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ORIGINAL ARTICLE

Major management factors associated with reproductive performance and disorders in cows at Rajshahi region of Bangladesh

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Abstract

Background: The present study was conducted with the objective of assessing major factors that affect the reproductive performance and disorders of dairy cows in Rajshahi region.

Methods: A cross-sectional study was conducted during the period from January 2014 to June 2015. Data on herd size, feed quality, breeding, grazing, management system, reproductive disorders, age at puberty, age at firs calving, post-partum heat period, service per conception, days open and calving interval of 500 cows were collected from farm owners by administering a questionnaire. We recorded the important diseases contacting farmers by mobile phone and visiting the farms. The effect of farm size, rearing system, feed quality and preventive measure on reproductive performance were evaluated by analysis of variance and Duncan multiple range test. Unpaired T-test was used to compare the reproductive performance according to breeding. Chi-square test was used to compare between two categories of a dichotomous outcome..

Results: The age at puberty, age at first calving, post-partum heat period, service per conception, days open and calving interval were 26.42±0.22 m, 35.48±0.22 m, 121.85±3.48 days, 1.93±0.04, 136.80±3.57 days and 401.04±3.94 days, respectively. Farm size had significant effect ($P<0.05$) on all reproductive traits (RT) except on service per conception and days open. The best reproductive performance (RP) was found in small size farm, good quality of feed, AI breeding method and preventive measure by veterinarian. Among the disorders, anestrus, abortion, repeat breeding, retained placenta were most prevalent followed by dystocia, mastitis, vaginal prolapse, pyometra, metritis, uterine prolapse, milk fever, and still birth. The highest prevalence of reproductive disorders (RD) was found in intensive rearing system (39.8%).The prevalence of all RDs was higher in artificially inseminated cows (59.6%) than those bred by natural service (19.0%).

Conclusion: The study revealed a lower RP of dairy cows and higher prevalence of RDs. The better reproductive performance was recorded in small than large and medium farms. Good quality of feed should be offered to dairy cow for better reproductive performance. Artificial insemination should also be preferred than natural service for better reproductive performance. Measures to control reproductive diseases should be undertaken in large herds and intensive housing system.

Keywords: Anestrus, abortion, repeat breeding, retained placenta

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Introduction

The livestock population in Bangladesh is currently estimated to be 25.7 million cattle, 0.83 million buffaloes, 14.8 million goats, 1.9 million sheep, 118.7 million chicken and 34.1 million ducks (Banglapedia, 2015), and the cattle population in Rajshahi district is approximately 5.45 lakh (personal contact with DLS, Rajshahi 2018). The contribution of livestock in gross domestic product (GDP) is about 2.51 % in Bangladesh (DLS, 2016). According to (FAO, 1990), 42% of the total cattle heads for the private holdings are milking cows. In contrast to huge livestock resource the livestock productivity is found to be very low. The major factors attributing to the low productivity include poor nutrition, poor management, traditional way of husbandry system and different diseases (Shitaye et al*.,* 2007). Internationally, reproductive performance of dairy cattle is declining. However, reproductive performance is declining due to multiple factors including increasing herd size, reduced estrous detection sensitivity and specificity. Continuing selection for increased milk production is also having negative effects on reproduction (Mcdougall, 2006).

Dairy cow rearing is one of the most important occupations among Bangladeshi people. The success of any dairy farm depends upon efficient productive and reproductive performances of a dairy animal. Different genetic and non-genetic factors influence its performance potential (Boroet al*.,* 2020). The best cows are clearly those that have their first calf at an early age, have minimum calving intervals, and live a long time. Thus, the most important measures of reproductive performance of cows are age at first calving, length of calving interval, and length of cow productive life. In most countries, the primary objective of a reproductive control program in a dairy herd is to have each cow calve and produce a live calf in every 12 months (Rahman et al*.,* 1995).

The presence of reproductive problems results poor reproductive performance which brings considerable economic losses to small holder dairy farms and the dairy industry (Bekana et al*.,* 1994). Among the major factors that influencing the reproductive performance are infertility or anestrus and repeat breeding, abortion, dystocia, uterine infection and management practices. The ultimate manifestation of infertility is failure to produce offspring (Hoojjer et al*.,* 1999). Female infertility may be due to failures to cycle, aberration to estrus cycle and ultimate failure to conceive (ILCA, 1994). The fertility of dairy cows has declined worldwide and this change is surprising given the importance of good fertility to the dairy industry. The decline in fertility can be explained by management change within the dairy industry and also negative genetic co-relation between milk production and reproduction (Lucy, 2007). Like other countries, poor reproductive efficiency has been considered to be the major limiting factors in medium and large-scale market oriented dairying in Bangladesh.

