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Research Article

Production of Kids through Hormonal Synchronization of Nulliparous Indigenous Goat at the Coastal Region of Bangladesh

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Abstract

The aim of this study was to produce of kids through hormonal synchronization of nulliparous indigenous non descriptive does. A total number of thirty (30) indigenous does were selected for this study from different areas of coastal region of Bangladesh. Two different protocols (protocol-A and protocol-B) were used and without treatment served as a control. Each treatment group comprises 10 goats. In case of protocol-A, all does were injected intramuscularly (IM) with 2.0 ml of Ovuprost® at 9 days apart from the first injection. In case of protocol-B, all does were injected IM with 2.5 ml Ovurelin® at a time. All does were kept freely with mature bucks. The oestrus sign was recorded in both control and treatment groups. The pregnancy rate in treatment group (90%) was significantly ($p < 0.05$) higher than that of pooled control group (66.7%). There was no any significant different ($p > 0.05$) between estrus and pregnancy rate in protocol-A and protocol-B. In this study, the mean litter size of control, protocol-A and protocol-B were 1.30 ± 0.45, 1.00 ± 0.00 and 1.11 ± 0.10, respectively. The average birth weight of kids in control, protocol-A and protocol-B were 1.24 ± 0.02, 1.21 ± 0.10 and 1.18 ± 0.21kg, respectively. Therefore, it is concluded that the hormonal synchronization increased the pregnancy rate of nulliparous goat.

Keywords: *Birth Weight; Coastal; Kids; Synchronization; Reproduction*

Abbreviations

ET: Embryo Transfer; AI: Artificial Insemination; GnRH: Gonadotrophin Releasing Hormone; SPSS: Statistical Program for Social Science; CL: Corpora Lutea

Introduction

Sub-tropical weather in Bangladesh is favorable for goat farming. However, the productivity of these goats is low due to poor genetic merit, poor nutrition as well as lower managemental problem [1], seasonal fluctuations in feed resources and prevalence of different diseases [2]. They are slow in body growth and small in body size. Due to poor growth several times they need more natural service per conception. Sometimes the owners cannot afford this cost.

In our country, goats are mainly kept by the poor farmers and reared by free ranging system without any supplementation. Under nutrition results in the loss of body weight and body condition, delays the onset of puberty, increases the post-partum onset of oestrus, interferes with normal ovarian cyclicity by decreasing gonadotropin secretion and increases infertility [3]. Additional nutrition supply during gestation not only affects maternal body weight gain, body condition and reproductive performance [4], but also affects prenatal and postnatal offspring growth and development [5].

Synchronization of oestrus cycle is a technique, which is used to bring large number of animals in a flock into overt heat at the predetermined time. Delayed puberty and prolonged lactation and seasonal anoestruses in goats ultimately increases the age, at first kidding and the inter-kidding period, resulting into low life time production. Reproductively in goat can be increased if the age at puberty and seasonal and or/lactation anoestrous period can be reduced [6]. The use of inducing oestrus in anoestrous females can increase the overall reproduction efficiency. Induction of oestrus/ovulation in anoestrous goats can be accomplished by the use of gonadotropins and steroid hormones. On the other hand, synchronization of oestrus cycle is a technique, which is used to bring large number of animals in a flock into overt heat at the predetermined time [7]. The technique offers an opportunity to increase the efficiency of animal reproduction in different ways such as superovulation and embryo transfer (ET).

Therefore, oestrus synchronization is necessary for controlled breeding in doe. In Bangladesh, it is more difficult to detect oestrus accurately in goat as they are reared on free range system. For successful breeding management oestrus synchronization is very essential. However, there are few studies involving oestrus synchronization in nulliparous goat in Bangladesh. In the Coastal areas, the goat farming is very rare.

Aim of the Study

The aim of this research is to reproduce of kids through hormonal synchronization of nulliparous goat at the Coastal area of Bangladesh.

Materials and Methods

Study place

The study was conducted at the Department of Medicine, Surgery and Obstetrics, Faculty of Animal Science and Veterinary Medicine, Patuakhali science and Technology University, Barishal Campus, Babugonj, Barishal.

