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Baseline Survey for Reproductive Disorders in Indigenous Dairy Animals Reared by Marginal Farmers in Three Districts of Punjab

Mrigank Honparkhe*, Ajeet Kumar, Sumit Singhal, Amarjeet Bisla, Parkash Singh Brar and Sarvpreet Singh Ghuman

Department of Veterinary Gynaecology and Obstetrics, Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana, Punjab

ABSTRACT

The attainment of maximum production potential from an animal envisages one calf crop per year. However, various reproductive problems are responsible for increasing the inter-calving period for more than 15 months even at the well managed dairy farms. Most of the dairy animals in India as well as in Punjab are reared by small and marginal farmers so, this study was aimed at to prepare baseline data of major reproductive problems in the indigenous dairy animals in three districts (Ludhiana, Bathinda and Tarn taran) of Punjab. A total of 127 villages were covered for completing 3000 households (1000 per district) based on a predesigned questionnaire. It was observed that buffaloes were more reared by all the small and marginal farmers of three districts than indigenous cattle. The average number of total cattle, total buffaloes, adult buffaloes, buffalo heifers as well as total livestock per household varied significantly ($p < 0.05$) among all the three districts. The three major reproductive problems that were encountered after questionnaire analysis from farmers were observed to be anestrus, delayed puberty and repeat breeding. The incidences (%) of delayed puberty ($p < 0.01$), anestrus ($p < 0.001$), repeat breeding ($p = 0.009$), ante-partum ($p < 0.001$) and post-partum prolapse ($p = 0.010$) were significantly greater in buffaloes as compared to indigenous cows. The baseline data indicated the predominance of infertility problems viz. anestrus, delayed puberty and repeat breeding as compared to peri-partum complications in buffalo and indigenous cattle reared by small and marginal farmers of three major district of Punjab. There is need to sensitize the dairy farmers regarding these reproductive disorders and their timely interventions so as to obtain maximum reproductive and productive potential.

Key words: Anestrus, Buffalo, Delayed puberty, Indigenous cattle, Repeat breeding

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*Corresponding author.

E-mail address: mhonparkhe@gmail.com (Mrigank Honparkhe)

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INTRODUCTION

India is an agrarian economy with about 20% share in 2020-21 (increased from 17.8% in 2019-20) in the total gross domestic product (GDP) of the country. Among the agriculture sector, the livestock sector contributes more than 25% with providing an employment to about two-third of rural population of the country (Economic Survey, 2022-23). The continuous expansion of industries, urbanization, reducing per capita land holding makes the animal husbandry sector more important in terms of its future demand. The livestock in India is mainly reared by small and marginal farmers. The total livestock population of country stands to be 536.76 million with an increase by 4.56% and 11.19% in rural and urban areas, respectively over the 2012 census (20th Livestock census, 2019). Punjab, being a prosperous state of India ranks at 17th in terms of total livestock population with 70.5 lakh total animal heads and 15th in bovine population with total of 65.5 lakh animals indicating that cattle and buffaloes are major animals reared in Punjab (20th Livestock census, 2019).

Despite, the largest hub of livestock population in world, the per capita production in animals are lesser in India than world average which could be due to many factors like fodder availability, rearing practices, germ plasm potential etc. (Bisla et al., 2018). It is desired that for the attainment of maximum production potential form an animal throughout its productive life, one calf crop per year (one calf per 13-14 months in buffaloes) should be achieved (El-wishy 2007; Sheldon et al., 2009). But, due to many diseases or reproductive problems this is not achieved which limits the inter-calving period of more than 15 months even at the managed dairy farms of various universities and research organizations in India (Annual Reports of ICAR-Indian Veterinary Research Institute 2022; National Dairy Research Institute 2022, Central Institute for Research on Buffaloes 2022). The reproduc-

tive problems like anestrus are more encountered in the summer season in both cattle as well as buffaloes (Das and Khan, 2010). Thus, the various reproductive problems like peri-partum complications, infertility (repeat breeding, anestrus, hormonal aberrations etc.) could be one of the major factors for reduced average productivity by the animals (El-wishy, 2007; Honparkhe et al., 2007; Singh et al., 2008; Das and Khan, 2010; Saraswat and Purohit, 2016; Gulia et al., 2022; 2023). Also, the reproductive disorders in dairy animals are major complications encountered by the working veterinarians in the field conditions. There is paucity of documents with large population data for reproductive disorders in indigenous dairy animals kept by marginal farmers. Considering all these factors, this study was done to assess the incidence of various reproductive problems in the animals reared in small groups by the small and marginal farmers of three districts (Ludhiana, Bathinda and Tarn Taran) of Punjab to prepare base line data.

