Gross Morphometric Characteristics of Reproductive Organs of Indigenous Non-gravid Cow Originating from Backyard Farms in Brahmanbaria, Bangladesh

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A Clinical Report Submitted as per Approved Styles and Contents

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TABLE OF CONTENTS

ABSTRACT

A study was carried out on the morphometry of reproductive genitalia of twenty indigenous cows available from backyard farms in Brahmanbaria, Bangladesh using standard procedure, with special reference to indigenous cows. Reproductive tracts were collected immediately after slaughter and measurement of the reproductive organs were done immediately after transportation. The average parameter of reproductive organs, length and width were recorded as 2.47 ± 0.08 and 1.85 ± 0.1 cm for right ovary and 2.25 ± 0.09 and 1.62 ± 0.1cm for left ovary; length of right and left uterine horns were 21.38 ± 0.68 and 21.70 ± 0.69 cm; length and width of body of uterus were 3.19 ± 0.06 and 2.49 ± 0.05cm; length and width of cervix were recorded as 5.28 ± 0.1 and 4.61 ± 0.1 cm; length and width of vagina were 19.44 ± 0.4 and 4.73 ± 0.1cm, respectively in indigenous cows. It was observed that right ovary is higher in length and width to that of the left ovary in indigenous cows. This confirms the fact of right ovary being more active than the left one. Moreover, left uterine horn is larger in length to that of the right uterine horn.The genitalia of heifer are smaller compared adult cow. This study provides a baseline for the study of genitalia of indigenous cow breed at Brahmanbaria district in Bangladesh.

Key words: Morphometry, indigenous cow, reproductive organs.

Chapter-1: INTRODUCTION

Bangladesh is a agro-based country where 70% of the people are directly or indirectly employed on agriculture. Livestock sector is also running to the wheel of our national economics. But in dairy industry, productive and reproductive performance of indigenous (Desi) dairy cow are not satisfactory because of existing poor management practices in the dairy farms in this country. However, indigenous cattle have higher adaptability and disease resistance capabilities in this tropical climate condition. But local cows have a very poor milk yielding trait and to replace the genetic trait artificial insemination (AI) has been introduced in national breeding policy since 1959 (Shamsuddin et al., 1987). Successful AI is very much crucial for the breeding of animals and conjugated with the comprehensive knowledge of the anatomical features of reproductive system of cow. Moreover, the reproductive performance largely depends upon the normal structure and functions of genital organs of an animal (Siddiqui et al., 2005) and numerous reproductive diseases and disorders including anestrus, repeat breeding, pyometra, metritis, retain placenta and prolapse of uterus have been previously reported in Bangladesh. So, this is quite understandable that the knowledge of biometrical status of female genital tract is essential to perform AI, pregnancy diagnosis and also to correct these reproductive problems efficiently (Memon, 1996).The backyard and commercial dairy farm setting in Bangladesh comprises of local cows as well as several cross breed cows such as Holstein Friesian, Jersey and also local cows bred in between. There are wide anatomical and physiological differences in the reproductive organs of these commonly available breeds in Bangladesh. An easy and efficient way to describe the exact anatomical position could be achieved by measuring of the reproductive organs in cows. This was previously conducted in various studies around the world but data deficient in Bangladesh.

Reproductive system in the cows comprises of ovary, oviduct, uterus, cervix and vagina. Each of this reproductive component is unique anatomically and physiologically.

Hence, this study was designed to mitigate the scientific gaps in previous reports and the main focus of this study was to describe the anatomical measurements of the reproductive organs in local cows in Bangladesh.

The main objectives were to estimate

1) To identify the actual measurements and provide a baseline data on anatomy and physiology for further research of reproductive tracts of indigenous cow.

2) To aid in the successful AI in order to improve the calving rate of indigenous cow.

