ASSESSMENT OF BODY CONDITION SCORE AS A PREDICTOR FOR CLINICAL HEALTH IN CATTLE: A COMPARATIVE STUDY IN ABEOKUTA, OGUN STATE, NIGERIA

[1]*OKUBOYE, J.O., [2]ADENAIKE, E.A., [3]ODUNBAKU, T.A., [4]AYINLA, I.O. & [4]TALABI, A.O.

[1]*Veterinary Department, Ministry of Agriculture, Ita Eko, Abeokuta, Ogun State, Nigeria; [2]Department of Veterinary Medicine, Michael Okpara University of Agriculture, Umudike, Abia State, Nigeria; [3]Veterinary Department, Ministry of Agriculture, Ita Eko, Abeokuta, Ogun State, Nigeria; [4]Department of Veterinary Medicine, College of Veterinary Medicine, Federal University of Agriculture, Abeokuta, Ogun State, Nigeria*

Correspondence: akinolaokuboye@gmail.com

ABSTRACT

Body Condition Score (BCS) of cattle were assessed in a farm in Abeokuta where 186 heads of adult white Fulani breed in both sexes were clinically examined. Sixty cattle with BCS of two or three on a 9-point scale (1-9) and 60 cattle with BCS of five or six were sampled for the presence of parasites, and the packed cell volume (PCV) values determined. Female cattle had significantly higher mean live weight compared to male cattle (p=0.29). Male cattle had slightly higher mean PCV compared to female cattle (p = 0.003). Animals with higher BCS had significantly higher live weight and PCV values compared to those with lower BCS. Heavier animals tend to have better body condition and higher PCV. Animals without parasites had significantly higher live weights, PCV, and BCS compared to those with parasites. Cattle with low PCV had a high prevalence of haemo-parasites (51.5%) and gastrointestinal tract parasites (62.5%). The multivariate regression analysis reveals that PCV, presence of BP, and weight are significant predictors of BCS in cattle. The odds ratio analysis shows that BP significantly increased the odds of having a low BCS, while GTP did not have a statistically significant impact. Protozoan parasites detected include *Anaplasma species, Babesia species and Theileria species, Eimeria* oocysts and that of *Balantidium coli*. Eggs of GIT-parasites detected include that of Strongyles, *Ascaris,* Strongyloid and *Moniezia benedeni*. In conclusion, this comparative study demonstrates the usefulness of BCS as a predictor of clinical health in cattle.

Keywords: Abeokuta, Body condition score, Cattle, Clinical health, Ogun state

INTRODUCTION

Body condition scoring (BCS) has been widely accepted as the most practical method for assessing changes in energy reserves in many species, including dairy cattle. Management of BCS on dairy farms has implications for milk yield, herd health, reproductive performance, animal well-being, and overall farm profitability (Bewley & Schutz, 2008). BCS is a metric used to estimate the body energy reserves of cattle based on the level of subcutaneous fat present on specific body landmarks, such as body ridges and protrusions. These features include the spinous process, the twelfth and thirteenth ribs, the hook bone, the pin bone, and the valley created between them. The method and scale used varies between countries (Winkler *et al*., 2024). The BCS describes the relative fatness of a cow through the use of a nine-point scale and is an effective management tool to evaluate nutritional and health status of the herd. The body condition scoring system allows producers to visually assess

their cow herd using a number system that objectively describes the amount of condition or fat reserve of an animal (Rasby *et al.*, 2014). Because cow/calf producers do not weigh cows on a regular basis, they need a management technique to evaluate their cow herd as it relates to health status, productivity and profit potential. BCS is closely related to reproductive efficiency, especially for calving females, and is a more reliable indicator of nutritional status of a cow than is body weight (Rasby *et al.*, 2014). Emphasizing the nine-point body condition scoring system, relationship between body condition and productivity of the cow herd, and use of body condition as a management tool to develop and monitor nutritional programmes is paramount because incorporation of body condition scoring as a management tool can increase the profit potential of the cow/calf enterprise (Lehman, 2001).

BCS is an important tool used in cattle management because it provides a reliable indication of the animal's body energy reserves and overall health. This scoring system uses a visual and tactile assessment of fat and muscle stores which is especially important for dairy and beef cattle. Proper BCS management has a direct impact on productivity, reproductive performance and overall welfare. BCS is equally important for beef cattle because it influences meat tenderness and marbling, which have a direct impact on market value. Furthermore, reproductive performance is strongly associated with BCS; cows with an optimal BCS have higher conception rates, fewer calving difficulties and healthier calves (Praveen *et al.*, 2024).

