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Research Article

Assessment of Body Condition Score of Horses and Associated Risk Factors in Maiduguri, Nigeria

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ABSTRACT

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This study was conducted during the dry and rainy season to assess the body condition score (BCS) of horses (*Equus equus caballus*) and its associated risk factors in Maiduguri- Nigeria. One hundred and sixty horses (80 each from the dry and rainy seasons) were assessed. The horse ownership and management practices were determined using structured questionnaires. In both seasons horse management was done by either the owners or horse managers and in the dry season horses were managed under the intensive system while the semi-intensive used during the rainy season. However, there was no statistical association between horse ownership, management practices and BCS ($p > 0.05$; $X^2 = 0.2017$; CI = 0.2545-8.847). Most of the horses assessed during the dry season had body condition scores of 3 (thin), while during the rainy season they had body condition scores of 5 (moderate). BCS of paired horses were mostly below ideal in the dry season but ideal in the wet season, however, for the unpaired most were below ideal in both seasons. There was no significant association between sex and BCS ($p > 0.05$), but horses had a significant association between their age groups and BCS ($p < 0.05$). There was also a strong statistical association between caretaking and BCS with ideal body condition scores significantly higher in horse manager caretaking than in horse owner caretaking ($p < 0.05$).

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INTRODUCTION

Body condition scoring (BCS) is a tool that gives an estimate of body fat cover and the score obtained is a reflection of several aspects of animal welfare (Christie *et al.*, 2006). Heavy parasite burden, poor dental care, inadequate nutrition and systemic disease may lead to a low BCS suggesting reduced physical welfare (Foreman, 1998). On the other hand, a high BCS is often difficult to interpret but may also imply reduced welfare, as overweight horses are at high risk of laminitis (Linford, 1996).

BCS in horses is an objective system of evaluating the amount of stored fat visibly assessed by palpating several specific locations that are most responsive to change in body fat, which are called the reference points (Henneke *et al.*, 1983). The system is rated on a scale of one (poor) to nine (extremely fat) with objectives of assessing horse fatness, health and physical wellbeing (Carroll and Huntington, 1988).

The Henneke body condition scoring system is based on a 9-point (1–9) system (Robin *et al.*, 2013; Morrison, 2015) in which particular anatomical areas are selected as being indicative of changes in stored body fat, including the neck, ribs, spinous processes, withers/area behind the shoulder, lumbar and tail regions. These areas are inspected visually, palpated, and then given a score from 1 (extremely emaciated) to 9 (extremely obese) (Henneke *et al.*, 1983; Carroll and Huntington, 1988). A score of 5 is moderate (ideal) (Henneke *et al.*, 1983). Scores lower than 5 indicate that horses are progressively thinner. A score of 6 is moderately fleshy (Henneke *et al.*, 1983), and scores from 6 to 9 are awarded to horses that are fatter/obese (Henneke *et al.*, 1983).

Maiduguri is located in the North Eastern region of Nigeria, harbors a lot of horses due to the cultural and traditional heritage of the people (Ajayi *et al.*, 1987). Due to limited economic resources and knowledge of modern horse management practices, the body condition scoring of Henneke *et al.*, (1983), has not been practiced in horse management in Maiduguri, Nigeria (Garlinghouse and Burrill, 1999). Several studies have been undertaken to access the impact of BCS on specific risk factors in horses across several regions of the world (Dugdale *et al.*, 2012; Robin *et al.*, 2014; Uldahl *et al.*, 2023). Therefore, this study was aimed at evaluating the body

condition score and associated risk factors in horses with a view to providing information useful in designing a comprehensive health maintenance programme for horses in the study area.

MATERIALS AND METHODS

Study Area and Population

This study was conducted in Maiduguri Borno State, which is located in the North eastern region of Nigeria. Borno State has a total area of 64,435.8 - 70,898 square kilometers and lies within latitudes 10°N and 14°N and longitudes 11°E and 14°E. Maiduguri is the capital of Borno State with a total area of 15.1km² and lies within latitudes 11°N and 42°N and longitude 13°E and 36°E. It is characterized by a short period of rainfall between three and four months and a prolonged period of dry season. Temperature is high, ranging between 30°C and 40°C and vegetation is typically Sahelian (Hess *et al.*, 1995; Maryah, 2005 and NBS 2016).

The horses used for this study were mainly from the royal stable, Nigeria Police Force stable, University of Maiduguri stable and other individually owned stables within the metropolis. Horses were identified as male or female based on the presences of external genitalia, kept under different systems of management. Ageing of horses were based on tooth eruption and wear (dentition) as described by Wayne and Melvin (2000), and categorized as foals (0 – 11 months), young (1– 4 years), adult (5 – 12 years), and old (> 12 years) (Ensminger, 1990; Evans *et al.*, 2007), and this information was supplemented by owner's records.

