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Management of anestrus cows using hormonal and non-hormonal drugs

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ABSTRACT

The breeding efficiency of dairy animals plays an important role in dairy economics. Any deviation in the breeding rhythm results in a progressive economic loss. Bangladesh failed to earn the targeted achievements in the dairy sector for a lot of constrains, among which anestrous is an important cause. This study was conducted to investigate the prevalence of anestrus and to determine the comparative effectiveness between hormonal and non-hormonal treatment for anestrus cows and heifers. This study was conducted at two Upazillas (Birganj and Kaharol) of the Dinajpur District of Bangladesh (from January-December, 2017). Forty (40) cows were confirmed to be anestrus through questionnaire and rectal palpation among 200. All cows were divided into prepartum heifers (15) and post-partum (25) cows. According to the design of treatment, again each group was randomly allocated into 3 groups, in which Group I, (Nutritional supplement as a balanced diet, appetizer, Vitamin ADE, Group II (GnRH analog), and Group III (GnRH analog and PGF2α). The results of this study showed that the overall prevalence of anestrus was 20%. The prevalence of anestrus was high in post-partum cows (20.16%) than that in prepartum heifers (19.74%). Results found that 83.3% of postpartum cows showed estrus after treatment with 2.5 ml GnRH followed by 3 ml PGF2α (Group III). The percentage of animals that showed estrus in prepartum heifers and post-partum cows were 75.0% and 66.0%, respectively after 2.5 ml GnRH injection. In post-partum cows, the mean intervals between treatments to the first estrus (onset of estrus) were significantly shorter ($P < 0.05$) in group II and III than that of group 1 (52.25 ± 12.78, 24.00 ± 6.93, vs. 583.11 ± 44.27 hours, respectively) in case of prepartum heifers. On the other hand, the mean intervals from treatments to the onset of estrus in pre-partum heifer were significantly ($P < 0.05$) shorter in III (36.94 ± 2.45 hours) and group II (74.67±1.33 hours) than group I (590.40 ± 58.59 hours). There is no significant differences in service per conception and pregnancy rate were observed among different groups of pre-partum heifer. Similarly, there was no significant variation in service per conception rate among all treated groups. Therefore, more than one insemination is required in both prepartum heifers and post-partum cows. It might be suggested that both nutritional and hormonal treatment is effective -for the treatment of anestrus.

Introduction

The fertility and breeding efficiency of dairy animals play a vital role in dairy economics (Peter et al., 2009). Any deviation in the breeding rhythm results in a progressive economic loss due to the widening of the dry period during the life span of the animal (Dudhatra et al., 2012). Profitability in a dairy herd is dependent on the onset of puberty and the calving interval. Delayed puberty and prolonged calving interval are considered to be important factors to reduce profitability. A calving interval of 365 days has been suggested (Esslemont et al, 1985) for optimum production.

Among the indigenous types, non-descript Deshi, Pabna, Red Chittagong, and North Bengal Grey are predominant Smallholder farmers maintain a majority of the animals that are generally maintained on crop residues and other agricultural by-products. Rice straw is the basic feed item satisfying over 80% of roughage needs throughout the country. Grazing animals on the roadside, fallow land, riverbank, or on lands from where crops have harvested partially fulfilling the green roughage requirement. Anoestrus is a period of sexual quietude in which the animal fails to exhibit normal oestrus cycles and no manifestation of heat (Boyd, 1977) and it is one of the major causes of economic losses in both the dairy and beef industries. Cows are regarded as physiologically anoestrous for a few days (up to 60) following parturition, whereas, lack of oestrus after 60 days postpartum is termed pathological anoestrus.

Puberty in heifers is the age at first ovulation and at which the regular estrus cycle begins. In dairy cattle, the possibility of improving the economic efficiency of milk production by the early mating of heifers is a valid objective but factors affecting puberty in cattle have not received a great deal of attention in the past relative to other aspects of bovine reproduction. (Hammond et al., 1927) estimated the average age at puberty in heifers of

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dairy breeds, maintained under normal conditions of feeding and management, as being about 9 months with a range from about 3 to 15 months. Several methods of estrus and ovulation induction using hormones have been recently developed for treating anestrus and improving reproductive efficiency (Lopez-Gaius et al., 2006). Nowadays PGF2α and GnRH are frequently used for the treatment of anestrus in Bangladesh. However, the effectiveness of these treatments under field conditions is not yet described in the northern part of Bangladesh. Therefore, the design of this study was undertaken to investigate the prevalence of anestrus in heifers and cows in the selected area and to determine the comparative effectiveness between hormonal and non-hormonal treatment for anestrus cows and heifers.

