

Original Research Article

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## Pre-Calving Management Practices Adopted by Dairy Farmers in Buffalo Calf Rearing: A Study in the Tapi District of South Gujarat, India

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### ABSTRACT

#### Keywords

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This research paper aims to investigate the pre-calving care practices implemented by dairy farmers in the rearing of buffalo calves in the Tapi district of South Gujarat. The study focuses on understanding the various pre-calving management techniques employed by farmers to ensure the well-being and reproductive health of the dam, ultimately leading to healthier offspring. A mixed-methods approach was utilized, combining surveys and interviews to gather data from a representative sample of dairy farmers in the region. The study highlights the significance of pre-calving care and its impact on the overall productivity and profitability of buffalo calf rearing. The findings shed light on the common practices, challenges faced, and areas for improvement in pre-calving management within the Tapi district, providing valuable insights for dairy farmers, researchers, and policymakers alike.

### Introduction

India is an agricultural country with about 70% of the rural household still depend primarily on agriculture for their livelihood and animal husbandry is a key sector in Indian agriculture with significant contribution in the economy. About 20.5 million people depend upon livestock for their livelihood. Livestock contributed 16.00% to the income of small rural households. The milk production during 2019-20 was 198.44 million tonnes and 209.96 in 2020-21, showing a 6.00% annual growth rate. India ranks first in the buffalo population and milk production. In spite of India having a high livestock population and milk production, the amount of

milk produced per animal is low. When compared to the global average of 2238kg/year, Indian milch animals are producing only 1538 kg/year (Vijay *et al.*, 2018; Juniwal *et al.*, 2022). India has the most important buffalo population in the world, with a population of 109.85 million, Highest buffalo population in India is in Uttar-Pradesh (33.0 million) and Gujarat stands at rank 3<sup>rd</sup> with a population of buffalo as 10.5 million in the year 2019.

Gujarat is one of the largest milk-producing states with a well-developed cooperative infrastructure. It contributed around 14.49 million tonnes (7.71%) of milk to the total milk pool of India and per capita milk availability was 626 gm/day during 2018-19. Gujarat has around 4.98%

of cattle and 9.60% of the buffalo population of the country (Anonymous, 2020). Calves are born agammaglobulinemic and thus are extremely susceptible to infectious diseases, particularly in the first hours of life. Consequently, it is essential to minimize the risk of disease to the newborn calf while maximizing development of immunity. Care of the calf begins before birth. Appropriate feeding of the dry cow, calving facilities and calving management are all essential to optimizing the health of newborn calves.

Over or underfeeding the dry cow influences her body condition score (BCS), changes in which may lead to a greater incidence of dystocia thus appropriate nutrition of the dry cow is crucial. In addition to dry cow nutrition, monitoring of the cow around calving is important for successful healthy calf births (Cummins *et al.*, 2016). So far very sporadic research has been conducted, specifically on buffalo calf management practices at the farmers' level, therefore it is imperative to ascertain the management practices of calves followed by buffalo owners under village conditions so that a need-based extension programme may be launched to make them aware, to increase their knowledge and to increase the adoption of scientific calf health management practices.

## **Materials and Methods**

This study was conducted in the Tapi district of Gujarat to investigate the pre-calving care practices of dairy farmers in buffalo calf rearing. Surveys were carried out in all seven talukas of the district, namely Vyara, Songadh, Uchchhal, Nizar, Valod, Dolvan, and Kukarmunda. A random sampling method was employed to select 20 dairy farmers from each taluka. Structured interviews were conducted with the selected participants using a predetermined interview schedule.

