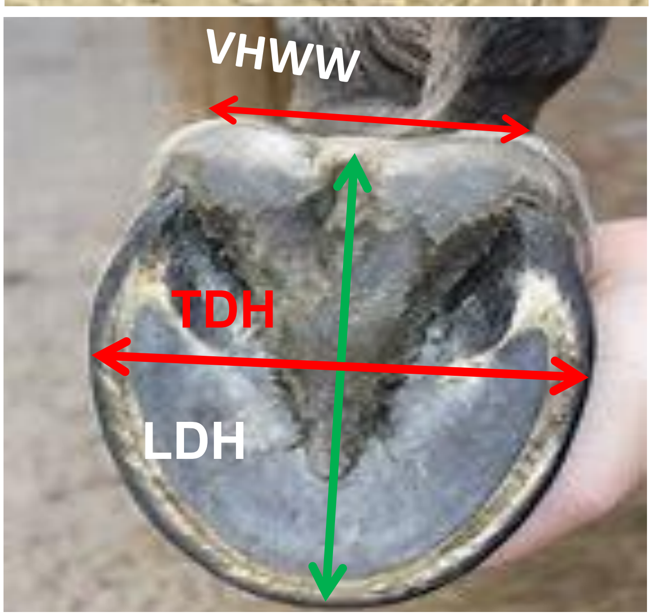
A purposive cross-sectional study of lameness among polo horses was carried out at the Ibadan polo club, Eleyele, Ibadan. All the horses in the polo club were included in the study. Ethical approval (FUNAAB/COLVET/CREC/2018/07/02) and consent of the Polo Federation of Nigeria were obtained before the commencement of the study. The history and signalment of each horse were obtained. Thereafter, each horse was walked and trotted by the handler to assess the gait subjectively, while the grade of lameness was scored based on the criteria by American Association of Equine Practitioner (AAEP; Table 1). and the condition of the shoe was noted.

Table I: American Association of Equine Practioners' lameness scoring criteria

Score	Criteria
1: No lameness	The horse walks and stands with a level back and has a normal gait. The hind feet are in line with the corresponding fore feet. No shortening of stride or nodding of the head. There is normal abduction/adduction. Weight is generally distributed evenly on all limbs when standing still
2: Mild lameness	The horse stands with a level back but may adopt an arched back while walking. The gait may show some abduction/adduction or other slight abnormalties which may be exaggerated by manipulation of the limbs.
3: Moderate Lameness 1	The horse may adopt an arched back while standing or walking. Its gait can be described as short stride in at least one limb.
4: Moderate Lameness 2	As for 3 plus the gait is more severely affected. The horse deliberately takes one step at a time. Weight may be taken off one more limbs (Favoured) when standing. The horse has more difficulty when turning
5: Severe lameness	The horse shows inability or extreme reluctance to bear weight on one or more limbs and may be reluctant to rise (if lying) or move (if standing). The horse may stop frequently while walking.

Hoof Morphometry

Each of the hoofs was measured using digital Vernier caliper and tape rule. In addition, photographs of each hoof were taken using digital camera. All measurements were recorded in millimeters. The pictures of each of the hoof was taken, printed and the hoof angle were traced out with a protractor. The angles were recorded in degrees. The following hoof parameters were determined in each of the horses as shown in Figure 1:



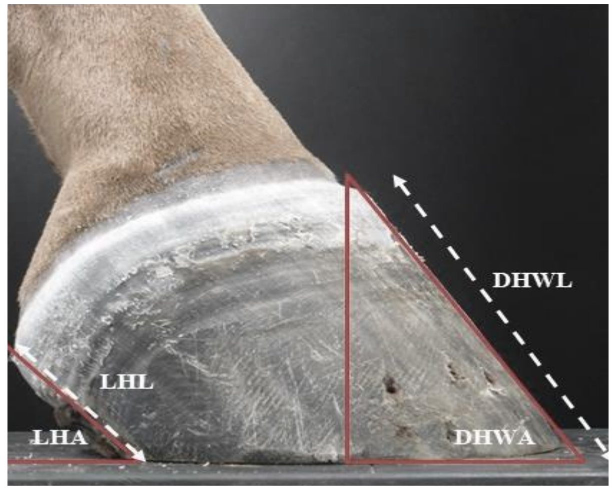


Figure 1: Schematic diagram of the hoof measurement taken in this study.

