
AN INVESTIGATION OF NEONATAL CALF MANAGEMENT PRACTICES IN KERALA

**Manju Sasidharan¹, Kannan A²., Harikumar, S³, Raji, K⁴.,
Shyama, K⁵.and Sunanda, C⁶**

¹Associate Professor, Base Farm, Kolahalamedu, KVASU.

^{2,3}Associate Professor, Department of Livestock Production Management,

⁴Professor, Department of Veterinary Physiology, ⁵Professor, Department of Animal Nutrition, CVAS, Mannuthy, Thrissur, KVASU, ⁶Statistician

Correspondence Email: manju@kvasu.ac.in

ABSTRACT

A survey was conducted in 350 selected dairy farms on neonatal and early calf feeding and health management strategies followed by dairy farmers in five different agro-climatic zones of Kerala through observations, discussions, interviews and well-designed questionnaire. The selected farms were categorised into small (1-2 cows), medium (3- 10 cows) and large (more than 10 cows). In calf management, 94.3 per cent farms followed natural suckling. Disinfecting the umbilicus of newborn calves was done in 63.7 per cent farms. Colostrum feeding within one hour after calving was practiced by 82.6 per cent farmers but they were unaware of the quantity and quality of colostrum consumed by the calf. Only 18 per cent of the farmers fed their calves with calf starter up to three months of age while 56.57 per cent fed the calves with adult cattle feed. Birth weight was assessed by

18 per cent farmers only. Eighty-eight per cent of farmers allowed natural suckling. While 52.29 per cent farmers gave one quarter of udder without milking, 19.4 per cent fed milk at the rate of one tenth of body weight. Milk was fed twice a day by 44.29 per cent farms. Majority of farmers (56.57%) fed concentrates or pellets for adult cow to calves whereas 31.14 per cent fed calf starter to calves. Drinking water was provided twice daily by 51.14 per cent of farmers. One third of farmers gave water to calves only after a month. Majority of farmers (53.14%) weaned calves when they were capable of eating 0.75-1 kg concentrate whereas 29.71 per cent weaned calves when they attained 3 months of age. The survey highlighted the need for educating farmers about colostrum feeding and feeding of calf starter.

INTRODUCTION

The cattle population of Kerala was 13.42 lakh heads according to 20th livestock

census report of India. The state's total requirement of milk per day in 2020-21 was 33.37 lakh MT but the production was only 25.34 lakh MT resulting in an import of 2.51 lakh MT per day. This also necessitated a need for increase in milk production by increasing the production potential of milch animals by keeping healthy and sizable herds. It could be achieved only by keeping the dairy industry's future herd healthy by raising calves under good management practices for replacement heifers. Although a large number of calves are born every year, the percentage of calves reared for replacement is very low as the farmers are unaware of scientific calf management practices and the economic constraints in raising the unproductive calves with no immediate returns.

Calf hood can be considered as the most sensitive period in the life of cattle. Rearing of dairy heifers invites a financial input of 20 per cent of farm's expenditure. Provision of restricted amount of milk may result in calves receiving inadequate nutrition. The welfare and productivity of dairy cow is determined by anatomical and physiological changes it undergoes during the pre-weaning period (Van Amburgh *et al.*, 2019). Conducting surveys helps in understanding present practices in calf rearing and identifies areas where scientific recommendations are poorly used,

highlighting the constraints associated with calf management. This will also detect areas where scientific knowledge is poorly practiced and will help us to understand the practices we need to focus on in order to improve calf welfare. Hence this study was designed to evaluate the existing calf rearing practices in different agro-climatic zones of Kerala and suggest management protocols to reduce calf morbidity and mortality thereby improving health and welfare of calves. It can also suggest changes to the present industry standards and can make new recommendations.