The reproductive efficiency of the dairy cows is affected by factors associated with management system like rearing or housing, nutrition, lack of knowledge for proper animal husbandry practices. Bangladeshi cattle mostly belong to small holder producers and are maintained on crop residues with limited supply of concentrates (Paul et al*.,* 2011). Productivity of dairy cow to a large extent depends on how well it is fed. Dairy cows are highly sensitive to changes in feeding regimes, and production can fall dramatically with small variation on a day-to-day basis (Regassa and Ashebir, 2016).) Nutrient requirement varies with the stage of lactation and gestation (Singh, 1995). To some extent lack of knowledge of profitable animal husbandry practice resulted low reproductive performance of dairy cows. It has negative effect on puberty. Improper use of artificial insemination is also another factor which reduces the reproductive performance of dairy cows (Kumar et al*.,* 1985).Even though, the reproductive performance of dairy cows is greatly influenced by multiple factors, research on major factors affecting

reproductive performance and disorders at study area in Rajshahi region is scanty. This present study was designed with the objectives of identification of reproductive performance and disorders of dairy cows in relation to farm size, rearing system, feed quality, breeding and treatment pattern available in selected areas, which will certainly help to take different initiatives to control the incidence of clinical disorders of dairy cows and to improve productive and reproductive performance.

Materials and Methods

Study areas, population and method of data collection

The study areas were selected from 6 upazilas viz. Charghat, Puthia, Poba, Godagari, Tanore, Mohanpurand 4 metro thanas were Motihar, Boalia, Rajpara, Shahmukdhmat the Rajshahi region of Bangladesh to determine the reproductive performance and disorders of cows. Total 500 cows selected and data were collected directly from the dairy farms owner by using questionnaire survey and observational study through regular visit during the study periods with the interval of once per two months and diagnosis of reproductive disorders was made on the basis of history, clinical signs and response to treatment.

Management of studied animals

The animals are generally maintained on crop residues and other agricultural by-products. Rice straw is the basic feed item satisfying over 80% roughage needs throughout the country. Grazing animals on roadside, fallow land, riverbank or on lands from where crops have been harvested or when available partially fulfilling the green roughage requirement. In farm conditions improved feeding and management practices are followed throughout the year. Deworming and vaccination program were not properly maintained most of the farms. Estrus detection was carried out by herdsmen and cows observed in estrus were artificially inseminated by high grade or purebred Friesian bulls and Sahiwal. Hand milking after a brief stimulation, commonly by the calf, was practiced twice daily. Some farmers practice routine de-worming and vaccination against FMD and sometimes anthrax.

Definition of different variables

Herd size
Small: Farms having 1 to 5 cows (n = 191)
Medium: Farms having 6 to 10 cows (n = 134)
Large: Farm having more than 10 cows (n = 175)

Management system
Intensive: Cows were in stall feeding (n=256)
Semi-intensive: Both stall feeding and grazing (n=169)
Free range: Grazing in pasture (n=75)

Feed quality
Poor: Cows were provided traditional feed (only grazing and little straw feeding) (n=99)
Medium: Cows were supplied some concentrate and straw (n = 168)
Good: Cows were supplied balanced feed (concentrate, vitamin and mineral mixture before calving) diet including green grass and straw (n = 233)

Breeding method
Natural service (n = 112)
Artificial insemination (n = 388)

Treatment provided by
Veterinarian (n = 251)
Unskilled personnel (n = 165)
Traditional healer: Treatment provided by others excluding first two (n = 84)

Reproductive traits

Age at puberty: The age at which a heifer first shows the estrous signs and behaviors may be defined as age at puberty. It was measured in month (m).
Age at first calving: It is defined as the age when a heifer first calving a newborn calf. It was measured in month (m).

Post-partum heat period: It is considered as the interval between date of calving and the date of

first insemination or first heat show after parturition. It was calculated in days (d).

Service per conception: The average number of services or inseminations required for each successful conception in case of heifer and cows.

Days open: Days open was measured in days. Day's open is referred as interval from parturition to date of conception of cows.

Calving interval: The number of days between two successful calving of the same cows or the period from one calving to the next was termed as calving interval. It was measured in days.

Reproductive disorders of cows

Abortion: It is the expulsion of dead fetus or recognizable fetus after organogenesis and before full term of gestation period. It causes various infectious and non-infectious (Roberts, 2002).

