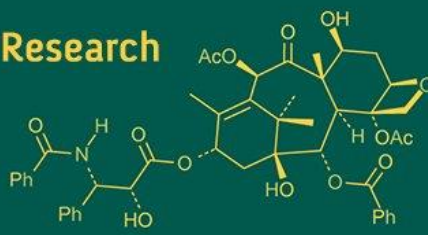


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Assessment of calcium and phosphorus in dairy cattle and its association with metabolic and reproductive disorders

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Abstract

A survey was carried out in Bhavnagar district of Gujarat state from March 2025 to May 2025 in six talukas, viz. Bhavnagar, Talaja, Sihor, Mahuva, Palitana and Umralla to estimate the calcium and phosphorus contents in feeds' and fodders' of the district in order to generate information on calcium and phosphorus status of dairy cattle and correlate it with the occurrence of metabolic and reproductive disorders. A multistage random sampling technique was used to select the respondents. From each village, 10 farmers owning dairy cattle producing 6 kg or more of milk per day were chosen, giving a total sample of 120 respondents and data were collected on 153 cattle. Detailed information on the types and quantities of feeds and fodder offered, estimated daily intake by each animal, individual milk yield and fat percentage, feeding schedules and overall feeding patterns was collected from individual farmers through a structured questionnaire specifically designed for the study. Samples of feed and fodders which were used by farmers/respondents were collected from the respondents. Calcium and phosphorus estimation of feeds and fodders was done as per the method of Talapatra *et al.* (1940). Calcium and phosphorus requirement of dairy cattle was calculated as per the guidelines of ICAR (2013) feeding standards based on the body weight, milk yield and fat% in milk of cattle. The levels of calcium and phosphorus in most samples were adequate. However, among the concentrates, cottonseed and several commercially available readymade concentrate mixtures had phosphorus levels below the critical limit. The average Ca and P intake as a% of requirement of dairy cattle in Bhavnagar district were $222.16 \pm 5.02\%$ and $153.60 \pm 1.90\%$, respectively. The occurrence of metabolic and reproductive disorders was low. Among metabolic issues, milk fever was most common, whereas retained placenta, anoestrus, and repeat breeding were the leading reproductive concerns. Overall, the findings indicate that calcium and phosphorus intake in dairy cattle of Bhavnagar district was substantially higher than the recommended requirements, reflecting an overall adequate to excess mineral status. Therefore, the occurrence of metabolic and reproductive disorders remained low under the existing feeding practices.

Keywords: Calcium, dairy cattle, metabolic disorders, mineral status, phosphorus, reproductive disorders

Introduction

The importance of minerals as a constitutional and functional component of the animal body is well known. Minerals are indispensable inorganic compounds for carrying out various physiological functions in the body. Minerals constitute about 3 percent of the body weight of animals (Reddy, 2016) ^[1]. In which calcium represents about 46 percent and phosphorus about 29 percent of total body minerals, whereas potassium, sulphur, sodium, chloride and magnesium together account for about 25 percent, while other essential minerals constitute 0.3 percent of the total (McDowell, 2000) ^[6].

The mineral disorders, including deficiencies, toxicities and imbalances, are severely inhibiting grazing livestock in developing tropical countries and have significant consequences than the infectious disease (McDowell, 2000) ^[6]. The mineral profile of feeds and fodder depends upon the cropping pattern, soil type, rainfall and feeding system of that particular region of the country depending on the agro-climatic zones. Thus, deficiency and surplus of a particular mineral varies between different regions of the country and may be called area-specific (Garg *et al.* 2005) ^[3]. Mineral deficiencies or imbalances in soil and forages are responsible for low productivity problems among growing cattle in the tropics.

Minerals are required by the body for optimum growth and proper muscle and nerve functions. In addition, they are essential components of body enzymes, hormones and cells. Proper production and reproduction of animals can only be maintained by supplementing area area-specific mineral mixture (Bhandari *et al.* 2014) ^[1]. Dietary factors usually affect mineral requirements by altering the absorption of minerals from the gut. The presence of major minerals and trace minerals in the fodders mainly depends on their level in the soil on which the fodders are grown (Singh 2005) ^[11]. However, other factors like soil type, pH of soil, species of plant and relative content of other elements also have an influence on the mineral content of plants. Deficiency of calcium is the main reason for the occurrence of milk fever in high-producing animals. Pica may lead to foreign body syndrome and botulism like fatal condition (Smith, 1990) ^[12]. The acute deficiencies of some minerals, viz., Ca and P, may sometimes prove fatal. Due to the vital role being played by macro minerals, their inadequacies usually result in marked or unnoticed decline in the performance of animals in terms of growth, production and reproduction, leading to heavy economic losses to the animal owners. Thus, in order to prevent the above-mentioned losses, it is essential to maintain adequate supplementation of these minerals through diet.

