J. Sher-e-Bangla Agric. Univ., 6(2): 1-6, July 2012 ISSN 1997-6038

EFFECT OF ARTIFICIAL INSEMINATION ON PREGNANCY RATE IN COWS AT MYMENSINGH DISTRICT IN BANGLADESH

Shohiduzzaman[1], M. M. Hossain[2], J. Alam[3] and M.T. Islam[4]

ABSTRACT

The study was conducted to determine the factors those affect the first service pregnancy rate (PR). A total of 180 cows, local 80, LocalxHolstein-Friesian(LxHF) 55 and localxSahiwal (LxSL) 45 were selected from January, 2011 to December 2011 to identify the potential risk factors such as body weight, breed, age, body condition score (BCS) and season to first service. Overall pregnancy rate at first AI (FAI) was 53.3% (n=96). The highest pregnancy rate (56.3%) was observed in local cows, which was significantly (p<0.05) higher than that of Holstein-Friesian × Local (47.3%) cows. Cows of 4-5 years of old revealed a significantly (p<0.05) higher pregnancy rate than that of cows of 2-3 years age. The higher pregnancy rate (64.5%) was in cows of BCS 3.5 than lower BCS 2.5 cows (31%; p<0.05). The pregnancy rate was higher in cows weighing between 151-250 kg (57.1%) and lower in cows up to 150 kg body weight (35%, p<0.05). Cows showed significantly (p<0.05) higher PR (59.6%) when FAI was done in winter (November-February) compared to spring (March-April) calving cows (55.6%).

Keywords: risk factors, first service, pregnancy rate, dairy cattle

INTRODUCTION

The major constraints of dairy farming in Bangladesh are low pregnancy rate, multiple number of services per pregnancy, prolonged calving to first service interval and poor oestrus detection (Alam and Ghosh, 1988; Shamsuddin *et al.*, 2001).

The post-AI pregnancy rate may be influenced by many factors such as time interval between oestrus and insemination, semen donor, BCS, interval between calving to AI, parity, milk yield, breed and age of cows/heifers. Higher pregnancy rates in cattle received AI between 5 and 18 hours after detecting oestrus than those of cows received AI between 19 and 32 hours of their counterparts (Shamsuddin *et al.*, 2001). Moreover, Gonzalez (1981) stated the higher conception rate (62.5%) when insemination was done at 12 to 18 hours after the onset of oestrus. Donor of semen used for AI, breed of bulls has been identified as one of the potential risk factors affecting the pregnancy rate in cows (Shamsuddin *et al.*, 2001). The 12 months calving interval is advantageous for maximal milk yield per cow per year with good economic return (Opsomer *et al.*, 1996). It was observed that the loss in gross margin (milk sell over feed cost) is increased when calving interval exceeded 12 month (Opsomer *et al.*, 1996, Shamsuddin *et al.*, 2006).

Reproductive efficiency is measured by pregnancy rate, oestrus detection rate. In lactating cows it is declined, which is associated with a steady increase in average milk yield per cow per year (Lucy, 2002). Dairy cows' tolerance to high temperatures is diminished during lactation due to increased internal metabolic heat production associated with high feed intake and milk synthesis. The reproductive performance of lactating cows under high environmental temperature is compromised because of the deleterious effect of heat stress (HS) on fertilization and embryo survival (Wolfenson *et al.*, 1995). The present study was, therefore, undertaken to determine the factors that affect the first service pregnancy rate in cows.

[1]MS student, Department of Surgery and Obstetrics, [3]MS student, Department of Anatomy and Histology, Bangladesh Agricultural University, Mymensingh-2202, [2]Lecturer, Department of Anatomy, Histology and Physiology, Faculty of Animal Science and Veterinary Medicine, Sher-e-Bangla Agricultural University, Dhaka-1207, [4]Lecturer, Department of Pathobiology, Faculty of Veterinary Medicine and Animal Science, Bangabandhu Sheikh Mujibur Rahman Agricultural University, Gazipur-1706

MATERIALS AND METHODS

Selection of study area

This study was conducted in dairy farms from January to December 2011 in the Muktagachha, Mymensingh sadar and Phulpur Upazilla under Mymensingh district.

