

Morphometric Characterization of Barind Sheep of Bangladesh

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Abstract

The study was undertaken aiming to characterize the morphological features of Barind sheep of Bangladesh in an attempt to give an important tool for intensive research to develop a management and breeding strategy that suits the production system of the area. Data were collected to study the morphological features of sheep of two Barind based upazillas; Paba and Godagari under Rajshahi district of Bangladesh through close observation, measuring and record keeping. Characteristics of body weight, wither height, rump height, body length, sternum height, Chest girth, bi-coastal diameter, ear length, rump width, head width, rump length, head length, heart girth, cannon bone circumference and muzzle diameter were collected from 508 (458 female and 50 male) sheep stratified into age categories of <1year, 1-1.5 year, 1.5-2 years, 2-2.5 years and >2.5 years by dentition. The average body weight of sheep was 18.03 ± 1.91 kg irrespective of sexes and was significantly ($p < .01$) higher in male. The body weight of sheep was increased gradually with the advancement of age. The wither height (cm), rump height (cm), body length (cm), sternum height (cm), Chest girth (cm), bi-coastal diameter (cm), ear length (cm), rump width (cm), head width (cm), rump length (cm), head length (cm), heart girth (cm), cannon bone circumference (cm) and muzzle diameter (cm) were 52.75 ± 2.56 , 52.70 ± 2.90 , 55.61 ± 3.04 , 26.89 ± 2.28 , 61.65 ± 3.38 , $11.27 \pm .88$, 7.28 ± 3.17 , 13.57 ± 1.03 , $11.44 \pm .85$, 11.40 ± 1.32 , 19.02 ± 1.47 , 70.15 ± 6.79 , $8.56 \pm .77$, 20.04 ± 1.52 respectively. The wither height, sternum height, body depth, bi-coastal diameter, head width, head length, cannon bone circumference and muzzle diameter were significantly differed ($p < 0.001$) between male and female and value of all mentioned characters were higher in male. The results indicated that the rump height, body length, bi-coastal diameter, head width, rump length, head length and muzzle diameter were non-significantly differed among different age categories but all of these were higher at aged sheep. Heart girth was differed significantly ($p < .01$) among ages and highest in full permanent teathed sheep. Cannon bone circumference differed significantly ($p < 0.05$) among different ages and also highest at aged sheep. Though Heart girth did not differ significantly between sexes, it was higher in female probably for their pregnancy.

Introduction

Bangladesh is a sub-tropical country, favorable for sheep rearing, as they can be maintained under rural conditions because of their ability to adapt to harsh environment, poor management and feeding practices. There are about 3.537 million sheep in Bangladesh (DLS, 2019). Most of the sheep are indigenous, with few crossbreds [1] and are capable of bi-annual lambing and multiple births. Native sheep are extremely resistant to infectious diseases including PPR [2]. Under traditional feeding systems, the sheep are raised on harvested or fallow lands, roads, and canal sides [3] and also graze on aquatic weeds and grass in knee-deep water. No other domestic animals are capable of existing on such feed.

Sheep are tolerant to disease in the humid and sub-humid tropics. With their small muzzles and split upper lips they can nibble tiny blades of vegetation, which cannot be eaten by bigger animals [4]. Sheep rearing is directly involved with poverty alleviation, employment generation and good quality nutrients supply. In these situations, where there are absent to access industrial and rigid beneficial agricultural facilities, formal financial and insurance institutions, small ruminants are “easy to cash” assets [5]. As human population is increasing day by day in the Barind region of the country, the access of rural families to land, capital, and labor diminishes while opportunities for income from off-farm activities become scant. As a result, households are often forced to enter small ruminants rearing and face consumption and income shocks

Small ruminants are also important in a diversification strategy that aims to reduce market and climatic risks and optimize the use of available resources [6]. In Barind region of Bangladesh, the roles of sheep in the livelihoods of rural households and their characterization have not been comprehensively investigated. So, there is limited information regarding morphometric feature and the potential of Barind sheep. This study was designed to assess the morphological characters to available the information about Barind sheep for taking intensive plan for improving and conservation of positive characters of Barind sheep.

