Original Research Article

A cross sectional study on some aspects of reproduction scenario and prevalence of reproductive disorders in Bangladesh

Comment [E1]: My suggestion is to change the tittle to: **A cross sectional study on some aspects of reproduction scenario and prevalence of reproductive disorders in dairy cattle in Bangladesh**

Abstract

Comment [E2]: Please rewrite the abstract to be more understandable to readers

A cross sectional survey was carried out in dairy herds in four districts of Bangladesh to determine some aspects of reproduction and the prevalence of reproductive disorders that affect dairy cattle industries in the country. A total of 2850 dairy cows (local 1020; 35.8% and crossbred 1830; 64.2%) in 256 local (204; 79.7%) and commercial (52; 20.3%) dairy herds located in Dhaka, Narayanganj, Gazipur, and Manikganj were investigated using questionnaire survey and face-to face interviews with the owners. We categorized the dairy herds into small (1-5 cows; 47.7%), medium (6-10 cows; 30.5%), and large (<10 cows; 21.8%). Most of the dairy herds (197/256; 76.9%) were determined the estrus cows by observing signs or taking history from herd owner. Moreover, 32.8% (84/256) of the dairy herds using reproductive calendar for the breeding purpose while, only 26.1% (67/256) were keeping the reproductive records either by log book or computerization. The results indicated that 71.5% (146/204) locals were using artificial insemination (AI) for the dairy cows reproduction when classified according to service method while, 73% (n=38/52) commercials were using AI other than natural service (NS), and AI and NS. The using of Department of Livestock Service (DLS) semen rate was higher 67.1 % (n=137/204) in locals while, Bangladesh Rural Advancement Committee (BRAC) semen rate was higher 61.5% (n=32/52) in commercials. The results of this study indicated that anestrus 8.6% (88/1020) in locals and repeat breeding syndrome (RBS) 9.8% (180/1830) were the major reproductive problems in the investigated dairy herds followed by poor heat detection 5.2% (54/1020) in locals and anestrus 4.7% (86/1830) in commercials. Finally, countrywide investigations of reproductive parameters and disorders, and increasing awareness to the owners are recommended for designing successful control strategies of reproductive disorders in Bangladesh.

Key Words: Dairy cows, Reproductive disorders, Reproductive technologies, Prevalence, Artificial insemination.

INTRODUCTION

Livestock's contribution to Bangladesh's gross domestic product (GDP) was 1.9% in 2021-22 (DLS 2022). Livestock plays great role in agriculture and livelihoods. Cattle, buffalo, sheep, and goat are mainly considered as livestock animals in Bangladesh. However, dairy farming is an important and potential agricultural sector in Bangladesh. Nearly 85% of the population of the country is engaged in agriculture and livestock sector (Raha 2000). In Bangladesh, there are about 24.7 million cattle, 1.5 million buffaloes, 3.7 million sheep, and 26.7 million goats (DLS 2022). Among the total of 6 million milking cows, 85–90% of them are indigenous and 10–15% are crossbred (DLS 2013). Therefore, reproduction is a vital factor in determining the efficiency of animal production. In cattle production, good reproductive performance is essential to efficient management and production as a whole. However, successful economy of a dairy farm either large or small scale lies on proper and optimal reproductive rhythm of each individual cow within the normal physiological range. Reproductive and production disorders of dairy cattle significantly reduce their productivity which is of great concern of dairy producers worldwide because most reproductive disorders adversely affect the future fertility. Poor reproductive performance is a crucial production of limiting issue. It has been reportable that reproductive disorders are accountable exceptional economic losses to the dairy farmers in Bangladesh (Talukder *et al.,* 2005). In European and American dairy herds, about a third of all cows are culled because of reproductive disturbances (Faruq, 2001). The occurrence of various reproductive disorders is increased in Bangladesh due to introduction of intensive cross breeding programme through artificial insemination (Faruq, 2001; Khair *et al.,* 2013). The occurrence of different reproductive disorders in cows has been reported in Bangladesh by several authors (Shamsuddin *et al*., 1988; Das *et al.,* 1995). Despite the large number of cattle and their economic importance in Bangladesh,

the productivity is low due to the constraints of disorders, nutrition, poor management, poor performance of local breeds, lack of using reproductive tools and technologies to manage the disorders. Therefore, the present study was undertaken and designed with the objectives of investigating the prevalence of reproductive disorders and collecting the base line data needed for formulating possible strategies for prevention and control of reproductive disorders.

