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Aetiologies and therapeutic management of infertility in cows reared in high altitude tribal areas of Himachal Pradesh

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Himachal Pradesh is a state where most of the people are dependent on agriculture and livestock rearing for their livelihood. In today's scenario, the farmer is willing to keep a cow until she is lactating, but if the cow becomes infertile due to some reasons, it becomes an economic burden on the farmer. In order to reduce economic losses, it is important to record the incidence of reproductive problems, their causes with appropriate treatment measures (Sharma *et al.* 2018). Reproductive and production disorders of crossbred dairy cattle significantly reduce the productivity which is of great concern for dairy producers worldwide. Among the major reproductive problems, abortion, dystocia, retained fetal membranes (RFM), pyometra, metritis, prolapse (uterine and vaginal), anestrus and repeat breeding have direct impact on reproductive performance of dairy cows (Bala 2017). In Himachal Pradesh, the proportion of dairy cattle suffering from repeat breeding syndrome due to anatomical, functional, infectious and managemental reasons was 14.74, 17.19, 55.66 and 12.41%, respectively (Singh *et al.* 2017). The present study was aimed at documentation and therapeutic management of infertility in cows of Himachal Pradesh with special reference to high altitude tribal areas.

The present study was carried out to document the infertility problems in cows reared in tribal areas of Himachal Pradesh (i.e. Pangi, Bharmaur, Kinnaur, Lahaul and Spiti) and to evaluate the effect of various treatments to manage the malady. The clinical evaluation of genitalia of cows (N=664) was done thoroughly by per-rectal examination in infertility treatment camps and infertile cows were scrutinized on basis of history, age, parity, feeding status, artificial insemination, date of last calving, post-partum estrus and cyclic regularity. All the cows which were presented in infertility treatment camps were provided with bolus fenbendazole (Fentas, Intas Pharmaceuticals Ltd., India) at the dose rate of @ 7.5 mg/kg body weight (BW) per os (p.o.), mineral mixture (Dhauladhar, CSKHPKV, Palampur) @ 50 g as a total dose per day per os.

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Cows showing turbid uterine discharge and affected with endometritis were treated with single i/u administration of benzathine salt of cephapirin (Metricef, MSD, India) and i/m administration of long acting antibiotics either enrofloxacin (Flobac SA, Intas Pharmaceuticals Ltd., India) @ 7.5 mg/kg BW or Marbofloxacin (Marbomet, Intas Pharmaceuticals Ltd., India) @ 8 mg/kg BW. Few of the cows were treated with Lugol's iodine 0.1%, 30 ml i/u for 3 days at the time of estrus.

Natural service or artificial insemination (AI) with double dose of semen was recommended for cows diagnosed with cervical disorders such as cervical fibrosis and kinked cervix. Likewise, the cows suffering from salpingitis were treated with parenteral administration of single dose of antibiotic enrofloxacin (Flobac SA, Intas Pharmaceuticals Ltd., India) @ 7.5 mg/kg BW in maximum cases or ciprofloxacin (C-Flox Power, Intas Pharmaceuticals Ltd., India) @ 5 mg/kg BW for 3 days through i/m route in few cases. Owners of the cows which were diagnosed as true anestrus and small/weak genitalia were instructed to give regular supplementation of minerals, vitamins and concentrate feeding. Additionally, these cows were administered Toldimphos sodium (T-Phos, Zydus AHL, India) @ 5–10 ml i/m. Tablets CoFeCu (CoFeCu Plus, Indian Herbs, India) or bolus. containing multiple minerals and vitamins (Totavit, Vet mankind, India) were also given to each cow @ 2 tablets p.o. daily for 20 days or 1 bolus p.o. daily for 10 days, respectively. Vitamin supplementation was provided by injecting vitamins A, D_3, E (Vetade, Zydus AHL, India) or Vitamins A, D_3, E and H (Intavita-H, Intas Pharmaceuticals Ltd., India) @ 5 ml i/m to each anestrus cow.

Cows suffering from silent estrus were treated by providing concentrates, minerals and vitamins supplementation along with AI at natural estrus or following corpus luteum (CL) lysis in other cows. CL lysis was done with i/m administration of cloprostenol sodium (Pragma, Intas Pharmaceuticals Ltd., India; Clostenol, Zydus AHL, India) @ 500 µg total dose. Cows affected with miscellaneous conditions were treated as per etiology, e.g. cows with follicular cyst, were treated with i/m administration of Buserelin-acetate (Receptal Vet, MSD,

India) @ 20 µg (5 ml); cases of pyometra and mummification were treated with i/m administration of cloprostenol sodium and antibiotics (enrofloxacin, ciprofloxacin, levofloxacin and ceftriaxone etc.). Similarly, the cows which were showing prolonged estrus during estrous cycle were treated with double insemination at a gap of 12–24 h or were injected with GnRH @ 10 µg (2.5 ml) along with insemination.

In the present study, prevalence of gynaecological ailments because of poor management (true anestrus and silent estrus) was quite high (44.27%). About 32.83% cows were diagnosed to be true anestrus whereas the highest prevalence (44.77%) was recorded from Lahaul area and the lowest (29.14%) from Pangi region (Table 1). Nearly comparable result of 32.21% prevalence of anestrus was recorded in cows of different tribal areas of Himachal Pradesh (Kumar and Singh 2018). Post treatment, 54 out of 132 (72%) true anestrus cows and 4 out of 10 (50%) silent estrus cows responded positively (Table 2).