Materials and Methods

The study was carried out in Barind region of Rajshahi district in Bangladesh. Among the rural activities, rain fed agriculture (51.33%) is the most important, followed by livestock keeping (13%) and off-farm activities (3%). Cattle, goat, sheep and poultry, were the main livestock species kept. The Barind tract lies in the monsoon region of the summer dominant hemisphere. The climate of the area is generally warm and humid. This region has already been designated as draught prone. The average temperature ranges from 25°C to 45°C in the hottest season and 5°C to 15°C in the coolest season with an average relative humidity of 75%. The research area was located between 240.18' and 240.36' North latitude and between 880.17' and 880.43' East longitude.

Data were taken from 508 (458 female and 50 male) adult sheep of 60 household of two Barind based upazila; Paba and

Godagari under Rajshahi district. Flock size varied from five to fifteen in no. All farmers used extensive production systems and sheep were reared only on grazing without any supplementation. Body measurements were taken on animals in a standing position with a raised head. Data were collected from March 2019 to August 2019. Measurements of 15 characters (Body weight, withers height, rump height, body length, sternum height, Chest girth, bi-coastal diameter, ear length, rump width, head width, rump length, head length, heart girth, cannon bone circumference, muzzle diameter) were taken by using a metric tape and digital hanging weighing balance accordance with the guidelines described by the FAO (2012). The collected data on morphology were checked, compiled and analyzed. The data on studied traits were analyzed using the statistical software SPSS, version 23.

Results and Discussion

Animal morph structure is defined by body dimensions and the relationships between them. These relationships determine the productive functionality and suitability of the animal in the meat, milk or dual-purpose performance. Results were expressed as mean, standard deviation and coefficient of variation for each linear measurement.

The morphometric features of Barind sheep on average, comparison between sex, among age according to dentition and comparison between two upazilas are shown in (Tables 1-4) respectively.

Parameters	Measurement (Mean \pm SD)	Parameters	Measurement (Mean \pm SD)
Body weight (Kg)	18.03 \pm 1.91	Rump width (cm)	13.57 \pm 1.03
Wither height (cm)	52.75 \pm 2.56	Head width (cm)	11.44 \pm .85
Rump height (cm)	52.70 \pm 2.90	Rump length (cm)	11.40 \pm 1.33
Body length (cm)	55.61 \pm 3.04	Head length (cm)	19.02 \pm 1.47
Sternum height (cm)	26.89 \pm 2.28	Heart girth (cm)	70.15 \pm 6.79
Chest girth (cm)	61.65 \pm 3.38	Cannon bone circumference (cm)	8.56 \pm .79
Bi-coastal diameter (cm)	11.27 \pm .88	Muzzle diameter (cm)	20.04 \pm 1.52
Ear length (cm)	7.28 \pm 3.17		

Table 1: Phenotypic characteristics of Barind sheep.

Parameters	Sex		F- value	Significant
	Male (Mean \pm SD)	Female (Mean \pm SD)		
Body weight (Kg)	18.84 \pm .41	17.94 \pm 1.94	10.21	**
Wither height (cm)	54.78 \pm 1.88	52.53 \pm 2.52	37.44	***
Rump height (cm)	53.83 \pm 1.78	52.58 \pm 2.98	8.5	*
Body length (cm)	54.90 \pm 3.13	55.69 \pm 3.06	2.99	NS
Sternum height (cm)	28.13 \pm 1.39	26.76 \pm 2.32	16.62	***
Chest girth (cm)	63.09 \pm 2.21	61.47 \pm 3.45	10.2	**
Bi-coastal diameter (cm)	12.15 \pm .80	11.17 \pm .84	61.81	***
Ear length (cm)	7.13 \pm 3.21	7.30 \pm 3.17	0.127	NS
Rump width (cm)	13.76 \pm .94	13.55 \pm 1.04	1.82	NS
Head width (cm)	12.15 \pm 1.09	11.36 \pm .78	41.96	***
Rump length (cm)	11.89 \pm 1.16	11.35 \pm 1.33	7.54	NS
Head length (cm)	20.06 \pm 1.28	18.90 \pm 1.45	29.05	***
Heart girth (cm)	67.80 \pm 4.46	70.41 \pm 6.96	6.74	NS
Cannon bone circumference(cm)	9.04 \pm .69	8.51 \pm .78	21.26	***
Muzzle diameter(cm)	21.27 \pm 1.35	19.90 \pm 1.48	39.01	***