BCS provides a quick, cheap and easy method for evaluating and improving performance of dairy herds under different management systems, seasons or environments (Amer, 2008). Some studies indicated that BCS at calving was strongly related to health, reproduction and milk production as well as milk curve parameters (Markusfeld *et al.,* 1997). The impact of BCS on subsequent health condition, dairy production and fertility had been evaluated by many researchers who recorded that low BCS suppressed peak milk yield and milk production traits in dairy herds, but cows with high BCS had no advantage in milk production (Flamenbaum *et al.,* 1995).

BCS provides a standardized framework for evaluating an animal's body condition, ranging from emaciation or extremely thin animal (BCS 1) to obesity or extremely fat animal (BCS 9). The BCS system is crucial for identifying malnourished animals, which are more susceptible to diseases, reproductive problems, and decreased productivity. Conversely, well-nourished animals (BCS ≥5) tend to exhibit improved health, fertility, and milk/meat production. Scores are assigned based on visual and palpation assessments of fat cover on key anatomical points such as the ribs, spine, hips and tail head. This systematic evaluation allows farmers to

monitor and manage the nutritional needs and overall health of their cattle effectively thereby ensuring the optimal productivity and welfare (Praveen *et al.*, 2024).

The implementation of BCS can bring improvement in farm, decrease incidence of diseases, and increase the levels of farmer's income (Almas, 2020). A low BCS can be described as a reflection of the ratio of energy consumed compared to energy expended. A cow in 'thin' condition (BCS 1-4) is angular and bony with minimal fat over the backbone, ribs, hooks, and pins. There is no visible fat around the tail head or brisket. A cow in 'ideal' condition (BCS 5-7) has a good overall appearance. A cow with a BCS of 5 has visible hips, although there is some fat over the hooks and pins and the backbone is no longer visible. Cows with BCS of 6 or 7 become fleshy and the ribs are no longer visible. There is also fat around the tail head and in the brisket. An over-conditioned cow (BCS 8-9) is smooth and boxy with bone structure hidden from sight or touch. She may have large protruding fat deposits (pones) around the tail head and on the pin bones. Ruminal contents or pregnancy can change the appearance of moderately fleshy cows, especially over the ribs or in front of the hooks (Eversole *et al.*, 2009).

Managing body reserves is critical for successful cow management and requires an accurate assessment of the cow's 'condition'. Body condition scoring is an important aspect of metabolic diseases of farm animals. Body weight alone is not a valid indicator of body reserves, as cows of a specific weight may be tall and thin or short and fat. The energy stores may vary by as much as 40% in cows of similar body weight, which emphasizes the futility and inaccuracy of relying on body weight alone as an index of cow condition. In addition, because tissue mobilization in early lactation occurs as feed intake is increasing, decreases in body tissue weight can be masked by enhanced fill of the gastrointestinal tract, so that body weight changes do not reflect changes in adipose tissue and lean tissue weight (Radostits *et al.*, 2007).

This assessment of BCS as a predictor of clinical health in cattle aims to compare the health status of cattle with BCS≤3 with those with BCS≥5 in Abeokuta, Ogun State. By examining the clinical parameters and health outcomes of these two groups, this study seeks to contribute to the development of effective disease management strategies for cattle production in Nigeria.

MATERIALS AND METHODS
LOCATION OF STUDY AND SAMPLED ANIMALS
The study was carried out in a Cattle Farm located on latitude N 70 13'58.2708" and longitude E 30 25'12.82224" in Abeokuta, Ogun State, where 186 heads of adult White Fulani breed of cattle were housed. All animals were

clinically observed and 60 heads of cattle with a BCS of two or three on a 9-point scale (1-9) were selected and sampled along with 60 heads of cattle with a BCS of five or six. The breed, sex and other clinical parameters were assessed. All samples were analyzed at the College of Veterinary Medicine, Federal University of Agriculture, Abeokuta, Ogun State.

CLINICAL PARAMETERS

The following clinical parameters were assessed once from each animal before going to graze in the morning between February and March during the peak of the dry season: body condition score, PCV, haemo-parasite check, GIT-parasite check, and live weight estimation.

SAMPLE COLLECTION AND ANALYSES

5ml of blood was collected from the jugular vein of each of the sampled animals into sterile labelled bottles containing Na_2EDTA. The samples were taken to the laboratory within few hours of collection. Each sample was examined for the presence of haemo-parasites by stained thin smears, PCV values determined using the micro-haematocrit centrifugation technique, or the Woo method and the presence of trypanosomes determined using the Murray's method (Soulsby, 1982).

