A study on obesity and risk factors among leisure and polo horses in Kaduna State, Nigeria

Olumide Odunayo Akinniyi1,3, Anthony Kojo Beku Sackey1, Gabriel Enenche Ochube2, Philip Wayuta Mshelia3

1Department of Veterinary Medicine, Ahmadu Bello University, Zaria, Kaduna State, Nigeria
2Department of Veterinary Surgery and Radiology, Ahmadu Bello University, Zaria, Kaduna State, Nigeria
3Department of Veterinary Medicine, University of Ibadan, Nigeria

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Abstract
Despite the growing concern about the impact of obesity on equine health, little information is available on equine obesity in Nigeria. The study aimed to determine the prevalence of obesity in leisure and polo horses as well as associated risk factors in Kaduna State, Nigeria. A cross-sectional study was carried out. A total of 116 horses were selected for the study, and the modified Henneke method (1–9 scale) was used to assess body condition scores, with animals having a score of ≥7 classified as obese. Information regarding age, breed, and sex was documented, while information regarding feeding and management was obtained from a structured questionnaire. Factors associated with obesity were assessed using logistic regression analysis. The overall prevalence of obesity in horses sampled was 12.1 % (14/116). The prevalence of obesity in leisure horses (21.4 %) was higher than in polo horses (3.3 %). Factors associated with increased odds of obesity were being a local breed of horse (18.6 %), being a stallion (21.4 %), horses not being exercised (66.7 %), horses tethered to a stake in the ground (23.2 %), and horses fed ad libitum on concentrates (21.4 %). Knowing the prevalence of obesity in this population and associated risk factors will enable optimal targeting of owner education regarding management strategies to reduce the prevalence of equine obesity, reducing the risk of conditions such as laminitis and insulin dysregulation.

Keywords: obesity; insulin dysregulation; equine metabolic syndrome; laminitis; horse.

1. Introduction

Obesity is the accumulation of excess fat tissue to the point where it may negatively affect an individual's health. It is a major health concern in horses due to its high prevalence and association with laminitis, oxidative stress and inflammation, hyperlipaemia, insulin resistance, and the equine metabolic syndrome (EMS) (Johnson et al., 2010). Adipose tissue is an endocrine organ made up of fat cells called adipocytes. Adipocytes can produce hormones and inflammatory cytokines, both of which can contribute to insulin resistance (Johnson et al., 2009). Insulin resistance is problematic because glucose builds up in the blood, causing hyperglycaemia, or high blood sugar. In response to hyperglycaemia, the pancreas produces more insulin to remove extra glucose from the blood. Hyperinsulinaemia or high insulin levels in the blood, can contribute to complications such as laminitis (de Laat et al., 2010). According to Akinniyi et al. (2023), 61.29 % of horses with EMS in Nigeria had laminitis.

Despite increased concern about the welfare impact of obesity, there is a dearth of information on the prevalence of equine obesity in both leisure and polo horses and risk factors in Nigeria. Identification of risk factors will aid in the targeted education of owners regarding management strategies to reduce the prevalence of obesity and associated conditions such as EMS.

The study aimed to determine the prevalence of obesity in leisure and polo horses in Kaduna State, Nigeria, and to identify possible risk factors associated with obesity.
2. Materials and methods

2.1 Study area
The study was conducted in Zaria and Igabi Local Government Areas (LGAs) of Kaduna State, Nigeria.

2.2 Study Design and sample size
A cross-sectional study was conducted. A total of 116 horses were sampled (50 leisure horses and 66 polo horses).