The reproductive performance of a cow herd has a great influence on the income and profit realized. The bovine sector, however, faces many constraints that hinder the increase in livestock productivity; they are mostly linked to the low genetic potential of local breeds, feed, health, husbandry practices and product flow (Kouamo et al., 2016).A good understanding of the anatomy of the cow's reproductive system is, therefore, beneficial for successful management. Knowledge of basic reproduction will help a producer to obtain higher conception rates when using estrous synchronization and/or artificial insemination. It will also allow for a better understanding of pregnancy examinations, reproductive diseases and calving difficulty problems (Gene H. Deutscher et al,1980). Indigenous cattle are reared scatteredly in the rural farmers house as because very difficult to get information due to poor awareness of the farmers. A comprehensive study on reproductive traits of indigenous cattle is essential for improving the breeding efficiency and to formulate selection and breeding strategy(M.A Habib et al;2010).

Anatomy of reproductive organs of Cow

The **ovary** is the primary reproductive organ of the cow and has two important functions: 1) production of the female reproductive cell, the egg or ovum, and 2) production of two hormones, estrogen and progesterone. Size of the ovaries varies with stage of the reproductive cycle and age of the female. The ovary consists of a cortex and medulla. The medulla is composed of connective tissue, lymphatic vessels, blood vessels, and nerves. Surrounding the medulla is the cortex. The cortex contains the ova surrounded by follicular cells within the connective tissue stroma. Exterior to the cortex, the ovary is covered by the dense fibrous tunica albuginea and a superficial epithelium. Because the ovary in the cow descends further from its embryologic origin near the kidney than other species, it is positioned closer to the pelvis. The consequence of this ovarian location and the attachment of the short mesovarium is that the uterine horns bend ventrally and caudally.

The secondary sex organs are, in effect, a series of tubes which receive the semen of the male, transport the sperm to the egg so it can be fertilized, nourish the fertilized egg (embryo), and expel the offspring. These organs include the vagina, cervix, uterus, uterine horns, and oviducts (also called Fallopian tubes).

The **oviduct** is arranged like a funnel near the ovary. The funnel-shaped end, or infundibulum, contains processes, the fimbriae, which collect the ovum on ovulation.The ovum is then transported through the abdominal opening of the oviduct located at the base of the

infundibulum. The ampulla of the fallopian tube is the region adjacent to the infundibulum where fertilization takes place. The isthmus, the continuation of the fallopian tube from the ampulla toward the uterus, is relatively long due to the meandering course it takes before ending at the uterine opening where it releases the ovum into the uterine horn.

The **uterus** consists of a body and two horns. The body is short, beginning immediately after the cervix ends. The horns branch from the body but are joined together by peritoneum, giving the appearance that the body is longer than it truly is. As the horns progress craniad they divide at the intercornual ligaments, each turning abruptly ventrally, then proceeding caudally, and finally ending dorsal to the ovary.

The **cervix** is in effect the neck of the uterus. It has thick walls and a small opening which softens and relaxes to allow a passageway for sperm at mating and expulsion of the fetus at the time of birth. During pregnancy, the cervix is filled with a thick mucus secretion known as the cervical plug, which protects the uterus from infections entering from the vagina. The cervical plug is expelled and the cervical opening begins to dilate in the days prior to calving.

In the cow, the semen is deposited in the **vagina** near the cervix during natural mating with the bull. When artificial insemination is used, an insemination instrument is threaded through the vagina and cervix and semen is deposited at the uterine side of the cervix. Urine is discharged from the urinary bladder through the urethra, which opens into the base of the vagina. The region behind the urethral opening is called the vestibule and is a common passageway for both the urinary and reproductive systems. The external opening of the vagina is called the vulva.

Chapter-3: MATERIALS AND METHODS

3.1 Study selection: The aim of the study was to evaluate and measurement of reproductive tract of indigenous cow. Reproductive organs included ovaries (length, width), uterine horns (length), body of uterus (length and width), cervix (length and width), vagina (length and width) were considered for this study.

3.2 Place selection: The study was conducted on indigenous cow slaughtered at Medda market, sadar, Brahmanbaria. Veterinary surgeon Dr. Nure Alam helped to select this place and he also helped to make connection with a butcher named Ali Ahmed. The place was somewhat close to Upazilla Veterinary Hospital, Brahmanbaria. At least one cow is slaughtering in that place.That's why it was easy to get sample.

3.3 Duration of the study: The study was started from 28th October and ended with 28th November, 2019.

3.4 Sample collection: Over the 30 days period of time, twenty samples of non-gravid female reproductive tract were collected and measured after routine slaughtering operation from indigenous cow.