Sample Size Estimation

A total of 160 available horses were conveniently sampled for this study as estimated using the formula of Thrusfield, (2005).

Ethical Approval

Ethical approval was obtained from Government institution/agencies involved and the Faculty of Veterinary Medicine, University of Maiduguri ethical committee. Additionally, oral consent of horse owners was sought prior to the sampling of horses. *Administration of questionnaires* and sampling of horses using careful restraint and palpation was done according to the protocols of the World Organization for Animal Health (WOAH), and Terrestrial Animal Health Code 2012.

Study Design

This study was conducted to evaluate the body condition of horses using Henneke's system of body condition scoring and to investigate the associated risk factors using structured questionnaires to obtain relevant information on management practices and correlate them with the body condition score.

Administration of Questionnaires to Horse Owners

Information on types of ownership, sex, age, and management system were obtained from the questionnaires handed to the horse owners

Determination of Body Condition Score

Henneke's system of body scoring was adopted to determine the body condition score. This technique is based on visual appraisal and palpable fat cover on the six most reference points on a horse's body that responds to change in body fat for an accurate score. These points were along the neck, withers; crease down back, tail head, ribs and behind the shoulder (Henneke *et al.*, 1983). Based on the assessments of fat deposits on these points a score was assigned to a particular body condition rated on a scale of one to nine (poor to extremely fat) or scores of <5 rated as below ideal, 5-6 as ideal and >6 as above ideal (Uldahl *et al.*, 2023).

Statistical Analysis

All data obtained were analyzed using percentages and chi-squared test was applied where necessary to test for association between variables at $p \leq 0.05$. Also bar charts were plotted using MedCalc Statistical Software version 15.6.1 (MedCalc Software bvba, Ostend, Belgium; <https://www.medcalc.org>; 2015).

RESULTS

The horse ownership and management practices in Maiduguri during the dry and rainy seasons are shown in Table 1. Out of the 80 horses sampled during the dry season, 16 were owned and managed by their owners while 64 were handled by a horse manager. Also out of the 80 horses sampled during the rainy season, 14 were owned and handled by their owners, while 66 were handled by a horse manager. Horses were kept under intensive management system during the dry season and in the rainy season by semi-intensive management system. There was no statistically significant difference between horse ownership and management practices ($p > 0.05$; $X^2 = 0.2017$; CI = 0.2545-8.847).

Table 1: Horse Ownership and Management Practices in Maiduguri in the Dry and Rainy Seasons

Season	Ownership	Number of Horses	Management
Dry	Horse Owner	16 ^a	Intensive
	Horse Manager	64 ^a	Intensive
Rainy	Horse Owner	14 ^b	Semi-Intensive
	Horse Manager	66 ^b	Semi-Intensive
Total		160	

* p -value = 0.6534; Chi-square = 0.2017; CI = 0.2545 -8.8470 and values with the same superscripts are statistically not different ($p > 0.05$).

The results of the body condition scores of paired: same horses were sampled in the two seasons are shown in Figure 1. It was observed that 7 of the paired horses that had body condition score (BCS) of very thin (2) during the dry season significantly reduced to a lower number (5) during the rainy season, where as

17 horses that had BCS of thin (3) during the dry season reduced to a lower number (8) during the rainy season. There was increase in the BCS of moderately thin (4) and moderate (5) in the number of the horses obtained during the dry season with that obtained during the rainy season to 10 and 11 as against 7 and 4.