MATERIALS AND METHODS

A survey was conducted in 350 selected dairy farms in five different agro-climatic zones of Kerala [NARP (ICAR), 1989], namely south, central, north, wetland and highland on calf rearing practices followed by dairy farmers through observations, discussions, interviews and well-designed questionnaire. The questionnaire was structured to give the neonatal and early feeding and health management practices of calves up to three months of age. The selected farms were categorised into small (1-2 cows), medium (3-10 cows) and large (more than 10 cows). The sample size for each category of farm was decided by probability proportion to size technique (George, 2016). Collected data were digitised using Microsoft

Excel. Preliminary analysis was done by using percentage analysis. Neonatal calf management practices among different zones and also feeding practices among different categories of farms were compared using Chi square test for independence. P-value less than 0.05 was considered statistically significant. All the statistical analysis was done by using SPSS version 24.0

RESULTS AND DISCUSSION

Neonatal Calf Management Practices of Dairy Farmers in Kerala

The various neonatal calf management practices followed by different categories of dairy farmers and in different zones in Kerala were presented in Table 1 and Table 2. Immediately after calving, the nostrils and nasal passage of new born calves were cleared by 91.7 per cent farmers. Among farmers in highland, only 76.1 per cent farmers cleared the nostrils and nasal passage of calves immediately after birth. Majority of farmers (63.7 %) disinfected the navel of the new born calf. In 36.3 per cent of the farms surveyed, disinfection of umbilicus was not followed despite scientific recommendations. Early disinfection helps in faster drying up of the umbilicus which reduces infections so that calf mortality can be decreased (Vasseur *et al.*, 2010). It also helps to improve the

welfare of young ones by reducing pain and distress due to various diseases. The percentage of farms disinfecting navel was much less (63.7%) than the reports of Stanek *et al.* (2014) in Czech Republic, where 75 per cent farmers disinfected navel while Patel and Sabapara (2019) in a survey of Gujarat reported only 14-20 per cent farmers disinfecting the navel. Better calf management practices in Czech Republic had resulted in a reduced mortality rate of 15 percent whereas in Gujarat it was over 30 per cent.

Proper management of colostrum feeding is essential for calves' survival, health and future productivity. Majority (82.6%) of farmers fed colostrum within one hour. The dairy farmers of Kerala are much aware of the necessity of early colostrum feeding than the farmers of Gujarat where only 67.9 per cent farms only fed colostrum within one hour (Sabapara *et al.* 2010). 94.3 per cent of calves were allowed to feed directly from the dam. Proper management of colostrum feeding is essential for calves' survival health and future productivity. Though a large proportion of dairy farmers in Kerala gave colostrum to calves within 30 minutes to one hour as per scientific recommendations, the exact quantity and quality of colostrum was not assessed by farmers. Also the neonatal calves were unable to suck colostrum

from the oedematous teats which reduced the quantity of colostrum intake. This may result in failure of transfer of passive immunity (FTPI) (Abuelo *et al.*, 2019). Higher the quality of colostrum faster will be the establishment of defence mechanism and healthier intestinal environment (Yang *et al.*, 2015). Timely and adequate intake of colostrum and transition milk protects calves from various infections (Zolova *et al.*, 2022). Dairy farmers frequently do not know the concentration of IgG in the colostrum being fed and it is recommended that calves be fed 10 per cent to 12 per cent of their body weight of colostrum at first feeding (Godden, 2008). Since 82 per cent farmers are not weighing the calves or assessing their body weight, it becomes difficult for the farmer to decide the quantity of colostrum to be fed. Again, the practice of allowing calf to suck colostrum directly from the udder makes measuring quantity of colostrum impossible.

The birth weights of calves were assessed by 18 per cent farmers only. There existed significant difference between highland and other zones ($p < 0.001$) in the neonatal calf management practices followed (Table 2). The proportion of farmers of highland following scientific practices was significantly lower than the other zones. Majority of farmers fed colostrum to calves within 30 minutes and

allowed the calves to suck directly from the udder. Less than 10 per cent farmers used nipple and bottle feeders to feed the new born calves. Disinfecting the navel with Tincture Iodine was done by 63.7 per cent farmers. There was no significant difference between zones in the method of colostrum feeding and disinfection of navel cord. When the different categories of farms were considered, large sized farms followed better scientific practices in calf management than medium and small farms.