Animals and management

A total of thirty (30) nulliparous indigenous does were selected and reared under control. The does were 2 - 3 years old of age and 15 - 20 kg body weight. The goats were allowed for freely for grazing and social interaction to each other. The goat was allowed to graze in the field about 5 - 6h per day. Mixed ration was provided three times in a day at morning, noon and afternoon and water was supplied *ad libitum*. All goats were dewormed and was injected 3 ml Renasol AD_3E® (Renata Animal Health, Dhaka, Bangladesh) and Cal D Mag® (Renata Animal Health, Dhaka, Bangladesh) at a time. At the end of estrus the goats were allowed for natural service. One matured buck is used for per 15 does. Goats were vaccinated against PPR at a time. The goats were regularly inspected by a veterinarian and treated them if the goats were suffering from any diseases or diseases condition.

Experimental design

The does were treated with Ovurelin®, an analogue of Gonadotrophin Releasing Hormone (GnRH), (Ovurelin® 20 ml Inj. Bayer New Zealand Limited, New Zealand and marketed by Animal Health Division, Renata Limited, Dhaka, Bangladesh) and an analogue of PGF2α (Ovuprost® 20 ml Inj. Bayer New Zealand Limited, New Zealand and marketed by Animal Health Division, Renata Limited, Dhaka, Bangladesh). Selected does were grouped randomly into three different treatment protocols (Protocol-A and protocol-B). Without treatment of goat served as control group. Each group was consisted of 10 does.

Control group: Does were not injected any hormonal drug and allowed only for natural service.

Protocol - A (PGF2α): Two doses of 2.0 ml of Ovuprost was injected intramuscularly (IM) at 9 days interval. After the injection the does were allowed for natural services for breeding.

Protocol-B (GnRH): 2.5 ml of Ovurelin was injected IM at a time. The does were allowed for natural services for breeding.

Detection of oestrus

The does will be observed closely for detecting the signs of oestrus at 4 hours interval after Day 1 of injection in each treated group. The oestrus does will be detected by using a teaser buck for inducing male effect. The onset and sings of oestrus will be recorded on the basis of clinical signs and symptoms. Duration of oestrus will be calculated from the time of onset of oestrus to the end of oestrus as rejection of female to the male. Detected oestrus will also confirmed by observing the cornified vaginal epithelial cells. In control group, the day of onset of oestrus will be suspected from counting the end of previous cycle.

Pregnancy diagnosis

Pregnancy of does were diagnosed by abdominal scanning with B-mode ultrasonogram machine (CONTEC^{Tm} B-ultrasound diagnostic system, model CMS600P2VET, CONTEC Medical system Company Limited, China) after 28 - 30 days of natural service.

Statistical analysis

The recorded data were entered in the Microsoft excel sheet. The oestrus and pregnancy rate were calculated according to the formula described by Landais and Cissoko [8]. Comparisons among of the data, mean and standard error of mean (Mean ± SEM), chi-square test were calculated by using statistical program for social science (SPSS) software (SPSS® version 22.0). The mean differences were compared using least significant difference that [9] at 5% level of significance.

Results and Discussion

Hormonal effect on oestrus and pregnancy rate

The oestrus rate of control, group A and group B were 60, 100 and 80%, respectively (Table 1). The pregnancy rate of control, group A and group B were 40, 80 and 60%, respectively. The pregnancy rates per oestrus were 66.7, 80 and 75%, respectively. In this study, it was found that the group A has showed significantly ($p < 0.05$) higher oestrus and pregnancy rate than that of control and Group B. The PGF2α analogue, cloprostenol acts on functional corpus luteum for regressing it to active follicular stage. Similar results also found by Vázquez., *et al.* [10], who synchronized the does by the administration of two IM injection of cloprostenol at 10 days apart. Wildeus [11] reviewed that in does and ewes, the opportunity for control is greater during the luteal phase, which is of longer duration and more responsive to manipulation. Strategies can be employed to extend the luteal phase by supplying exogenous progesterone or to shorten this phase by prematurely regressing existing corpora lutea. Successful techniques must not only establish tight synchrony, but also provide an acceptable level of fertility upon artificial insemination or natural mating.