2.3 Body condition scoring
A body condition score (BCS) (1–9) was used to measure obesity as described by Henneke et al. (1983) and modified by Kohnke (1992). To assess accumulated fat, both visual inspection and palpation of the neck, ribs, withers, area behind the shoulder, loin, and tailhead were carried out on the horses. A numerical value (1–9) was assigned based on the fat accumulated in all the listed areas. After each area was assessed and assigned a score, an average of all the scores was obtained to get the horse’s final overall score, which was rounded up or down to the nearest half-score to obtain each BCS (Kohnke, 1992). The BCS was carried out by a highly experienced veterinarian. Based on the BCS, the horses were classified as under-condition (< 4.5), moderate condition (4.5–5.5), over-condition (6–6.5), and obese condition (≥ 7) (Dugdale et al., 2012).

2.4 Risk factors
Age, breed, and sex were all documented. The method used to determine age was based on dentition, as described by Richardson et al. (1995). A structured questionnaire was used to collect information on housing, exercise, and concentrate feeding.

2.5 Data analysis
The obtained data were summarised and presented in tables using descriptive statistics to compute prevalence. The odds ratio, using logistic regression, was used to determine the strength of the risk factors. Confidence intervals of 95 % were calculated, and values of P ≤ 0.05 were considered significant. The Statistical Package for Social Sciences (SPSS®, version 26) was used.

2.6 Ethical statement
The Ahmadu Bello University Committee on Animal Use and Care (ABUCAUC) granted ethical permission for the study with the approval code ABUCAUC/2022/042.

3. Results and discussion

3.1 Demographics
A total of 116 horses were sampled: 56 leisure horses and 60 polo horses. There were 70 (60.3 %) local horse breeds and 46 (39.7 %) Argentine polo ponies. There were 56 (48.3 %) stallions and 60 (51.7 %) mares. In terms of age, 42 (36.2 %) horses were < 5 years old, 67 (57.8 %) horses were between 5 and 15 years old, and 7 (6.0 %) horses were > 15 years old. Fifty-six (48.3 %) horses were tethered to a stake in the ground, and 60 (51.7 %) were stabled. Six (5.2 %) horses had no history of exercise, and 110 (94.8 %) horses had a history of exercise. Fifty-six (48.3 %) horses were fed concentrates ad libitum, 19 (16.4 %) horses were fed concentrates twice a day, and 41 (35.3 %) horses were fed concentrates thrice a day.

3.2 Distribution of Obesity
Of the 116 horses examined, a total of 16 (13.8 %), 61 (52.6 %), 25 (21.6 %), and 14 (12.1 %) were in under-condition, moderate condition, over-condition, and obese condition, respectively (Table 1).

3.3 Prevalence of Obesity
The result showed the prevalence of obesity in leisure horses to be 21.4 % (12/56) and in polo horses to be 3.3 % (2/60). The overall prevalence of obesity in this study was 12.1 % (14/116) (Table 2).

3.4 Risk factors
A Univariable logistic regression analysis identified several risk factors. Regarding breed, local horse breeds (18.6 %) were 10.26 times more likely to be obese than Argentine polo ponies (2.2 %), and the relationship was significant (OR 10.26, 95 % CI [3.25; 31.06], P = 0.028). In terms of sex, stallions (21.4 %) were 7.91 times more likely to be obese than mares (3.3 %), and the relationship was significant (OR 7.91, 95 % CI [1.68; 37.17], P = 0.009). In terms of age, horses aged < 5 years (9.5 %) were 1.67 times more likely to be obese than horses aged < 5 years (9.5 %). The relationship was not significant (OR 1.67, 95 % CI [0.49; 5.70], P = 0.416). Concerning housing, tethered horses (23.2 %) were 17.89 times more likely to be obese than stabled horses (1.7 %), and the relationship was significant (OR 17.89, 95 % CI [2.25; 141.5], P = 0.006). In terms of exercise, horses not exercised (66.7 %) were 20 times more likely to be obese than horses exercised (9.1 %), and the relationship was significant (OR 20, 95 % CI [3.25; 123.14], P = 0.001). Regarding concentrate feeding, horses fed concentrate ad libitum (21.4 %) were 10.01 times more likely to be obese than horses fed concentrate twice a day (2.4 %), and the relationship was significant (OR 10.01, 95 % CI [1.36; 87.71], P = 0.025) (Table 3).