Faecal samples were also collected per rectum from each animal with the aid of a disposable pair of gloves per sample and the samples examined for presence of helminth eggs or coccidia oocysts using the Floatation Technique MAFF, (1986).

DESCRIPTION OF BODY CONDITION SCORE FOR CATTLE ON A SCALE OF 1-9

The BCS of each of the animals was done as described by Eversole *et al*. (2009). Areas such as the back, tail, head, pins, hooks, ribs, brisket and muscle, as well as the level of fat deposit around the aforementioned areas and physical weakness of the cattle were used to determine the BCS.

CONDITION SCORE 1: EXTREMELY EMACIATED

The spinous processes show no fat cover, are very prominent and sharp. There are visible spaces between the vertebrae. The ribs and bone structure are visible with no fat cover; the tail head is very prominent. There is severe muscle loss in the shoulder, loin, and hind regions. There is no fat over muscle, or under skin. An animal with a score of one is life-threateningly thin.

CONDITION SCORE 2: VERY THIN

There is more fat cover over the ribs and backbone, but space is still visible between the vertebrae. The tail head is

less prominent, but there is still muscle loss. Overall, there is slightly more fat cover than in condition Score 1 (Figure I).

Figure I: Cattle with BCS of 2

CONDITION SCORE 3: THIN

The spinous processes are still visible, but less sharp. There is less space between the vertebrae, and more fat cover along the entire backbone. The loin muscle has more depth, but there is no obvious fat cover. The ribs and tail head are still visible, with more cover, and there is only slight muscle loss.

CONDITION SCORE 4: SLIGHTLY THIN (BORDERLINE)

There are no spaces between the vertebrae, and the spinous processes are no longer visible, but can be palpated with little pressure. The last two to four ribs and the hipbones are still visible. Fat covers the loin and shoulder, and the animal has no muscle loss, but is still flat.

CONDITION SCORE 5: MODERATE OR AVERAGE

There is just the right amount of fat cover over the shoulders, ribs, loin, and tail head. The spinous processes can be palpated with a little pressure, and feel smooth to the touch. Only the last two ribs are visible, and the loin is filled. There is little fat in the brisket and over the hooks and pins.

CONDITION SCORE 6: SLIGHTLY FLESHY

The spine is palpated with moderate pressure, and the hindquarters have become slightly rounded. There is visible fat in the brisket and around the tail head. All ribs, the loins, shoulders, and fore ribs are covered with fat (Figure II).

Figure II: Cattle with BCS of 6

CONDITION SCORE 7: FLESHY
The entire animal appears smooth. The spine can be felt with significant pressure. There is fat that fills the brisket, flanks, and tail head. There is more fat cover over the shoulder, loins, and fore ribs.

CONDITION SCORE 8: FAT (OBESE)
The animal appears square. The tail head is embedded in fat, and the flanks and brisket appear to be full

CONDITION SCORE 9: EXTREMELY FAT (VERY OBESE)
There is no visible bone structure or definition in the muscles. The spine cannot be felt. The brisket is filled with fat, and the neck appears shorter due to the deposition of fat. The loin, hip, and tail head have a rippled look due to the excess fat.

WEIGHT ESTIMATION
The weight estimation of cattle in kilogramme was done by wrapping a measuring tape (measures in centimetre) around the thorax of the animal (girth), and then the length (measured in centimetre) from the point-of-shoulder to the point-of-rump was measured using the Lambourne formula (Hasan *et al*., 2020).

$$\text{Weight in kilogramme} = \frac{\text{circumference of girth* length of cow}}{10{,}840}$$

DATA ANALYSIS
Data obtained were expressed in descriptive statistics on percentage (%) and inferential statistics. Multivariate regression analysis of factors affecting body condition score and odds ratio analysis of factors associated with parasite presence were also evaluated.

RESULTS
The results obtained from 60 heads of cattle with a BCS of two or three were compared with the results obtained from 60 heads of cattle with a BCS of five or six and presented in Tables I to VIII.

The mean live weight, packed cell volume and body condition score of assessed cattle showed that the mean live weight for females is slightly higher than males with a p value of 0.29 (Table I). This difference is not statistically significant.

TABLE I: MEAN LIVE WEIGHT, PCV AND BCS OF ASSESSED CATTLE

Parameter	Females (n=80) (Mean ± SD)	Males (n=40) (Mean ± SD)	p-value
Weight (kg)	207.26 ± 52.76	195.68 ± 57.76	0.29
PCV (%)	25.29 ± 3.31[a]	27.45 ± 3.84[b]	0.003
BCS	3.93 ± 1.41	4.43 ± 1.71	0.113

Different superscript letters (a,b) within the same column indicate statistically significant differences between groups (p<0.05)

Males demonstrated a higher mean PCV compared to females. This difference is statistically significant (p=0.003). In BCS, males had a higher mean BCS compared to females. However, with a p value of 0.113, this difference does not reach statistical significance at the conventional threshold.