3.5 Experimental procedure: Before collection and measurement of sample, hand gloves, measuring tape, thread, scissors and surgical blade were managed. Collected reproductive organs were transported to the Upazilla Veterinary Hospital, Brahmanbaria using plastic bag ensuring safety environment. There was no need to use physiological saline for immerse the samples because the hospital is very near to the slaughtering area. Measurement of the reproductive organs were done immediately after collection of the sample.

A large dissection tray was collected from hospital to keep the organ for the recording of measurement. As documented by Wilson, 1995; the ovaries were removed at their junction with the ovarian ligament -as close to the ovarian tissue as possible after the fimbria was removed. The length of ovary was taken along the excision from the ovarian ligament. The width was taken as the greatest line perpendicular to the length line. The uterine horns were dissected free of their ligamentous attachments and extended their full length for measurement. Each uterine horn was incised along its dorsal surface to expose its lumen from the oviduct tubal junction to the bifurcation of the body of the uterus. The body of the uterus was also incised and this dorsal incision continued in a straight line to the dorsal commissure of the vulva in order to fully expose the cervical canal and the vagina. The length of the uterine body

was taken from its bifurcation to the internal os of the cervix using thread. The length and diameter of the cervix was recorded. The length of the vagina was taken as the distance from the external os of the cervix to the ventral commissure of the vulva. A measurement of the vaginal width was regularly taken at a point from the external os of the cervix, prior to extending the dorsal incision through the vagina.

All measurements were taken with a thin, flexible and graduated steel tape. Measurement errors due to variation in operator technique were kept to a minimum by following a standard procedure of dissection as adopted by Chibuzor (2006), with each tract in an identical position. All measurements were recorded in centimeters with the help of of measuring tape.

Fig.1: Measurement of the length of vagina taken from the external os of the cervix to the ventral commissure of the vulva.

Fig.2: Measurement of length of Cervix taken from the external os to the beginning point of Uterus.

Fig.3: Measurement of length of Body of Uterus taken from the end point of cervix to the bifurcation of Uterus.

Fig.4: Measurement of Ovary

3.6 Statistical analysis: Data was presented as Mean±SE. All analysis was performed using STATA software version 13. p<0.05 was considered as significant.

Chapter-4: RESULTS and DISCUSSIONS

Major anatomic deviation of reproductive tract especially length and width were measured and these measurements of cows shown in Table:

Table: Measurements of reproductive organs of indigenous cows (Mean ± SE)

Reproductive organs	Measurements	Number of indigenous cow(n=20)
Right ovary	Length(cm) Width(cm)	2.47±0.08 1.85±0.1
Left ovary	Length(cm) Width(cm)	2.25±0.09 1.62±0.1
Right uterine horn **Left uterine horn**	Length(cm) Length(cm)	21.38±0.68 21.70±0.69
Body of uterus	Length(cm) Width(cm)	3.19±0.06 2.49±0.05
Cervix	Length(cm) Width(cm)	5.28±0.1 4.61±0.1
Vagina	Length(cm) Width(cm)	19.44±0.4 4.73±0.1

Ovary: The measurements of ovaries of cows were shown in Table. The ovaries of cows were oval in shape, had no ovulation fossa and located at the cranial portion of the oviduct. The mean length and width were recorded as 2.47±0.08 and 1.85±0.1cm for right ovary and2.25±0.09 and 1.62±0.1cm for left ovary, respectively.

The comparison of the morphometric values of both for right and left ovaries showed significant differences ($p<0.05$) in length and width. Right ovary had significantly higher values ($p<0.05$) on most of the parameters measured.