Materials and Methods

Experimental area and duration

This study was conducted at two Upazillas (Birganj and Kaharol) of Dinajpur districts of Bangladesh under the supervision of the Department of Medicine, Surgery, and Obstetrics, Hajee Mohammad Danesh Science and Technology University, Dinajpur. The duration of the experiment was one year and was conducted during the period from January- to December 2017.

Selection of household and experimental animal

Two hundred heifers and cows from 60 households were randomly selected at two Upazillas (Birganj and Kaharol) Dinajpur district in Bangladesh. Out of 200 cows, 40 cows were confirmed to be anestrus through direct interviews of the farmers by using a questionnaire and confirmed by per rectal palpation twice at 10 days intervals during the experimental period.

Data collection and diagnosis of pregnancy

The information about the calving history, interval from calving to the examination, parity, feeding, and management was obtained from the owners. For these, a structured questionnaire was used in a cross-sectional study to gather data for the selection of experimental animals for anestrus in smallholder farms. The number of parity and ages of cows was determined by dental examination. The nutritional status of the cows was determined by scoring the body conditions of the cows using 1 to 5 scales with 0.5 increments (Ferguson et al., 1994). Physical examination and rectal palpation were performed for the confirmation of anoestrus.

Experimental design

Pre-partum anestrus heifers

For pubertal heifers of two Upazillas (Birganj and Kaharol) of Dinajpur districts of Bangladesh at the age group of between 3 to 3.5 years and body weight of 210 to 290 Kg which still had not shown signs of estrus and did not show the presence of corpus luteum (CL) in one of the ovaries at two examinations made by rectal palpation 11 days apart, were selected.

Postpartum anestrus cows

Postpartum cows, which had not shown the signs of estrus even after 3 months after parturition and did not show the presence of CL in one of the ovaries at two examinations made by rectal palpation 11 days apart were selected.

Management of the experimental animals

The cows were housed in a semi-conventional concrete floor shed. The animal shed was equipped with a freshwater supply system and furnished with a good drainage system. Routine deworming against roundworms and liver flukes was done by using Triclabendazole (900mg) and levamisole (600mg) (Endex, Novartis) and 1 bolus per 75kg. The cows were vaccinated routinely against foot and mouth disease, anthrax, and hemorrhagic septicemia. All cows were housed in their rearing sheds having the facilities of natural ventilation and were fed concentrate, green grasses, straw, and ad libitum water.

Grouping

All the selected animals were grouped into prepartum and post-partum and further both groups were divided as Group I: only nutritional supplements; Group II: 2.5 ml GnRH treatment; Group III: GnRH + PGF2a treatment.

Treatment of anoestrus

The hormonal treatment was given to 20 cows having cyclicity confirmed by per rectal palpation based on the presence or absence of follicle and corpus luteum (CL).

Group I: Animals of this group were provided with concentrate feed supplements (Maize powder, wheat bran, mastered oil cake, rice polish, molasses, and iodine salt). The animals were also supplemented with an appetizer (Powder Anorexon®, Renata Limited, Bangladesh) and injected with vitamin ADE (Vit-ADE®, ACME Limited, Bangladesh) @ 10 ml/animal at every alternative day for 1 month.

Group II: The animals of this group were provided a single dose of 2.5 ml GnRH analog (Ovurelin®, Bomec, Bangladesh).

Group III: The animals of this group were injected intramuscularly with 2.5 ml GnRH analog (Ovurelin®, Renata Limited, Bangladesh) followed by 2.5 ml PGF2α (Ovuprost®, Bomec, Bangladesh) at 7 days interval.

Estrus detection

The follow-up visit was conducted regularly after the initiation of treatment for observing estrus signs to obtain the records for estrus.