Retained placenta: When a cow fails to expel her placenta within twelve (12) hours after calving, the condition is known as retained placenta.

Dystocia: It refers to a condition during the delivery process in which the first stage (opening period) or the second stage (expulsion period) is so prolonged that delivery is difficult or impossible without assistance.

Vaginal prolapse: This refers to a condition in which part or the entire vaginal wall protrudes from the vulva.

Uterine prolapse: It refers to a post-partum condition in which part or the entire uterus is reversed and prolapsed from the cervical canal to the outside of the vulva.

Metritis: Metritis is the inflammation of the uterus, generally caused by infection, is known as metritis (Jackson, 2004).

Pyometra: Pyometra is the accumulation of pus in the uterus. It is characterized by the persistence of corpus luteum in one or both ovaries.

Anestrus: Lack of expression of the estrus at an expected time is called anestrus. Clinically, if a heifer is 18 or more months old or a cow has passed 60-70 days post-partum but did not show estrus the condition is referred to as anestrus.

Repeat breeding: A condition in which no abnormality was detected in the reproductive organs but no conception occurs after three or more times of mating with a fertile bull or AI with proven semen. Its pathogenesis involves either failure of fertilization or early embryonic death (Zemjanise, 1980).

Mastitis: Inflammation of the mammary gland is called mastitis caused mainly by bacterial pathogens, although mycotic or algal microbes play a role in some cases.

Statistical analysis

The data obtained from the questionnaire was entered into the Microsoft Excel 2007 and transferred to SPSS version, 17 for analysis. Data were summarized as Mean ± SE. The effect of farm size, rearing system, feed quality and preventive measure on reproductive performance were evaluated by Analysis of Variance (ANOVA) and Duncan Multiple Range Test (DMRT). Unpaired T-test was used to compare the reproductive performance according to breeding (Artificial insemination VS natural service). Chi-square test was used to compare between two categories of a dichotomous outcome. $P \leq 0.05$ was considered as significant.

Results

Effect of farm size on reproductive performance

The effect of farm size on reproductive performance of dairy cows is presented in Table 1. Farm size had significant ($P<0.05$) effect on age at puberty, age at first calving, post-partum heat period and calving interval. The age at puberty (27.42 ± 0.34 m) and age at first calving (36.51 ± 0.34 m) were significantly higher in larger than small and medium farms. Whereas, the post-partum heat period (134.56 ± 6.58 d),

service per conception (1.98 ± 0.06), days open (146.73 ± 6.65 d) and calving interval (413.90 ± 7.57 d) were significantly higher in small farm than medium and large farms.

Effect of management system on reproductive performance of dairy cows

The effect of management system on reproductive performance of dairy cows is presented in Table 2. The age at puberty (26.06 ± 0.28 m), age at first calving (35.14 ± 0.29 m), service per conception (1.84 ± 0.05) and calving interval (399.85 ± 5.80 d) were lowest in intensive management system. The post-partum heat period (120.08 ± 5.63 d) and days open (134.58 ± 5.93 d) were lowest in semi-intensive rearing system.

Table 1. Reproductive characteristics of dairy cows according to farm size in Rajshahi region

Reproductive Parameters	Farm size			Grand Total
	Small	Medium	Large	
Age at puberty (m)	25.56 ± 0.36^{b} (n=191)	26.33 ± 0.46^{b} (n=134)	27.42 ± 0.34^{a} (n=175)	26.42 ± 0.22 (n=500)
Age at 1st calving (m)	34.59 ± 0.36^{b} (n=185)	35.43 ± 0.45^{ab} (n=131)	36.51 ± 0.34^{a} (n=166)	35.48 ± 0.22 (n=482)
Post-partum heat period (d)	134.56 ± 6.58^{a} (n=164)	121.42 ± 6.40^{ab} (n=117)	108.39 ± 4.66^{b} (n=151)	121.85 ± 3.48 (n=432)
Service per conception	1.98 ± 0.06 (n=191)	1.90 ± 0.07 (n=134)	1.89 ± 0.09 (n=175)	1.93 ± 0.04 (n=500)
Days open (d)	146.73 ± 6.65 (n=159)	133.40 ± 6.30 (n=117)	128.66 ±5.24 (n=145)	136.80 ± 3.57 (n=421)
Calving interval (d)	413.90 ± 7.57^{a} (n=132)	392.38 ± 6.23^{b} (n=93)	393.62 ± 5.84^{b} (n=120)	401.04 ± 3.94 (n=345)

The values are Mean ± SE, SE=Standard Error of Mean, n=no. of observation, m=months, d=days, small=1 to 5, medium=6 to 10, large=more than 10 no. of cow; a,b, Mean ± SE with different superscript letters in the same row differs significantly with each other (P<0.05).

