

Physiological Monitoring of Berari Goat Kids during Neonatal Period

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Abstract

The present study was undertaken to monitor the variations in physiological parameters viz., body weight (BW), rectal temperature (RT), respiration rate (RR), and heart rate (HR) in twelve Berari goat kids during January and February 2023. The parameters were recorded on day 0 (day of birth) and days 3, 10, 20, and 30 days of age. All the physiological parameters were statistically significant. The average respiratory rate in neonate kids was 65.43 ± 2.47 breaths/min. Respiratory rate was highest on day 0 and reduced as the age advanced with a mean of 47.67 ± 4.45 breaths/min at 30 days. The average heart rate in neonate kids was 103.95 ± 2.17 beats/min. Heart rate was significantly higher on the day of birth (116.47 ± 3.15 beats/min) and dropped significantly up to the advancing age of 30 days (94.17 ± 4.29 beats/min). The average rectal temperature in neonate Berari kids was 102.60 ± 0.08 °F with a significant lowest on the day of birth (102.03 ± 0.22 °F) and highest on day 10 (102.88 ± 0.11 °F). The average body weight was 2.23 ± 0.06 kg on the day of birth and increased significantly as the age advanced to 30 days (6.32 ± 0.19 kg). The total weight gain of neonate kids was 3.79 ± 0.15 kg in 30 days, whereas the average daily weight gain was 0.13 ± 0.005 kg.

Keywords: Berari Goat, Birth Weight, Heart Rate, Physiological Parameters, Rectal Temperature, Respiration Rate.

Introduction

The neonatal period represents a transition from the controlled and protected intrauterine environment to the exposed extra uterine environment. The neonatal period is the riskiest period after birth. The first day of life is recognized as the most vulnerable period in the animal's life because of the high mortality (Piccione *et al.*, 2010). Neonatal mortality is a relevant cause of economic losses in livestock production (Dwyer, 2008). Goats play a key multifunctional role in food security and poverty alleviation of landless laborers and farmers in India. The knowledge of the growth and physiological parameters in neonates is essential for management, early diagnosis, and animal health interventions during the early life of goat kids (Al Dawood *et al.*, 2020; EL-Tonsy *et al.*, 2018). The Berari goat, is low yielding prolific meat breed thriving well in tropical wet and dry climate of central India (Vidarbha region of Maharashtra). Hence, the study aimed to monitor and evaluate heart and respiratory rate and rectal temperature during the first 30 days of life in the Berari goat kids, as these parameters represent valid indicators of the kid's homeostatic response during this adaptive period.

Materials and Methods

The present study was carried out at Berari goat and Deccani sheep Breeding Farm, Borgaon Manju, District Akola (MS), India in January and February 2023. Twelve advanced pregnant goats were selected and their kids were used for the study. Rectal temperature (RT), rate (HR), and respiratory rate (RR) were recorded for all kids by the same operator on day 0 (immediately after birth), 3, 10, 20, and 30. Body weight was recorded using digital platform balance. A digital thermometer was used to record rectal temperature whose probe was inserted 4 cm into the rectum, the heart rate was measured using an oscillometric apparatus, and the respiratory rate was assessed visually by observation of chest and abdomen movements and auscultation with a stethoscope over 5 minutes. The data obtained in the present study was subjected to statistical analysis by Completely Randomized Design (CRD) using WASP, 20 ICAR, Goa.

Results and Discussion

The results of the present study are tabulated in Table 1 and described below:

Table 1: Mean ($\pm$ SEM) values of rectal temperature, respiratory rate, heart rate and body weight in neonates of Berari goat

Age (days) Parameters	0 days	3 days	10 days	20 days	30 days	Overall
Rectal Temperature (°F)	102.03 ^b $\pm$ 0.22	102.60 ^a $\pm$ 0.18	102.88 ^a $\pm$ 0.11	102.70 ^a $\pm$ 0.11	102.77 ^a $\pm$ 0.14	102.60 $\pm$ 0.08
Respiratory Rate (breaths/min)	80.08 ^a $\pm$ 6.53	71.66 ^a $\pm$ 4.34	69.66 ^{ab} $\pm$ 3.92	58.08 ^{bc} $\pm$ 2.92	47.66 ^c $\pm$ 4.45	65.43 $\pm$ 2.47
Heart Rate (beats/min)	116.66 ^a $\pm$ 3.15	107.33 ^{ab} $\pm$ 6.02	103.33 ^{bc} $\pm$ 3.58	98.25 ^{bc} $\pm$ 4.69	94.16 ^c $\pm$ 4.29	103.95 $\pm$ 2.17
Body Weight (Kg)	2.53 ^e $\pm$ 0.06	2.97 ^d $\pm$ 0.08	3.90 ^c $\pm$ 0.10	5.05 ^b $\pm$ 0.12	6.32 ^a $\pm$ 0.19	4.15 $\pm$ 0.18

Mean having different superscript in a row differ significantly

Body Weight: The mean body weight of Berari goat kids on days 0, 3, 10, 20, and 30 was 2.53 $\pm$ 0.06, 2.97 $\pm$ 0.08, 3.90 $\pm$ 0.10, 5.05 $\pm$ 0.12 and 6.32 $\pm$ 0.19 kg respectively. A significant difference in live body weight was observed with the increase in age and was significantly higher on day 30. The overall mean body weight from birth to 30 days was 4.15 $\pm$ 0.18 kg in Berari goat kids. The kids gained **3.79 $\pm$ 0.15** kg live weight in 30 days, with an average daily gain

in body weight from birth to 30 days of age was 0.13 ± 0.005 kg.