Table 1
Body condition score distribution of leisure and polo horses in Kaduna State, Nigeria

<table>
<thead>
<tr>
<th>Horse</th>
<th>BCS</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>UC (&lt; 4.5)</td>
<td>MC (4.5–5.5)</td>
<td>OC (6–6.5)</td>
<td>ObC (≥ 7)</td>
<td>Total</td>
</tr>
<tr>
<td>Leisure</td>
<td>No. (%)</td>
<td>No. (%)</td>
<td>No. (%)</td>
<td>No. (%)</td>
<td>No. (%)</td>
</tr>
<tr>
<td>Polo</td>
<td>16 (28.6)</td>
<td>19 (33.9)</td>
<td>9 (16.1)</td>
<td>12 (21.4)</td>
<td>56 (100)</td>
</tr>
<tr>
<td>Total</td>
<td>16 (13.8)</td>
<td>61 (52.6)</td>
<td>25 (21.6)</td>
<td>14 (12.1)</td>
<td>116 (100)</td>
</tr>
</tbody>
</table>

BCS = Body Condition Score, UC = Under condition, MC = Moderate condition, OC = Over condition, ObC = Obese condition

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Table 2
Prevalence of equine obesity in leisure and polo horses, Kaduna State, Nigeria

<table>
<thead>
<tr>
<th>Horse</th>
<th>No. of horses sampled</th>
<th>No. of obese horses</th>
<th>Prevalence of obesity (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leisure</td>
<td>56</td>
<td>12</td>
<td>21.4</td>
</tr>
<tr>
<td>Polo</td>
<td>60</td>
<td>2</td>
<td>3.3</td>
</tr>
<tr>
<td>Overall</td>
<td>116</td>
<td>14</td>
<td>12.1</td>
</tr>
</tbody>
</table>

Table 3
The prevalence of equine obesity with respective categories of the risk factors in both leisure and polo horses, Kaduna State, Nigeria

<table>
<thead>
<tr>
<th>Risk factors</th>
<th>No. of sampled horse</th>
<th>No. of obese horses</th>
<th>Prevalence (%)</th>
<th>OR (95% CI)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breed</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• LHB</td>
<td>70</td>
<td>13</td>
<td>18.6</td>
<td>10.26 (1.29; 81.43)</td>
<td>0.028*</td>
</tr>
<tr>
<td>• APP</td>
<td>46</td>
<td>1</td>
<td>2.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Stallion</td>
<td>56</td>
<td>12</td>
<td>21.4</td>
<td>7.91 (1.68; 37.17)</td>
<td>0.009*</td>
</tr>
<tr>
<td>• Mare</td>
<td>60</td>
<td>2</td>
<td>3.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• &lt; 5 years</td>
<td>42</td>
<td>4</td>
<td>9.5</td>
<td>Reference</td>
<td></td>
</tr>
<tr>
<td>• 5 to 15 years</td>
<td>67</td>
<td>10</td>
<td>14.9</td>
<td>1.67 (0.49; 5.70)</td>
<td>0.416</td>
</tr>
<tr>
<td>• &gt; 15 years</td>
<td>7</td>
<td>0</td>
<td>0</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Housing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Tethered</td>
<td>56</td>
<td>13</td>
<td>23.2</td>
<td>17.89 (2.25; 141.5)</td>
<td>0.006*</td>
</tr>
<tr>
<td>• Stabled</td>
<td>60</td>
<td>1</td>
<td>1.7</td>
<td>Reference</td>
<td></td>
</tr>
<tr>
<td>Exercise</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• No</td>
<td>6</td>
<td>4</td>
<td>66.7</td>
<td>20 (3.25; 123.14)</td>
<td>0.001*</td>
</tr>
<tr>
<td>• Yes</td>
<td>110</td>
<td>10</td>
<td>9.1</td>
<td>Reference</td>
<td></td>
</tr>
<tr>
<td>Concentrate feeding</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Ad libitum</td>
<td>56</td>
<td>12</td>
<td>21.4</td>
<td>10.01 (1.36; 87.71)</td>
<td>0.025*</td>
</tr>
<tr>
<td>• Twice a day</td>
<td>41</td>
<td>1</td>
<td>2.4</td>
<td>Reference</td>
<td></td>
</tr>
<tr>
<td>• Thrice a day</td>
<td>19</td>
<td>1</td>
<td>5.3</td>
<td>2.22 (0.13; 37.55)</td>
<td>0.580</td>
</tr>
</tbody>
</table>