Early separation of calves from their dam is preferable, as the longer the calf remains with its mother, the more stressful breaking their bond becomes (Flower and Weary, 2001). Researchers have demonstrated a higher rate of FPTI in calves that were allowed natural suckling of colostrum compared with those given artificial supplementation. Calves that were not hand fed developed chances of agammaglobulinaemia three times than those calves supplemented with colostrum artificially (Vogels *et al.*, 2013). The results of the study identified the improvements required for removal of calf from the dam and feeding adequate volumes of colostrum and to practice assessment of colostrum quality. The survey highlighted the need for further educating farmers about colostrum feeding and management.

Table 1. Neonatal calf management practices of dairy farmers in Kerala

Practices	Response	Category of farm			Overall (350)
		Small (n=244)	Medium (n=90)	Large (n=16)	
Clearing the nostrils and nasal passage immediately after calving	Yes	219 (89.8)	86 (95.6)	16 (100)	321 (91.7)
	No	25 (10.2)	4 (4.4)	0 (0)	29 (8.3)
Weighing the calf or assessing its body size at birth	Not taking weight	202 (82.8)	77 (85.6)	8 (50)	287 (82)
	<25 kg	21 (8.6)	5 (5.6)	0 (0)	26 (7.4)
	25-30 kg	19 (7.8)	6 (6.7)	6 (37.5)	31 (8.9)
	Above 30 kg	2 (0.8)	2 (2.2)	2 (12.5)	6 (1.7)
Time taken for first colostrum feeding	No response from farmer	12 (4.9)	1 (1.1)	0 (0)	13 (3.7)
	Less than 30 minutes	125 (51.2)	61 (67.8)	12 (75)	198 (56.6)
	Up to one hour	66 (27)	21 (23.3)	4 (25)	91 (26)
	More than one hour	13 (5.3)	1 (1.1)	0 (0)	14 (4)
	Allows the calf to suck colostrum as and when the calf wants	28 (11.5)	6 (6.7)	0 (0)	34 (9.7)
Method of colostrum (first milk) feeding	Directly from the udder	235 (96.3)	81 (90)	14 (87.5)	330 (94.3)
	Bottle and nipple feeding	9 (3.7)	9 (10)	2 (12.5)	20 (5.7)
Disinfecting the umbilicus of calves immediately after calving with Tincture Iodine	Yes	151 (61.9)	60 (66.7)	12 (75)	223 (63.7)
	No	93 (38.1)	30 (33.3)	4 (25)	127 (36.3)

Values in the brackets are percentages within each category farms

Feeding Practices of Calves in Different Categories of Farms in Kerala

The milk feeding practices followed by dairy farmers for rearing calves is given in Table 3. In majority of farms (88%) the calves were allowed to suckle milk from their dams. Pail feeding and nipple feeding were followed in 12.18 per cent farms only. The proportion of farms following pail feeding and nipple feeding were

significantly higher in large farms followed by medium and small farms. As most of the farms followed natural suckling, 52.29 per cent farmers gave one quarter of the udder without milking for suckling by the calves. In 19.14 per cent farms milk at the rate of one-tenth of the calves' body weight was given for feeding. About 28.57 per cent did not follow any of these scientific protocols. There was no significant difference in the

Table 2. Neonatal calf management practices of dairy farmers in different Zones

Practices	Response	Zone					χ^2 Value (P-value)
		South (n=73)	Central (n=70)	North (n=73)	Wetland (n=67)	High- land (n=67)	
Clearing the nostrils and nasal passage immediately after calving	Yes	72 (98.6)	68 (97.1)	69 (94.5)	61 (91)	51 (76.1)	29.55** (<0.001)
	No	1 (1.4)	2 (2.9)	4 (5.5)	6 (9)	16 (23.9)	
Weighing the calf or assessing its body size at birth	Yes	18 (24.7)	30 (42.9)	8 (11)	4 (6)	3 (4.5)	49.82** (<0.001)
	No	55 (75.3)	40 (57.1)	65 (89)	63 (94)	64 (95.5)	
Time taken for feeding colostrum	No response from farmers	3 (4.1)	0 (0)	3 (4.1)	5 (7.5)	2 (3)	
	Less than 30 minutes	27 (37)	64 (91.4)	29 (39.7)	43 (64.2)	35 (52.2)	
	Up to one hour	33 (45.2)	4 (5.7)	26 (35.6)	11 (16.4)	17 (25.4)	
	More than one hour	6 (8.2)	0 (0)	4 (5.5)	1 (1.5)	3 (4.5)	
	Allows the calf to suck colostrum as and when the calf wants	4 (5.5)	2 (2.9)	11 (15.1)	7 (10.4)	10 (14.9)	
Method of colostrum (first milk) feeding	Directly from the udder	70 (95.9)	68 (97.1)	72 (98.6)	64 (95.5)	56 (83.6)	-
	Bottle and nipple feeding	3 (4.1)	2 (2.9)	1 (1.4)	3 (4.5)	11 (16.4)	
Disinfecting the umbilicus of calves immediately after calving with Tincture Iodine	Yes	44 (60.3)	41 (58.6)	52 (71.2)	50 (74.6)	36 (53.7)	9.30 ^{ns} (0.054)
	No	29 (39.7)	29 (41.4)	21 (28.8)	17 (25.4)	31 (46.3)	