Animal selection and management

A total of 180 cows of different breeds, age, body weight, BCS were selected in Muktagachha (n=60), Mymensingh Sadar (n=60) and Phulpur (n=60). Animals were vaccinated against Foot and Mouth Disease, Anthrax and Hemorrhagic Septicemia. All animals were dewormed orally using bolus containing tetramisole hydrochloride (2.Og) and oxyclozanide (1.2g) per 100-150 kg body weight. Animals were grazed from early morning up to noon (mid day) and fed 4-6 kg green grasses mixed with 2-3 kg straw daily as evening meal.

Grouping of animal on the basis of risk factors

Breed of cows: Three breeds were selected as follows: (i) Local (Indigenous cow); (ii) L×HF cross and (iii) LXSL cross.

Age of animal: The age of cows was determined by observation of teeth eruption. The age of Cows were divided into the following three groups: (i) 2-3 years; (ii) 4-5 years and (iii) > 5years. **Body weight**: Body weight of cows was determined using measuring tape (Changhai, Chaina). The cows were divided in to the following groups: (i) Up to 150 kg (ii) 151-250 kg and (iii) 251-350 kg.

Determination of BCS of Animals: The BCS of the Cows/ heifers was determined by eye estimation. The BCS was measured by 1-5 scale. The BCS of inseminated Cows were divided into the following four groups: (i) 2.5 (ii) 3.0 (iii) 3.5 and (iv) 4.0.

Season of year of Artificial Insemination: Seasons of artificial insemination were divided into following four groups: (i) Summer season (May - July); (ii) Rainy season (August - October) (iii) Winter (November - February) and (iv) Spring (March - April).

Oestrus detection and timing of AI

The oestrus of cows was detected by observing following signs: (i) Dorling of mucous from vagina (ii) Bellowing and (iii) Excitement. The instruments were washed with tube well water and the metal instruments were treated with boiling water before use. It was checked, and adjusted the water temperature in the thawing flask within a range of 35°-38°C. The straw was placed in the thawing water as quickly as possible and leaved it there for a minimum of 12 seconds. Approximately 20 cm of paper was tearing off. By using fingers the straw were removed from the thawing flask and dried it with a paper towel. The straw was held by the manufacturer's end after drying completed. The insemination gun was removed from the clips on the inside of the kit box lid. The plunger of the gun was pulled back about 120-180 mm. The straws were hold by the end the manufacturer's end was thread into the gun as far as it would gun. It was prepared to cut-off the laboratory end of the straw by thoroughly cleaned and dried scissors. The loaded gun was hold vertically at eye level and clean sharp scissors a horizontal cut was made 10 cm above the gun to remove the crimped end. A sheath was placed over the barrel of the gun. The sheath was pushed through the leveled centre hole of the locking ring and twisted it down on the conical seat of the gun. The loaded AI gun was held in mouth. Plastic disposable gloves were used. A small quantity of glove lubricant was applied. The vulva was thoroughly cleaned of dung and dirt by wiping it with the piece of paper used on the tail. A cone was formed with the gloved fingers and inserted hand into the rectum. The lips of the vulva were parted. The gun was inserted cleanly betweens the lips of the vulva into the vagina. The semen was pushed to the body of uterus. The gun was removed slowly from the vagina. The arm was withdrawn slowly from the rectum of the cow.

Pregnancy diagnosis by rectal palpation

All inseminated animals were subjected to pregnancy diagnosis by per rectum examination after 60-80 days post AI. The result of pregnancy diagnosis was recorded.

Statistical analyses

The data generated from this study were entered in Microsoft Excel Worksheet and descriptive statistics were performed. The pregnancy rate in different analysis was expressed as percentage. Statistics was

performed to calculate the mean, percentages of total pregnancy rate. The data were analyzed by DMRT using SPSS soft ware version 17. The variation in pregnancy rates was considered significant when the P value was < 0.05.

RESULTS AND DISCUSSION

A total of 180 cows were inseminated with frozen semen. Effects of breeds, age, body weight and BCS (Body condition score) on First Service pregnancy rate of inseminated cows are presented in Table 1 and effects season on pregnancy rate is presented in Table 2.