LHB = Local horse breed, APP = Argentine polo pony, * = Significant

3.5 Discussion
Our study provides important information regarding the prevalence and risk factors for obesity in both leisure and polo horses based on body condition scoring (BCS) in Kaduna State, Nigeria. The overall prevalence of obesity in the present study is lower than in previous studies in different populations of horses and ponies in various countries (Wyse et al., 2008; Stephenson et al., 2011; Thatcher et al., 2012; Jensen et al., 2016; Potter et al., 2016), which may be accounted for by differences in study populations, sampling methods, and body condition scoring methods. The prevalence of obesity in polo horses (3.3 %) was lower than in leisure horses (21.4 %). A possible explanation could be that polo horses participate in more intense activities and are more athletic than leisure horses, which decreases their risk of obesity. Similar findings have been reported by Robin et al. (2015).

The current study identified breed as a risk factor for obesity, with local horse breeds having significantly greater odds of being obese than Argentine polo ponies. The results are consistent with the previous reports of Pratt-Phillips et al. (2010) and Thatcher et al. (2012).

Sex was also identified as a risk factor for obesity; stallions had significantly greater odds of being obese than mares. However, Thatcher et al. (2012) reported that mares had significantly greater odds of being obese than stallions, while Potter et al. (2016) and Kosolofski et al. (2017) reported that sex did not influence the likelihood that a horse would be obese. Stallions having greater odds of being obese than mares in the present study could be due to the fact that most of the stallions are leisure horses.

There was no significant association between age and the prevalence of equine obesity in this study, suggesting that horses in the three age groups kept under similar conditions were equally susceptible to obesity. This agrees with a similar finding by Kosolofski et al. (2017).

The greater odds of obesity in tethered horses could be because they have more restricted movement (physical activity) than horses turned into paddocks or pastures. The greater odds of obesity in horses who were not exercised are consistent with the widely held belief that exercise is an important component of weight management and weight loss regimens for horses (Powell et al., 2002; Stewart-Hunt et al., 2006). However, Kosolofski et al. (2017) observed that exercise was not connected to the horse's BCS, which he attributed to factors such as misclassification of exercise intensity, a relatively small sample size, and the potential variability among clinicians' scores leading to BCS misclassification.
There are significantly higher odds of obesity among horses fed concentrate ad libitum. This is because horses are overfed without exercise, and excess fat accumulates. The quantity of feed intake for those fed twice and three times a day was well regulated.

4. Conclusions

Our findings demonstrate that a large proportion of the horses in Kaduna State, Nigeria, were obese, with most of the obese horses being leisure horses. This highlights the need to promote awareness among the horse community that obesity, especially among leisure horses, is a matter of concern. Veterinarians must educate caregivers on body condition scoring and weight management to reduce the prevalence of obesity and associated health risks such as laminitis and insulin dysregulation.

Authors contribution

All authors contributed to the study revision. Material preparation, data collection, and analysis were performed by Olumide Odunayo Akinniyi, Anthony Kojo Beku Sackey, Gabriel Enenche Ochube, and Philip Wayuta Mshelia. The first draft of the manuscript was written by Olumide Odunayo Akinniyi, and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

Conflict of interest

The authors declare no conflict of interest.

References