Transverse diameter of the hoof (TDH): measured at the widest part of hoof starting from medial to lateral quarter at the solar side.

Longitudinal diameter of the hoof (LDH): measured from the centre of the toe to the heel buttress line. Dorsal hoof wall length (DHWL): measured from the coronary rim of the hoof to the centre of the end of the toe. Ventral hoof wall length (VHWL): measured from the coronary rim to ground surface of heel wall at the outer heel buttress. Dorsal hoof wall width (DHWW): measured at the widest part of the dorsal part of the hoof to end at the beginning of hoof buttress. Ventral hoof wall width (VHWW): measured between heel buttresses points of the hoof. Dorsal hoof wall angle (DHWA): measured as an angle formed between the dorsal wall of the hoof and the ground surface. Ventral hoof wall angle (VHWA): measured as an angle formed from the point of beginning of the heel and ground surface.

Data Analysis

Descriptive statistical analysis was performed for all variables using Microsoft Excel and Epi info (Version 3. 3. 2). Continuous data was assessed for normality using the Kolmogorov–Smirnoff test/ Histogram. Differences between lame and normal horses, male and female horses, as well as *shod* and non-*shod* horses were investigated using Student's t test on SPSS (Statistics Package for the Social Sciences, version 11.0; SPSS Inc., Chicago, IL, USA). Values were considered significant at $p \leq 0.05$.

RESULTS

A total of fifty-one (51) polo horses comprising of 42 female and 9 male horses were examined. Forty-nine (96%) of the horses were intact while 2 (4%) were neutered. The mean height of the horses was 156.5 ± 12.4 cm (Height Range ≡ 146 – 172 cm). Also, the mean weight of the horses was 431.1 ± 137.8kg (Weight Range ≡ 297 – 525kg). The breeds of the horses included Sudanese (38; 74.5%), Tallon (8; 15.7%) and Arewa (5; 9.8%). Forty (78.4%) of the horses were housed on concrete floor, while 11 (21.6%) were on non-concrete floor. Eight (15.7%) of the horses were *shod*, while 43 (74.3%) were not *shod*. History of the diet of the horses showed that all the horses were fed grass, wheat bran and concentrate. None of the horse was fed on any special supplement. The health history of the horses showed that 22 (43.1%) had previous colic, 19 (37.3%) had previous history of lameness, while 20 (39.2%) horses had previous body injury. Thirteen (65%) of the cases of body injury resulted from sports injury, three (15%) from automobile accident and two (10%) from inappropriate shoe size. Seventeen (85%) of the body injury involved the limbs while the remaining 3 (15%) involved the neck. Method of treatment of body injury used included massage and bandaging (13; 65%), local herb (3; 15%), petrol (2; 10%) and fiberglass cast (1; 5%).

Lameness score of horses at Ibadan Polo club

The severity of lameness based on the AAEP criteria is shown in Table 2

TABLE II: Lameness score of horses at Ibadan polo club

Gait Score	Number of Horses	Prevalence (%)
1	35	68.6
2	14	27.5
3	0	0.0
4	2	3.9
5	0	0.0
Total	51	100

Thirty two (62.7%) of the horses had normal gait, while 14 (27.5%) of the horses had mild lameness. In addition, 5 (9.8%) of the horses had moderate lameness given an overall lameness prevalence of 37.3%

Sexual dimorphism in the hoof wall angles and hoof morphometry in horses at Ibadan polo club

The sexual differences on hoof wall angle in polo horses was shown in Table 3a.

TABLE IIIa: Effect of sex on hoof wall angles in polo horses.

Hoof Parameters	Male (n ≡ 9)	Female (n ≡ 42)	P value
Dorsal hoof angles (^{0})			
Right Fore Limb	53.0 ± 6.3	52.3 ± 9.4	0.833
Left Fore Limb	57.4 ± 5.9	51.2 ± 10.8	0.103
Right Hand Limb	59.4 ± 9.3	55.8 ± 10.3	0.342
Left Hind Limb	52.9 ± 7.9	54.4 ± 10.4	0.699
Ventral hoof angle (^{0})			
Right Fore Limb	50.3 ± 8.9	48.0 ± 9.0	0.488
Left Fore Limb	52.2 ± 8.6	47.9 ± 8.5	0.186
Right Hand Limb	49.3 ± 4.7	50.0 ± 10.1	0.856
Left Hind Limb	44.6 ± 7.9	50.0 ± 9.1	0.112

The hoof wall angles did not differ significantly ($p > 0.05$) between male and female horses. The hoof morphometry (Table 3b) tended to be higher in female horses than male horses, although the values were not statistically significant. However, the values of the hoof longitudinal diameters for the left fore and left hind limbs were significantly ($p \leq 0.05$) higher in female horses (Table 3 b).