MATERIALS AND METHODS

Study area

The study covered four districts in Bangladesh; these were Dhaka, Narayanganj, Gajipur, and Manikganj. The dairy herds were randomly selected from different upazila's among these districts from September 2021 to June 2022.

Comment [E3]: Did the estrus synchronization is applied in these dairy herds?

Comment [E4]: Please specify the percentage of these FOUR DISTRICTS among the total area of Bangladesh, and in which region located.

Study design and animals

Cross-sectional type of study using questionnaire survey and field visit, was carried out in dairy farms in four districts in Bangladesh. A total of 2850 dairy cows (local 1020; 35.8% and crossbred 1830; 64.2%) in 256 local (204; 79.7%) and commercial (52; 20.3%) **(Table1)** dairy herds located in Dhaka (local 31; 15.3% and commercial 10; 19.3%), Narayanganj (local 54; 26.4% and commercial 12; 23%), Gajipur (local 57; 27.9% and commercial 19; 36.7%), and Manikganj (local 62; 30.4% and commercial 13; 25%) (Table2) were investigated using questionnaire survey and face-to face interviews with the owners. We categorized the dairy herds into small (1-5 cows; 47.7%), medium (6-10 cows; 30.5%), and large (<10 cows; 21.8%) **(Table1)**.

Comment [E5]: What you mean by LOCAL and COMMERCIAL dairy herds?

Questionnaire survey

A total of 256 owners of dairy herds were interviewed face-to-face using close ended questions to ease data processing; minimize variation and improve precision of responses. In the survey, information on reproductive parameters (estrus detection method, reproductive calendar, reproductive records, service methods, source of semen, and breed of semen) as well as reproductive disorders were collected.

Data processing and analysis

Questionnaires were numbered (coded) before processing and the collected data were sorted manually. Collected the data reproductive parameters, the prevalence and the relative frequencies of reproductive disorders were determined as percentages.

RESULTS and DISCUSSION

Total 256 questionnaires were administered based on the number total of dairy herds investigated. Out of the 256 dairy herds visited, 57 were local and 19 were commercial in Gazipur district while, 147 were local and 33 were commercial dairy herds in other areas (**Table 1**).

Total 256 dairy herds (local 204 and commercial 52) were investigated with a maximum 47.7% (n=122/256) small categorized dairy herds compared with medium and large size dairy herds. Of these, 35.8% (n=1020/2850) were locals and 64.2% (n=1830/2850) were crossbred dairy cows (**Table** ~~1~~2). In Bangladesh, there are about 24.7 million cattle, 1.5 million buffaloes, 3.7 million sheep, and 26.7 million goats (DLS 2022). Among the total of 6 million milking cows, 85–90% ofthem are indigenous and 10–15% are crossbred (DLS 2013). Smallholder producers dominate the dairy sector in Bangladesh. More than 70% of the dairy farmers are smallholders and produce around 70–80% of the country's total milk (Uddin et al., 2012). It is estimated that there are about 1.4 million dairy farms with an average herd size of 1–3 cows (Hemme et al., 2008).