Table 2. Influence of management system in reproductive traits of dairy cows in Rajshahi region

Reproductive Parameters	Rearing system			Grand Total
	Intensive	Semi-intensive	Free range	
Age at puberty (m)	26.06 ± 0.28 (n=256)	26.81 ± 0.39 (n=169)	26.74 ± 0.67 (n=75)	26.42 ± 0.22 (n=500)
Age at 1st calving (m)	35.14 ± 0.29 (n=244)	35.82 ± 0.39 (n=164)	35.85 ± 0.65 (n=74)	35.48 ± 0.22 (n=482)
Post-partum heat period (d)	121.81 ± 5.08 (n=216)	120.08 ± 5.63 (n=152)	126.18 ± 9.05 (n=64)	121.85 ± 3.48 (n=432)
Service per conception	1.84 ± 0.05 (n=256)	2.04 ± 0.08 (n=169)	1.98 ± 0.09 (n=75)	1.93 ± 0.04 (n=500)
Days open (d)	137.34 ± 5.17 (n=211)	134.58 ± 5.93 (n=147)	140.19 ±8.92 (n=63)	136.80 ± 3.57 (n=421)
Calving interval (d)	399.85 ± 5.80 (n=167)	400.13 ± 6.63 (n=123)	406.72 ± 9.18 (n=55)	401.04 ± 3.94 (n=345)

The values are Mean ± SE, SE=Standard Error of Mean, m=months, d=days, n=no. of observation

Effect of feed quality on reproductive performance of dairy cows

The variation in the reproductive traits according to the quality of feeds offered to dairy cows is presented in Table 3. Feed quality had significant (P<0.05) effect on post-partum heat period, service per conception, days open and calving interval. The lowest value of age at puberty (26.07 ± 0.31 m), age at first calving (35.18 ± 0.31 m), post-partum heat period (110.63 ± 4.60 d), service per conception (1.85 ± 0.07), days open (127.34 ± 4.88 d) and calving interval (391.15 ± 5.42 d) were obtained in good type of feed.

Table 3.The reproductive performance of dairy cows based on the feed quality in Rajshahi region

Reproductive Parameters	Feed quality			Grand Total
	Poor	Medium	Good	Mean ± SE
	Mean ± SE	Mean ± SE	Mean ± SE	
Age at puberty (m)	27.25 ± 0.53 (n=99)	26.40 ± 0.39 (n=168)	26.07 ± 0.31 (n=233)	26.42 ± 0.22 (n=500)
Age at 1st calving (m)	36.28 ± .52 (n=97)	35.40 ± 0.39 (n=162)	35.18 ± 0.31 (n=223)	35.48 ± 0.22 (n=482)
Post-partum heat period (d)	136.30 ± 9.52[a] (n=82)	129.29 ± 5.86[a] (n=147)	110.63 ± 4.60[b] (n=203)	121.85 ± 3.48 (n=432)
Service per conception	2.19 ± 0.10[a] (n=99)	1.89 ± 0.07[b] (n=168)	1.85 ± 0.07[b] (n=233)	1.93 ± 0.04 (n=500)
Days open (d)	148.87 ± 9.70[a] (n=82)	142.64 ± 5.79[ab] (n=145)	127.34 ±4.88[b] (n=194)	136.80 ± 3.57 (n=421)
Calving interval (d)	415.02 ± 10.72[a] (n=70)	406.43 ± 6.23[ab] (n=114)	391.15 ± 5.42[b] (n=161)	401.04 ± 3.94 (n=345)

SE=Standard Error of Mean, n=no. of observation, m=months, d=days; a,b, Mean ± SE with different superscript letters in the same row differs significantly with each other (P<0.05).

Effect of breeding methodson reproductive performance of dairy cows

The effect of breeding on reproductive performance of dairy cows is presented in Table 4. The age at puberty (25.87 ± 0.25 m), age at first calving (34.95 ± 0.25 m), and calving interval (395.84 ± 4.44 d) were significantly lower in artificially inseminated cows in comparison to those bred by natural service.

Effect of treatment provider on reproductive performance of dairy cows

The effect of treatment provider on reproductive performance of dairy cows is presented in Table 5. The age at puberty (25.98 ± 0.39 m), age at first calving (35.05 ± 0.37 m), and calving interval (394.93 ± 5.01 d) were significantly lower in those cows treated by veterinarians.