MATERIALS AND METHODS

Field survey was conducted to collect the information on incidence of reproductive problems in indigenous cattle and buffalo in 127 villages of district Ludhiana (n=64), Bathinda (n=34) and Tarn Taran (n=31) of Punjab. The survey was done in the months of May to July in year 2019 to assess the incidence of various reproductive disorders in the dairy cattle and buffaloes of three district of Punjab mainly in the summer season. The summer season is much pronounced in the northern India including Punjab with a peak of temperature ranging from 45-48°C. The data was collected from 1,000 poor and marginal farmers from each district (total 3,000). The selection criteria for each household included the number of animals not more than 15 and having 2.5 - 5 acre land holding. The questionnaire was designed to assess the incidence of various reproductive problems encountered by the farmers in cattle and buffaloes (Table 1).

Table 1: Survey questionnaire for collection of data from small and marginal farmers regarding animal rearing practices

Data sheet no._____					Date:_____					
Name of the owner:_____					Phone No:_____					
Address:_____										
Land holding:_____										
Managed by: lady/ male/labour										
Total No. of animals:_____										
Type of animals:_____										
Cattle (Breed_____)/ Buffalo (Breed_____)										
Parameters	1	2	3	4	5	6	7	8	9	10
Heifer (ID &Sp)										
Cattle-C buffalo-B										

Estrus shown (Y/N)										
Age at 1 st estrus										
Present age										
Parous animal (ID &Sp) Cattle-C, Muraah buffalo-MB, NiliRavi Buffalo- NB										
Age										
Parity										
Date of calving										
Peak Milk yield (Kg)										
1 st estrus after calving (date/ month)										
Complications										
Pre-partum prolapse										
Post-partum prolapse										
Dystocia										
ROP										
No. of AI, if empty										
Present status (P/NP)										
If NP then status Anestrus- An , Pubertal- Pu Delayedpubertal- Dpu , Repeater - R , cycling - C										

The statistical analysis was done using GraphPad Prism 8.0.2 (263) statistical software. The average number of heads of animals per household for each type (adult cattle and buffaloes, cattle and buffalo heifers, total cattle and buffaloes and total livestock) was compared using One-way analysis of variance (ANOVA) test among the three districts. Further, incidence (%) of various reproductive problems was calculated for cattle and buffaloes separately and was compared using unpaired T-test. The values with confidence interval of 95% or more ($p < 0.05$) were considered to be varying significantly while, values near to $p < 0.1$ were considered to be tend to significant.

RESULTS AND DISCUSSION

A total of 127 villages were covered for completing 3000 households in the three districts of Punjab. The general animal population data has been shown in Table 2 from 3,000 households in Ludhiana, Bathinda and Tarn Taran which revealed that total buffaloes were more in number than cattle in all the three districts. Overall, the number of adult animals was more as compared to the heifers for both cattle as well as buffaloes.

Table 2: General Information on number of animals

Sr. No.	Items Surveyed		Bathinda	Ludhiana	Tarn-Taran	Total
1	Number of indigenous cattle	C	84	51	141	276
2	Number of buffaloes	B	2466	3630	2828	8924
3	Number of heifers	C(1.6 -2.6Y)	30	22	34	86
		B (2.0-3.6Y)	1368	1299	1356	4023
4	Total no of bull	C	02	3	87	92
		B	32	67	238	337

C-Cattle, B- Buffalo

The average heads of animals per household have been presented in the Table 3. It was observed that average number of heifers, adults and total female buffaloes per household were significantly ($p<0.05$) greater in all the three districts as compared to their counterpart cattle, respectively. The average number of total cattle, total buffaloes, adult buffaloes, buffalo heifers as well as total live-stock per household varied significantly ($p<0.05$) among all the three districts. While, the number of adult cattle varied significantly between only the household of district Bathinda and Tarn taran while, non-significantly ($p>0.05$) than the district Ludhiana. The number of cattle heifers per household varied significantly ($p<0.05$) in district Bathinda than both Ludhiana and Tarn taran.