Natural service or artificial insemination

All the animals were followed for at least 3 months' post-treatment or two natural cycles after induced estrus. Then the animals showing estrus behavior were artificially inseminated.

Diagnosis of pregnancy

The pregnancy was diagnosed by non-return to estrus and per rectal palpation after 65 days after service. The data collected on response to treatment interventions concerning estrus and conception.

Statistical analysis

Statistical analysis was performed for the data recorded on cow information and response to treatment concerning induction of cyclicity and conception. The data were analyzed using SPSS software, Version 17.0 (SPSS Inc., Chicago, IL, USA). Estrus induction response and conception rates overall and at induced estrus were calculated and compared by using the chi-square test and ANOVA test.

Results and Discussion

In the present study, the overall prevalence of anoestrus in prepartum heifers were 19.74% and in postpartum cows were 20.16% (Table 1). The prevalence of postpartum anoestrus in dairy cattle was herd specific and varies widely from one herd to another up to 59% have been reported in individual herds (Lucy, 2001; Stevenson et al., 2006; Walsh et al., 2007) The reason for this dissimilarity might be the nutritional deficiency leading to inactive ovaries and abnormal progesterone profiles (Hossain et al., 2004; Opsomer et al., 1998). Generally, in the early postpartum period, cows will have a problem with energy balance caused by the increased energy output associated with high milk yield (Robinson et al., 2006).

Table 1: Overall prevalence of anestrus in prepartum heifers and postpartum cows

Types of animal	Total No. of animal	No. of animal with estrus (%)	No. of animal with anestrus (%)
Pre-partum	76	61 (80.26%)	15 (19.74 %)
Post-partum	124	99 (79.84%)	25 (20.16 %)

Reproductive performance of pre-partum heifer after different treatment was illustrated in Table 2 and Table 3. There was no significant differences ($P > 0.05$) found on the rate of onset of estrus among three treated groups (71.4% vs.75.0% vs. 75.0%, respectively). On the other hand, the mean intervals from treatments to the onset of estrus were significantly ($P < 0.05$) shorter in III (36.94 ± 2.45 hours) and group II (74.67±1.33 hours) than group I (590.40 ± 58.59 hours). Up to 80% oestrus induction response was observed in anoestrus crossbred heifers after feeding vitamin-mineral supplements (Akhtar et al., 2004). Srivastava (2008) reported 93.33% oestrus induction response in anoestrus crossbred heifers following mineral mixture supplementation for 20 days with 28.36 days average oestrus induction interval from initiation of treatment.

No Significance differences ($P > 0.05$) in service per conception were observed among three groups. The average number of service per conception was 1.40 ± 0.25 in group I, 1.67 ± 0.33% in group II and 1.33 ± 0.33% in group III. There were no significant ($P > 0.05$) differences in pregnancy rate among different groups.

Table 2: Effects of treatment protocols on onset of estrus in pre-partum anestrus heifers

Traits	Non-hormonal treatment	Hormonal treatment	
	Group I (Nutrition)	Group II (GnRH)	Group III (GnRH and PGF2α)
No. of cows	7	4	4
Incidence of estrous	5 (71.4%)[a]	3(75.0%)[a]	3 (75.0%)[a]
Hours from treatment to onset of estrus	590.40 ± 58.59[a]	74.67 ± 1.33[b]	36.94 ± 2.45[c]

Values in the same row with different superscripts (a, b, c) are significantly different at least (P<0.05).

Table 3: Effects of treatment protocols on number of service per conception (mean ± SEM) and Pregnancy rates (%) in prepartum anestrus heifers

Traits	Non-hormonal treatment	Hormonal treatment	
	Group I (Nutrition, n=7)	Group II (GnRH, n=4)	Group III (GnRH and PGF2α, n=4)
No of cows showed estrus	5 (71.4%)	3 (75.0%)	3 (75.0%)
No of service per conception (mean ±SD)	1.40±0.25	1.67±0.33	1.33 ± 0.33
Pregnancy rate	100%	100%	100%