2. Materials and Methods

A survey was carried out in Bhavnagar district of Gujarat state from March 2025 to May 2025 in six talukas, viz. Bhavnagar, Talaja, Sihor, Mahuva, Palitana and Umralla (Table 1) to estimate the calcium and phosphorus contents in feeds' and fodders' of the district in order to generate information on calcium and phosphorus status of dairy cattle and correlate it with the occurrence of metabolic and reproductive disorders. A multistage random sampling technique was used to select the respondents. From each village, 10 farmers owning dairy cattle producing 6 kg or more of milk per day were chosen, giving a total sample of 120 respondents and data were collected on 153 cattle. Detailed information on the types and quantities of feeds and fodder offered, estimated daily intake by each animal, individual milk yield and fat percentage, feeding schedules, overall feeding patterns and occurrence of metabolic and reproductive disorders in cattle was collected from individual farmers through a structured questionnaire specifically designed for the study. Samples of feed and fodders which were used by farmers/respondents were collected from the respondents. The individual samples from the talukas were pooled to create a composite sample representing the taluka region for the analysis of calcium and phosphorus content. The body weight of cattle in the district was calculated using records of body length and chest girth by Schaeffer's formula (Sastry *et al.*, 1982) ^[10]. The data of milk yield of cattle was converted to 4% Fat Corrected Milk (FCM) (Gaines, 1928) ^[2]. Calcium and phosphorus estimation of feeds and fodders was done as per the method of Talapatra *et al.* (1940) ^[14]. The amount of calcium and phosphorus available to dairy cattle were calculated from the records of intake of feeds and fodders

using results of mineral contents of feeds/fodders collected during the survey and compared with their respective requirement to calculate the nutrient intake as percent of requirement. Calcium and phosphorus requirement of dairy cattle was calculated as per the guidelines of ICAR (2013) ^[5] feeding standards based on the body weight, milk yield and fat% in milk of cattle. The data regarding calcium and phosphorus intake and requirement were compiled, tabulated and analysed by one-way analysis of variance as per Snedecor and Cochran (1994) ^[13]. Pairwise mean differences between talukas were compared by Duncan's post hoc test. The two-way chi-square test was carried out to know the distribution of respondents in six talukas for particular managemental practices using the MedCal statistical software.

Table 1: Randomly sampling from selected talukas and villages for research

Sr. No.	Talukas	Selected Villages	No. of Respondents	No. of Cattle
1	Bhavnagar	Bhavnagar	10	16
		Bhumbhali	10	13
2	Talaja	Piparala	10	12
		Sankhadasar no. 1	10	14
3	Sihor	Kajavadar	10	12
		Sanosara	10	12
4	Mahuva	Kalsar	10	13
		Kumbhan	10	12
5	Palitana	Bhandariya	10	13
		Mokhadaka	10	13
6	Umralla	Dadva	10	11
		Dharuka	10	12
Total			120	153

3. Results and Discussion

3.1 Calcium and Phosphorus Content of Feeds and Fodders

The values of calcium and phosphorus contents (% DM basis) in various feeds and fodders being used in Bhavnagar district are presented in Table 2.

The calcium and phosphorus levels in most of the feed samples analyzed in the present study were higher than the critical limits suggested by McDowell (1985) ^[7], which are 0.30% for calcium and 0.25% for phosphorus on a dry matter (DM) basis. The overall calcium content of the representative feed and fodder samples collected from the district varied from 0.37 ± 0.00 to $1.75 \pm 0.00\%$ in concentrates, 0.57 ± 0.04 to $1.70 \pm 0.04\%$ in green fodder and 0.58 ± 0.06 to $1.71 \pm 0.09\%$ in dry fodder. In all cases, the calcium concentration exceeded the critical level of 0.30%, indicating that the available feed resources in the study area provide an adequate calcium supply.