The overall prevalence of clinical endometritis was 42.77% in different tribal areas of Himachal Pradesh and was higher than overall prevalence (3.4–40%) reported in the world (Gilbert *et al.* 2005). The present prevalence was higher than 33% but lower than 69.8% recorded by Wang *et al.* (2021) and Ribeiro *et al.* (2014), respectively. The disparity in the prevalence of endometritis compared to the above-mentioned reports can be due to differences in the management system under which the cows were maintained. Endometritis is a common reproductive malady in cows with consequences ranging from no effect on reproductive performance to permanent sterility. It badly affects their reproductive performance (Amiridis *et al*. 2003). Only 66.67% endometritic cows conceived following treatment with antibiotics (Table 2).

In the current study, 6.17% of cows had problems associated with cervix which included cervical fibrosis, cervicitis and kinked cervix (Table 1). It is much higher than findings of Mekibib *et al.* (2013), where it was 2.32% only. Similarly, Andrade *et al.* (2005) found cervical inflammation in 0.6% cases only. Following treatment, one (50%) cow conceived.

In this study, overall 101 cows could be followed and 70 had responded to the treatment with success rate of 69.30%. Almost similar results were obtained by Kumar (2018) while treating the infertile cows where success rate was 65.95%. Our results were also comparable to the results obtained by Bala (2017) where success rate was 62.50%.

Amongst the reproductive abnormalities in cows reared in tribal areas, very high prevalence (44.27%) of reproductive disorders was related to anestrus, out of which 70.84% were treatable. However, 42.77% prevalence of infectious problems (clinical endometritis) was found and 66.67% post treatment recovery rate was recorded. Overall, 69.30% infertile cows having various genital tract problems recovered successfully following different therapeutic regimes and ailment based treatment of infertile cows with respect to specific diagnosis led to enhancement of

Table 1. Prevalence of various reproductive disorders in cattle reared in different tribal areas of Himachal Pradesh

Diagnosis		Tribal location(s)										Tribal area overall	
		Kinnaur		Lahaul and Spiti				Chamba					
				Lahaul		Spiti		Pangi		Bharmour			
		Number of infertility treatment camps											
		n=30		n=16		n=24		n=21		n=10		n=101	
		N	%	N	%	N	%	N	%	N	%	Total	%
Infectious infertility	Clinical endometritis	81	38.20	28	41.79	68	44.73	84	48.00	23	39.65	284	42.77
Functional causes	Anestrus True/ Post-partum/ Small genitalia	64	30.10	30	44.77	50	32.89	51	29.14	23	39.65	218	32.83
	Silent estrus	32	15.00	2	2.98	19	12.50	8	4.57	7	12.06	68	10.24
	Prolonged estrus	8	3.77	0	0	0	0	0	0	0	0	8	1.20
	Total	104	49.05	32	47.76	69	45.39	59	33.71	30	51.72	294	44.27
Anatomical abnormalities	Cervical fibrosis/ Kinked Cervix/ Cervicitis	14	6.60	5	7.46	2	1.31	11	6.28	2	3.44	34	5.12
	Ovaro-bursal adhesions/ Salpingitis	3	1.41	0	0	0	0	4	2.28	0	0	7	1.05
Miscellaneous	total	17	8.01	5	7.46	2	1.31	15	8.57	2	3.44	41	6.17
	Abortion	8	3.77	2	2.98	9	5.92	13	7.42	1	1.72	33	4.96
	Other (Mummification, maceration etc.)	2	0.90	0	0	4	2.63	4	2.28	2	3.44	12	1.80
	Total	10	4.71	2	2.98	13	8.55	17	9.71	3	5.17	45	6.76
	Grand total	212	99.97	67	99.99	152	99.98	175	99.99	58	99.98	664	99.97

Table 2. Overall post-treatment recovery in cows with various reproductive disorders treated in infertility treatment camps in tribal districts of Himachal Pradesh

Diagnosis			Treated	Followed	Responded	
			N	n	n	%
Himachal Pradesh Overall (n=16)	Infectious infertility	Clinical endometritis	44	15	10	66.67
	Anatomical infertility	Cervical fibrosis/ Kinked cervix/ Cervicitis	2	2	1	50.00
	Functional infertility	Prolonged estrus	1	1	1	100.00
		True/ Post-partum/ Small genitalia	132	75	54	72.00
		Silent estrus	10	8	4	50.00
		Total	143	84	59	70.00
		Grand total	189	101	70	69.00

conception rate in cows.

SUMMARY

Infertile cows (664) reared in different tribal areas of Himachal Pradesh were examined thoroughly by rectal examination during infertility treatment camps and diagnosis of reproductive ailments was done to document the prevalence of different types of infertility. The highest prevalence was recorded for anestrus (44.27%) followed by endometritis (42.77%) and miscellaneous reproductive disorders (6.77%). Highest prevalence of anestrus conditions was recorded in Bharmour (51.72%) followed by Kinnaur (49.05%), Lahaul (47.76%) and Spiti (45.39%) areas whereas, lowest prevalence was recorded in Pangi (27.93%) region. After diagnosis, 189 cows were treated for different reproductive ailments; however, only 101 cows could be followed, and 70 responded to the treatment with success rate of 69.30%. Anestrus and endometritis were the most prevalent forms of infertility in cows of tribal areas and were successfully treated with their respective treatment regimen.

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