***p=.001; **p= 0.01 (p<0.01) *p=0.05 (p<0.05), NS= Non-significant

Table 2: Phenotypic characteristics of Barind sheep according to sex.

Parameters	Type of teeth (Mean \pm SD)					F- value	Significant
	All temporary	1 st pair permanent	2 nd pair permanent	3 rd pair permanent	4 th pair permanent		
Body weight (Kg)	15.37 \pm 2.09	17.780 \pm 1.56	18.03 \pm 1.72	18.95 \pm 2.16	19.33 \pm 2.35	9.851	***
Wither height (cm)	52.39 \pm 2.59	52.99 \pm 2.61	52.73 \pm 2.58	52.69 \pm 2.29	52.95 \pm 2.54	0.904	NS
Rump height (cm)	52.22 \pm 2.92	52.81 \pm 2.65	52.86 \pm 3.04	52.60 \pm 2.74	53.13 \pm 3.61	1.057	NS
Body length (cm)	55.27 \pm 2.80	55.35 \pm 3.01	55.68 \pm 3.35	56.33 \pm 2.90	56.39 \pm 2.95	1.936	NS
Sternum height (cm)	26.74 \pm 2.34	27.14 \pm 2.23	26.99 \pm 2.25	26.27 \pm 2.29	26.92 \pm 2.48	1.741	NS
Body depth (cm)	61.27 \pm 3.09	61.23 \pm 3.10	61.67 \pm 3.52	62.64 \pm 3.94	63.09 \pm 3.24	3.667	NS
Bi-coastal diameter (cm)	11.18 \pm .97	11.27 \pm .94	11.23 \pm .75	11.36 \pm .89	11.55 \pm .84	1.3	NS
Ear length (cm)	6.90 \pm 3.08	7.48 \pm 3.21	7.09 \pm 3.32	7.57 \pm 2.69	7.94 \pm 3.26	1.114	NS
Rump width (cm)	13.41 \pm 1.05	13.43 \pm 1.01	13.67 \pm .99	13.66 \pm .97	14.18 \pm 1.21	4.959	**
Head width (cm)	11.29 \pm .88	11.51 \pm .94	11.46 \pm .74	11.35 \pm .75	11.59 \pm .91	1.573	NS
Rump length (cm)	11.26 \pm 1.42	11.28 \pm 1.25	11.52 \pm 1.29	11.51 \pm 1.27	11.72 \pm 1.58	1.44	NS

Head length (cm)	18.99±1.38	19.13±1.38	18.96±1.38	18.78±2.12	19.29±1.15	0.942	NS
Heart girth (cm)	69.51±6.88	69.15±6.08	69.40±6.53	73.08±7.33	75.65±6.56	10.049	***
Cannon bone circumference (cm)	8.52±.77	8.49±.71	8.58 ±.81	8.48±.92	9.08±.66	3.99	*
Muzzle diameter (cm)	19.95±1.74	20.10±1.50	19.87±1.40	20.08±1.48	20.77±1.41	2.502	NS
***p=.001; **p= 0.01 (p<0.01) *p=0.05 (p<0.05), NS= Non-significant							

Table 3: Phenotypic characteristics of Barind sheep according to age.