The prevalence of various reproductive disorders of dairy cows at study area

The prevalence of various reproductive disorders of dairy cows has been summarized in Table 6. The overall prevalence of reproductive disorders was 78.6%. The most prevalent reproductive disorders were anestrus (24.6%), abortion (13.4%), repeat breeding (11.4%), and retained placenta (10.2%).

Prevalence of reproductive disorders of dairy cows based on farm size

The distribution of reproductive disorders of dairy cows according to farm size is presented in Figure 1. The prevalence of all reproductive diseases was higher in large farms.

The prevalence of reproductive disorders of dairy cows based on the management system is presented in Figure 2. The prevalence of all reproductive diseases was higher in intensive management system of cows.

Prevalence of reproductive disorders of dairy cows based on feed quality

The prevalence of reproductive disorders of dairy cows according the quality of the feed is presented in Figure 3. The prevalence of all reproductive disorders was higher in cows received poor quality of feed.

Prevalence of reproductive disorders of dairy cows according breeding

The prevalence of reproductive disorders of dairy cows based on breeding methods is presented in Figure 4. The prevalence of all reproductive disorders was higher in artificially inseminated cows than those bred by natural service.

Table 4. Effect of breeding methods on reproductive parameters of dairy cows at study area

Reproductive Parameters	Breeding methods		Grand Total
	Natural service	Artificial Insemination	
Age at puberty (m)	28.30±0.44 (n=112)	25.87 ± 0.25 (n=388)	26.42±0.22 (n=500)
Age at 1st calving (m)	37.26 ± 0.45 (n=110)	34.95 ± 0.25 (n=372)	35.48 ± 0.22 (n=482)
Post-partum heat period (d)	127.35 ±6.66 (n=100)	120.20±4.06 (n=332)	121.85±3.48 (n=432)
Service per conception	1.93 ± 0.09 (n=112)	1.93 ± 0.05 (n=388)	1.93 ± 0.04 (n=500)
Days open (d)	150.10 ±7.24 (n=97)	132.82±4.08 (n=324)	136.80±3.57 (n=421)
Calving interval (d)	418.56 ±8.26 (n=79)	395.84±4.44 (n=266)	401.04±3.94 (n=345)

m=months, d=days, n=no. of observation

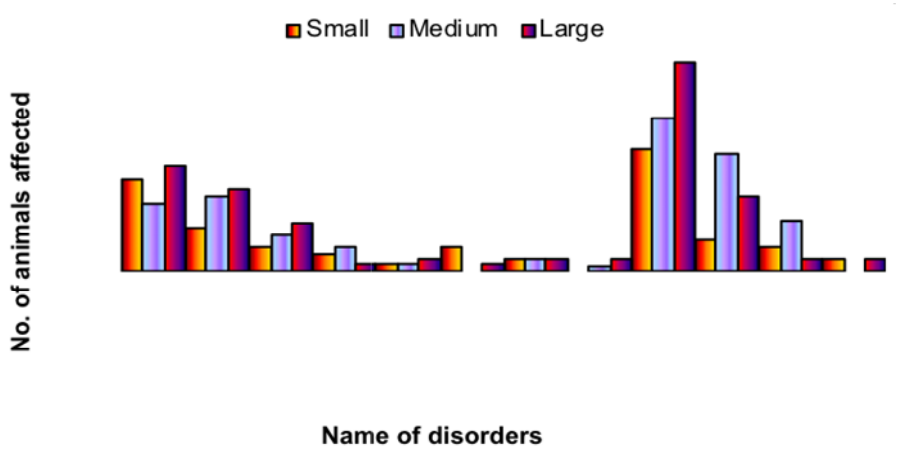

Figure 1.Prevalence of reproductive disorders of dairy cows among the farm size.

Table 5. Reproductive parameters of dairy cows according to the treatment providers in Rajshahi region