The details on estrus detection methods, reproductive ~~calender~~ calendar and records of these dairy herds are presented in **Table 3**. Most of the dairy herds (n=197; 76.9%) were observing estrus signs or taking history from herd owner to detect the estrus of dairy cows other than calling of veterinarian and using digital technologies. Moreover, 32.8% (n=84/256) of the dairy herds using reproductive calendar for the breeding purpose while only 26.1% (n=67/256) were keeping the reproductive records either by log book or computerization. Detection of estrus in cows may often be difficult due to short periods of standing estrus, silent estrus, changing nutritional regimens, environmental temperatures and estrus onset during the late night to early morning hours. There is a report that about 40% cows remained undetected when they were in estrus in small holding farms in Bangladesh (Shamsuddin et al., 2001).

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Of 256 dairy herds in the study, 71.5% (n=146/204) locals were using artificial insemination (AI) for the dairy cows reproduction when classified according to service method while, 73% (n=38/52) commercials were using AI other than natural service (NS), and AI and NS (**Table 4**). Artificial Insemination (AI) is the first generation reproductive biotechnology that has made a profound contribution to the genetic improvement of the cattle. Failure of cows to become pregnant and the need for repeated AI are usually causing frustration and economic losses of the cattle farmers (Stevenson et al., 1990). Although AI is a widely recognized breeding tool but farmers in Bangladesh are not yet able to adopt it perfectly. This is due to facing some problems while practicing AI at farmers' level. Some of the problems are poor ability to adapt services, low pregnancy rate, poor communication, unable to select the desired breed and to practice AI inappropriate time etc. (Alam, 2005; Paul, 2008).

The source of semen of dairy cows reproduction are presented in **Table 5**. The using of Department of Livestock Service (DLS) semen rate was higher 67.1 % (n=137/204) in locals compared with BRAC 21.5% (n=44/204) and Lal Teer 11.2% (n=23/204). On the other hand, BRAC semen rate was higher 61.5% (n=32/52) in commercials compared with DLS 34.6% (n=18/52) and Lal Teer 3.8% (n=2/52). The present finding is consistent with other investigators where cows inseminated with frozen semen derived from BRAC showed higher (61.6%) pregnancy rate than that of semen derived from DLS (55.0%) (Shikder, 2011). Moreover, the breed of semen of dairy cows reproduction are presented in **Table 6**. Most of the locals were using Holstein breed 60.2% (n=109/204) semen compared with Sahiwal 37.1% (n=77/204) and Red Chittagong 2.7% (n=5/204) while, 75% (n=39/52), 19.2% (n=10/52) and 5.7% (n=3/52) using in commercials, respectively. The crossbreds and purebreds are mostly in Bangladesh Sindhi,Sahiwal, and Holstein Friesian breeds (Miazi et al., 2007).

The results of this study indicated that anestrus 8.6% (n=88/1020) in locals and repeat breeding syndrome (RBS) 9.8% (n=180/1830) were the major reproductive problems in the investigated dairy herds followed by poor heat detection 5.2% (n=54/1020) in locals and anestrus 4.7% (n=86/1830) in commercials (**Table 7**). The other major reproductive disorders investigated in