Values in the brackets are percentages within each category farms

** Significant at 0.01 level; ns non-significant

quantity of milk given among the different category of farms. Calves were fed milk two times a day by 44.29 per cent farmers, three times a day by 38.29 per cent. Supplements

like fish oil, vitamins and minerals were given by 44 per cent farmers upto three months. Milk feeding was continued up to three months by only 39.71 per cent farmers.

The method of milk feeding practices followed in different zones varied significantly. Farmers of central zone practiced pail feeding (35.71%) while it was negligible in other zones. The quantity, frequency and duration of milk feeding also varied significantly among zones. The farmers in central zone followed scientific protocols than other zones. Farmers of highland (10%) practiced bottle feeding. In north zone, wetland and highland, the frequency and duration of feeding was more. Farmers of central zone practiced pail feeding (35.71%) while it was negligible in other zones. The quantity, frequency and duration of milk feeding also varied significantly among zones. The farmers in central zone followed scientific milk feeding practices than other zones.

There existed significant difference ($P < 0.01$) between the different category of farms on the method of milk feeding. Natural suckling was practiced more by small farmers (90.98 %). While in large farms 25 per cent followed pail feeding and 12.5 per cent did bottle feeding. The methods of milk feeding and weaning practices followed by majority of farms in central zone were as per KVASU (2022). These were different from the feeding methods followed in other countries (Hotzel *et al.*, 2014) where bottle feeding, bucket feeding and suckling nurse cow method were practiced in majority of farms. The

quantity of milk fed in most of the dairy farms in Kerala is one-tenth of body weight of calves. This quantity is less than the reports of Vassuer *et al.* (2010), Khan *et al.* (2011), Hotzel *et al.* (2014) and Johnson *et al.* (2021). The health, productivity, growth and welfare of commercially grown heifers are affected due to insufficient supply of nutrients to calves in pre weaning period (Johnson *et al.*, 2018). Also milk contains biologically active factors that are beneficial for rumen development (Diao *et al.*, 2019). The various studies by Vassuer *et al.* (2010), Khan *et al.* (2011), Hotzel *et al.* (2014) and Johnson *et al.* (2021) suggest that the quantity of milk feeding needs to be increased than the present practice of feeding milk at the rate of one-tenth of body weight or below during the pre-weaning period.

Feeding management practices of concentrates to calves in dairy farms of Kerala is presented in Table 4. Majority of farmers (56.57%) fed concentrates or pellets for adult cow to the calves. About 31.14 per cent farmers fed calf starter to the calves. Most of the farmers were not aware about the importance of calf starter. The knowhow on calf starter was more for farmers in central zones followed by wetland. Forty per cent farmers of this zone fed calf starter from second week onwards and majority of farmers of wetland and south zone provided feed supplements to calves.

A great proportion of farmers (54.86%) did not respond about the duration of calf starter feeding. Only 18 per cent farms fed calf starter up to three months. Majority (54.57%) farmers gave concentrates after 21 days and feed supplements were given by 54.29 per cent farmers. Very few farmers (10.86%) prepared concentrates of their own and fed the calves.