TABLE IIIb: Effect of sex on hoof wall dimensions in polo horses.

Hoof Parameters	**Male (n ≡ 9)**	**Female (n ≡ 42)**	**P value**
Transverse Diameters (mm)			
Right Fore Limb	112.0 ± 11.8	116.7 ± 8.1	0.166
Left Fore Limb	110.1 ± 12.6	116.1 ± 7.6	0.068
Right Hand Limb	104.6 ± 11.1	109.1 ± 8.1	0.169
Left Hind Limb	104.6 ± 11.0	110.1 ± 8.0	0.098
Longitudinal Diameters (mm)			
Right Fore Limb	112.5 ± 9.3	117.1 ± 10.9	0.251
Left Fore Limb	109.8 ± 6.1	118.8 ± 9.3	0.009
Right Hand Limb	111.5 ± 8.7	115.1 ± 8.3	0.252
Left Hind Limb	106.8 ± 12.1	117.1 ± 8.3	0.004
Dorsal Hoof wall Lengths (mm)			
Right Fore Limb	82.0 ± 6.6	83.5 ± 10.3	0.681
Left Fore Limb	79.8 ± 8.9	88.7 ± 12.0	0.419
Right Hand Limb	81.9 ± 6.4	88.5 ± 7.2	0.486
Left Hind Limb	82.2 ± 10.4	83.7 ± 8.9	0.678

Ventral Hoof wall Lengths (mm)			
Right Fore Limb	37.4 ± 6.0	39.4 ± 7.4	0.453
Left Fore Limb	38.6 ± 6.4	38.5 ± 11.4	0.976
Right Hand Limb	35.9 ± 2.8	34.0 ± 6.2	0.384
Left Hind Limb	33.2 ± 5.2	35.0 ± 4.9	0.340
Dorsal Hoof wall Widths (mm)			
Right Fore Limb	262.2 ± 21.5	263.8 ± 37.1	0.907
Left Fore Limb	265.6 ± 19.5	267.1 ± 32.8	0.895
Right Hand Limb	264.4 ± 22.2	261.2 ± 33.5	0.786
Left Hind Limb	257.8 ± 20.4	264.1 ± 18.7	0.382
Ventral Hoof wall Widths (mm)			
Right Fore Limb	55.6 ± 11.7	60.1 ± 19.3	0.506
Left Fore Limb	58.9 ± 16.0	61.3 ± 23.8	0.773
Right Hand Limb	57.8 ± 13.2	63.0 ± 24.7	0.552
Left Hind Limb	61.1 ± 15.2	64.3 ± 24.7	0.720

Effect of shoeing on hoof wall angles and hoof morphometry in polo horses.

The effect of shoeing on hoof wall angle in polo horses was shown in Table 4a. The hoof wall angles did not differ significantly ($p > 0.05$) between shod and unshod horses.

TABLE IVa: Effect of shoeing on hoof wall angles in polo horses.

Hoof Parameters	Not *shod* (n ≡ 43)	*Shod* (n ≡ 8)	P value
Dorsal hoof angles (^{0})			
Right Fore Limb	53.0 ± 9.4	49.1 ± 5.4	0.268
Left Fore Limb	52.1 ± 10.9	53.0 ± 7.0	0.833
Right Hand Limb	56.7 ± 10.7	54.8 ± 7.3	0.623
Left Hind Limb	54.1 ± 10.4	54.0 ± 8.1	0.977
Ventral hoof angle (^{0})			
Right Fore Limb	48.8 ± 9.5	46.4 ± 5.7	0.502
Left Fore Limb	48.4 ± 9.0	50.4 ± 6.8	0.559
Right Hand Limb	50.8 ± 9.3	44.6 ± 7.9	0.088
Left Hind Limb	49.0 ± 9.4	49.0 ± 7.7	1.000

However, most of the hoof morphometric values were significantly ($p \leq 0.05$) higher in horses that were shod compared to horses that were not shod except for the transverse diameter of the right fore and right hand limbs; longitudinal diameters of the right and left hind limbs; dorsal hoof wall length of the of the right fore limb and ventral hoof wall length of the right hind limb (Table 4b).