locals included RBS 2.7% (n=28/1020), dystocia (n=19/1020), and retained placenta (RP) 1.1% (n=11/1020) while, poor heat detection 3.5% (n=65/1830), metritis 3.1% (n=57/1830), RP 1.7% (n=32/1830), and dystocia 1.4% (n=27/1830) in commercials. Also, less than 1% reproductive disorders in locals and cross breeds are shown in detail in **Table 7**. The prevalence of reproductive disorders was 23% in dairy cows in Patiya upazila of the Chittagong district of Bangladesh (Maruf et al., 2012). On the other hand, the major reproductive disorders recorded in goats were dystocia (41.21%), abortion (21.83%), mastitis (21.89%), retained placenta (11.82%), and pyometra (3.44%) (Sultan *et al.*, 2015). Similarly, major reproductive disorders in sheep were dystocia (53.71%), abortion (25.0%), pyometra (7.12%), mastitis (7.16%), and retained placenta (7.17%) (Sultan *et al.*, 2015). The occurrence of anoestrus was 6.79%, which was lower than that (26.52%) observed in South West Ethiopia (Bitew and Prasad, 2010). Previously, reported 27.73% cases of retained placenta in Karan Fries cows (Satya Pal, 2003). In comparison, other researchers reported lower incidence of retained fetal membrane (0.31%, 1.47%, 8.28%, and 7.84% respectively) (Shamsuddin *et al.*, 2010). The occurrence of metritis was recorded 25.57% in South West Ethiopia (Molalegne and Shiv, 2011). Retained placenta is an important post-parturient problem in cattle farming. Its incidence can be as high as 12% even in normal delivery, about 63% of the retained placenta out of 750 calving in the Savar Dairy farm; the highest incidence was recorded in March and the lowest in September (Shamsuddin *et al.*, 1988). The incidence of repeat breeding in the present studies was 3.20% which was lower than the findings in Ethiopia (Getachew and Nibret, 2014). In addition to these, communal use of bulls for natural services is also considered as contributing factor reported 5% repeat breeding cases (Shamsuddin *et al.*, 2010). The prevalence rate of pyometra 0.16% was lower than the prevalence rate of Savar dairy farm 8.2% (Shamsuddin *et al.*, 1988). A 47.7% of dairy cows were having at least one of the reproductive problems observed by (Benti and Zewdie, 2014) in indigenous Borena breed cows in Borena zone in Southern Ethiopia. Contrasting to the resent finding, only 39.4% prevalence of reproductive diseases or disorders was reported in cross-bred dairy by (Alam *et al.*, 2014) at Ullapara upazila under Sirajganj district. Haile *et al.* (2014) recorded 43.07 % of cows were found to be affected either with one or more of reproductive problems. Therefore, this study has the similar opinion to

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the other researcher reported as the main constraint in the enhancement of dairy enterprises in Bangladesh is the low reproduction efficiency of dairy cows because of reproductive disorders (Shamsuddoha and Edwards, 2000).

CONCLUSION

This study revealed a wide variety of reproductive parameters and reproductive disorders affecting local and commercial dairy industry in Bangladesh. The situation demands for further investigations in both crossbred and local breed of dairy cows to determine causes, economic impact, and appropriate control strategies under different management systems. This study also refers the use of digital technologies and increasing awareness of the animal owners about these problems and their proper management.

REFERENCES

Alam, M.G.S. 2005. National Livestock Policy and Action Plan, Veterinary Services and Animal Health, FAO Office, Dhanmandi, Dhaka, Bangladesh.

Alam, M.A., Bhuiyan, M.M.U., Parvin, M.S., Rahman, M.M. and Bari, F.Y. 2014. Prevalence of reproductive diseases and its associated risk factors in crossbred dairy cows. *Res. Agri. Livest. Fisheries.*, 1: 71-79.

Bitew, M. and Prasad, S. 2010: Study on Major Reproductive Health Problems in Indigenous and Cross Breed Cows in and Around Bedelle, South West Ethiopia. *J. Anim. Vet. Adv*., 10: 723-727.

Das, S.C., Rahman, M.A., Ahmed, J.U. and Alam, M.G.S. 1995. Reproductive disorders in zebu cows of Tangail milk shed area. *Bd. J. Anim. Sci.*, 24: 19-25.

DLS. 2013. Department of Livestock Services: An Overview. Ministry of Fisheries and Livestock, Government of the People Republic of Bangladesh, Dhaka.

DLS. 2022. Department of Livestock Services: Livestock economy at a glance. Ministry of Fisheries and Livestock, Government of the People Republic of Bangladesh, Dhaka.

Faruq, M.B.H. 2001. Clinical and abattoir studies on reproductive diseases of cows in Bangladesh. MS Thesis. Department of Surgery and Obstetrics, Faculty of Veterinary Science, Bangladesh Agricultural University, Mymensingh, Bangladesh.