The interviews aimed to collect comprehensive data on various aspects of pre-calving care, including the provision of additional ration for pregnant dams, vaccination practices, deworming during the last trimester, veterinary assistance during calving, availability of calving pens, separate prepartum shelters for buffaloes and heifers, facilities in the prepartum area, drying off practices, duration of the drying period, staff responsible for prepartum care, and frequency of observations during the prepartum period. The collected data underwent both qualitative and quantitative analysis. Qualitative responses were quantified and organized in tabular form to facilitate meaningful interpretation. The

data were further classified based on taluka, landholding, and herd strength to enable a comprehensive analysis. Frequencies and percentages were calculated for each variable to draw significant conclusions. The chi-square test (Test of Independence) was applied to determine any associations between animal management practices and different categories. This exploratory study aimed to provide valuable insights into the prevailing pre-calving care practices among dairy farmers in buffalo calf rearing in the Tapi district. By analyzing the data, the study aims to identify any significant associations between management practices and different categories, highlighting areas that require improvement or intervention. The findings will contribute to enhancing pre-calving care strategies, leading to improved outcomes for both the dams and their offspring in buffalo calf rearing systems.

## **Results and Discussion**

The study examined various aspects of pre-calving care practices followed by the dairy farmers in the area of study. The findings presented in Table 1 shed light on important factors related to buffalo calf rearing.

### **Additional Ration for Steaming Up**

Majority (72.10%) of the dairy farmers provided concentrate feed as an additional ration to their pregnant animals, indicating their awareness of the benefits of providing steaming up ration. These findings are partially similar to the results reported by Rathore *et al.*, (2010), while contrary findings were observed by Damor *et al.*, (2017).

### **Vaccination of Dams**

Only a small percentage (15.00%) of the dairy farmers vaccinated their pregnant animals, while majority (85.00%) did not. This can be attributed to beliefs that vaccination may cause fever and abortion, as well as a lack of awareness about the benefits of vaccination.

### **Deworming of Pregnant Dams**

The study revealed that only 27.90% of the dairy farmers dewormed their pregnant animals in the last trimester, while majority (72.10%) did not. These findings were significantly different between talukas and herd sizes. The low deworming rate may be attributed to a lack of awareness about the benefits of deworming among

farmers, despite its importance for the health of pregnant animals.

### **Veterinary Assistance at Calving**

Only 37.90% of the dairy farmers sought veterinary assistance at the time of calving, while majority (62.10%) did not require veterinary intervention. This finding varied significantly between different talukas. It is essential to emphasize the importance of veterinary assistance during calving to ensure safe deliveries and manage potential complications.

### **Calving Pen for Pregnant Animals**

Only 14.30% of the dairy farmers had calving pens in their animal sheds, while majority (85.70%) did not. This difference was significant across different talukas. The lack of calving pens may be due to space limitations and small herd sizes among farmers.

### **Separate Prepartum Shelter for Buffaloes and Heifers**

The study found that only 10.70% of the farmers had separate prepartum shelters for buffaloes and heifers, while majority (89.30%) did not. This difference was highly significant based on talukas and significant based on herd sizes. Lack of space and small herd sizes were likely reasons for not constructing separate prepartum shelters.

### **Facilities at the Prepartum Area**

The study revealed that only a minority of the dairy farmers provided a bed of grass paddock (22.90%), access to shade (62.90%), wind shelter (12.90%), and adequate water drainage (1.40%) in the prepartum area. These findings contradicted the results reported by Rathore *et al.*, (2010) and Carlos *et al.*, (2020). Improving infrastructure and facilities in the prepartum area is necessary to ensure the comfort and well-being of pregnant animals.

### **Drying of Pregnant Animals**

Only 27.10% of the dairy farmers dried off their pregnant animals 60 days before calving, while majority (72.90%) did not practice drying off. These findings were significant between different talukas and herd sizes.

Majority of farmers may believe that buffaloes naturally dry off in the last trimester.

### **Method of Drying**

Among the farmers who practiced drying off, 5.00% adopted abrupt cessation, 20.70% adopted intermittent milking, and 1.40% adopted incomplete milking while majority (72.90%) did not follow any specific drying-off method. These findings contradicted the results reported by Singh *et al.*, (2015) and Singh *et al.*, (2018).