The average mean length of the ovary recorded in the present study was shown in the (figure:4) higher than the range (right ovary:2.17±0.45,left ovary:2.19±0.49cm) of the results of (Reazul et al,2018) and (right ovary:2.25±0.33,left ovary:2.15±0.42cm) R.khatun et al. in indigenous cows. The width of the ovary recorded in the present study was also somewhat higher than the range(right ovary:1.70±0.33,left ovary(1.58±0.44cm)the results of Reazul et al. (2018) and (right ovary:1.70±0.56,left ovary:1.54±0.69cm) R. Khatun et al.(2015) in indigenous cows. The average dimension of the ovaries of heifer were comparatively smaller compared to adult non-pregnant cows, and larger ovaries in adult cow were reported to be due to greater quantity of interstitial tissue and pressures of corpora lutea of albicans (Darnell, 1987; Chauhan and Adamu, 1990). The discrepancy in the parameters could be due to age, parity, body weight, body condition score, and managing factors.It was concluded that the left ovary is shorter in length and narrower in width to that of the right ovary in indigenous cows. This confirms the fact that the right ovary is more active than the left ovary.

Uterine horns: The uterus of non-gravid cow was "Y" shaped hollow muscular organ consisting of a body and divided anteriorly into two horns. The average mean length of right and left uterine horns were 21.38 ± 0.68 and 21.70 ± 0.69 cm, respectively in indigenous non-gravid cows. The uterine horns of the heifer are comparatively smaller than those of the adult non-pregnant cows (A. Belloa et al.2012). The average mean length of the uterine horns recorded in the present study was higher than the result of Reazul et al. (2018)(right uterine horn:18.90±1.05, left uterine horn:19.31±1.03cm).On the other hand, the measurement for length recorded in the present study were shorter than the result reported by R. Khatun et al (2015)(right uterine horn:22.72±1.05, left uterine horn:22.83±1.00cm)in indigenous cows. The difference in values could have been due to sample size, age, fertility status and geographic location etc.

Body of Uterus: The uterus of cows was bicornuate in shape; two horns were joined posteriorly to form a short body of uterus. This is the point where semen is deposited during artificial insemination. In the present study, the mean length and width of body of uterus was shown in the (figure:3) were 3.19±0.06 and 2.49±0.05cm, respectively in non-gravid cows. The result for length and width of uterine body were higher than those of (2.86±0.12,2.30±0.46cm)reported by Reazul et al. (2018) and (2.90±0.12,2.30±0.46cm)reported by R. Khatun et al (2015) in indigenous non-gravid cows.The difference in values could have been due to age, fertility status and shrinkage of the endometrium.

Cervix: Cervix was made of smooth muscle sphincter, which formed a physiological barrier between the vagina and uterus. Its wall was harder, thicker and more rigid than the walls of either the uterus or the vagina. The cervix was consisted of rings and the rings were very hard in structure. The average mean length and width of cervix in the present study was shown in the (figure:2) were recorded as 5.28±0.1 and 4.61±0.1 cm, respectively in indigenous non-gravid cows. The length and width recorded in this study were higher than the results (4.64±0.13,4.36±0.17cm) obtained by Reazul et al. (2018), and (4.65±0.16,4.36 ±0.12cm) by R. Khatun (2015) et al. respectively in cows. The results which were disagreed may be due to variation in sample size, age, geographic location, nutritional status and estrus condition.

Vagina: The vagina appeared as a long musculo-membraneous tubular sheath like structure/passage which extends from cervix to the urethral opening. The average mean length and width of vagina were 19.44±0.4 and 4.73 ± 0.1 cm, respectively in indigenous cows. The length and width of vagina of the present study was shown in the (figure:1) were shorter than the result (19.81±0.47,4.86±0.13) reported by Reazul et al. (2018) and (21.81±0.47,4.83±0.17) R. Khatun (2015) et al. respectively in cows. The findings regarding the vagina of the present study was lower with the values reported by Reazul et al. (2018) and R. Khatun (2015) et al. in indigenous cows. This might be due to sample size, age and geographic location etc.

CHAPTER-5: CONCLUSIONS

In summary, it was observed that, the right ovary was wider in diameter, larger in length as compared to left one. This confirms the fact of right ovary being more active than the left one. In case of uterine horns, left uterine horn is larger in length to that of the right uterine horn. The genitalia of heifer are smaller compared to adult cow. The results which were disagreed may be due to variation in sample size, age, geographic location, nutritional status etc. The data will very helpful for the artificial insemination workers for proper artificial insemination. From the present study it is concluded that the morphometric characteristics of reproductive organs of indigenous cow is essential for getting better performance.

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