TABLE IVb: Effect of shoeing on hoof wall dimensions in polo horses.

Hoof Parameters	**Not *shod* (n ≡ 43)**	***Shod* (n ≡ 8)**	**P value**
Transverse Diameters (mm)			
Right Fore Limb	114.7 ± 8.8	121.9 ± 8.2	0.041
Left Fore Limb	113.8 ± 8.8	121.9 ± 6.1	0.018
Right Hand Limb	107.9 ± 9.0	110.8 ± 7.2	0.391
Left Hind Limb	108.3 ± 8.5	113.4 ± 9.4	0.141
Longitudinal Diameters (mm)			
Right Fore Limb	115.0 ± 9.1	123.2 ± 15.5	0.050
Left Fore Limb	115.6 ± 7.8	125.6 ± 12.9	0.006
Right Hand Limb	111.4 ± 7.7	116.7 ± 11.4	0.438
Left Hind Limb	115.1 ± 9.2	116.4 ± 12.9	0.752
Dorsal Hoof wall Lengths (mm)			
Right Fore Limb	82.7 ± 8.9	86.0 ± 13.1	0.386
Left Fore Limb	82.4 ± 10.5	112.9 ± 64.7	0.007
Right Hand Limb	83.3 ± 7.5	111.8 ± 58.2	0.004
Left Hind Limb	81.8 ± 9.0	91.9 ± 4.0	0.004

Ventral Hoof wall Lengths (mm)			
Right Fore Limb	37.7 ± 6.6	46.4 ± 5.4	0.001
Left Fore Limb	37.0 ± 6.5	46.3 ± 20.7	0.024
Right Hand Limb	34.0 ± 5.8	36.0 ± 5.5	0.381
Left Hind Limb	33.8 ± 4.3	39.1 ± 5.7	0.005
Dorsal Hoof wall Widths (mm)			
Right Fore Limb	271.9 ± 19.4	218.5 ± 57.5	0.000
Left Fore Limb	273.3 ± 17.2	232.2 ± 55.4	0.000
Right Hand Limb	268.1 ± 15.9	227.5 ± 61.0	0.001
Left Hind Limb	264.9 ± 17.6	252.5 ± 23.3	0.096
Ventral Hoof wall Widths (mm)			
Right Fore Limb	55.8 ± 9.2	78.1 ± 35.4	0.001
Left Fore Limb	57.7 ± 12.0	78.3 ± 46.1	0.017
Right Hand Limb	58.1 ± 13.2	83.0 ± 48.6	0.005
Left Hind Limb	60.0 ± 11.1	83.8 ± 48.2	0.007

Effect of lameness on hoof wall angles and hoof morphometry in polo horses

The effect of lameness on hoof wall angle in polo horses was shown in Table 5a. The hoof wall angles did not differ significantly ($p > 0.05$) between lame and normal horses except for the dorsal hoof angles of the right hind limb which was significantly ($p=0.009$) higher in horses that were lame compared to horses that were not lame.

TABLE Va: Effect of lameness on hoof wall angles in polo horses

Hoof Parameters	Not lame (n ≡ 32)	Lame (n ≡ 19)	P value
Dorsal hoof angles (^{0})			
Right Fore Limb	53.2 ± 10.1	51.1 ± 6.4	0.433
Left Fore Limb	52.3 ± 10.8	52.3 ± 9.6	0.983
Right Hand Limb	53.6 ± 8.3	61.3 ± 11.5	0.009
Left Hind Limb	53.7 ± 10.7	54.7 ± 9.0	0.734
Ventral hoof angle (^{0})			
Right Fore Limb	47.7 ± 9.8	49.6 ± 6.4	0.480
Left Fore Limb	48.6 ± 8.1	48.8 ± 9.6	0.949
Right Hand Limb	48.5 ± 9.4	52.2 ± 8.9	0.175
Left Hind Limb	50.0 ± 9.7	47.3 ± 7.7	0.305

Similarly, the transverse diameter of the left fore-limb, longitudinal diameter of the left fore-limb, ventral hoof walls lengths of the right and left fore-limbs and dorsal hoof wall width of the left-fore limbs were significantly ($p \leq 0.05$) higher in horses that are lame compared to horses that are not lame (Table 5b)

TABLE Vb: Effect of lameness on hoof wall dimensions in polo horses.