### **Duration of Drying Period**

Only a small percentage of the dairy farmers dried their buffaloes for less than 30 days (0.70%) or 46-60 days (0.70%), while majority (98.60%) dried them for more than 60 days before parturition. This aligns with the understanding that buffaloes naturally dry off in the last trimester.

### **Personnel Associated with the Prepartum Period**

The study found that majority (97.10%) of the dairy farmers had several activities associated with the prepartum period, while only 2.90% had dedicated personnel for prepartum and calving activities. This difference was significant based on land holdings and significant based on talukas and herd sizes.

### **Number of Observations during the Prepartum Period**

The study showed that majority (97.90%) of the dairy farmers observed their pregnant animals more than four times a day, indicating their awareness of the difficulties during calving and their concern for the well-being of the dam and new born calf. The findings of the study provide valuable insights into the pre-calving care practices followed by the dairy farmers in the study area. These findings highlight areas for improvement, such as increasing awareness about vaccination and deworming, promoting the use of calving pens and separate prepartum shelters, improving facilities in the prepartum area, emphasizing the importance of drying off pregnant animals, and encouraging appropriate observation and management during the prepartum period. Implementing these improvements can contribute to better reproductive health, productivity, and welfare outcomes in buffalo calf rearing systems.

**Table.1** Pre-calving care of Dam by dairy farmers

Particulars	Categories according to Taluka								Categories according to land holding						Categories according to herd size			
	Vyara	Valod	Dolvan	Son-gadh	Uch-chhal	Nizar	Kukar-munda	Total	Landless	Marginal (< 1 ha)	Small (1-2 ha)	Medium (2-4 ha)	Large (>4 ha)	Total	2-5 animals	6-10 animals	> 10 animals	Total
	n=20	n=20	n=20	n=20	n=20	n=20	n=20	n=140	n=27	n=81	n=15	n=12	n=5	n=140	n=47	n=43	n=50	n=140
<b>Additional ration forpregnant dam</b>																		
Yes	13	17	11	17	17	12	14	101	18	56	11	11	5	101	33	30	38	101
	65.00	85.00	55.00	85.00	85.00	60.00	70.00	72.10	66.70	69.10	73.30	91.70	100.00	72.10	70.20	69.80	76.00	72.10
No	7	3	9	3	3	8	6	39	9	25	4	1	0	39	14	13	12	39
	35.00	15.00	45.00	15.00	15.00	40.00	30.00	27.90	33.30	30.90	26.70	8.30	0.00	27.90	29.80	30.20	24.00	27.90
$\chi^2$	9.881 (P value 0.130)								4.985 (P value 0.289)						0.578 (P value 0.749)			
<b>Vaccination applied to dams</b>																		
Yes	4	3	1	2	4	5	2	21	4	11	2	2	2	21	5	6	10	21
	20.00	15.00	5.00	10.00	20.00	25.00	10.00	15.00	14.80	13.60	13.30	16.70	40.00	15.00	10.60	14.00	20.00	15.00
No	16	17	19	18	16	15	18	119	23	70	13	10	3	119	42	37	40	119
	80.00	85.00	95.00	90.00	80.00	75.00	90.00	85.00	85.20	86.40	86.70	83.30	60.00	85.00	89.40	86.00	80.00	85.00
$\chi^2$	4.706 (P value 0.582)								2.639 (P value 0.620)						1.719 (P value 0.423)			
<b>Deworming of the pregnant dam in last trimester</b>																		
Yes	10	2	10	6	6	4	1	39	6	18	6	5	4	39	9	8	22	39
	50.00	10.00	50.00	30.00	30.00	20.00	5.00	27.90	22.20	22.20	40.00	41.70	80.00	27.90	19.10	18.60	44.00	27.90
No	10	18	10	14	14	16	19	101	21	63	9	7	1	101	38	35	28	101
	50.00	90.00	50.00	70.00	70.00	80.00	95.00	72.10	77.80	77.80	60.00	58.30	20.00	72.10	80.90	81.40	56.00	72.10
$\chi^2$	18.837**(P value 0.004)								2.639 (P value 0.620)						10.089** (P value 0.006)			