Phenotypic characteristics	Upazila		F- value	Significant
	Paba (Mean ± SD)	Godagari (Mean ± SD)		
Body weight (Kg)	18.17±1.92	17.90±1.91	2.67	NS
Wither height (cm)	52.92±2.53	52.59±2.57	2.031	NS
Rump height (cm)	52.75±2.90	52.66±2.91	0.127	NS
Body length (cm)	55.68±2.89	55.55±3.25	0.207	NS
Sternum height (cm)	26.85±2.32	26.94±2.25	0.225	NS
Body depth (cm)	61.87±3.34	61.44±3.41	2.075	NS
Bi-coastal diameter (cm)	11.21±.88	11.32±.89	1.874	NS
Ear length (cm)	7.41±2.96	7.15± 3.36	0.853	NS
Rump width (cm)	13.58±.94	13.56±1.11	0.03	NS
Head width (cm)	11.41±.77	11.46±.92	0.45	NS
Rump length (cm)	11.24±1.26	11.56±1.36	7.236	NS
Head length (cm)	19.00±1.39	19.05±1.55	0.17	NS
Heart girth (cm)	70.28±6.87	70.03±6.73	0.178	NS
Cannon bone circumference (cm)	8.54±.78	8.58±.79	0.359	NS
Muzzle diameter (cm)	20.04±1.54	20.04±1.51	0	NS
NS= Non-significant (p>0.01)				

Table 4: Comparison Phenotypic characteristics of Barind sheep in Paba and Godagari Upazila.

The average mature Body Weight (BW) of Barind sheep was 18.03 ± 1.91 kg irrespective of sex; 18.85 ± 1.41 kg in male and 17.94 ± 1.94 kg in female and was significantly ($p<.01$) higher in male. This result is disagreed with the previous findings of [7-9] in indigenous sheep of Bangladesh as well as [10] in the Bengal sheep of West Bengal in India. [9] Found the BW in Jamuna river basin, Barind and Coastal regions sheep were 41.2, 40.6 and 41.6 kg respectively. [8] Measured BW in ram of Jamuna river basin, Barind and Coastal regions sheep were 18.04, 19.10 and 23.64 kg respectively. They found the BW in ewe in Jamuna river basin, Barind and Coastal regions sheep 16.52, 15.25 and 17.93 kg respectively. The BW of sheep, considering age according to type of teeth, was differed significantly ($p<.01$) and it was increased gradually with the advancement of age. The average Wither Height (WH) irrespective of sex observed in this study was 52.75 ± 2.56 cm and in ram and ewe was 54.78 ± 1.88 and 52.53 ± 2.52 cm respectively and the value significantly differed ($p<0.001$) between male and female and was higher in male. The value without differencing sex was about to similar with the value 52.9 cm observed by [9]. The stated value by [8] for WH in Jamuna river basin, Barind and Coastal regions sheep was 47.71, 48.50, 56.30 cm in ram and 49.03, 46.03, 51.11 cm in ewe respectively. Their observation differed quietly with this study. The mean value of Body Length (BL) for sexes was 55.61 ± 3.04 cm and 54.90 ± 3.13 , 55.69 ± 3.06 cm in ram and ewe respectively. This finding is not