Table 1. Effects of breeds on pregnancy rate in cows

Risk Factors		No. of cows inseminated	No. of cows pregnant at first service	Pregnancy rate at first service (%)
Breeds	Local	80	45	56.3a
	Local × Holstein- Friesian	55	26	47.3b
	Local × Sahiwal	45	25	55.6a
	Total	180	96	**53.3**
	LSD			2.22
Age (years)	2-3years	52	26	50b
	4-5years	74	42	56.4a
	>5years	54	28	51.9b
	Total=	180	96	
	LSD			1.99
Body weight (Kg)	Up to 150 kg	20	7	35c
	151-250 kg	112	64	57.1a
	251-350 kg	48	25	52.1b
	Total=	180	96	
	LSD			2.38
BCS	2.5	29	9	31d
	3	55	30	54.5b
	3.5	76	49	64.5a
	4	20	8	40c
	Total=	180	96	

Values bearing different letters within a column differ significantly (P< 0.05)

Table 2. Effects of season on pregnancy rate in cows

Seasons	Humidity	Temperature		No. of cows inseminated	No. of cows pregnant at first service	Pregnancy rate at first service (%)
		maximum	minimum			
Summer (May-Jul)	84.9	31.8	25.2	48	25	52c
Rainy (Aug-oct)	85	32.7	25.4	44	20	45.5d
Winter (Nov-Feb)	82.2	26.3	13.2	52	31	59.6a
Spring (Mar-Apr)	75.5	31	20.8	36	20	55.6b
Total=				180	96	
LSD						1.87

Values bearing different letters within a column differ significantly (P< 0.05)

In the present study, the first service pregnancy rate was (53.3%) which is similar to Balachandran (1975) who recorded an average pregnancy rate of 53% at first insemination. The pregnancy rate due to 1st service

in the present study is partially similar with other studies using frozen semen in cows (Mullah, 2010 and Shamsuddin *et al.*, 2001). Conversely, Freer (1981) recorded a pregnancy rate of 43% and 76% for cows AI using frozen semen at first and second cycle, respectively. The variation in pregnancy rate using frozen semen among studies might be due to variation in management of cows and agro-climate conditions in different studies.

The first service pregnancy rates in different breeds of cows were Local (56.30%), L×HL (47.3%), L×SL (55.6%).The association between breeds of cows and PR/FAI was significant ($P<0.05$). It is supported by Gwazdauskas *et al.* (1975) and they observed a pregnancy rate of 33.8, 34.6, 37.0, 35.5 and 48.4% for Ayrshire, Brown Swiss, Guernsey, Holstein- Friesian and Jersey respectively. This is supported partially by Japri *et al.* (1997) and Rao *et al.* (1992).

The pregnancy rate in cows 2-3 years, 3-5 years, and 5-7 years of age was 50%, 56.8%, and 51.9%, respectively. It shows that the first service pregnancy rate of 3-5 years and 5-7 years of old was higher (56.8% and 51.9%) than that of 2-3years (50%). The association between age of cows and PR/FAI was significant($P<0.05$) .This is supported by Spalding *et al.*(1975) who reported that a slightly increase in the fertility of cows up to 3 to 4 years of age and decline after 4 years of age and marked decline in fertility in the cow over 7 years of age. The reason for low pregnancy rate in young cows in the present study may be explained by the fact that these cows may have suffered more from negative energy balance than middle aged grown cows. Moreover, the older cows might have more chance to get subclinical uterine infection resulting in lower conception rate.

The pregnancy rate at different body weight of cow's up to 150kg, 151-250 kg and 251-350 kg groups were 35%, 57.1%, and 52.1% respectively. The pregnancy rate in cows from 151 kg to 250 kg body weight was higher (57.1%) than that of others. This is disagrees with the previous study done by Saacke *et al.*(1991) .They reported that the reproductive performance of heavier cows more than lighter counterparts. The reason for high pregnancy rate in cows from 151kg to 250 kg body weight in the present study may be explained by the fact that in these group most of the cows are indigenous. Sarder *et al.* (1997) reported that the overall fertility was better in local nondescript cows than in Holstein-Friesian cross-bred animals. However, statistically the effect of different body weights of cows on pregnancy rate was significant ($P<0.05$).