In the table bold numeric letter indicate percentage;

\* Significant at 5% level (P<0.05);

\*\* Significant at 1% level (P<0.01)

**Table.1** Conti...

Particulars	Categories according to Taluka								Categories according to land holding						Categories according to herd size			
	Vyara	Valod	Dolvan	Son-gadh	Uch-chhal	Nizar	Kukar-munda	Total	Landless	Marginal (< 1 ha)	Small (1-2 ha)	Medium (2-4 ha)	Large (>4 ha)	Total	2-5 animals	6-10 animals	> 10 animals	Total
	n=20	n=20	n=20	n=20	n=20	n=20	n=20	n=140	n=27	n=81	n=15	n=12	n=5	n=140	n=47	n=43	n=50	n=140
<b>Veterinary assistance at the time of calving</b>																		
Yes	12	10	8	11	5	3	4	53	8	29	9	5	2	53	13	17	23	53
	60.00	50.00	40.00	55.00	25.00	15.00	20.00	37.90	29.60	35.80	60.00	41.70	40.00	37.90	27.70	39.50	46.00	37.90
No	8	10	12	9	15	17	16	87	19	52	6	7	3	87	34	26	27	87
	40.00	50.00	60.00	45.00	75.00	85.00	80.00	62.10	70.40	64.20	40.00	58.30	60.00	62.10	72.30	60.50	54.00	62.10
$\chi^2$	16.517* (P value 0.011)								4.132 (P value 0.388)						3.538 (P value 0.170)			
<b>Calving pens for a pregnant animal</b>																		
Yes	4	0	1	4	8	2	1	20	5	8	2	3	2	20	3	6	11	20
	20.00	0.00	5.00	20.00	40.00	10.00	5.00	14.30	18.50	9.90	13.30	25.00	40.00	14.30	6.40	14.00	22.00	14.30
No	16	20	19	16	12	18	19	120	22	73	13	9	3	120	44	37	39	120
	80.00	100.00	95.00	80.00	60.00	90.00	95.00	85.70	81.50	90.10	86.70	75.00	60.00	85.70	93.60	86.00	78.00	85.70
$\chi^2$	18.317** (P value 0.005)								5.517 (P value 0.238)						4.831 (P value 0.089)			
<b>Separate parturition shelter for buffaloes and heifers</b>																		
Yes	4	0	0	3	7	1	0	15	4	6	1	2	2	15	2	3	10	15
	20.00	0.00	0.00	15.00	35.00	5.00	0.00	10.70	14.80	7.40	6.70	16.70	40.00	10.70	4.30	7.00	20.00	10.70
No	16	20	20	17	13	19	20	125	23	75	14	10	3	125	45	40	40	125
	80.00	100.00	100.00	85.00	65.00	95.00	100.00	89.30	85.20	92.60	93.30	83.30	60.00	89.30	95.70	93.00	80.00	89.30
$\chi^2$	22.400** (P value 0.001)								6.584 (P value 0.160)						7.184* (P value 0.028)			

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\*\* Significant at 1% level (P<0.01)