A significant difference in live body weight was observed with the increase in age and was significantly higher on day 30. The Birth weight of Berari kids in the present study was comparable with the findings of Harikrishna *et al.* (2013), Jat *et al.* (2018), and Patel *et al.* (2019) as they reported the birth weight of 2.48 ± 0.01 kg, 2.57 ± 0.036 and 2.555 ± 0.043 kg in Osmanabadi, Sirohi and Mehsana goat kids respectively whereas lower birth weight was reported by Mandal *et al.* (2016); Khan and Naznin (2013); Hassan *et al.*, (2010) in Barbari (1.66 ± 0.47 kg), Black Bengal (1.42 ± 0.10 kg) and Jamunapari (1.6 ± 0.6 kg) kids respectively; and higher birth weight was reported by Fazio *et al.*, (2016) in Maltese goat kid (3.20 ± 0.13 kg). Hegde and Deo (2020) reported higher birth weights in Sirohi, Jamnapari, and Beetal goats, lower in Sangamneri, Malabari, and Black Bengal goats, whereas at par with Osmanabadi, Marwadi, and Ganjam breeds of goats. The average daily gains in body weight reported in Jamnapari goat kids in the first week is 110.67 ± 6.52 g/day (Das and Yadav, 2015), and in Barbari goat kids in 0-3 months is 59.9 g (Mandal *et al.*, 2016) which was lower than reported in the present study.

Rectal Temperature: Rectal temperature is generally used to measure animal core temperature (Swanson & Reece, 1996). In the present study, the rectal temperature recorded was $102.03 \pm 0.22^\circ\text{F}$ on day 0, which increased significantly to $102.60 \pm 0.18^\circ\text{F}$ on day 2 and remained nearly constant till day 30 ($102.77 \pm 0.14^\circ\text{F}$). The overall rectal temperature from birth to day 30 of age was $102.60 \pm 0.08^\circ\text{F}$ in Berari goat kids.

The rectal temperature recorded on day 0, increased significantly on day 2 and remained nearly constant till day 30. The findings in the present study of low rectal temperature at birth, as compared to the other periods, agree with the observations of Jacob *et al.*, (2011). The values for day 0 observed in this study agreed with those reported by Jacob and Ganesan (2013). They were higher than those reported by Vázquez-García *et al.* (2021), Jacob *et al.* (2011) and lower than those recorded by Aleksiev (2009), Arfuso *et al.* (2021) and Fazio *et al.* (2016). A similar trend of a significant increase in rectal temperature from day 0 to day 30 was reported by Jacob & Ganesan (2013). The overall rectal temperature from birth to day 30 was $102.60 \pm 0.08^\circ\text{F}$ in Berari goat kids, which agrees with Jacob *et al.*, 2011. Arfuso *et al.*, 2021 reported nonsignificant values throughout the seven-day study in goat kids.

Respiration Rate: Respiration rate (RR) indicates the animal's physiological status and varies with age, size, and species. The mean respiratory rate of Berari goat kids on days 0, 3, 10, 20, and 30 was 80.08 ± 6.53 , 71.66 ± 4.34 , 69.66 ± 3.92 , 58.08 ± 2.92 and 47.66 ± 4.45 breaths /min respectively. The mean respiration rate from birth to day 30 of age was 65.43 ± 2.47 breaths/min in Berari goat kids.

The RR values found in the present study for day 0 were lower than that reported by Arfuso *et al.* (2021), Fazio *et al.* (2016) and Jacob and Ganesan (2013), whereas Vázquez-García *et al.* (2021) reported lower RR at birth. Respiration rate was significantly highest on day 0 (80.08 ± 6.53 breaths/min), which got reduced significantly as the age advanced with a mean of 47.67 ± 4.45 breaths/min at the age of day 30. A similar trend was observed by Fazio *et al.* (2016) and Jacob and Ganesan (2013).

Heart Rate: The animal's heart rate (HR) is directly related to its post-natal age and indicates the homeostatic adaptations it undergoes until it attains its adult values. The mean heart rate of Berari goat kids on days 0, 3, 10, 20, and 30 was 116.66 ± 3.15 , 107.33 ± 6.02 , 103.33 ± 43.58 , 98.25 ± 4.69 , and 94.16 ± 4.29 beats /min respectively. The mean heart rate from birth to day 30 of age was 103.95 ± 2.17 beats/min.

Vázquez-García *et al.* (2021); Fazio *et al.*, (2016) reported higher heart rates on day 0 and day 30 (Fazio *et al.*, 2016) compared to that of Berari goat kids. The heart rate values from birth to day 30 of age showed a significant decline as the age of the animal advanced. A similar trend is reported by Fazio *et al.* (2016) as well as Jacob and Ganesan (2013). The value obtained at birth was higher than that obtained on day 3 of age, significantly higher than that obtained on 10, 20, and 30 days. During the 30-day study period, heart rate decreased from a mean of 106.47 ± 2.48 to 85.67 ± 5.57 beats/min. This decrease in heart rate was not consistent as it decreased sharply from day 3 to day 10 of age, followed by an irregular increase and decrease ($p < 0.001$) at the end of the trial. The mean HR value found in the present study for day 0 was lower than that reported by Jacob and Ganesan (2013). The excitement caused due to exposure to a new environment, and stress may be the reason for increased heart rate at birth. The progressive decline in the heart rate as age increases is a physiological response until it reaches adulthood.

Conclusions

Under the conditions of this study, despite the observed changes, all new-born kids exhibited good homeostatic ability and could maintain the assessed parameters within the physiological limits. Results from this study contribute to the understanding of homeostatic, cardiorespiratory, and thermoregulatory adaptations that occur in kids during the first 30 days of life.

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Contribution by Authors

Each co-author contributes equally.

Conflict of Interests

There is no conflict of interest.

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