Reproductive Parameters	Treatment provided			Grand Total
	Veterinarian	Unskilled personnel	Traditional healer	
Age at puberty (m)	25.98 ± 0.39^{b} (n=251)	26.21 ± 0.30^{b} (n=165)	27.92 ± 0.58^{a} (n=84)	26.42 ± 0.22 (n=500)
Age at 1st calving (m)	35.05 ± 0.37^{b} (n=238)	35.27 ± .31^{b} (n=160)	36.92 ± 0.58^{a} (n=84)	35.48 ± 0.22 (n=482)
Post-partum heat period (d)	118.44 ± 4.55 (n=217)	121.00 ± 6.94 (n=141)	133.48 ± 7.74 (n=74)	121.85 ± 3.48 (n=432)
Service per conception	1.90 ± 0.06 (n=251)	1.93 ± 0.07 (n=165)	2.01 ± 0.09 (n=84)	1.93 ± 0.04 (n=500)
Days open (d)	132.62 ± 4.65 (n=207)	135.92 ± 6.95 (n=141)	150.35 ±8.25 (n=73)	136.80 ± 3.57 (n=421)
Calving interval (d)	394.93 ± 5.01^{b} (n=172)	398.95 ± 7.51^{b} (n=116)	423.77 ± 9.98^{a} (n=57)	401.04 ± 3.94 (n=345)

The values are Mean ± SE, SE=Standard Error of Mean, n=no. of observation, m=months, d=days; a,b, Mean ± SE with different superscript letters in the same row differs significantly with each other ($P<0.05$).

Management factors associated with reproductive performance and disorders

Table 6. Prevalence of various reproductive disorders of dairy cows in Rajshahi region (n=500).

Name of reproductive disorders	**No. of cases**	**Prevalence (%)**
Abortion	67	13.4
Retained placenta	51	10.2
Dystocia	27	5.4
Vaginal prolapsed	12	2.4
Uterine prolapsed	7	1.4
Metritis	8	1.6
Pyometra	9	1.8
Still birth	4	0.8
Anestrus	123	24.6
Repeat breeding	57	11.4
Mastitis	22	4.4
Milk fever	6	1.2
Grand total	393	78.6

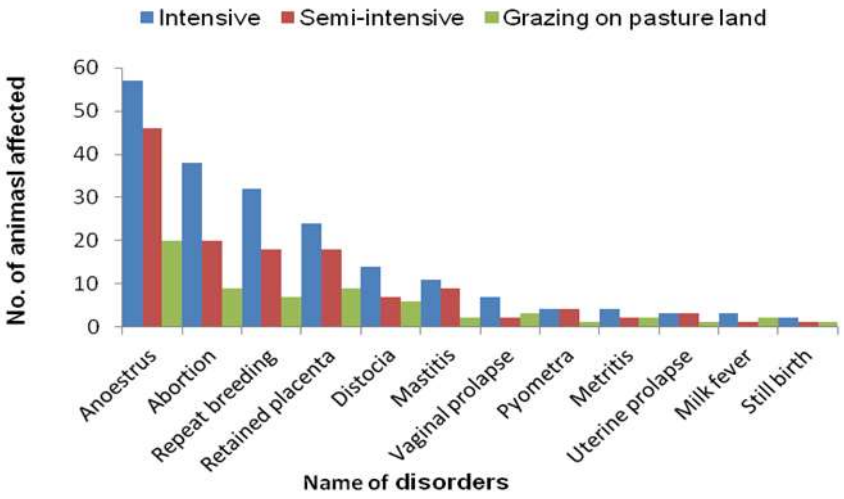

Figure 2.Prevalence of reproductive disorders of dairy cows in differentmanagement systems.

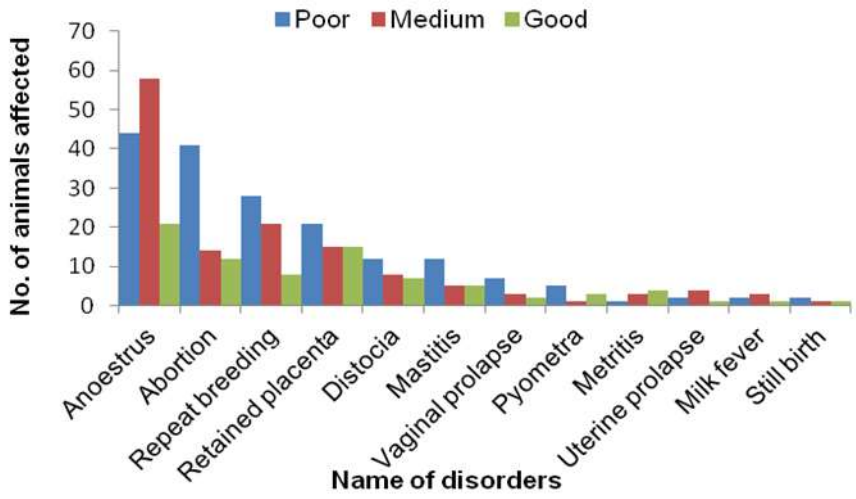

Figure 3.Prevalence of reproductive disorders of dairy cows among the feed quality