Table 1: *Hormonal effect on oestrus and pregnancy rate in does.*

Study group (n)	Oestrus rate n (%)	Pregnancy rate n (%)	Pregnancy rate (%)	Chi-square value and p value
Control (10)	6 (60.0)	4 (40.0)	66.7	$\chi^2 = 3.33$ p = 0.189
Group A (10)	10 (100.0)	8 (80.0)	80.0	
Group B (10)	8 (80.0)	6 (60.0)	75.0	

Oestrus and pregnancy rate between control and pooled synchronized group

The oestrus rate of control and pooled synchronization group were 60 and 90%, respectively (Table 2). The pregnancy rate of control and pooled synchronized group were 40 and 70%, respectively. In this case, it was found that the oetrus rate and pregnancy rate in pooled synchronized group was significantly ($p < 0.05$) higher than that of no hormonal treatment group.

Table 2: *Comparisons of oestrus rate and pregnancy rate between control and pooled synchronization group.*

Study group	Oestrus rate n (%)	Pregnancy rate n (%)
Control (10)	6 (60.0)	4 (40.00)
Pooled synchronized (20)	18 (90.0)	14 (70.0)
Chi-square value and p value	$\chi^2 = 3.75$ $p = 0.05$	$\chi^2 = 2.5$ $p = 0.114$

Oestrus rate and pregnancy rate between protocol A and B

The oestrus rate of protocol A and B were 100 and 80%, respectively whereas the pregnancy rate of protocol A and B were 80 and 60%, respectively (Table 3). It was found that the protocol A has showed higher rate of oestrus rate and pregnancy rate than that of protocol B. Two injection of cloprostenol has acted on ovary through duel action. The first injection of cloprostenol regress the mature or rudimentary corpus luteum in the ovary and induced new follicular wave whereas the second injection of cloprostenol at 9 days apart act on the newly formed corpus luteum to regress it again for induce 2^{nd} follicular wave. The does were showed sign of oestrus due to 2^{nd} follicular wave.

Table 3: *Comparisons of oestrus rate and pregnancy rate between protocol A and B.*

Study group	Oestrus rate n (%)	Pregnancy rate n (%)
Protocol A (10)	10 (100.0)	8 (80.0)
Protocol B (10)	8 (80.0)	6 (60.0)
Chi-square value and p value	$\chi^2 = 2.22$ $p = 0.136$	$\chi^2 = 0.952$ $p = 0.329$

Martemucci., *et al.* [12] studied the efficiency of combined FGA-PGF2α-5d treatment is demonstrated by the fact that progestogen prevents the formation of new corpora lutea (CL) and ensures that any functional 5-day-old or persistent CL are subject to luteolysis by PGF2α. It is possible that follicular wave turnover will be accelerated by supra-luteal levels of progesterone, so that short-high priming of progesterone/progestogen results effective in oestrus induction/synchronization followed by fertile breeding [13]. The efficiency of PGF2α-FGA-eCG-5d, has also been observed in ewes [14], could be explained by the fact that induced PGF2α luteolysis at onset of short treatment will ensure similar and adequate serum level of progestogen during the treatment, while at the end of treatment it assures the presence of a large follicle capable of ovulating in most does [13] with subsequent fertile breeding, like it was in most does in this study.

Hormonal effect on litter size of does

The litter size, sex of kids, abortion and stillbirth rate is shown in table 4. In this study, the mean litter size of control, treatment A and B were 1.30 ± 0.45, 1.00 ± 0.00 and 1.11 ± 0.10, respectively (Table 4). In this experiment, the does were nulliparous. This data showed the similarity with the study of Baiden [15] who stated that litter size of first-parity kids was significantly smaller ($p < 0.05$) than in subsequent parities. In treatment A, one doe aborted at 110 days of conception whereas one stillbirth kid born in treatment B.

Table 4: *Hormonal effect on litter size of does.*

Study group	No. of kids	Litter size (Mean ± SEM)	Sex n (%)		Abortionn (%)	Stillbirth n (%)
			Male	Female		
Control (10)	13	1.30 ± 0.45	7 (53.8)	6 (46.2)	0 (0.0)	0 (0.0)
Group A (10)	9	1.00 ± 0.00	3 (33.3)	6 (66.7)	1 (10)	0 (0.0)
Group B (10)	10	1.11 ± 0.10	4 (40.0)	6 (60.0)	0 (0.0)	1 (10)

Hormonal effect on birth weight of kids

The birth weight of goat's kids in different treatment protocol is shown in table 5. The average birth weight of kids in control, treatment A and B were 1.24 ± 0.02, 1.21 ± 0.10 and 1.18 ± 0.21 kg, respectively. This finding has showed the similarity with Khan and Naznin [16] who reported that average birth weight of male and female black Bengal goats kids were 1.22 ± 0.15, 1.01 ± 0.14, 1.42 ± 0.10 and 1.12 ± 0.27 kg. Our data were showed comparatively lower birth weight than that of the findings of Baiden [15] in the country Ghana, who found the overall mean birth weight was 1.32 ± 0.01 kg. Here we could not differentiate the birth weight according to the sex.