TABLE II: MEAN LIVE WEIGHT, MEAN PACKED CELL VOLUME AND BCS OF ANIMALS

BCS (n)	Weight (kg) (Mean ± SD)	PCV (%) (Mean ± SD)
2 (21)	124.76 ± 36.18[b]	22.52 ± 2.64[b]
3 (39)	202.54 ± 42.01[b]	23.87 ± 2.45[b]
5 (28)	241.71 ± 37.41[a]	27.93 ± 2.37[a]
6 (32)	222.53 ± 35.86[a]	29.22 ± 2.41[a]

Different superscript letters (a,b) within the same column indicate statistically significant differences between groups (p<0.05)

The mean live weight, mean packed cell volume and BCS of animals in Table II showed that animals with higher BCS (5 and 6) have significantly higher weights and PCV compared to those with lower BCS (2 and 3).
The differences are slightly statistically significant (p<0.05), indicating that greater body condition correlates with higher

weight and higher packed cell volume, which may reflect better overall health status and nutrition.

substantially higher mean body weight (231.48 ± 37.53 kg) compared to animals with haemo-parasites (175.53 ± 40.00 kg), GIT-parasites (173.13 ± 33.9 kg), or both types of parasites (177.65 ± 67.4 kg). Presence of these parasites

TABLE III: MEAN LIVE WEIGHT, PACKED CELL VOLUME AND BODY CONDITION SCORE OF ANIMALS WITH PARASITES AND WITHOUT PARASITES

Parameter	With Haemo-parasites alone (Mean±SD) (n=17)	With GIT-parasites alone (Mean±SD) (n=23)	With Both Parasites (Mean±SD) (n=20)	Without Parasites (Mean±SD) (n=60)	P-values
Weight (kg)	175.53±40.00[a]	173.13± 52.67[a]	177.65±67.35[a]	231.48±37.53[b]	p<0.001
PCV (%)	23.47±2.12[a]	23.96±1.94[a]	22.7±3.40[a]	28.61±2.46[b]	p<0.001
BCS	2.76±0.44[a]	2.65±0.49[a]	2.55±0.51[a]	5.53 ±0.50[b]	p<0.001

Different superscript letters (a,b) within the same row indicate statistically significant differences between groups (p<0.05)

TABLE IV: MEAN LIVE WEIGHT, PCV RANGE, BODY CONDITION SCORE, PRESENCE OF HAEMO-PARASITE AND GASTROINTESTINAL PARASITES

PCV (%) Range	Number of animals	Mean Weight (kg)	Mean BCS	Haemo-parasite Present	GIT-parasite Present
18-20	9	133.56 ± 40.26[a]	2.33 ± 0.50[a]	8 (88.9%)	6 (66.7%)
21-24	30	192.47 ± 59.96[b]	2.77 ± 0.43[a]	20 (66.7%)	22 (73.3%)
25-29	62	211.53 ± 51.87[b]	4.55 ± 1.44[b]	8 (12.9%)	14 (22.6%)
30-35	19	227.21 ± 23.39[c]	5.53 ± 0.77[c]	0 (0%)	0 (0%)
P-values	<0.001	<0.001	<0.001	<0.001	

Different superscript letters (a,b,c) within the same column indicate statistically significant differences between groups (p<0.05)p-values represent overall differences between PCV range groups.

TABLE V: CORRELATION BETWEEN BCS, HAEMO-PARASITES AND GIT-PARASITE PRESENCE

BCS	Noof Animals	Weight (kg) (Mean ± SD)	PCV (%) (Mean ± SD)	No of Animals with GIT Parasites	No of Animals with Haemo-Parasites	P-values
2	21	124.76 ± 36.18[a]	22.52 ± 2.64[a]	17(81%)[a]	13 (62%)[a]	p<0.001
3	39	202.54 ± 42.00[b]	23.87 ± 2.45[a]	26(44%)[b]	24 (41%)[b]	p<0.001
5	28	241.71 ± 37.41[c]	27.93 ± 2.37[b]	0[c]	0[c]	p<0.001
6	32	222.53 ± 35.86[c]	29.22 ± 2.41[b]	0[c]	0[c]	p<0.001

Different superscript letters (a,b,c) within the same column indicate statistically significant differences between BCS groups (p<0.05)