Majority of farmers (54.57 %) of Kerala gave concentrates to calves only after 21 days. Research findings by Heinrichs and Jones (2002) showed that in order to stimulate rumen development and early weaning calves should be offered a palatable calf starter by three days of age. The amount of solid feed intake can be continued as the primary measure for determining weaning age (Hulbert and Moisa, 2016). Calves require fermentable carbohydrates provided by starter for rumen development including changes in the epithelium of fore stomach (Drackley, 2008). The results show that only 36.57 per cent farmers know about calf starter. The availability of calf starter in different zones varies. Farmers of central zone 65.71 per cent know about calf starter. Extension work has to be done in all other zones to make the farmers aware of the need for feeding calf starter at an earlier age. The stockists and retailers are not selling calf starter and hence the farmers find it difficult to procure the same. Co-operative societies

are more cow-centred and aim in production of milk and hence feeding adult cattle. While educating farmers, the co-operative societies should also be encouraged to stock calf starter. Government schemes must be planned to supply calf starter at subsidised rate.

Roughage feeding and watering management practices in dairy farms of Kerala are presented in Table 5. In majority (62.57%) of farmers, roughage feeding was started when the calves were 21 days old. Only a few farms (5.14%) fed roughages to calves within one week. Water was provided twice daily or made available throughout the day. Very few farms provided water from first week onwards and were seen in 47.14 per cent farms of central zone. In all other zones majority of farmers gave water from second week onwards.

Lack of forage in the calf's diet may affect rumen development. Calves' behaviour like nibbling the bedding material can be an indicator of when forage should be included in the ration. Results of this work shows that most (62.57 %) of the farmers started feeding roughages only by 21 days. For better rumen development large particles should reach rumen and rubbing (physical stimulation) of these particles against rumen wall prevents hyperkeratosis of rumen papillae. This helps in better absorptive capacity of

Table 3. Milk feeding practices of calves among different categories of farms

Practices	Response	Category of farm			Overall (350)	χ^2 Value (P-value)
		Small (n=244)	Medium (n=90)	Large (n=16)		
Method of milk feeding practiced	Natural suckling	222 (90.98)	76 (84.44)	10 (62.5)	308 (88)	13.925** (0.008)
	Pail feeding	17 (6.97)	9 (10)	4 (25)	30 (8.57)	
	Bottle feeding	5 (2.05)	5 (5.56)	2 (12.5)	12 (3.43)	
Quantity of milk fed to calves	One quarter is left without milking	129 (52.87)	48 (53.33)	6 (37.5)	183 (52.29)	2.078 ^{ns} (0.721)
	One-tenth of body weight	46 (18.85)	16 (17.78)	5 (31.25)	67 (19.14)	
	Others	69 (28.28)	26 (28.89)	5 (31.25)	100 (28.57)	
Number of times in a day the calf is given milk	Once	4 (1.64)	2 (2.22)	0 (0)	6 (1.71)	-
	Two times	101 (41.39)	45 (50)	9 (56.25)	155 (44.29)	
	Three times	99 (40.57)	29 (32.22)	6 (37.5)	134 (38.29)	
	Others	40 (16.39)	14 (15.56)	1 (6.25)	55 (15.71)	
Supplements given to the calf	Fish oil/ vitamins & minerals	109 (44.67)	35 (38.89)	10 (62.5)	154 (44)	3.221 ^{ns} (0.200)
	No supplements	135 (55.33)	55 (61.11)	6 (37.5)	196 (56)	
How long milk feeding is continued	≤ 1 month	14 (5.74)	3 (3.33)	1 (6.25)	18 (5.14)	6.390 ^{ns} (0.384)
	Upto 2 month	36 (14.75)	20 (22.22)	2 (12.5)	58 (16.57)	
	Upto 3 month	92 (37.7)	40 (44.44)	7 (43.75)	139 (39.71)	
	Above 3 month	102 (41.8)	27 (30)	6 (37.5)	135 (38.57)	

Values in the brackets are percentages within each category farms** Significant at 0.01 level; *Significant at 0.05 level; ns non-significant

papillae (Heinrichs and Jones, 2002). Feeding practices of calves in Kerala has to be changed by including calf starter and roughages in their ration at an early age of 3-7 days.

