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Biometric study on female reproductive tract of Nellore sheep

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Abstract
The present biometric study on female reproductive tract of Nellore sheep was carried out at the College of Veterinary Science, Tirupati, using specimens collected from a slaughter house located in Tirupati. It was found that the mean length of ovary, oviduct, uterine horn, uterine body and cervix was 1.05±0.04, 12.78±0.86, 7.70±0.30, 0.73±0.05 and 2.81±0.28 cm, respectively. The mean width/diameter of ovary, oviduct, uterine horn, uterine body and cervix was 0.74±0.05, 0.12±0.01, 0.82±0.04, 1.14±0.05 and 0.89±0.02 cm, respectively. There was no significant difference in measurements between right and left sides in case of ovaries and oviducts. In case of uterine horns, the left one was significantly longer than the right one, while there was no significant difference in terms of diameter. From the results of the present study, it was concluded that the total length of female reproductive tract from tip of ovary to external os of cervix in case of Nellore ewe lambs is around 25.07 cm, and length of left uterine horn is higher than that of right horn.

Keywords: Biometry, slaughter, ovary, uterine horn

1. Introduction
Domestic sheep (*Ovis aries*) is an important livestock species which contributed 10.33% of total meat production in India in 2021-22 (DAHD, 2023) [5]. The sheep is popularly known as poor man's mobile bank as it gives income through sale of lambs, wool and milk. Nellore sheep is the major indigenous sheep breed of India accounting for 20.00% of total indigenous sheep population (DAHD, 2022) [4]. It is the tallest sheep breed of India and is popular for mutton production. It is distributed in the states of Andhra Pradesh and Telangana.
Assisted reproductive technologies such as Artificial Insemination (AI) and, In-Vitro Fertilization and Embryo Transfer (IVF & ET) require a clear understanding of biometry of female reproductive tract. Only a few studies, such as those of Prasad *et al.* (2020) [17] and Supriya *et al.* (2021) [20], have been conducted on Nellore sheep. The present study is aiming to provide insights on female reproductive tract of Nellore sheep and to supplement the available information.

2. Materials and Methods
The present study was carried out at the Department of Veterinary Gynaecology and Obstetrics, College of Veterinary Science, Sri Venkateswara Veterinary University, Tirupati for a period of two months from 1st March, 2023 to 30th April, 2023 using specimens collected from a slaughter house located in Tirupati. All the slaughtered animals belonged to Nellore breed and they were of 6-7 months age. All the specimens examined were free from gross abnormalities.
The length and width of ovary were measured using Vernier Calliper (Fig. 1). The length of oviduct was measured with the help of thread and ruler (Fig. 2), while its diameter was measured using the Vernier Calliper. The length of uterine horn was measured from its junction with oviduct to bifurcation of uterine horns using thread and ruler, while its diameter was measured at mid-point using the Vernier Calliper (Fig. 3).

The thread and ruler were used to measure length of uterine body from the bifurcation of uterine horns to internal os of cervix, while the Vernier Calliper was used to measure diameter of uterine body at its mid-point. The length of cervix was measured using thread and ruler from the internal os to external os, while its diameter was measured using the Vernier Calliper at mid-point (Fig 4).

All the recorded data was presented as Mean±S.E. The right and left sided measurements of ovary, oviduct and uterine horns were analysed through paired sample t-test using IBM SPSS Statistics version 20.

Fig 1: Measuring width of ovary

Fig 2: Measuring length of oviduct

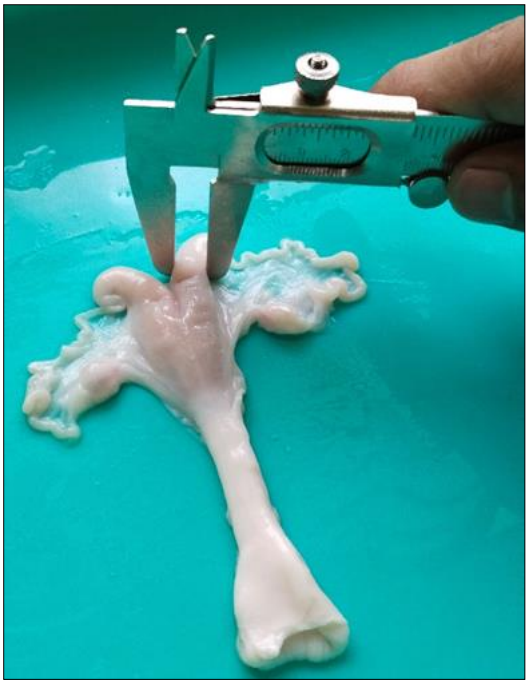

Fig 3: Measuring diameter of uterine horn

Fig 4: Measuring diameter of cervix

3. Results and Discussion

The mean measurements of different parts of female reproductive tract of Nellore sheep are presented in Table 1.