The mean live weight, packed cell volume and body condition score of animals with parasites and without parasites (Table III) suggests that presence of haemo-parasites and or GIT-parasites, regardless of type, are associated with reduced body weight potentially due to nutritional drain, metabolic disturbances, or reduced feed intake caused by the parasites. Animals without parasites had

reduced PCV, which could reflect anaemia. This is particularly notable in animals with haemo-parasites or dual infections, likely because blood parasites directly affect erythrocytes and hematopoietic tissues. Animals without parasites showed higher PCV values (28.61 ± 2.5) compared to those with haemo-parasites (23.47 ± 2.12), GIT-parasites (24.00 ± 1.9), or both parasites (22.7 ± 3.4). Presence of parasites had negative impact on the overall physical

condition and nutritional status of the animals. Animals without parasites had significantly better body condition scores (5.55 ± 0.5) compared to those with parasites (ranging from 2.76 to 2.89).

The mean live weight, PCV range, body condition score, presence of haemo-parasite and gastrointestinal parasites (Table IV) showed there is a strong positive correlation between PCV levels and mean weight, BCS and parasite presence. Animals in the lowest PCV range (18-20) showed the lowest mean weight (133.55 ± 40.3 kg) and poorest BCS (2.33 ± 0.5). Also, 8 out of 9 animals had haemo-parasites, and 6 had gastrointestinal parasites. In the highest PCV range (30-35), none of the 19 animals had either type of parasite. This suggests a strong negative association between PCV and parasite burden. As PCV increased through each category, there were corresponding increase in mean weight and BCS, reaching the highest values in the 30-33 PCV range (227.21 ± 23.4 kg weight and 5.53 ± 0.8 BCS). Gastrointestinal parasites were more prevalent in the mid-PCV range (21-24 and 25-29), while haemo-parasites appeared more evenly distributed across the lower three PCV ranges. The complete absence of parasites in the highest PCV range strongly suggests that parasite-free animals maintain healthier PCV levels.

The correlation between BCS and Haemo-parasites and GIT-parasite presence (Table V) showed there was a striking inverse relationship between BCS and parasite burden in animals with BCS 2: 17/21 (81%) had GIT-parasites and 13/21 (62%) had haemo-parasites. This inverse relationship was also in animals with BCS 3: 26/59 (44%) had GIT-parasites and 24/59 (41%) had haemo-parasites; and in animals with BCS 4 and 6: 0% had either type of parasite. This demonstrates that parasite presence is strongly associated with poorer body condition.

TABLE VI: PREVALENCE OF SPECIFIC PARASITES

| Endoparasites	Percentage Distribution	Confidence Intervals
Strongyle species	43.3%	34.5% - 52.4%
Eimeria species	15%	28.2% - 45.8%
Balantidium coli	6.7%	9.3% - 22.8%
Monieziabenedeni	5%	6.7% - 18.9%
Ascaris species	6.7%	3.1% - 12.6%
Anaplasma species	36.7%	3.1% - 12.6%
Theileria species	11.7%	2.0% - 10.5%
Babesia species	3.3%	1.1% - 8.5%

Note: Confidence intervals calculated using the Wilson score interval method with a sample size of 120 animals

The prevalence of various endoparasites identified in the study is presented in Table VI (Figure III, IV, V, VI and VII). *Strongyle* species emerged as the most prevalent parasite with 43.3% of animals affected, representing a substantial burden in the studied population. *Anaplasma* species followed as the second most common parasite at 36.7%, indicating a high prevalence of this tick-borne haemo-parasite.