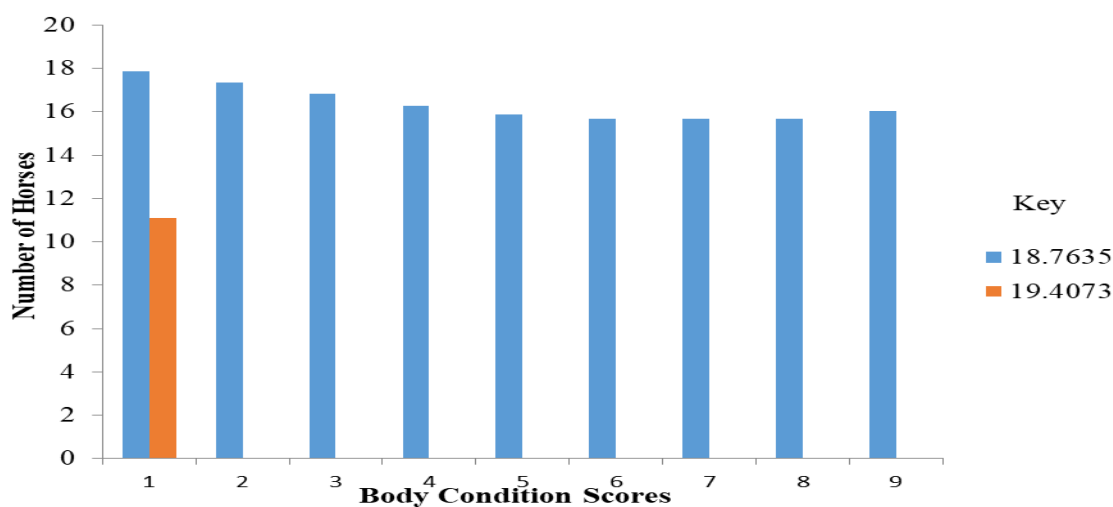


Figure 1: Body Condition Scores of Horses during the Dry and Rainy Seasons in Maiduguri (Paired: same horses were sampled in the two seasons).

The body condition scores of Unpaired: different horses sampled in the two seasons in Maiduguri are shown in Figure 2. Two (2) and 3 horses had a BCS of 2 in the dry and wet seasons respectively, 5 had BCS of 2 also in both the dry and wet seasons. BCS of 3 was seen in 14 horses for the dry season and in 16 horses for the wet season. BCS of 4 was in 13

horses for the dry season and 10 horses in the wet season. BCS 5 was seen in 5 and 6 horses and BCS 6 was seen in 3 and 2 horses in the dry and wet seasons respectively. BCS 7 was seen in 2 horses in the dry season and in 1 horse in the wet season, while BCS 8 was in 1 horse only during the wet season with no BCS 9 recorded in either season.

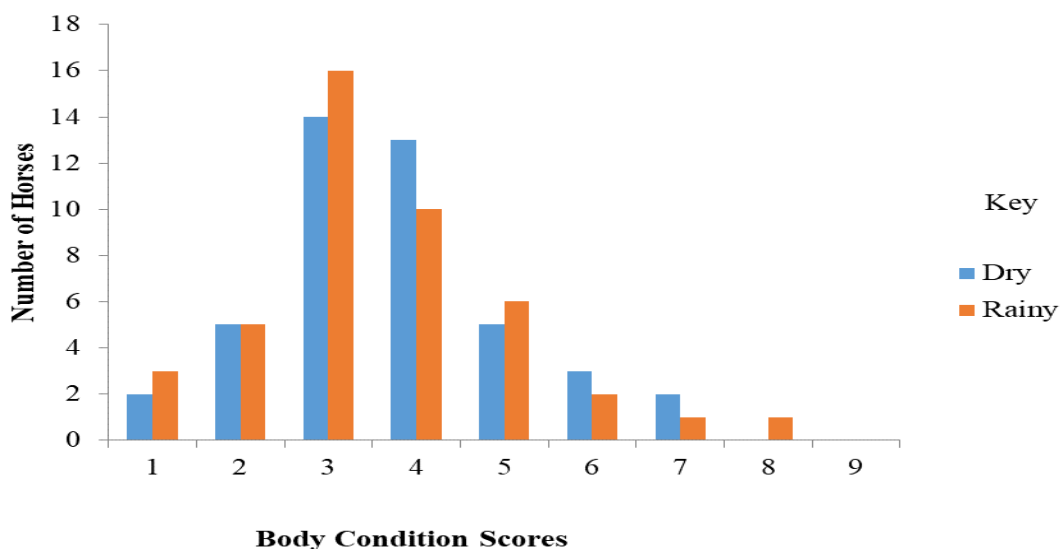


Figure 2: Body Condition Scores of Horses during the Rainy and Dry Seasons in Maiduguri (Unpaired: different horses were sampled in the two seasons)

Table 2 shows the body condition scores of stallions and mares in Maiduguri. There was no statistical association between sex and BCS but most stallions (76.6%) and mares (84.2%) were of below ideal (<5).

Table 2: Body Condition Scores of Stallions and Mares in Maiduguri

Body Condition Scores (BCS)	No. (%) Affected	
	Stallions (n=141)	Mares (n=19)
Below Ideal (<5)	108(76.6)	16(84.2)
Ideal (5-6)	28(19.6)	2(10.5)
Above Ideal (>6)	5(3.5)	1(5.3)

Table 3 shows body condition scores amongst various age groups of horses in Maiduguri. There was a significant association between age and BCS as indicated in >12yrs old horses which were more affected by the three categories

Table 3: Body Condition Scores amongst various Age Groups of Horses in Maiduguri

Age Groups	No. (%) Affected (n=160)		
	Below Ideal	Ideal	Above Ideal
Foal (0-11months)	1(0.8)	-	-
Young (1-4 yrs)	7(5.6)	-	-
Adults (5-12 yrs)	42(33.9)	10(33.3)	-
Old (>12 yrs)	74(59.7)	20(66.7)	6(100)

Table 4 shows body condition scores in relation to caretaking of horses in Maiduguri. Most of the horses 9 were of BCS 2 (very thin) under horse owners care but of BCS 3 (thin) 47 under a horse managers care There was a statistically significant difference ($p>0.05$).