Table 1: Mean measurements of different parts of female reproductive tract of Nellore sheep

Part of tract (Sample Size = 60)	Ovarall	Right side	Left side	Significance
	Mean ± S.E. (cm)			
Ovary length	1.05±0.04	1.01±0.04	1.10±0.07	NS
Ovary width	0.74±0.05	0.72±0.05	0.75±0.10	NS
Oviduct length	12.78±0.86	11.80±1.35	13.76±1.03	NS
Oviduct diameter	0.12±0.01	0.11±0.02	0.12±0.01	NS
Uterine horn length	7.70±0.30	7.57^{a}±0.41	7.83^{b}±0.46	*
Uterine horn diameter	0.82±0.04	0.83±0.06	0.81±0.06	NS
Uterine body length	0.73±0.05	---	---	---
Uterine body diameter	1.14±0.05	---	---	---
Cervix length	2.81±0.28	---	---	---
Cervix diameter	0.89±0.02	---	---	---

NS: Non-significant, *p<0.05, Means bearing different superscripts in a row differ significantly.

3.1 Ovary
The mean length and width of ovary was 1.05±0.04 and 0.74±0.05 cm, respectively. Rajput and Sharma (1997) [18], Bhat *et al.* (2011) [3], El-Saigh *et al.* (2011) [7], Jaji *et al.* (2013) [12], Hyacinth *et al.* (2016) [10], Aliyu *et al.* (2016) [1], Shehan *et al.* (2017) [19], Hena *et al.* (2019) [9], Islam *et al.* (2018) [11], Prasad *et al.* (2020) [17] and Supriya *et al.* (2021) [20] reported similar values. However, Jannat *et al.* (2018) [13] reported higher values which might be due to differences in age and breed. The study revealed that there was no significant difference between right and left ovaries in terms of length and width, which is in agreement with the findings of Bhat *et al.* (2011) [3] and Supriya *et al.* (2021) [20]. However, Rajput and Sharma (1997) [18] reported that length and width of right ovary are significantly smaller than those of left ovary.

3.2 Oviduct
The mean length and diameter of oviduct was 12.78±0.86 and 0.12±0.01 cm, respectively, which were lower than those reported by Rajput and Sharma (1997) [18], Bhat *et al.* (2011) [3] and Hena *et al.* (2019) [9]. The disagreement was probably due to low age of animals under the present study. It was observed from the present study that there was no significant difference between right and left oviducts in terms of length and diameter, which is in contrast with the finding of Rajput and Sharma (1997) [18], who reported that left oviduct was significantly longer than right one.

3.3 Uterine horn
The mean length and diameter of uterine horn was 7.70±0.30 and 0.82±0.04 cm, respectively. These results were lower than those of Rajput and Sharma (1997) [18], Al-Saigh *et al.* (2006) [2], Bhat *et al.* (2011) [3], Jaji *et al.* (2013) [12], Hyacinth *et al.* (2016) [10], Jannat *et al.* (2018) [13] and Prasad *et al.* (2020) [17] which might be attributed to variation in terms of breed, age and physiology. Upon comparison of measurements of left and right uterine horns through paired t-test, it was found that length of left uterine horn was significantly (p<0.05) higher than that of right one, while there was no significant difference in terms of diameter. However, Rajput and Sharma (1997) [18] reported that difference between right and left horns in terms of length was not significant.

3.4 Uterine body
The mean length and diameter of uterine body was 0.73±0.05 and 1.14±0.05 cm, respectively, which were lower than the findings of Rajput and Sharma (1997) [18], Al-Saigh *et al.* (2006) [2], Jaji *et al.* (2013) [12], Hyacinth *et al.* (2016) [10], Jannat *et al.* (2018) [13] and Prasad *et al.* (2020) [17] which might be attributed to variation in terms of breed, age and physiology.

3.5 Cervix
The mean length and diameter of cervix was 2.81±0.28 and 0.89±0.02 cm, respectively, which were almost similar to those of El-Shahat and Alsafy (2009) [8], Jannat *et al.* (2018) [13] and Prasad *et al.* (2020) [17]. However, Naqvi *et al.* (2005) [16], Bhat *et al.* (2011) [3], Motlagh (2014) [15], Júnior *et al.* (2018) [14], Hena *et al.* (2019) [9] and Elkarmoty *et al.* (2020) [6] reported slightly higher values, which might be attributed to variation in age.

4. Conclusion
From the results, it can be concluded that total length of female reproductive tract from tip of ovary to external os of cervix in case of Nellore ewe lambs is around 25.07 cm, and length of left uterine horn is higher than its right counterpart.

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