Among the coccidia, *Eimeria* species were detected in 15% of animals, while *Theileria* species, another important haemo-parasite, affected 11.7% of the population. Less frequently observed parasites included *Balantidiumcoli* and *Ascaris* species (both at 6.7%), *Monieziabenedeni* (5%), and *Babesia* species, which showed the lowest prevalence at 3.3%.
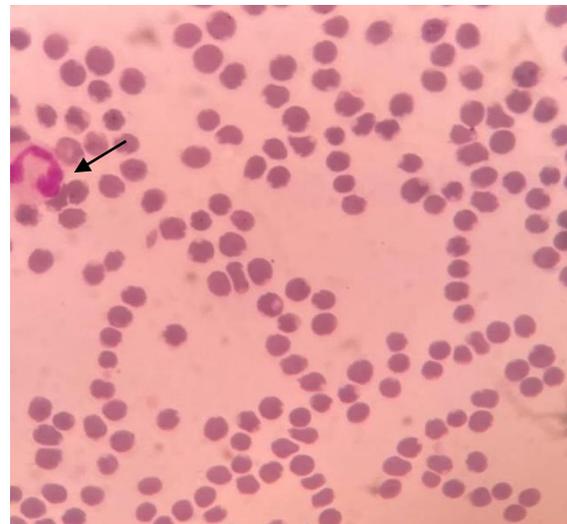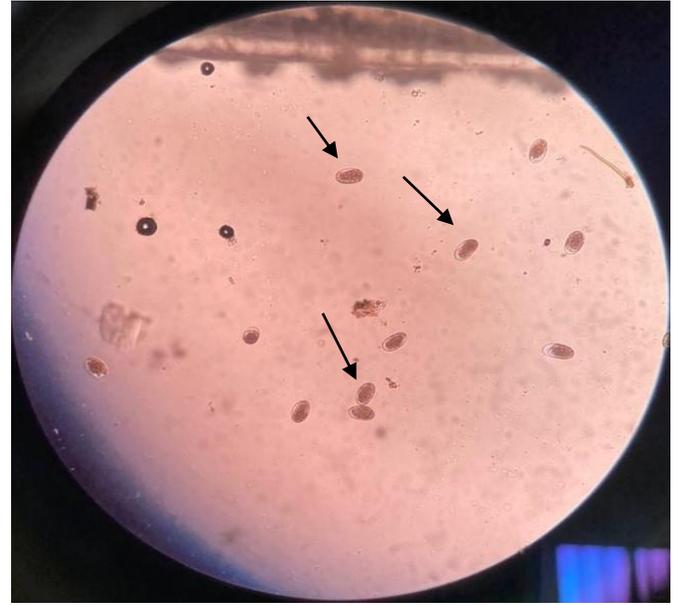

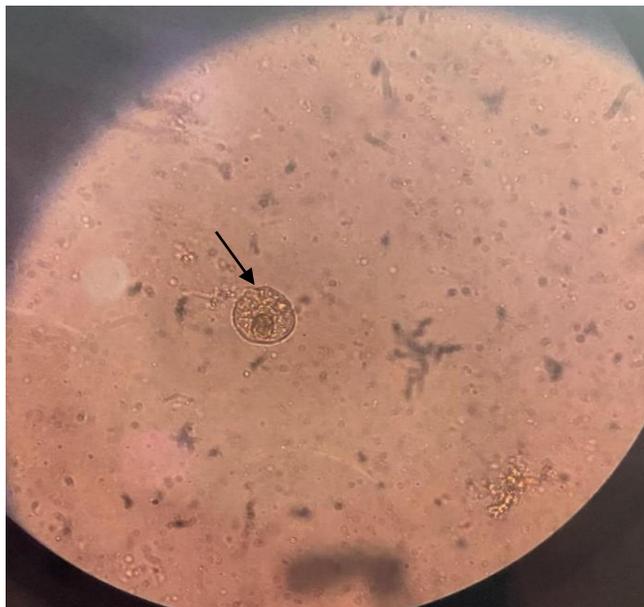**Figure III: Thin blood smear showing *Anaplasma species* (arrow). Mag: x100**
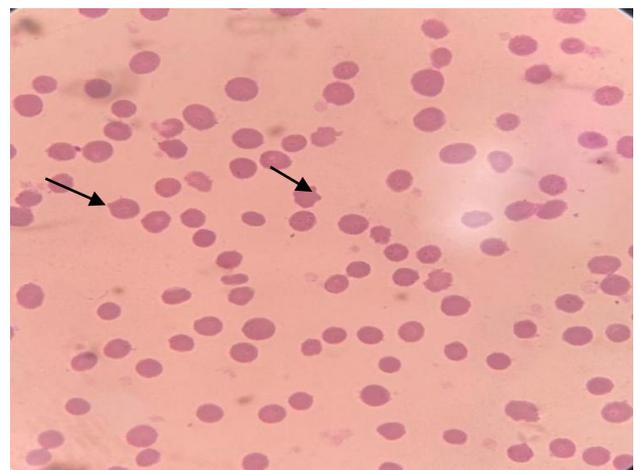
Figure IV: Thin blood smear showing *Theileria species* (arows). Mag: x100
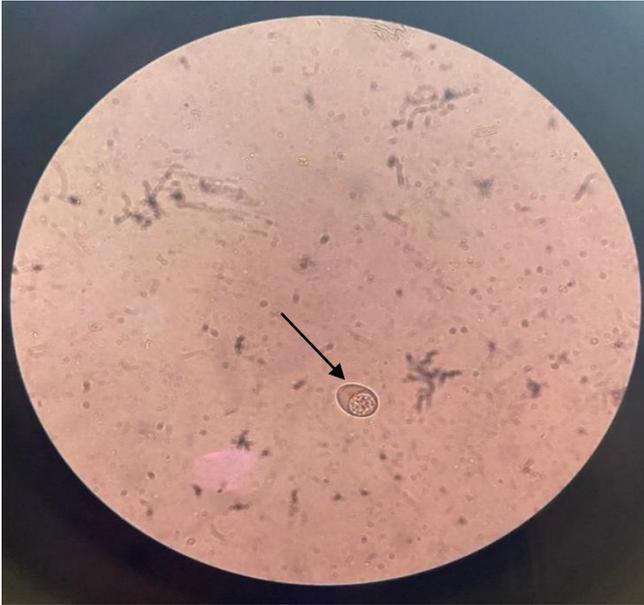
Figure V: Faecal centrifugal floatation method showing *Eimeria species* (arrow). Mag: ×40