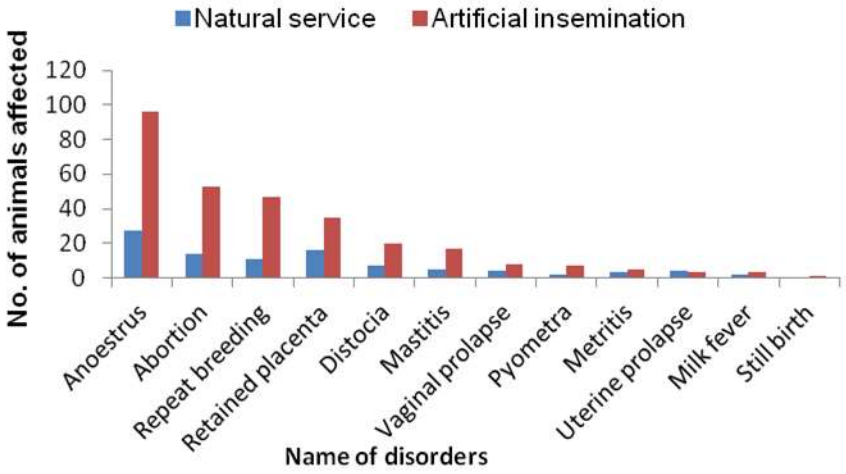

Figure4.Prevalence of reproductive disorders of dairy cows according to the breeding methods

Discussion

Reproductive performance of dairy cows in Rajshahi region of Bangladesh

We observed that the farm size affect the age at puberty, age at first calving, post-partum heat period, service per conception, days open and calving interval. It was reported that the incidence of reproductive disorders and reproductive performance are affected by farm size (Coleman et al., 1985). The mean (±SD) age at puberty (AP), age at first calving (AFC), service per

conception (S/C) and days open (DO) were reported to be 23.1±6.4 months, 33.2±6.7 months, 2.0±1.2 and 176.8±79.0 days, respectively (Lemma and Kebede, 2011). AP, AFC and S/C were significantly different (P<0.05) between farms and mating systems. The first service conception rate for pregnant cows (n=77) was 45.5% for all farms, 60.0% for AI (Artificial insemination) farms, and 40.0% for NS (Natural service) farms with significant difference (P<0.05) between mating methods (Lemma and Kebede, 2011). Abeygunawardena et al. (2001) reported similar S/C in smallholdings (1.99) and in large farms (1.99) in Sri-Lanka. Lobago et al. (2006) reported 187 days as mean days open in small holder dairy farm and average number of S/C as 1.6±1.0 in central Ethiopia. (Benon et al. (2015) conducted a survey in Uganda and reported significantly higher (P=0.0003) calving rate in small herds (≤3 dairy cows) than in large ones (>3 dairy cows). One study reported significantly (P<0.05) lower repeat breeding in small farms than medium and large farms (Asaduzzaman, 2015). The higher reproductive performance of small size farm might be due to close observation, good management system of the farm and easily heat detection and timely performing AI.

Overall good reproductive performance was found in intensive management system comparing to the semi-intensive and free range systems. Our values of age at puberty and age at first calving of all rearing systems were lower than the values recorded a study in Bangladesh (Islam et al., 2015). The average values of remaining reproductive traits (post-partum heat period [PPHP], S/C, DO and CI) were higher than the values recorded by Islam et al. (2015). Another study suggested an intensive rearing of heifers and insemination at an early age (18-22 vs. 24 or 30 months) for extending the productive live span (Misostov and Konovalova, 1994).