Hoof Parameters	**Not lame (n ≡ 32)**	**Lame (n ≡ 19)**	**P value**
Transverse Diameters (mm)			
Right Fore Limb	114.5 ± 8.4	118.2 ± 9.7	0.164
Left Fore Limb	113.1 ± 8.8	118.3 ± 8.2	0.048
Right Hand Limb	107.1 ± 8.1	110.4 ± 9.7	0.210
Left Hind Limb	107.8 ± 8.4	111.3 ± 9.2	0.174
Longitudinal Diameters (mm)			
Right Fore Limb	115.5 ± 8.2	117.6 ± 14.0	0.515
Left Fore Limb	114.8 ± 7.9	121.2 ± 10.6	0.021
Right Hand Limb	114.8 ± 6.8	113.9 ± 10.7	0.693
Left Hind Limb	115.2 ± 10.0	115.6 ± 9.7	0.903
Dorsal Hoof wall Lengths (mm)			
Right Fore Limb	81.8 ± 9.8	85.6 ± 9.3	0.193
Left Fore Limb	82.6 ± 12.5	94.9 ± 44.5	0.155
Right Hand Limb	83.1 ± 8.6	94.1 ± 37.9	0.135
Left Hind Limb	82.7 ± 9.5	84.6 ± 8.6	0.493

Ventral Hoof wall Lengths (mm)			
Right Fore Limb	37.2 ± 6.0	42.2 ± 7.9	0.015
Left Fore Limb	35.6 ± 5.7	43.3 ± 14.	0.012
Right Hand Limb	33.2 ± 4.9	36.6 ± 6.5	0.063
Left Hind Limb	33.8 ± 4.2	36.1 ± 5.8	0.116
Dorsal Hoof wall Widths (mm)			
Right Fore Limb	269.1 ± 19.4	254.1 ± 49.8	0.144
Left Fore Limb	273.8 ± 16.2	255.2 ± 43.6	0.038
Right Hand Limb	267.2 ± 14.6	252.6 ± 47.2	0.119
Left Hind Limb	264.1 ± 16.7	261.1 ± 22.5	0.596
Ventral Hoof wall Widths (mm)			
Right Fore Limb	55.6 ± 8.6	65.5 ± 26.6	0.063
Left Fore Limb	56.9 ± 11.0	67.7 ± 33.1	0.102
Right Hand Limb	58.1 ± 8.8	68.6 ± 35.2	0.122
Left Hind Limb	60.0 ± 9.9	70.0 ± 35.1	0.143

DISCUSSION

This study showed that 37.3% of polo horses at the Ibadan polo club showed varying severity of lameness, with horses having mild lameness accounting for the majority of the cases. Eze et al., (2014) earlier reported a prevalence of 34% prevalence rate of hoof lameness among polo horses. Although the lameness diagnosed in this study comprises of both hoof and non-hoof related hoof lameness. The high prevalence of lameness has been attributed to the activities of the horses (sport injury) as well as presence of favourable environmental conditions (high moisture and humidity) which enhances bacterial proliferation as the case of hoof related lameness (Khan et al., 2005). Sex did not significantly affect the hoof parameters or hoof wall angles in the study population. However, both lameness and shoeing condition significantly altered the hoof wall angles and parameters.