Figure VI: Faecal centrifugal floatation method showing *Balantidium coli* (arrow). Mag: ×40

The distribution pattern reveals that gastrointestinal nematodes (*Strongyle* species) and haemo-parasites (*Anaplasma* species) represent the predominant parasitic challenges in these animals. This finding has important implications for parasite control strategies, suggesting that integrated approaches targeting both helminth infections and vector-borne diseases would be necessary for effective herd health management. The relatively high prevalence of multiple parasite species also indicates potential for polyparasitism, which may compound negative effects on animal health and productivity.

Figure VII: Faecal centrifugal floatation method showing Strongyle eggs (arrows). Mag: ×40

TABLE VII: MULTIVARIATE REGRESSION ANALYSIS OF FACTORS AFFECTING BODY CONDITION SCORE IN ANIMALS

Variable	Coefficient (β)	p-value
Packed Cell Volume	0.15	0.02
Presence of Haemo-Parasites (BP)	-0.45	0.03
Presence of GTP	-0.30	0.08
Weight (kg)	0.02	0.01
Sex (Male/Female)	0.10	0.25

Our multivariate regression analysis revealed significant associations between body condition score (BCS) and several physiological and pathological parameters (Table VII). Packed cell volume demonstrated a positive relationship with BCS ($\beta = 0.15$, $p = 0.02$), supporting previous observations that haematological parameters serve as reliable indicators of overall health status in ruminants.

The presence of haemo-parasites emerged as a strong negative predictor of body condition ($\beta = -0.45$, $p = 0.03$). This substantial effect underscores the detrimental impact of haemo-parasites on host metabolism and nutritional status, likely through mechanisms involving anaemia, systemic inflammation, and altered energy utilization.

Similarly, gastrointestinal parasitism showed a negative association with BCS ($\beta = -0.30$, $p = 0.08$), though this relationship approached but did not reach statistical significance at the conventional threshold. Weight exhibited

a modest but significant positive association with BCS (β = 0.02, p = 0.01), confirming the expected relationship between these parameters while also highlighting that BCS captures aspects of body composition not fully explained by weight alone. Sex did not significantly influence BCS in our model (β = 0.10, p = 0.25), suggesting that under the studied conditions, physiological and pathological factors outweigh sexual dimorphism in determining body condition.

The findings in Table VII emphasize the multifactorial nature of body condition in ruminants, with particular importance of haemo-parasites and haematological status as determinants of nutritional well-being.

TABLE VIII: ODDS RATIO ANALYSIS OF FACTORS ASSOCIATED WITH PARASITE PRESENCE IN RUMINANTS

Variable	Odds Ratio	95% Confidence Interval	p-value
Haemo-Parasites	2.5	1.8–3.4	< 0.01
GTP	1.8	0.9–3.2	0.12

TABLE IX: INTERACTION EFFECTS

Interaction Term	p-value
PCV and Parasite Presence	> 0.05

Table VIII presents odds ratio analysis for parasite presence in the studied population. Haemo-parasites demonstrated a significant association with the outcome variable (OR = 2.5, 95% CI: 1.8-3.4, p < 0.001), indicating a 2.5-fold increase in odds. Gastrointestinal tract parasites showed a positive but non-significant association (OR = 1.8, 95% CI: 0.9-3.2, p = 0.12), with the confidence interval crossing the null value.

No significant interaction was observed between PCV and parasite presence (p > 0.05), suggesting that parasite effects remain consistent across PCV levels. These findings highlight haemo-parasites as particularly important risk factors, with their effects potentially operating through mechanisms independent of their impact on PCV values.