Getachew, E. and Nibret, M. 2014. Major Reproductive Health Disorders in Cross breed Dairy Cows in Ada'a District, East Shoa, Ethiopia. Department of Veterinary Clinical Studies, Faculty of Veterinary Medicine, University of Gondar. *Ethio. Glo. Veterinaria*., 13(4): 444- 449.

Haile, A., Tsegaye, Y. and Tesfaye, N, 2014. Assessment of major reproductive disorders of dairy cattle in urban and per urban area of Hosanna, Southern Ethiopia. *Anim. Vet. Sci.*, 2: 135-141.

Hemme, T., Deeken, E. and Ramanovich, M. 2008. IFCN Dairy Report 2008. International Farm Comparison Network (IFCN), Dairy Research Center Kiel.

Khair, A., Alam, M.M., Rahman, A.K.M.A., Islam, M.T., Azim, A and Chowdhury, E.H. 2013. Incidence of reproductive and production diseases of cross-bred dairy cattle in Bangladesh. *Bd. J. Vet. Med*., 11: 31-36.

Miazi, O.F., Hossain, M.E. and Hassan, M.M. 2007. Productive and Reproductive Performance of Crossbred and Indigenous Dairy Cows Under Rural Conditions in Comilla, Bangladesh. *University J. Zoo., RU*., 26: 67–70.

Molalegne, B. and Shiv, P. 2011: Study on Major Reproductive Health Problems in Indigenous and Cross-Breed Cows in and Around Bedelle, South West Ethiopia. *J Anim Vet Adv.*, 10(6): 723-727.

Paul, A. K. 2008. Factors that Limit First Service Pregnancy Rate in Cows at Char Management of Bangladesh. Department of Surgery and Obstetrics, Faculty of Veterinary Science, Bangladesh Agricultural University, Mymensingh.

Raha, S.K. 2000. Development of Livestock Sector: Issues and Evidences. Changing Rural Economy of Bangladesh. Bangladesh Economic Association, Eskaton Garden Road, Dhaka

Satya P. 2003. Investigation on health disorder in dairy cattle and buffaloes during pre and post- partum period Phd. Thesis submitted to NDRI, Karnal.

Shamsuddoha, A.K. and Edwards, G. 2000. Dairy Industry in Bangladesh: Problems and Prospects. 44th AARES (Australian Agricultural and Resource Economics Society) Conference, Sydney, Australia. 23-25 January 2000.

Shamsuddin, M., Alam, M.G.S. and Ahmed, J.U. 1988. Reproductive disorder of cross- bred cows. *Bangladesh Vet. J.*, 22: 21-28.

Shamsuddin, M., Bhuiyan, M.M., Sikder, T.K., Sugulle, A.H., Chanda, P.K., Alam, M.G. and Galloway, D. 2001. Constraints limiting the efficiency of artificial insemination of cattle in Bangladesh. *Int. Atom. Erg. Agcy.*, 1220: 9-27.

Shamsuddin, M., Bhattacharjee, J., Goodger, W.J., Momont, H., Frank, G., Talukder, A.K. and Akteruzzaman, M. 2010. Community-based productivity veterinary service for smallholder dairy farmers in Bangladesh. In: Suntainable improvement of animal production and health, Food and Agriculture Organization of the United Nations, Rome: 247-253.

Stevenson, J. S., Call, E. P, Scoby, R. K. and Phatak, A. P. 1990. Double Insemination and Gonadotrophin releasing hormone treatment of repeat breeding dairy cattle. *J. Dairy Sci.*, 73, 1766-1722.

Talukder, M.A.S., Khandoker, M.A.M.Y., Rahman, M.G.M., Islam, M.R. and Khan, M.A.A. 2005. Reproductive problems of cow at Bangladesh Agricultural University Dairy Farm and possible remedies. *Pak. J. Bio. Sci.,* 8: 1561-1567.