Table 5: *Hormonal effect on birth weight of kids.*

Study group	No. of kids	Birth weight (kg) Mean ± SEM	P value
Control (10)	13	1.24 ± 0.02	0.004
Group A (10)	9	1.21 ± 0.10	0.090
Group B (10)	10	1.18 ± 0.21	0.040

Conclusion

It may be concluded that hormonal stimulation increased the pregnancy rate of nulliparous indigenous goat at the coastal areas of Bangladesh. Synchronization with PGF2α analogues injection at 9 days apart has showed the higher oestrus and pregnancy rate. Productions of the mean litter size and average birth weight of kids through synchronization have no any significant difference among the groups. However, abortion and still birth were very common in synchronized groups. Further study is needed with more sample size and hormonal assay.

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Conflict of Interest

No conflict of interest.

Bibliography

1. Alam MGS., *et al*. "Supplementation with urea and molasses and body weight, milk yield and onset of ovarian cyclicity in cows". *Journal of Reproduction and Development* 52 (2006): 529-535.

2. Mukasa-Mugerwa E., *et al*. "Reproductive performance and productivity of Menz and Horro sheep lambing in the wet and dry seasons in the highlands of Ethiopia". *Small Ruminant Research* 45.3 (2002): 261-271.

3. Boland MP., *et al*. "Effect of nutrition on endocrine parameters, ovarian physiology, and oocyte and embryo development". *Theriogenology* 55 (2001): 1323-1340.

4. Hess BW., *et al*. "Nutritional controls of beef cow reproduction". *Journal of Animal Science* 83 (2005): E90-E106.

5. Wu G., *et al*. "Intrauterine growth retardation: Implications for the animal sciences". *Journal of Animal Science* 84 (2006): 2316-2337.

6. Leboeuf B., *et al*. "Production and storage of goat semen for artificial insemination". *Animal Reproduction Science* 62 (2000): 113-141.

7. Panhwar F., "Modern reproductive methods used to enhance goat production" (2007).

8. Landais E and Cissoko MM. "Methodological bases for measuring animal performances". IEMVT/ISRA (1986): 433-485.

9. Steel RGD., *et al*. "Principles and Procedure of Statistics-A Biomedical Approach". Mc Grow-Hill Book Co. Inc., New York and London (1997): 139-177.

10. Vázquez MI., *et al*. "Effects of treatment with a prostaglandin analogue on developmental dynamics and functionality of induced corpora lutea in goats". *Animal Reproduction Science* 118 (2010): 42-47.

11. Wildeus S. "Current concepts in synchronization of estrus: Sheep and goats". *Journal of Animal Science* 77 (2000): 1-14.

12. Martemucci G and D'Alessandro AG. "Synchronization of oestrus and ovulation by short time combined FGA, PGF2_, GnRH, eCG treatments for natural service or AI fixed-time". *Animal Reproduction Science* 123 (2011): 32-39.

13. Rubianes E and Menchaca A. "The pattern and manipulation of ovarian follicular growth in goats". *Animal Reproduction Science* 78 (2003): 271-287.

14. Martemucci G and Alessandro AGD. "Induction/synchronization of oestrus and ovulation in dairy goats with different short term treatments and fixed time intrauterine or exocervical insemination system". *Animal Reproduction Science* 126 (2011): 187-194.

15. Baiden RY. "Birth weight, birth type and pre-weaning survivability of West African Dwarf goats raised in the Dangme West District of the Greater Accra Region of Ghana". *Tropical Animal Health and Production* 39 (2007):141-147.

16. Khan MKI and Naznin M. "Study the Live Weight and Live Weight Gain of Black Bengal and Jamunapari Goat Breeds by Fitting the Linear Regression under Semi-intensive Conditions". *Pakistan Journal of Biological Sciences* 16 (2013): 998-1003.

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