**Table.1** Conti...

Particulars	Categories according to Taluka								Categories according to land holding						Categories according to herd size			
	Vyara	Valod	Dolvan	Son-gadh	Uch-chhal	Nizar	Kukar-munda	Total	Landless	Marginal (< 1 ha)	Small (1-2 ha)	Medium (2-4 ha)	Large (>4 ha)	Total	2-5 animals	6-10 animals	> 10 animals	Total
	n=20	n=20	n=20	n=20	n=20	n=20	n=20	n=140	n=27	n=81	n=15	n=12	n=5	n=140	n=47	n=43	n=50	n=140
Facilities at the prepartum area																		
Bed of straw/grass	5	0	7	13	7	2	0	34	2	18	6	5	3	34	7	13	14	34
	25.00	0.00	35.00	65.00	35.00	10.00	0.00	24.30	7.40	22.20	40.00	41.70	37.50	23.80	14.90	30.20	26.40	23.80
Access to shade	11	18	11	5	9	16	18	88	21	52	8	6	4	91	30	25	36	91
	55.00	90.00	55.00	25.00	45.00	80.00	90.00	62.90	77.80	64.20	53.30	50.00	50.00	63.60	63.80	58.10	67.90	63.60
Access to the wind shelter	4	2	2	2	4	2	2	18	4	11	1	1	1	18	10	5	3	18
	20.00	10.00	10.00	10.00	20.00	10.00	10.00	12.90	14.80	13.60	6.70	8.30	12.50	12.60	21.30	11.60	5.70	12.60
$\chi^2$	40.754**(P value 0.001)								9.482 (P value 0.303)						7.697(P value 0.103)			
Drying of the pregnant animals 60 days before calving																		
Yes	11	0	11	13	2	1	0	38	5	19	7	5	2	38	6	10	22	38
	55.00	0.00	55.00	65.00	10.00	5.00	0.00	27.10	18.50	23.50	46.70	41.70	40.00	27.10	12.80	23.30	44.00	27.10
No	9	20	9	7	18	19	20	102	22	62	8	7	3	102	41	33	28	102
	45.00	100.00	45.00	35.00	90.00	95.00	100.00	72.90	81.50	76.50	53.30	58.30	60.00	72.90	87.20	76.70	56.00	72.90
$\chi^2$	53.024**(P value 0.001)								6.161(P value 0.187)						12.426**(P value 0.002)			

In the table bold numeric letter indicate percentage;

\* Significant at 5% level (P<0.05);

\*\* Significant at 1% level (P<0.01)

**Table.1** Conti...

Particulars	Categories according to Taluka								Categories according to land holding						Categories according to herd size			
	Vyara	Valod	Dolvan	Son-gadh	Uch-chhal	Nizar	Kukar-munda	Total	Landless	Marginal (< 1 ha)	Small (1-2 ha)	Medium (2-4 ha)	Large (>4 ha)	Total	2-5 animals	6-10 animals	> 10 animals	Total
	n=20	n=20	n=20	n=20	n=20	n=20	n=20	n=140	n=27	n=81	n=15	n=12	n=5	n=140	n=47	n=43	n=50	n=140
The method adopted for drying																		
Abrupt cessation	4	0	1	2	0	0	0	7	0	5	1	1	0	7	0	4	3	7
	20.00	0.00	5.00	10.00	0.00	0.00	0.00	5.00	0.00	6.20	6.70	8.30	0.00	5.00	0.00	9.30	6.00	5.00
Intermittent milking	6	0	9	11	2	1	0	29	4	14	5	4	2	29	6	6	17	29
	30.00	0.00	45.00	55.00	10.00	5.00	0.00	20.70	14.80	17.30	33.30	33.30	40.00	20.70	12.80	14.00	34.00	20.70
Incomplete milking	1	0	1	0	0	0	0	2	1	0	1	0	0	2	0	0	2	2
	5.00	0.00	5.00	0.00	0.00	0.00	0.00	1.40	3.70	0.00	6.70	0.00	0.00	1.40	0.00	0.00	4.00	1.40
None	9	20	9	7	18	19	20	102	22	62	8	7	3	102	41	33	28	102
	45.00	100.00	45.00	35.00	90.00	95.00	100.00	72.90	81.50	76.50	53.30	58.30	60.00	72.90	87.20	76.70	56.00	72.90
$\chi^2$	63.047** (P value 0.001)								12.992 (P value 0.370)						17.657** (P value 0.007)			
Duration of the drying period																		
<30 days	0	0	0	1	0	0	0	1	0	1	0	0	0	1	0	0	1	1
	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.70	0.00	1.20	0.00	0.00	0.00	0.70	0.00	0.00	2.00	0.70
30-45 days	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
46-60 days	0	0	0	1	0	0	0	1	0	1	0	0	0	1	1	0	0	1
	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.70	0.00	1.20	0.00	0.00	0.00	0.70	2.10	0.00	0.00	0.70
>60 days	20	20	20	18	20	20	20	138	27	79	15	12	5	138	46	43	49	138
	100.00	100.00	100.00	90.00	100.00	100.00	100.00	98.60	100.00	97.50	100.00	100.00	100.00	98.60	97.90	100.00	98.00	98.60
$\chi^2$	12.174 (P value 0.432)								1.478 (P value 0.993)						3.792 (P value 0.435)			