Nearly eight per cent farmers did not respond about providing drinking water to calves. At one week age only 28.29 per cent farms provided water for calves. One third

of farmers gave water to calves only after one month. In most of the (51.14%) farms drinking water was provided twice daily. Water was supplied through automatic drinkers in very few farms (5.14%) and in 33.43 per cent farms provision of drinking water was given throughout the day.

About 80 per cent farmers did not respond when asked about the frequency of

Table 4. Concentrate feeding practices of calves among different categories of farms

Practices	Response	Category of farm			Overall (350)	χ^2 Value (P-value)
		Small (n=244)	Medium (n=90)	Large (n=16)		
Type of concentrate feed given to calves	Pellets same as the cow	150 (61.48)	41 (45.56)	7 (43.75)	198 (56.57)	-
	Calf starter	61 (25)	42 (46.67)	6 (37.5)	109 (31.14)	
	Concentrate mixture prepared in the farm	29 (11.89)	6 (6.67)	3 (18.75)	38 (10.86)	
	Other feeds	4 (1.64)	1 (1.11)	0 (0)	5 (1.43)	
Whether farmer knows about calf starter?	Yes	81 (33.2)	38 (42.22)	9 (56.25)	128 (36.57)	5.108 ^{ns} (0.078)
	No	163 (66.8)	52 (57.78)	7 (43.75)	222 (63.43)	
How long calf starter was fed?	No response	141 (57.79)	41 (45.56)	10 (62.5)	192 (54.86)	-
	1 month	31 (12.7)	13 (14.44)	4 (25)	48 (13.71)	
	2 months	36 (14.75)	7 (7.78)	0 (0)	43 (12.29)	
	3 months	34 (13.93)	27 (30)	2 (12.5)	63 (18)	
	Above 3 months	2 (0.82)	2 (2.22)	0 (0)	4 (1.14)	
When did concentrate feeding start?	0	50 (20.49)	13 (14.44)	1 (6.25)	64 (18.29)	-
	Within one week	11 (4.51)	2 (2.22)	0 (0)	13 (3.71)	
	14 days	36 (14.75)	28 (31.11)	4 (25)	68 (19.43)	
	21 days	139 (56.97)	43 (47.78)	9 (56.25)	191 (54.57)	
	One month or above	8 (3.28)	4 (4.44)	2 (12.5)	14 (4)	
Whether feed supplements are given?	Yes	137 (56.15)	46 (51.11)	7 (43.75)	190 (54.29)	1.422 ^{ns} (0.491)
	No	107 (43.85)	44 (48.89)	9 (56.25)	160 (45.71)	

Values in the brackets are percentages within each category farms** Significant at 0.01 level; *Significant at 0.05 level; ns non-significant

providing drinking water. While the calves are milk fed, the farmers were unaware of the need of drinking water for their growth and development. When no fresh water was offered starter intake and weight gain was reduced. About 51.14 per cent farmers restricted the frequencies of providing water to two or three times a day. Again,

providing clean fresh drinking water helps in reducing the thermal stress in calves (Maiti *et al.*, 2014). Drackley (2008) opined that calves should have free access to fresh, clean water from birth. Increase in water intake resulted in increased concentrate and roughage intake leading to increase in body weight.

Table 5. Roughage feeding and watering of calves among different categories of farms

Practices	Response	Category of farm			Overall (350)
		Small (n=244)	Medium (n=90)	Large (n=16)	
When does roughage feeding start?	Not responded	23 (9.43)	2 (2.22)	2 (12.5)	27 (7.71)
	Within one week	15 (6.15)	3 (3.33)	0 (0)	18 (5.14)
	14 days	49 (20.08)	22 (24.44)	4 (25)	75 (21.43)
	21 days	151 (61.89)	59 (65.56)	9 (56.25)	219 (62.57)
	One month or above	6 (2.46)	4 (4.44)	1 (6.25)	11 (3.14)
Frequency of providing drinking water	Not responded	20 (8.2)	5 (5.56)	0 (0)	25 (7.14)
	Always	86 (35.25)	24 (26.67)	7 (43.75)	117 (33.43)
	Once daily	2 (0.82)	0 (0)	0 (0)	2 (0.57)
	Twice daily	115 (47.13)	59 (65.56)	5 (31.25)	179 (51.14)
	Thrice daily	8 (3.28)	1 (1.11)	0 (0)	9 (2.57)
	Using automatic drinker	13 (5.33)	1 (1.11)	4 (25)	18 (5.14)
From which day onwards drinking water was given to calves?	Not responded	22 (9.02)	6 (6.67)	0 (0)	28 (8)
	Within one week	11 (4.51)	2 (2.22)	0 (0)	13 (3.71)
	1 week	67 (27.46)	30 (33.33)	2 (12.5)	99 (28.29)
	2 weeks	64 (26.23)	30 (33.33)	2 (12.5)	96 (27.43)
	1 month	73 (29.92)	22 (24.44)	7 (43.75)	101 (28.86)