The overall phosphorus content of the representative feed and fodder samples ranged from 0.15 ± 0.00 to $0.60 \pm 0.00\%$ in concentrates, 0.27 ± 0.06 to $0.51 \pm 0.00\%$ in green fodder and 0.26 ± 0.04 to $0.33 \pm 0.04\%$ in dry fodder. While the phosphorus content of most samples exceeded the critical limit of 0.25%, a few, such as cottonseed and certain commercial concentrate mixtures like Kamdhenu and Kesar, were found to be below this threshold.

Table 2: Calcium and Phosphorus contents in feedstuffs of Bhavnagar district (% DM basis) (Mean $\pm$ SE)

Sr. No.	Feedstuffs	Calcium	Phosphorus
		%	
Critical level suggested by McDowell (1985) ^[7]		0.30	0.25
Concentrates			
1.	Cottonseed cake (n = 12)	0.54 ± 0.04	0.37 ± 0.04
2.	Groundnut cake (n = 6)	0.76 ± 0.07	0.40 ± 0.06
3.	Cottonseed (n = 1)	0.46 ± 0.00	0.19 ± 0.00
4.	Sarvottam dan (n = 8)	0.97 ± 0.04	0.43 ± 0.02
5.	Maahi dan (n = 1)	0.84 ± 0.00	0.31 ± 0.00
6.	Kamdhenu readymade conc. mixture (n = 1)	1.46 ± 0.00	0.23 ± 0.00
7.	Supar 800 readymade conc. mixtutre (n = 1)	1.56 ± 0.00	0.37 ± 0.00
8.	Elu readymade conc. mixture (n = 1)	1.75 ± 0.00	0.27 ± 0.00
9.	Kesar readymade conc. mixture (n = 1)	1.51 ± 0.00	0.15 ± 0.00
10.	Kesar kalyan readymade conc. mixture (n = 1)	1.02 ± 0.00	0.29 ± 0.00
11.	Suryatimbi readymade conc. mixture (n = 1)	0.95 ± 0.00	0.26 ± 0.00
12.	Amrut readymade conc. mixture (n = 1)	0.81 ± 0.00	0.28 ± 0.00
13.	Khedutghar readymade conc. mixture (n = 1)	1.34 ± 0.00	0.45 ± 0.00
14.	Rajmoti readymade conc. mixture (n = 1)	0.80 ± 0.00	0.48 ± 0.00
15.	Varun 3000 readymade conc. mixture (n = 1)	1.28 ± 0.00	0.57 ± 0.00
16.	Rajlaxmi readymade conc. mixture (n = 2)	1.31 ± 0.01	0.42 ± 0.02
17.	Wheat bran (n = 1)	0.51 ± 0.00	0.60 ± 0.00
18.	Udad chuni (n = 1)	0.37 ± 0.00	0.36 ± 0.00
Green fodders			
19.	Lucerne (n = 8)	1.70 ± 0.04	0.27 ± 0.06
20.	Napier (n = 6)	0.72 ± 0.05	0.33 ± 0.05
21.	Green maize (n = 1)	0.71 ± 0.00	0.51 ± 0.00
22.	Green jowar (n = 9)	0.57 ± 0.04	0.31 ± 0.05
23.	Marvel grass (n = 5)	0.72 ± 0.08	0.41 ± 0.06
Dry fodders			
24.	Groundnut gotar (n = 9)	1.71 ± 0.09	0.26 ± 0.04
25.	Jowar hay (n = 12)	0.58 ± 0.06	0.33 ± 0.04
Figures in parentheses indicate the number of composite samples analyzed			

Figures in parentheses indicate the number of composite samples analyzed

3.2 Calcium and Phosphorus Status of Dairy Cattle in Surveyed Talukas of Bhavnagar District

The data on the 4% FCM, DM intake and average estimated levels of minerals supplied to dairy cattle in comparison to their calculated requirements in Bhavnagar district are presented in Table 3. The 4% FCM yield ranged from 9.93 $\pm$ 0.34 kg/d to 14.65 $\pm$ 1.14 kg/d in different talukas, averaging 11.26 $\pm$ 0.34 kg/d at the district level. The overall DMI of cattle in the district was 12.49 kg/d.