Feeding practice varies in different countries and different places of a same country. Post-partum ovarian activity was closely associated with total digestible nutrient intake (Whitemore et al., 1974). The energy deficient diet in the late pregnancy and early lactation is associated with reduced ovarian function (Butler *et al.,* 1981; Lalman et al., 1997). We observed the minimum value of age at puberty, age at first calving, post-partum heat period, service per conception, days open and calving interval in cows provided with good quality feed. Feed quality had significant (P<0.05) effect on most of the reproductive traits. It was reported that, the highest milk yielders had longer calving interval because of delayed return to post-partum due to negative energy balance to supply the poor quality of feed in Holstein Friesian cows (Currado et al., 1991). It was reported that good nutritionally managed cross-bred heifers can be bred at 15-18 months (Mukasa-Mugerwa, 1989). Moreover, the addition of urea-molasses-mineral block (UMMB) in the diet was reported to enhance earlier sexual maturity in zebu heifers (Alam et al., 2001). Alam et al. (2006) found that the UMMB group cow required relatively shorter period of expression of standing estrus (91-101 days, mean 96.2) than non UMMB group (130-135 days, mean 141.6). Adding 3-4 kg energy source concentrate per cow per day helped the studied cows (86%) to be inseminated within 90 days post-partum as well as to be conceived (59%) within 115 days post-partum than 1-2 kg/day, 2-3 kg/day, >4 kg/day, respectively (Haider, 2007). The weak or silent heats occur in heifers due to under feeding energy, phosphorus or vitamin A (Shamsuddin and Arya, 2009). All these factors limit growth of heifers and delay their age at first calving. Balanced nutrition with better management helps to maintain general health condition of the cow that stimulate the endocrine system through the activation of the hypothalamo-pituitary-ovarian axis to work properly and thereby improve reproductive performance (Morrow, 1980); Fitzpatrick, 1994). Feeding programmes at pre and post calving period helped in initiating the earlier post-partum onset of ovarian cyclicity (Brosaster and Broaster, 1998). The age at puberty, age at first calving, services per

conception and calving interval were lower in cows provided straw and green grass. However, the post-partum heat period and days open were lower in cows provided with concentrate and green grass (Islam et al*.,* 2015). The main cause of poor reproductive performance could be due to poor health management, inadequate nutrition during and after calving. Inadequate dietary intake and decreased utilization of some nutrition may result in delayed onset of ovarian activity by preventing release of gonadotropin from the pituitary (Nolan et al*.,* 1988; Randel, 1990; Osawaet al*.,* 1996).

Reproductive efficiency in the dairy herd is the most important factor for its economic success and a major concern for dairy farmers when using (AI) or (NS) (Valergakis et al*.,* 2007). AI has proven to be a reliable technology for dairy producers to make genetic progress and control venereal diseases in their herds. The better reproductive performance was observed in artificially inseminated cows than those bred by natural service in the present study. We observed significant effect ($P<0.05$) of breeding methods on age at puberty, age at first calving and calving interval. In contrast, Malik et al. (2012) observed the higher pregnancy rate in NS group than in the AI group, but the difference was not significant ($P>0.05$).Service period (44.25 vs 35.40 days) and number of services per conception (1.43 vs 1.14) were observed to be significantly higher in animals served through AI (Khan et al*.,* 2012).

In present study, better reproductive performance was observed among cows treated by veterinarian than unskilled personnel. one study reported significant ($P<0.01$) effect of preventive/treatment measures on age at first heat /puberty (AP), age at first calving (AFC), number of S/C, PPHP and CI(Islam et al*.,*2000).

Reproductive disorders of dairy cows in Rajshahi region of Bangladesh

Large farm showed more frequency of reproductive disorders of cows in this study. Similarly, the highest frequency of reproductive diseases was reported in large farm compared to the medium and small farm (Kader, 2010). The variation of results might be due to inadequate veterinary supervision, management error etc. The highest prevalence of reproductive disorders was in intensive rearing system. Similarly, the highest prevalence of reproductive diseases was observed in the intensive management system (Kader, 2010). This may be due to the fact that diseases transmit rapidly in intensive management system and slowly in the free range system.

In the current study, the prevalence of all reproductive disorders were higher in cows provided with poor quality feed. Similarly, the lowest reproductive disorders were observed in cow provided with excellent quality feed (Sardar, 2008). The results of present study controvert from Kader, (2010). High milk production and imbalanced feeding are the factors for reproductive disorders in cross-bred cows (Shamsuddin et al*.,* 1988). The prevalence of all reproductive disorders was higher in artificially inseminated cows than those bred by natural service. This may be due to the fact that high yielding cross-bred cows are more vulnerable to diseases. The risk of disease transmission via AI cannot be ruled out also. The lack of proper hygienic management of post-partum cow and supervision of veterinary personnel performing AI predispose to reproductive disorders in dairy cows.

Conclusion

The study revealed a lower reproductive performance of dairy cows and higher prevalence of reproductive health problems. The better reproductive performance was recorded insmall farm than large and medium farms. Good quality of feed should be offered to dairy cow for better reproductive performance. Artificial insemination should also be preferred than natural service for better reproductive performance. However, AI leads to more reproductive disorders than NS. The risk of disease transmission via AI should be explored. Measures to control reproductive diseases should be undertaken in large herds and

intensive housing system. Efforts should be extended towards training, increasing awareness of the animal owners, available veterinary services about these problems and their proper management.

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Conflict of Interest
The authors declare no conflict of interest.

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