Reproductive performance of post-partum cows after different treatment was illustrated in Table 4 and Table 5. The rate of onset of estrus in postpartum was 69.2% in group I, 66.7% in Group II and 83.3%) in Group III. There was no significant (P < 0.05) differences observed among three groups. Previous studies showed that the ovulation in response to GnRH treatment in postpartum in cattle it was 85% (Wiltbank et al., 1997), there are also interval after GnRH to ovulation was 48 h while, 30-32 h has been reported in cattle (Pursley et al., 1995). Islam et al. (2013) using GnRH and PGF2α for the treatment of postpartum anoestrus in cows obtained 75.00 per cent oestrus response rate. On the other hand, the mean intervals from treatments to the onset of estrus were significantly shorter (P < 0.05) in group III (24.00 ± 6.93 hours) and Group II (52.25 ± 12.78 hours) than Group I (583.11 ± 44.27 hours). No Significance differences in service per conception were observed among different groups. In a study by Parmar et al. (2012), the oestrus induction response in postpartum anoestrus buffaloes treated with Inj. Receptal® and Tono-Vitacept was 83.33% and 50.00, respectively. The corresponding figures for oestrus induction interval were 20.90 ± 3.13 and 27.14 ± 3.74 days and the overall conception rate was 80% and 71.42 %, respectively.

The average number of service per conception was 1.44 ± 0.18 in Group I, 1.25 ± 0.25 in group II and 1.25 ± 0.25 in Group III. (Markendeya et al. 2002) documented 75% oestrus response with 1.9 services per conception after micro mineral and vitamin E supplementation in anoestrus Deoni cows. The pregnancy rate was also insignificant (P > 0.05) among different groups. (Pattabiraman el al. 1986) treated postpartum anestrus cows with single injection of 5ml of Receptal (GnRH) with 60% results. The interval between injection and induction of estrus was 10-22 days.

Table 4: Effects of treatment protocols on incidence of estrus (%) and onset of estrus in post-partum anestrus cows

Traits	Non-hormonal treatment	Hormonal treatment	
	Group I (Nutrition)	Group II (GnRH)	Group III (GnRH and PGF2α)
No of cows	13	4	6
Incidence of estrous	9 (69.2%)	3 (66.7%)	5 (83.3%)
Hours from treatment to onset of estrus	583.11 ± 44.27[a]	52.25 ± 12.78[b]	24.00 ± 6.93[b]

Values in the same row with different superscripts (a, b) are significantly different at least (P<0.05).

The present relative are far better than the results of (Patel et al., 1992), who recorded 33.3 and 50.0 % estrus induction response with 50.0 and 66.6 % conception rate in anoestrus buffaloes treated with PGF2α and GnRH.

We studied effects of two hormones and nutrition on oestrus induction and conception in cows, and results discuss above. It shows that the higher proportion of cows showed oestrus and no significant difference among different methods.

Only between hormonal and nutritional treatment was statistically significant ($P<0.05$) observe in onset of time of estrus.

Table 5: Effects of treatment protocols on no. of service per conception (mean ± SEM) and Pregnancy rates (%) in post-partum anestrus cows

Traits	Non-hormonal treatment	Hormonal treatment	
	Group I (Nutrition)	Group II (GnRH)	Group III (GnRH and PGF2α)
No of cows	13	4	6
No. of cows showed estrus	5 (69.2%)	3 (66.7%)	5 (83.3%)
No. of service per conception (mean±SD)	1.44 ± 0.18	1.25 ± 0.25	1.40 ± 0.24
Pregnancy rate	100%	100%	100%

Various workers have reported varied response of hormones and nutrition on oestrus induction and conception as well as onset of time of estrus in cows (Islam et al., 2013; Sheshappa et al., 2002; Kumar et al., 2011). However, the variations observed in estrus induction response and fertility in different studies could be due to the stage of cycle, product potency, estrus detection efficiency, nutritional status, general and genital health, breeding time and quality of semen used season/climate, and luteal activity or sustainability leading to embryo survival and such other factors.

Conclusions

Both nutritional and hormonal treatment could be effective tool for anestrus in heifers and cows. As application of hormone is hazardous to human health, instead of only advising the hormonal drugs the practitioners have to look after the management factors such as estrus detection and the plan of nutrition at postpartum in order to prevent prolonged anoestrus.

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