3.2.1 Ca intake

The data on the average estimated levels of calcium (Ca) intake (g/d) of dairy cattle in comparison to their calculated requirements are presented in Table 3. The overall average Ca intake of the cattle in the district was 114.50 $\pm$ 2.99 g/d. In Talaja taluka, the Ca intake in Piparala and Sankhadasar No.1 villages was 96.23 $\pm$ 4.75 and 143.02 $\pm$ 11.73 g/d, respectively with a taluka average of 123.06 $\pm$ 7.73 g/d. In Sihor taluka, the Ca intake in Kajavadar and Sanosara villages was 114.00 $\pm$ 8.85 and 129.20 $\pm$ 8.31 g/d, respectively with a taluka average of 120.73 $\pm$ 6.17 g/d. In Palitana taluka, the Ca intake in Mokhadka and Bhandariya villages was 94.29 $\pm$ 8.17 and 116.80 $\pm$ 9.03 g/d, respectively with a taluka average of 108.45 $\pm$ 6.92 g/d. In Bhavnagar taluka, the Ca intake in Bhumbhali and Bhavnagar villages was 115.96 $\pm$ 12.27 and 142.41 $\pm$ 12.82 g/d, respectively with a taluka average of 127.67 $\pm$ 8.93 g/d. In Mahuva taluka, the Ca intake in Kalsar and Kumbhan villages was 101.60 $\pm$ 6.83 and 132.92 $\pm$ 7.32 g/d, respectively with a taluka average of 116.63 $\pm$ 5.84 g/d. In Umralla taluka, the Ca intake in Dadva and Dharuka villages was 90.39 $\pm$ 4.95 and 82.85 $\pm$ 4.28 g/d, respectively with a

taluka average of 86.23 $\pm$ 3.16 g/d.

The data on Ca intake as% of requirement of dairy cattle are given in Table 3. In Talaja taluka, the values were 238.10 $\pm$ 11.96% and 258.02 $\pm$ 15.91% in Piparala and Sankhadasar No.1 villages, respectively with a taluka average of 248.83 $\pm$ 10.19%. In Sihor taluka, the values in Kajavadar and Sanosara villages were 172.39 $\pm$ 15.99% and 238.52 $\pm$ 14.56%, respectively with a taluka average of 205.45 $\pm$ 12.63%. In Palitana taluka, the Ca intake as% of requirement in Mokhadka and Bhandariya villages was 195.63 $\pm$ 19.24% and 233.92 $\pm$ 13.12%, respectively with a taluka average of 214.77 $\pm$ 12.03%. In Bhavnagar taluka, the values in Bhumbhali and Bhavnagar villages were 209.32 $\pm$ 17.11% and 288.00 $\pm$ 17.63%, respectively with a taluka average of 244.53 $\pm$ 14.18%. In Mahuva taluka, the Ca intake in Kalsar and Kumbhan villages was 203.51 $\pm$ 8.84% and 271.06 $\pm$ 10.36%, respectively with a taluka average of 235.93 $\pm$ 9.56%. In Umralla taluka, the values for Ca intake as% of requirement were 171.39 $\pm$ 5.29% and 177.65 $\pm$ 11.64% in Dadva and Dharuka villages, respectively with a taluka average of 174.66 $\pm$ 6.47%. The overall average Ca intake as% of requirement in dairy cattle of the district was 222.16 $\pm$ 5.02%, indicating a surplus relative to the calculated requirement. The Ca intake as% of requirement in dairy cattle differed highly significantly ($P = 0.000$) among talukas.

In the present study the Ca intake of cattle was more than the calculated requirement. In contrast, many studies aiming to assess the mineral status in dairy cattle indicated deficient Ca intake relative to their requirement. For example, Garg *et al.* (2009) ^[3] reported a major deficiency of calcium (Ca) among lactating dairy cattle in Junagadh district, Gujarat,

where approximately 21.15% of the animals were deficient by about 30% and only a small proportion (28.45%) had an adequate calcium supply. Meenalochani *et al.* (2015) [8] observed that calcium intake also remained below the requirement in dairy cattle of Dharmapuri district, Tamil Nadu, with deficits of 23.4%, 21.1%, 10.2%, and 8.2% during early, mid, and late lactation, and late gestation stages, respectively.