Table 3: Average animal heads per household in three districts of Punjab

District Name	Total Indigenous Cattle	Adult cattle	Cattle Heifers	Total Buffaloes	Adult buffaloes	Buffalo Heifers	Total
Ludhiana	0.07±0.01 ^{Aa}	0.11±0.02 ^{Aab}	0.08±0.02 ^{Aa}	4.92±0.06 ^{Ba}	3.64±0.05 ^{Ba}	1.50±0.04 ^{Ba}	5.00±0.06 ^a
Bathinda	0.12±0.01 ^{Ab}	0.08±0.009 ^{Aa}	0.81±0.07 ^{Ab}	3.85±0.04 ^{Bb}	2.47±0.03 ^{Bb}	1.68±0.03 ^{Bb}	3.96±0.04 ^b
Tarn Taran	0.18±0.02 ^{Ac}	0.14±0.01 ^{Ab}	0.03±0.006 ^{Aa}	4.18±0.05 ^{Bc}	2.83±0.04 ^{Bc}	1.36±0.03 ^{Bc}	4.36±0.05 ^c
Overall	0.12±0.007 ^A	0.11±0.007 ^A	0.07±0.007 ^A	4.31±0.03 ^B	2.98±0.03 ^B	1.50±0.02 ^B	4.44±0.03

Values with superscripts A, B vary significantly ($p<0.05$) (comparison within row between Total indigenous cattle vs Total Buffaloes; Adult cattle vs Adult Buffaloes; Cattle Heifers vs Buffalo Heifers); Values with superscripts a, b, c vary significantly ($p<0.05$) within column between the rows (comparison among three districts for each category of animals)

The overall reproductive status of cattle and buffalo in three districts has been presented in Table 4. The three major reproductive problems that were encountered after questionnaire analysis from farmers were observed to be anestrus, delayed puberty and repeat breeding. Maximum delayed pubertal heifers were in Tarn taran (42%) followed by Bathinda (33%) and Ludhiana (24%). Anestrus in buffaloes in Tarn Taran, Bathinda and Ludhiana was 12.9%, 11.9% and 10.9%, respectively. In Tarn taran, 32% indigenous cattle suffered from delayed puberty followed by 29% in Bathinda and 0.78% in Ludhiana. Anestrus in indigenous cattle was encountered maximum in Bathinda (28%) followed by Tarn taran (13%) and Ludhiana (3.9%).

Table 4: Comparative analysis of various reproductive problems in dairy cattle and buffaloes in overall three districts of Punjab

S. No.	Parameter	Cattle (% incidence)	Buffaloes (% incidence)	P-Value
1.	Delayed Puberty	0.94±0.52 ^A	8.15±0.27 ^B	<0.001
2.	Anestrus	2.91±0.97 ^A	11.96±0.34 ^B	<0.001
3.	Repeat Breeding	1.71±0.76 ^A	3.49±0.20 ^B	0.009
4.	Antepartum genital prolapse	1.05±0.62 ^A	4.74±0.27 ^B	<0.001
5.	Postpartum genital prolapse	0.63±0.47 ^A	2.31±0.18 ^B	0.010
6.	Dystocia	1.46±0.75	1.11±0.14	0.496
7.	Retained Fetal membranes	1.05±0.55	1.59±0.16	0.359

Values with superscripts A, B vary significantly ($p<0.05$) (comparison within row between cattle and buffaloes)

Following inclusion of more data on indigenous cattle from Tibba, Khanna, Payal and Talwandi sabo villages, the total population of indigenous cows was 698. Amongst these, 9.59% (67/698) cows were affected with anestrus whereas 5.58% (39/698) cows were repeat breeder. The incidence of pre and postpartum prolapse were higher in buffaloes as compared to indigenous cattle (4.42% vs 2.69% and 2.33% vs 1.67%). The incidence of dystocia was non-significantly higher in cattle than buffaloes. Anestrus in buffaloes was 12.9%, 11.9% and 10.9%, respectively. In Tarn taran, 32% indigenous cattle suffered from delayed puberty followed by 29% in Bathinda and 0.78% in Ludhiana. Anestrus in indigenous cattle was encountered maximum in Bathinda (28%) followed by Tarn taran (13%) and Ludhiana (3.9%).

After the T-test, comparative analysis of incidence of seven reproductive problems in cattle and buffaloes it was found that incidence (%) of delayed puberty ($p<0.01$), anestrus ($p<0.001$), repeat breeding ($p=0.009$), ante-partum ($p<0.001$) and post-partum prolapse ($p=0.010$) was significantly greater in buffaloes as compared to cows while, incidence of dystocia and retained fetal membranes varied non-significantly ($p>0.05$). The rearing of buffaloes is more by the small and marginal farmers as compared to the indigenous cattle which could be due to less production potential of indigenous cattle breeds (Patel *et al.*, 2020). The reproductive problems related to infertility like delayed puberty, anestrus and repeat breeding were observed to be more in buffaloes than cattle which is in concurrence with the previous study (Honparkhe *et al.*, 2008a; 2008b; 2011; 2022; Modi *et al.*, 2011) where repeat breeding and anestrus were found to be major causes of

infertility in buffaloes (Azawi *et al.*, 2008a; 2008b; Ali *et al.*, 2009; Bisla *et al.*, 2018). Delayed puberty has also been reported by many workers as major reproductive problem in buffalo heifers reared in the village conditions in India (Singh *et al.*, 2000;) which has similar observation in the present study. The delay in onset of puberty in buffaloes causes increased age at first calving leading to less exploitation of reproductive as well as productive potential (Ali, 2015).