The pregnancy rate in cows having BCS-2.5, BCS-3, BCS-3.5 and BCS-4 were 31%, 54.5%, 64.5% and 40% respectively. The pregnancy rate in cows having BCS 3.5 was higher (64.5%) than that of others. Cows having BCS 2.5 were showed lowest pregnancy rate (31%). The association between BCS of cows and PR/FAI was significant ($P<0.05$). Providing adequate quantity of balanced diet to animals will help to gain good BCS resulting in satisfactory conception rate. Higher pregnancy rate in cows with good BCS than that in cows with poor BCS has been documented by Shamsuddin et *al.* (2001) in Bangladesh. It was found in a number of studies that nutrition manipulation can result in changes in gonadotrophin secretion. The cows (BCS 3) deficient in adequate quantity of balanced feed had reduced pituitary responsiveness to a GnRH challenge (Nolan *et al.*, 1988).

The study was divided into four seasons of a year such as summer (May - July), rainy (August - October), winter (November - February) and spring (March - April) and the pregnancy rate in different seasons were 52.2%, 45.5%, 59.6%, and 55.6% respectively. The PR/FAI of summer (May - July) season (52.2%) was higher than rainy (August - October) season (45.5%).

The association between seasons of AI and PR/FAI was significant ($P<0.05$). In the summer season, heat stress (29 C) of dairy cattle is markedly affecting the pregnancy rate (25.4%) of dairy cattle (Ricardo *et al.*, 2004).The green grass is available in winter (November-February) and Spring (March-April) and more scarcity of grass is in the rainy season (August-October).The season of insemination might be the important factors to get maximum conception rate in cows (Miah *et al.*, 2004).

This finding is agreed with Quintela *et al.* (2004) who stated Calving season was a significant factor for low PR/FAI. The results showed that autum calving predispose to lower pregnancy rates than other calving season (Quintela *et al.*, 2004). It is reported that small ovarian follicles are susceptible to heat stress

(Badinga *et al.*, 1993; Wolfenson *et al.*, 1995) and that takes above 40-50 days for small antral follicles to develop into large dominant follicle (Lussier *et al.*, 1987). Ahmed *et al.* (1987) studied the seasonal effect on conception rate of cows in Bangladesh and recorded the highest conception rate (62.1%) in spring followed by summer (51.6%), winter (47.8%) and rainy (41.5%). The author suggested that the spring (February to march) may be the best season for good fertility of cows and heifers in Bangladesh.

It can be concluded that, the first service pregnancy rate was 53.3% and Local (Indigenous) cows showed the higher pregnancy rate than others breeds. The pregnancy rate in cows at 3-5 years age was higher than that of others. The pregnancy rate in cows having BCS 3.5 was higher (64.5%) than that of others. Pregnancy rate to first AI in the winter season (November – February) was higher (59.6%) than others seasons of AI (45.5-55.6%). The pregnancy rate in cows having body weight (151-250 kg) was higher (57.1%) than that of others.

REFERENCES

Ahmed, Z. and Islam, T.S. 1987. Cattle breeding program through artificial insemination in Bangladesh, AI Extension Project, Central Cattle Breeding Station, Savar, Dhaka.

Alam, M.G.S. and Ghosh, A. 1988. Reproductive performance in cows: its relation to parity and season. *Bangladesh Vet. J.*, 22: 51-61.

Badinga, L., Thatcher, W.W., Diaz, T., Drost, M. and Wolfenson, D. 1993. Effect of environmental heat stress on follicular development and steroidogenesis in lactating Holstein cows, Theriogenology, 39: 797-810.

Balachandran, K. 1975. Artificial insemination and herd fertility level of cattle in Shri-Lanka. Animal Breeding Abstract, 43: 376.

Freer, R.E. 1981. Comperative Conception rates from artificial insemination and natural services in beef herds.Proc. 2nd conf. Australia. Association Animal breeding genetics.University of Melbourne, Australia.

Gonzalez, S.C. 1981. Factors affecting fertility at first service in cross breed cows. World Review of Animal Production, 16: 123.

Gwazdauskas, F.C., Wilcox, C.J. and Thatcher, W.W. 1975. Environmental and manage mental factors affecting conception rate in a subtropical climate. *J.Dairy Sci.*, 58: 88-92.