3.2.2 Phosphorus intake

The data on average estimated levels of phosphorus (P) intake as g/d of dairy cattle in comparison to their calculated requirements are presented in Table 3. The overall average P intake of the cattle in the Bhavnagar district was 41.68 ± 0.83 g/d. In Talaja taluka, the P intake in Piparala and Sankhadasar No.1 villages was 36.02 ± 1.23 and 43.26 ± 3.26 g/d, respectively with a taluka average of 40.25 ± 1.90 g/d. In Sihor taluka, the P intake in Kajavadar and Sanosara villages was 56.07 ± 5.25 and 48.39 ± 1.79 g/d, respectively with a taluka average of 52.22 ± 2.81 g/d. In Palitana taluka, the P intake in Mokhadka and Bhandariya villages was 38.18 ± 1.78 and 31.82 ± 1.46 g/d, respectively with a taluka average of 35.71 ± 1.36 g/d. In Bhavnagar taluka, the P intake in Bhumbhali and Bhavnagar villages was 40.88 ± 2.85 and 38.21 ± 1.57 g/d, respectively with a taluka average of 39.65 ± 1.62 g/d. In Mahuva taluka, the P intake in Kalsar and Kumbhan villages was 37.86 ± 2.05 and 37.80 ± 0.98 g/d, respectively with a taluka average of 38.53 ± 1.08 g/d. In Umralla taluka, the values for P intake in Dadva and Dharuka villages were 48.47 ± 1.95 and 42.11 ± 1.65 g/d, respectively with a taluka average of 45.02 ± 1.34 g/d. The data on P intake as% of requirement of dairy cattle are presented in Table 3. In Talaja taluka, the P intake in Piparala and Sankhadasar No. 1 villages was 163.99 ± 4.71

and $146.24 \pm 6.08\%$, respectively, with a taluka average of $154.42 \pm 4.24\%$. In Sihor taluka, the values for P intake as% of requirement in Kajavadar and Sanosara villages were 154.02 ± 4.65 and $173.90 \pm 7.72\%$, respectively with a taluka average of $163.96 \pm 4.87\%$. In Palitana taluka, the P intake in Mokhadka and Bhandariya villages was 149.14 ± 4.50 and $122.28 \pm 4.81\%$, respectively with a taluka average of $135.71 \pm 4.20\%$. In Bhavnagar taluka, it was 143.09 ± 4.12 and $150.98 \pm 5.13\%$ in Bhumbhali and Bhavnagar villages, respectively with a taluka average of $146.62 \pm 3.26\%$. In Mahuva taluka, the values for P intake as% of requirement in Kalsar and Kumbhan villages were 152.56 ± 7.52 and $151.20 \pm 5.96\%$, respectively with a taluka average of $151.90 \pm 4.75\%$. In Umralla taluka, the P intake in Dadva and Dharuka villages was 174.90 ± 3.26 and $170.76 \pm 4.96\%$, respectively with a taluka average of $172.73 \pm 2.99\%$. The overall average P intake of dairy cattle in the district was $153.60 \pm 1.90\%$, indicating a surplus intake relative to the calculated requirement. The P intake as% of requirement in dairy cattle differed highly significantly ($P = 0.000$) among talukas.

Similar researches conducted in this regard reported variation in P intake of dairy animals. Garg *et al.* (2009) [3] reported a major deficiency of phosphorus (P) among dairy cattle in Junagadh district of Gujarat, with more than 50% of the animals exhibiting P deficiency at levels approximately 30% below the requirement. Only a small proportion (13.72%) of dairy cattle were found to have adequate phosphorus intake. Meenalochani *et al.* (2015) [8] observed that phosphorus intake was in excess among dairy cows in Dharmapuri district, Tamil Nadu, ranging from 4.7% above the requirement during mid-lactation to as high as 59.8% during late gestation.