The seasonality of reproduction with reduced ovarian activity during the summer season has been postulated as a common reason for the delayed onset of puberty in buffaloes (Halder and Prakash, 2005). Other factors that are found to be associated with delayed puberty in buffalo heifers could be season of birth, exposure to the male, feeding practices (Singh *et al.*, 2000) which could be linked to the present study where majority of farmers did not have bulls also, the feeding of mineral mixture was not done by many of them. Naidu *et al.* (2009) reported combination of mineral supplementation along with hormonal therapy had beneficial effects in induction of estrus with good conception rate in delayed pubertal buffalo heifers. One study done in indigenous cattle breeds of Jabalpur region in Madhya Pradesh also revealed a higher incidence of delayed puberty (more than 40%) in Gir, Sahiwal and non-descript cows (Patel *et al.*, 2020) where low body condition score was most responsible factor.

Seasonality in buffalo reproduction has been reported from Egypt, India, Italy, Pakistan and many other parts of the world (Zicarelli, 1997; Singh *et al.*, 2000; Barile, 2005) which has been attributed to environmental factors including photoperiodic day length than the genetic factors (Gangwar, 1980). The incidence of summer anestrus in buffaloes has been reported to be higher due to heat stress induced inactive, smooth ovaries, abnormal hormonal profiles. Also, heat stress induced anestrus has been reported in cattle breeds but their incidence is lower as compared to buffaloes (Das and Khan, 2010). The problem of repeat breeding is observed to be lesser than anestrus in buffaloes (Saraswat and Purohit, 2016) which has similar concurrent finding. The major reasons for the repeat breeding syndrome in buffaloes are reported to be failure of fertilization and early embryonic deaths. Early embryonic deaths are common in buffaloes mated/inseminated during the end of the breeding season due to low luteal progesterone (Saraswat and Purohit, 2016) where small size of follicles with less population of futuristic large luteal cells could be a major reason for low luteal insufficiency (Baithalu *et al.*, 2013).

The peri-partum complications like antepartum and postpartum genital prolapse, dystocia and retained

fetal membranes also affects the fertility and reproductive efficiency of dairy animals adversely (El-wishy, 2007; Honparkhe and Bisla, 2023; Gulia *et al.*, 2023). In the present study, the incidence of peri-partum complications was found to be lesser than the infertility associated problems as well as there was no significant the incidence of these disorders difference between cattle and buffaloes except for antepartum cervico-vaginal prolapse which was more in buffaloes. It has been observed that incidence of antepartum cervico-vaginal prolapse in buffaloes could be from 2-68% depicting a higher range and also it was lesser than postpartum uterine prolapse. The etiology of the prolapse continues to be poorly understood although increasing levels of plasma estradiol during gestation and low levels of circulating trace elements such as copper, selenium and zinc and minerals such as calcium and phosphorous are some of the postulated contributing factors (Purohit *et al.*, 2018).

Retention of fetal membranes (RFM) is a foremost complication of dystocia making the animal more predisposed for metritis complex to occur. The incidence of RFM in buffaloes varies from 6-14% (Gautam, 2000; Indurkar *et al.*, 2019; Gulia *et al.*, 2022) with increased incidence up to 35% in relation to premature calvings, abortions and dystocia (Indurkar *et al.*, 2019; Gulia *et al.*, 2023) but, this study reported a lower incidence of RFM in both cattle as well as buffaloes.

CONCLUSIONS

It was concluded from the present study that incidence of infertility related problems like delayed puberty, anestrus and repeat breeding were more than the peri-partum complications. Also, buffaloes suffer more than indigenous cattle from various reproductive problems suggesting that rearing of indigenous cows could be increased for more economic benefits along with the better management in the buffalo rearing practices. This survey data could form a baseline for the incidence of various reproductive problems in the dairy animals reared by small and marginal farmers as well as possible futuristic therapeutic and management practices.

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CONFLICT OF INTEREST

The authors declare no conflict of interest among themselves.

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