The demographic records of the polo horses showed that majority of the horses (83%) are intact female. It has been reported that sex preference exists regarding the use of horses. Mares are reported to be preferred for polo and racing, while the males are preferred for dressage (Aurie *et al.*,2020). This might explain the higher proportion of intact female among the horses at Ibadan Polo club. The preference for female horses in polo game might also be because female horses might be easier to control than the male horses (Aune et al., 2020). The health record of the horses showed that 37.3% of the horses have had previous episode of colic. This incidence of colic among the horses in this study is similar to that reported for horses in Malaysia (Adamu *et al.*,2012), but is higher than the 18% for colic cases in Sokoto, Nigeria (Mayaki, 2017). It is noteworthy to state that the exact cause and type of colic previously experienced by the horses in this study was not determined but may be associated with the diet of the horses (Stephanie, 2015). In addition, the incidence and distribution of injury in the polo horses in this study is similar to that reported by Olaifa *et al.* (2017), where 57% of the injury are located in the limbs and are associated with polo game. The AAEP grading scale was used to assess the severity of lameness in this study. Based on this grading system, thirty two (62.7%) of the horses have normal gait, while 14(27.5%) of the horses had mild lameness. In addition, 5(9.8%) of the horses had moderate lameness. The major limitation to this method of lameness grading is the low agreement between equine clinicians for subjective scoring of mild to moderate lameness (Keegan *et al.*,2010). This may suggest that there might be some errors in the scoring in this study as majority of the lame horses are scored as having mild to moderate lameness. Studies have shown that subjective scoring of lameness in horses is either only ‘moderately reliable or just within acceptable limits (Hewetson *et al.*,2006). In addition, subjective assessment of lameness after perineural anaesthesia has been shown to be biased, with lameness severity significantly decreasing whether or not a block was actually performed (Dyson and Nagy, 2011). Objective assessment of lameness using kinetic or kinematic analysis would have produced better scores in this study; however the facilities required for this are not available. The predominance of grade 2 lameness in this study may be due to owners’ inability to identify horses with mild lameness or perhaps ignoring mild lameness and postponing veterinary attention to avoid expenses or absence of urgency for treatment. This may be a reflection of the level of equine practice in this country. In developed nations, horse owners are better informed and aware of the importance of routine veterinary visits for early diagnosis in order to ensure musculoskeletal health and prolong athletic ability of their horses. In this study, dorsal hoof wall angle ranges between 49 and 57 degrees for the fore limb and between 52 and 59 degree for the hind limbs, while the ventral hoof wall angle ranges between 48 and 52 degrees for the fore limb and between 44 and 50 degrees for the limb. It has been reported that the ideal hoof wall angle should be that the angle of the dorsal hoof wall relative to the ground is 50 – 55 degrees in the forelimb and 55 – 57 degrees in the hind limb (Reilly, 2010). In addition, there was no significant difference in the hoof wall angles between male and female horses or between shod and unshod horses. However, the dorsal hoof wall angle was significantly higher in lame horses than normal horses. It has been reported that particular patterns of foot placement may be either a cause or consequence of lameness (Moleman *et al.*,2010). In this study, it is unclear if the differences observed in hoof wall angles between shod and unshod horses is actually due to the effect of the lameness on the horse or that the lameness in the horse is responsible for the conformational changes. It is also of note that shoeing did not have significant influence on the hoof wall angle in the horse population in this study. This appears contrary to previous study which reported that conformation changes between shoeing lead to a decrease in hoof angles (Wilson *et al.*,2014). The lack of difference in hoof wall angles between shod and unshod horses might be due to the few number of shod horses in the study population which may suggest that shoeing is seldom done in the horse population. In the resting horse, relationships between limb conformation and static foot balance are examined by viewing the foot from the lateral, dorsal and solar aspects and are based on the principle that the bearing border of the foot should be trimmed perpendicular to the longitudinal axis (Dyson *et al.*,2011). Hoof length is the measurement of the length of the hoof wall and it is most commonly measured on the dorsum of the wall from the center of toe to the coronary rim, the most proximal portion of the wall. Hoof length, either short or long, may cause lameness. The hoof width is defined as the distance between the medial and lateral hoof wall measured at the broadest part of the solar surface of the hoof (Goulet *et al.*,2015). In this study, the hoof dimensions did not differ between male and female horses. However, the hoof dimensions vary between shod and unshod horses as well as between lame and normal horses. In a previous study, presence of shoe was reported to produce significant changes in over 75% of analyzed spatiotemporal variables in shod horses when compared to unshod horses (Stutz *et al.*,2018). The changes in the hoof measurements between lame and normal horses may actually be as a result of the lameness rather being the effect of the lameness.

CONCLUSION

In conclusion, the 37.3% prevalence of lameness in the polo horses at the Ibadan polo club can be said to be moderate when compared with prevalence studies from other countries. This has implication of the performance of the horse for polo game. However, it is noteworthy that majority of the lame horses have mild severity of lameness. The sex of the horse does not have significant influence on hoof wall angles and dimensions. However, shoeing conditions and lameness significantly alters hoof wall angles and measurements in the polo horses.

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