Table 3: Average estimated levels of minerals supplied to dairy cattle in comparison to their calculated requirements (Mean $\pm$ SE)

Talukas	Villages	4% FCM (kg/d)	DMI (kg/d)	Minerals Intake (g/d)		Minerals Requirement (g/d)		Minerals Intake (% of requirement)	
				Calcium	Phosphorus	Calcium	Phosphorus	Calcium	Phosphorus
Talaja	Piparala	8.04 ± 0.60	10.48 ± 0.34	96.23 ± 4.75	36.02 ± 1.23	42.46 ± 1.58	22.31 ± 0.82	238.10 ± 11.96	163.99 ± 4.71
	Sankhadasar no.1	12.87 ± 1.57	12.82 ± 0.89	143.02 ± 11.73	43.26 ± 3.26	57.10 ± 5.15	30.44 ± 2.73	258.02 ± 15.91	146.24 ± 6.08
	Average	10.64 ± 1.00	11.73 ± 0.55	123.06 ± 7.73	40.25 ± 1.90	50.34 ± 3.17	26.69 ± 1.70	248.83 ± 10.19^c	154.42 ± 4.24^{bc}
Sihor	Kajavadar	16.77 ± 1.95	15.50 ± 1.25	114.00 ± 8.85	56.07 ± 5.25	69.10 ± 6.68	36.82 ± 3.62	172.39 ± 15.99	154.02 ± 4.65
	Sanosara	12.54 ± 0.91	13.27 ± 0.30	129.20 ± 8.31	48.39 ± 1.79	54.65 ± 3.09	28.37 ± 1.68	238.52 ± 14.56	173.90 ± 7.72
	Average	14.65 ± 1.14	14.38 ± 0.67	120.73 ± 6.17	52.22 ± 2.81	61.87 ± 3.90	32.60 ± 2.14	205.45 ± 12.63^{ab}	163.96 ± 4.87^{cd}
Palitana	Mokhadka	10.16 ± 0.76	11.29 ± 0.52	94.29 ± 8.17	38.18 ± 1.78	49.95 ± 2.65	26.03 ± 1.46	195.63 ± 19.24	149.14 ± 4.50
	Bhandariya	10.57 ± 0.74	11.44 ± 0.65	116.80 ± 9.03	31.82 ± 1.46	51.84 ± 2.56	27.20 ± 1.37	233.92 ± 13.12	122.28 ± 4.81
	Average	10.37 ± 0.52	11.36 ± 0.41	108.45 ± 6.92	35.71 ± 1.36	50.90 ± 1.82	26.62 ± 0.99	214.77 ± 12.03^{bc}	135.71 ± 4.20^a
Bhavnagar	Bhumbhali	12.12 ± 1.29	13.61 ± 0.93	115.96 ± 12.27	40.88 ± 2.85	54.22 ± 2.82	28.46 ± 1.55	209.32 ± 17.11	143.09 ± 4.12
	Bhavnagar	9.93 ± 0.76	12.07 ± 0.48	142.41 ± 12.82	38.21 ± 1.57	49.29 ± 2.79	25.72 ± 1.49	288.00 ± 17.63	150.98 ± 5.13
	Average	11.14 ± 0.80	12.91 ± 0.56	127.67 ± 8.93	39.65 ± 1.62	52.01 ± 2.01	27.23 ± 1.10	244.53 ± 14.18^c	146.62 ± 3.26^{ab}
Mahuva	Kalsar	10.00 ± 0.53	11.61 ± 0.42	101.60 ± 6.83	37.86 ± 2.05	49.52 ± 1.92	25.96 ± 1.03	203.51 ± 8.84	152.56 ± 7.52
	Kumbhan	9.86 ± 0.44	11.87 ± 0.21	132.92 ± 7.32	37.80 ± 0.98	48.80 ± 1.53	25.28 ± 0.86	271.06 ± 10.36	151.20 ± 5.96
	Average	9.93 ± 0.34	11.73 ± 0.24	116.63 ± 5.84	38.53 ± 1.08	49.17 ± 1.22	25.63 ± 0.66	235.93 ± 9.56^{bc}	151.90 ± 4.75^{bc}
Umralla	Dadva	12.58 ± 1.20	14.21 ± 0.61	90.39 ± 4.95	48.47 ± 1.95	52.70 ± 2.71	27.79 ± 1.48	171.39 ± 5.29	174.90 ± 3.26
	Dharuka	9.56 ± 0.74	12.24 ± 0.45	82.85 ± 4.28	42.11 ± 1.65	47.58 ± 2.20	24.87 ± 1.19	177.65 ± 11.64	170.76 ± 4.96
	Average	11.00 ± 0.75	13.18 ± 0.42	86.23 ± 3.16	45.02 ± 1.34	50.03 ± 1.78	26.27 ± 0.97	174.66 ± 6.47^a	172.73 ± 2.99^d
District	Average	11.26 ± 0.34	12.49 ± 0.22	114.50 ± 2.99	41.68 ± 0.83	52.32 ± 1.05	27.47 ± 0.57	222.16 ± 5.02	153.60 ± 1.90
P value								0.000	0.000

a, b, c, d Means with different superscripts within same column differ significantly ($p < 0.05$)