Hasan, M.J. 2003. Assessment of the Reproductive Performance of a Holstein Dairy Herd as affected by the Efficiency of the Inseminator, *J.King Soud Univ. Agric. Sci.*, 2: 79-88.

Japri, B.M., Majid, A.M., Fauziah, H.E. and Adrien, K.R. 1997. Effects of breed of sire, percentage of *Bos taurus* inheritance and season of birth on calving performance of crossbred dairy cattle. *Australian J. Animal Sci.*, 10: 313-317.

Lucy, M.C. 2002. Reproductive loss in farm animals during heatstress. Pages 50–53 in Proc. 15th American Meteorological Society Biological Systems and Aero Meeting.

Lussier, J.G., Matton, P. and Dufour, J.J. 1987. Growth rates of follicles in the ovary of the cow, *J. Reprod. Fertil.*, 81(2):301-307.

Miah, A.G., Ummay, S. and Hossain, M.M. 2004. The production and characterization of monoclonal antibodies specific for cattle proinsulin using a sensitive microdot assay procedure. Endocrinology, 113: 2135-2144.

Mullah, M.F.K. 2010. Post AI Conception Rate of Zebu Cows at Shaghata, Gaibandha. M.S Thesis, Department of Surgery and Obstetrics, Faculty of Veterinary Science, Bangladesh Agricultural University, Mymensingh.

Nolan, C.J., Bull, R.C., Sasser, R.G., Rudder, C.A., Parilasigui, P.M. and Reevoes, J.J. 1988. Post-partum reproduction in protein restricted beef cows: effect on the hypothalmo-pituitary-ovarian axis. *J. Animals Sci.*, 66: 3208-3211.

Opsomer, G., Mijten, P., Coryn, M. and Kruif, A.D.E. 1996. Post-partem Anoestrus in Dairy Cows, Veterinary Quarterly, 18: 68-75.

Quintela, L.A., Pena, A.I., Taboada, M.J., Alonso, G., Varela, P.B., Diaz, C., Barri, M., Garcia, M.E., Becerra, J.J. and Herradon, P.G. 2004. Risk Factors For Lo' Pregnancy Rate In Dairy Cattle: A Retrospective Study In The vort West of Spain, Archivos de Zootecnia, 53: 69-76.

Rao, A.V.M., Naidu, M.S. and Murthy, Y.N. 1992. Effects of breed type and season on conception rates in cows. World Review of Animal Production, 27: 23 25.

Saacke, R.G., Dejarnett, G.M., Nebel, R.L. and Nadir, S. 1991. Assessing bull fertility, proceeding of annual meeting of society for Theriogenology San Diego California, 56-69.

Sarder, M.J.U., Shamsuddin, M., Bhuiyan, M.M.U. and Rahman, M.A. 1997. Individual cows as determinant of the fertility and productivity in mini dairy farms. *Bangladesh Vet. J.,* 31: 91-98.

Shamsuddin, M., Bhuiyan, M.M.U., Sikder, T.K., Sugulle, A.H., Chanda, A.M.G.S. and Galloway, D. 2001. Constraints limiting the efficiency of artificial insemination of cattle in Bangladesh. Proc. final Research Co-ordination Meeting organized by the joint FAO/IAEA, held on 10-14 May 1999 in Uppsala, Sweden, IAEA-Tecdoc-1220: 9-27.

Shamsuddin, M, Goodger, W.J., Hossein, M.S., Azizunesa, Bennett, T. and Nordlund, K. 2006. A survey to identify economic opportunity for small holder dairy farms in Bangladesh, Tropical Animal *Health and Production*, 38: 131140.

Spalding, R.W., Everett, R.W. and Foote, R.H. 1975. Fertility in New York artificially inseminated Holstein herds in dairy improvement. *J.Dairy Sci.,* 58: 718-721.

Wolfenson, D., Thatcher, W.W., Badinga, L., Savio, J.D., Meidan, R., Lew, B.J., Braw, T.R., Berman, A. 1995. Effect of heat stress on follicular development during the estrus cycle in lactating dairy cattle. Biol. Reprod., 52: 1106-1113.