supported by the previous results of [8,9,11]. The reported value by [9] of BL in Jamuna river basin, Barind and Coastal regions sheep was 41.5, 43.4 and 45.9 cm respectively. The measured BL by [8] was 64.42, 65.70 and 67.60 cm in ram and 62.67, 62.20 and 63.48 cm in ewe of Jamuna river basin, Barind and Coastal regions sheep respectively. There was a exceptionality observed in this study that in spite of lighter, Barind ewes were longer than ram. [11] Found 48.70 and 46.38 cm BL in Barind ram and ewes respectively. The mean rump height (RH) was 52.70 ± 2.90 cm irrespective of sex and 53.83 ± 1.78 cm in rams and 52.58 ± 2.98 cm in ewes. These findings were more or less similar with the obtaining result of [9], these were 51.9, 52.5 and 52.9 cm in Jamuna river basin, Barind and Coastal regions sheep. Non significantly varied Ear Lengths (EL) between sexes observed in the Barind sheep were 7.13 ± 3.21 and 7.30 ± 3.17 cm gradually in ram and ewes that were near to similar with the findings of 6.40 and 6.06 cm by [8] and 8.35 and 8.19 cm by [11] in ram and ewes respectively. The data disagreed to the observation of 3.2 cm EL in Barind sheep and 8.4 cm both in Jamuna river basin and Coastal regions sheep by [9]. [11] observed vestigial ear in Garole sheep and similar observations were reported by [12,13] in Garole sheep of West Bengal in India. We observed 10.85% rudimentary ear bearing sheep, probably it may be the consequence of crossing of Barind sheep with Garole. The Head Length (HL) had significant ($p < 0.001$) variation in both male and female population in this study. The average, ram and ewes HL was found 19.02 ± 1.47 , 20.06 ± 1.28 and 18.9 ± 1.45 cm which differed significantly between sexes. The result was disagreed with the observation of [9] but supported by [8,11]. The average HL of Barind sheep in the observation of [9] was 16.10 cm. [8] Stated 19.75 and 19.58 cm HL in the ram and ewes of Barind sheep respectively where [11] observed 19.04 cm HL in ram of Barind sheep. Prevailing significant ($p < 0.001$) difference head width (HW) in ram and ewes was obtained 12.15 ± 1.09 and $11.36 \pm .78$ cm respectively in Barind sheep that was inconsistent with the result reported by [9]. They observed 7.7, 7.4 and 7.8 cm width head in Jamuna river basin, Barind and Coastal regions sheep respectively. The average Chest Girth (CG) observed in this study was 61.65 cm that was quietly similar with the data 61.50 cm mentioned by [9]. The significantly differed ($p < 0.001$) CG was 63.09 ± 2.21 and 61.47 ± 3.45 cm in ram and ewes respectively were slightly higher of the measurement performed by [8,11]. The stated value of CG in ram was 60.20 and 59.58 cm and in ewes was 57.31 and 57.72 cm in the study of [8,11] respectively. Though the Heart Girth (HG) did not differ significantly between sexes, it was higher in female probably for their pregnancy. The HG was differed significantly ($p < .01$) among ages and highest in full permanent teathed sheep.

Bi-coastal Diameter (BD) ranged from $11.17 \pm .97$ to $11.55 \pm .84$ cm with a mean $11.26 \pm .88$ cm and was significantly ($p < .001$) higher in ram. Muzzle Diameter (MD) ranged from 19.90 ± 1.48 to 21.27 ± 1.35 cm with an average 20.03 ± 1.52 cm was

significantly ($p < .001$) higher in male. Both BD and MD carried none significantly higher value in aged sheep. The Sternum Height (SH) of ram and ewes was 28.13 ± 1.39 and 26.76 ± 2.32 cm with a mean 26.89 ± 2.28 cm in Barind sheep that differed significantly ($p < .001$) between sexes. The mean Rump Length (RL) and rump width (RW) were 11.40 ± 1.32 and 13.57 ± 1.03 cm and the value were almost same between sexes. Giving ($p < .001$) significant difference between sexes the mean of cannon bone Circumference (CC) was $8.56 \pm .79$ cm having highest ($9.04 \pm .69$ cm) value in the rams of Barind tract. The value regarding CC was increased significantly ($p < .001$) with the advancement of age. There were no significant differences picked up in different body characters between the two upazilas; Paba and Godagari of Rajshahi district.

Conclusion

In fact, Barind sheep are less cared animals till now in Bangladesh and have been reared under traditional scavenging system in small flock by countryside people in Barind region. This valuable germplasm is still being neglected and very little attention has been paid until to date for their characterization and improvement. Non-descript Barind sheep of Bangladesh is a valuable genetic resource, especially in their contribution to the overall genetic diversity and their stable production under rural condition even with adverse changing climate. But this valuable asset is diminishing for unplanned cross breeding. Recently government of Bangladesh has emphasized by implementing, community and commercial managed sheep rearing program through two government institutes (Department of Livestock Services, DLS and Bangladesh Livestock Research Institute, BLRI) for their genetic improvements in some sheep potentials areas of Bangladesh. The information of this study will create an opportunity to have available their genetic potentials by supplying more distinct morphology, morphometric characteristics of Barind sheep. Thus, this study was carried out to investigate the morphology, morphometric characteristics, productive and reproductive potential of indigenous Barind sheep of Bangladesh.

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