In the table bold numeric letter indicate percentage;

\* Significant at 5% level (P<0.05);

\*\* Significant at 1% level (P<0.01)

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Particulars	Categories according to Taluka								Categories according to land holding						Categories according to herd size			
	Vyara	Valod	Dolvan	Son-gadh	Uch-chhal	Nizar	Kukar-munda	Total	Landless	Marginal (< 1 ha)	Small (1-2 ha)	Medium (2-4 ha)	Large (>4 ha)	Total	2-5 animals	6-10 animals	> 10 animals	Total
	n=20	n=20	n=20	n=20	n=20	n=20	n=20	n=140	n=27	n=81	n=15	n=12	n=5	n=140	n=47	n=43	n=50	n=140
Personnel association with the prepartum period																		
Several work activities	19	20	17	20	20	20	20	136	27	81	13	11	4	136	47	43	46	136
	95.00	100.00	85.00	100.00	100.00	100.00	100.00	97.10	100.00	100.00	86.70	91.70	80.00	97.10	100.00	100.00	92.00	97.10
Prepartum and calving only	1	0	3	0	0	0	0	4	0	0	2	1	1	4	0	0	4	4
	5.00	0.00	15.00	0.00	0.00	0.00	0.00	2.90	0.00	0.00	13.30	8.30	20.00	2.90	0.00	0.00	8.00	2.90
$\chi^2$	13.897* (P value 0.031)								15.699** (P value 0.003)						7.412* (P value 0.025)			
Number of observations during the prepartum period																		
≤2 times/d	2	0	0	0	0	0	0	2	0	2	0	0	0	2	1	1	0	2
	10.00	0.00	0.00	0.00	0.00	0.00	0.00	1.40	0.00	2.50	0.00	0.00	0.00	1.40	2.10	2.30	0.00	1.40
3 times/d	0	0	0	1	0	0	0	1	0	1	0	0	0	1	0	0	1	1
	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.70	0.00	1.20	0.00	0.00	0.00	0.70	0.00	0.00	2.00	0.70
≥4 times/d	18	20	20	19	20	20	20	137	27	78	15	12	5	137	46	42	49	137
	90.00	100.00	100.00	95.00	100.00	100.00	100.00	97.90	100.00	96.30	100.00	100.00	100.00	97.90	97.90	97.70	98.00	97.90
$\chi^2$	18.190 (P value 0.110)								2.233 (P value 0.973)						2.918 (P value 0.572)			

In the table bold numeric letter indicate percentage;

\* Significant at 5% level (P<0.05);

\*\* Significant at 1% level (P<0.01)



## Author Contribution

S. T. Parmar: Investigation, formal analysis, writing—original draft. N. B. Patel: Validation, methodology, writing—reviewing. V. D. Rani:—Formal analysis, writing—review and editing. V. R. Patel: Investigation, writing—reviewing. Y. D. Padheriya: Resources, investigation writing—reviewing. J. V. Patel: Validation, formal analysis, writing—reviewing.

## Data Availability

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

## Declarations

**Research Funding:** Not applicable

**Ethical Approval:** Not applicable.

**Consent to Participate:** Not applicable.

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