DISCUSSION

The results of this comparative study demonstrate a significant relationship between BCS and clinical health in cattle. Animals with a BCS $\leq$3 exhibited lower weight, lower PCV and more endoparasites, compared to those with a BCS $\geq$5. This finding is consistent with previous studies, which have reported a strong association between malnutrition and increased susceptibility to diseases in cattle (FAO, 2012; Zerfu *et al.*, 2022). The lower BCS group ($\leq$3) showed significant alterations in mean PCV values and mean body weight indicative of malnutrition and parasitic diseases. In

contrast, the higher BCS group ($\geq$5) exhibited relatively normal values for these parameters, suggesting better nutritional status and overall health. The study's findings highlight the importance of BCS as a predictor of clinical health in cattle. By regularly monitoring BCS, cattle producers and veterinarians can identify animals at risk of malnutrition and disease, enabling timely interventions to prevent or mitigate these conditions. Furthermore, the results emphasize the need for improved nutritional management practices, including provision of high-quality feed and adequate access to clean water, to maintain optimal BCS and promote overall health in cattle populations.

BCS offers a range of benefits across various aspects of cattle management. Its importance is underscored by its impact on nutrition, production and reproduction. BCS helps farmers and veterinarians assess the nutritional needs of cattle. Monitoring BCS allows for early detection of health issues. Cattle with a consistently poor BCS might be suffering from underlying health problems, parasitism, or inadequate nutrition (Rasby *et al.*, 2014). Protozoan parasites detected in this study include *Anaplasma species, Babesia species and Theileria species, Eimeria* oocysts and that of *Balantidium coli*. Eggs of endoparasites detected include that of Strongyles, *Ascaris,* Strongyloid and *Moniezia benedeni*. All the blood samples collected in the course of the study were negative of the presence of *Trypanosome species*. The high prevalence of haemo-parasite recorded in this study is similar to previous works of 50.2% prevalence of blood protozoan in the transboundary areas of Ogun State, Nigeria (Talabi *et al.*, 2011), 54% prevalence in sheep at Abeokuta, Ogun State (Takeet *et al.*, 2009) and 51% of haemo-parasites of cattle in Abeokuta, South west, Nigeria (Akande, *et al.*, 2010). The high incidence of haemo-parasite recorded could be as a result of favourable environmental condition that helps in the survival and proliferation of the arthropod vector responsible for the transmission of these parasites (Adejinmi *et al.*, 2004).

Female cattle had a significantly higher mean weight compared to male cattle (p=0.29). Male cattle had a slightly higher mean PCV compared to female cattle (p = 0.003). Animals with higher BCS (5 and 6) have significantly higher weights and PCV compared to those with lower BCS (2 and 3). Heavier animals tend to have better body condition and higher PCV. John *et al.* (2021) conducted a study to determine the effect of age among Adamawa Gudali, Sokoto Gudali, Bunaji and Rahaji breeds of cattle in four selected States in Nigeria. They concluded that body weight of cattle increases with increase in age across the age categories. Body weight was positively and highly correlated (p<0.01) with biometric traits of cattle. Most of the biometric traits of cattle increased with increase in age. High and positive

relationships existed between body weight and biometric traits of cattle.

In this study, animals without parasites have significantly higher weights, PCV, and BCS compared to those with parasites. Cattle with low PCV had a high prevalence of haemo-parasites (51.5%) and gastrointestinal tract parasites (62.5%). The multivariate regression analysis reveals that PCV, presence of BP, and weight are significant predictors of BCS in cattle. The odds ratio analysis shows that BP significantly increased the odds of having a low BCS, while GTP does not have a statistically significant impact. Kamani *et al*, (2010) investigated the prevalence and significance of haemo-parasites of cattle from north-central Nigeria, an overall prevalence of 25.7% was recorded for all samples examined. *Babesia bigemina* and *B.bovis* accounted for 16.0%, followed by *Theileria mutans* (3.1%), *Trypanosoma* spp (2.8%), *Anaplasma marginale* (1.9%), and Microfilaria (1.4%). The haemo-parasites identified alone or in combination with others had a significant (P<0.05) effect on the mean PCV of infected animals. Similarly, haemo-parasites infection in young animals as well as during the dry season resulted in significant (P<0.05) reduction of PCV values. Kamani *et al.*, (2010) therefore concluded that haemo-parasites are endemic in Nigerian cattle which may result in serious disease conditions when such animals are subjected to stressful condition.

CONCLUSION

This comparative study demonstrates the usefulness of BCS as a predictor of clinical health in cattle. The findings highlight the importance of maintaining optimal BCS through improved nutritional management practices, supplementary feeding and elimination of haemo-parasites and GIT-parasites by routine clinical observations to promote overall health and reduce the risk of disease in cattle populations.

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