Uddin, M.M., Sultana, M.N., Bruermer, B. and Peters, K.J. 2012. Assessing the Impact of Dairy Policies on Farm-Level Profits in Dairy Farms in Bangladesh: Benchmarking for Rural Livelihoods Improvement Policy. *J.Revi. Global Eco.*, 1, 124–138.

Table 1. Study area in Bangladesh and number of dairy herds investigated

Locality	Number of dairy herds investigated			
	Local	**Percentage (%)**	**Commercial**	**Percentage (%)**
Dhaka	31	15.3	10	19.3
Narayanganj	54	26.4	12	23
Gazipur	57	27.9	19	36.7
Manikganj	62	30.4	13	25

Types of dairy Herd	Local	204	79.7%
	Commercial	52	20.3%
Herd Size	Small (1-5)	122	47.7%
	Medium (6-10)	78	30.5%
	Large (<10)	56	21.8%
Dairy Cows	Local cows	1020	35.8%
	Cross-bred	1830	64.2%

Table 2. Baseline survey of dairy herds.

Table 3. Survey of some reproductive aspects of dairy herds.

Estrous detection	History/Signs	197	76.9%
	Veterinarian observation	57	22.3%
	Digital technologies (Ultrasound, CCTV camera etc) observation	2	0.8%
Reproductive calendar	Yes	84	32.8%
	No	172	67.2%
Reproductive records	Log book	48	18.7%
	Computerization	19	7.4%
	None	189	73.9%

CCTV: Closed circuit camera

Table 4. Dairy cows reproduction when classified according to service method.

Number dairy herds	Type of dairy herds	AI only	Percentage (%)	NS only	Percentage (%)	AI and NS	Percentage (%)
204	Local	146	71.5	23	11.2	35	17.1
52	Commercial	38	73.0	0	0	14	26.9

AI: Artificial insemination; NS: Natural Service

Table 5. Source of semen of dairy cows reproduction.

Type of dairy herds	Number dairy herds	DLS	Percentage (%)	BRAC	Percentage (%)	Lal Teer	Percentage (%)
Local	204	137	67.1	44	21.5	23	11.2
Commercial	52	18	34.6	32	61.5	2	3.8

DLS: Department of Livestock Service; BRAC: Bangladesh Rural Advancement Committee

Table 6. Breed of semen of dairy cows reproduction.

Type of dairy herds	Number dairy herds	Holstein	Percentage (%)	Sahiwal	Percentage (%)	Red Chittagong	Percentage (%)
Local	181	109	60.2	77	37.1	5	2.7
Commercial	52	39	75	10	19.2	3	5.7

Table 7. ~~Prevalance~~ Prevalence of reproductive disorders in dairy cows.

Dairy cows	Breed of Cows		Reproductive disorders	Affected cows		Prevalence (%)	
	Local	Crossbred		Local	Crossbred	Local	Crossbred
2850	1020	1830	Anoestrus	88	86	8.6	4.7
			Repeat breeding	28	180	2.7	9.8
			Metritis	9	57	0.8	3.1
			Retained placenta	11	32	1.1	1.7
			Early embryonic death	7	13	0.7	0.7
			Poor heat detection	54	65	5.2	3.5
			Ovarian cyst	0	7	0	0.3
			Uterine prolapsed	0	12	0	0.6
			Vaginal prolapsed	1	7	0.09	0.3
			Still birth	0	12	0	0.6
			Abortion	1	8	0.09	0.4
			Fetal mummification	1	5	0.09	0.2
			Dystocia	19	27	1.9	1.4
			Pyometra	4	9	0.3	0.4
			Ovarian tumor	0	1	0	0.05
			Cervicitis	0	4	0	0.2
			Sulphingitis	0	3	0	0.1
			Ovobarsal adhesion	1	2	0.09	0.1

	Ovarian atrophy	0	3	0	0.1
Total		**309**	**533**	**21.6**	**31.45**