3.3 Occurrence of Metabolic and Reproductive Disorders in Cattle

Metabolic and reproductive disorders significantly affect the health, productivity and reproductive performance of dairy

cattle, leading to reduced milk yield and extended calving intervals, thereby causing economic losses. Data on the occurrence of these disorders in dairy cattle of Bhavnagar district were systematically collected through a structured

questionnaire and personal interviews with farmers, and the results are presented in Table 4.

The occurrence of metabolic and reproductive disorders in dairy cattle was reported by the respondents from different talukas of Bhavnagar district. About 35.00% of respondents reported the occurrence of one or more metabolic disorders such as ketosis, acidosis, milk fever, etc. in their cattle, whereas 65.00% did not observe any such problems in their animals. Milk fever and ketosis were observed in only 13.33% and 7.50% of animals, respectively. The difference among respondents across the six talukas was statistically significant ($p < 0.05$).

The incidence of mastitis was reported by 17.50% of respondents, while the majority (82.50%) did not report this disorder in their cattle.

Reproductive disorders were found to be less prevalent than metabolic disorders, with 30.00% of respondents reporting reproductive issues in their cattle, while 70.00% did not encounter any such problems. Among these, retention of placenta, anoestrus and repeat breeding were reported by 10.00, 1.67 and 23.33% of respondents, respectively. The relatively higher occurrence of repeat breeding indicates potential for enhancing reproductive efficiency through improved management practices in the surveyed dairy cattle.

Table 4: Distribution of the dairy cattle owners according to occurrence of metabolic and reproductive disorders in cattle

Sr. No.	Practices	Talaja (n = 20)	Sihor (n = 20)	Palitana (n = 20)	Bhavnagar (n = 20)	Mahuva (n = 20)	Umralla (n = 20)	Overall (n = 120)	Overall (%)
1	Occurrence of metabolic disorders								
	Yes	4	12	7	9	5	5	42	35.00
	No	16	8	13	11	15	15	78	65.00
	χ^2	10.1099 (P = 0.0722)							
2	Occurrence of milk fever								
	Yes	1	7	4	2	1	1	16	13.33
	No	19	13	16	18	19	19	104	86.67
	χ^2	12.6923* (P = 0.0264)							
3	Occurrence of ketosis								
	Yes	1	1	0	5	1	1	9	7.50
	No	19	19	20	15	19	19	111	92.50
	11.1712* (P = 0.0481)								
4	Occurrence of mastitis								
	Yes	2	6	3	4	3	3	21	17.50
	No	18	14	17	16	17	17	99	82.50
	χ^2	3.2900 (P = 0.6554)							
5	Occurrence of reproductive disorder								
	Yes	9	7	5	5	6	4	36	30.00
	No	11	13	15	15	14	16	84	70.00
	χ^2	3.8095 (P = 0.5772)							
6	Occurrence of retention of placenta								
	Yes	0	4	3	0	3	2	12	10.00
	No	20	16	17	20	17	18	108	90.00
	χ^2	7.7778 (P = 0.1689)							
7	Occurrence of anoestrous								
	Yes	0	1	0	0	1	0	2	1.67
	No	20	19	20	20	19	20	118	98.33
	χ^2	4.0678 (P = 0.5397)							
8	Occurrence of repeat breeding								
	Yes	9	6	2	5	3	3	28	23.33
	No	11	14	18	15	17	17	92	76.67
	χ^2	9.3168 (P = 0.0971)							

* $p < 0.05$

4. Conclusions

Calcium and phosphorus intake in cattle was sufficient when compared to their requirements, as the district's feed and fodder sources generally contained these minerals above the critical limit, ensuring an adequate supply of these minerals. Therefore, the occurrence of metabolic and reproductive disorders remained low under the existing feeding practices.

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