Table 4: Body Condition Scores in relation to Caretaking of Horses in Maiduguri

Body Condition Scores (BCS)	Number of Horses	Frequency of BCS	
		Horse owner	Horse manager
1 (Poor)	5	3	2
2 (Very thin)	22	9	13
3 (Thin)	55	8	47
4 (Moderately thin)	40	6	34
5 (Moderate)	26	4	22
6 (Moderate to fleshy)	6	-	6
7 (Fleshy)	5	-	5
8 (Fat)	1	-	1
9 (Extremely fat)	0	-	0
Total	160	30	130

DISCUSSION

The body condition of horses is a good indicator of their general health, influenced by many physiological functions, and enables the average horse owner and horse managers to establish a monitoring system that will aid to improve feed efficiency, growth rates, and work performance (Bittante *et al.*, 2007),.

This study observed that horse management was done by either the owners or horse managers under the intensive system in the dry season and the semi-intensive in the rainy season. However, there was no statistical association between horse ownership and management practices and BCS ($p>0.05$; $X^2=0.2017$; $CI=0.2545-8.847$). Most of the horses assessed during the dry season had body

condition scores of 3 (thin), but 5 (moderate) during the rainy season, however BCS of horses paired and unpaired was almost similar for both seasons. Management practices and season have previously been indicated as major factors in the maintenance of equines (Well and Kreeck, 2001). In Nigeria management practices of horses are poor; especially some methods of restrain and poorly designed harnesses causes discomfort and inflict wounds. In addition, poor housing and sanitation, inadequate nutrition, stress, biting insects and lack of veterinary services are predisposing factors to diseases (Akinniyi *et al.*, 2024). Based on sex stallions BCS fall between poor (1) to fat (8), while that of mares falls between poor (1) to Fleshy (7) and age-wise Foals (0-11 months) had body condition scores of poor (1), young (1-4 years) had body condition scores of poor (1) and very thin (2), adults (5-12 years) had body condition scores from poor to moderately fleshy (1-6) but majority were thin (3) and the old >12 years had body condition scores of poor to fat (1-8) and also most were thin (3).

Body condition scores in relation to caretaking of horses had most of the horses 9 with BCS 2 (very thin) under horse owners care and of BCS 3 (thin) 47 under a horse manager's care contrary to the finding that horses managed and handled by skilled managers usually exhibit evidence of good nourishment and proper handling as they show an ideal body condition score (Dinka *et al.*, 2007; Pal *et al.*, 2013). Most horses in Nigeria are sedentary and are characterized by little physical activity, lack or inadequate feed and uncomfortable environment hence the poor body condition (Akinniyi *et al.*, 2023) which agrees with the findings in this study. Also aging horses are reported (Seboka *et al.*, 2021) to have reduced feed intake, inefficient digestion and utilization and dental problems identified as risk factors to poor body condition. In conclusion risk factors of management, age, sex, and season all interplay and have causal relationships with poor body condition of horses due to poor feeding, uncomfortable housing, diseases and dental problems.

Therefore, since majority of horse owners and horse managers had no prior knowledge on body condition scoring system and the risk factors associated in management, which affects the health and well-being of these horses a thorough understanding of modern

horse management practices is important. A consistent method of body condition scoring is a useful management tool that improves communication between stable employees, owners and veterinarians on good quality health in equine husbandry.

The variations in the BCS across season with a remarkable improvement during the rainy season suggest the availability of feeds mainly pasture during the wet season. Also, the improvement could be due to improvement in appetite as the dry season is characterized with harsh weather and soaring temperature that makes it difficult for the animals to feed properly. Furthermore, with increasing age, the risk of obesity increases in adult and old horses tending to be more obese compared to younger horses. This observation agrees with previous studies where horses ≤ 5 years old were most likely not to be obese (Robin *et al.*, 2014). Similar observation has been recorded in human population (Kennedy *et al.*, 2004). This may be connected with age-related decreases in physical activity and energy expenditure predisposing to fat accumulation and redistribution.

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AUTHORS CONTRIBUTION

Abdullahi Abubakar Biu, Stephen Bitrus Balami, and ThankGod, E. Onyiche conceived, designed and coordinated the study, while Esther Solomon Mshelia conducted the experiments assisted by the appropriate laboratory staff.

Conflict of Interest

There is no conflict of interest as regards to this manuscript

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