Values in the brackets are percentages within each category farms

Rationale Behind Weaning from Milk to Solid Feed

Age was considered as the main criteria for weaning of calves by 53.14 per cent of farms (Stanek *et al.*, 2014). Early weaning can make calf rearing economically feasible by significantly lowering the cost of production, and cross-bred calves can be weaned at four weeks of age without any appreciable variation in growth parameters (Rani *et al.*, 2007). Calves were weaned at three months of age by majority farmers of Kerala while Yanar *et al.* (2015) had suggested weaning of crossbred calves at two months of age. This weaning age was earlier than the age followed by dairy

farmers in Kerala. Early weaning at seven weeks may affect rumen development (Schwarzkopf *et al.*, 2022).

CONCLUSION

The study revealed the common colostrum management and calf rearing practices in Kerala. Since most of the farmers allowed direct suckling from the udder, the practices like harvesting colostrum and measuring their quality was not practiced in any of the farms. Many of the farms in Kerala did not conform to protocol of package of practices KVASU (2022), the farmers were unable to ensure that calves received adequate good quality colostrum as they are relying on calf

suckling from the dam. As a result, FTPI can happen. Most of the farmers did not remove the calves from the cow as the milk feeding was by natural suckling. A new milk feeding and weaning strategy has to be designed for calves which is economically viable and satisfying the development and welfare of calves. Projects have to be implemented for supply of milk replacers at subsidised rate. Farmers urgently need extension services on scientific calf rearing practices such as disinfecting the navel cord, providing colostrum and milk as per body weight, provision of milk replacer, calf starter, deworming and vaccinations.

ACKNOWLEDGEMENT

The authors place their gratitude to Department of Animal Husbandry, Kerala for funding the research and Kerala Veterinary and Animal Sciences University for the facilities provided.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest with respect to findings of the study.

REFERENCES

- Abuelo, A., Havrlant, P., Wood, N., & Hernandez-Jover, M. (2019). An investigation of dairy calf management practices, colostrum quality, failure of transfer of passive immunity, and occurrence of enteropathogens among Australian dairy farms. *Journal of Dairy Science*, 102(9), 8352–8366. <https://doi.org/10.3168/jds.2019-16291>
- Diao, Q., Zhang, R., & Fu, T. (2019). Review of strategies to promote rumen development in calves. *Animals*, 9(9), 490. <https://doi.org/10.3390/ani9090490>
- Drackley, J. K. (2008). Calf nutrition from birth to breeding. *Veterinary Clinics of North America: Food Animal Practice*, 24(1), 55–86. <https://doi.org/10.1016/j.cvfa.2007.10.005>
- Flower, F. C., & Weary, D. M. (2001). Effects of early separation on the dairy cow and calf—Separation at 1 day and 2 weeks after birth. *Applied Animal Behaviour Science*, 70(4), 275–284. [https://doi.org/10.1016/S0168-1591\(00\)00164-7](https://doi.org/10.1016/S0168-1591(00)00164-7)
- George, S. (2016). *Economics of dairy farming systems of Kerala* (Doctoral thesis). Kerala Veterinary and Animal Sciences University.
- Godden, S. (2008). Colostrum management for dairy calves. *Veterinary Clinics of North America: Food Animal Practice*, 24(1), 19–39. <https://doi.org/10.1016/j.cvfa.2007.10.005>
- Heinrichs, A. J., & Jones, C. M. (2002). *Feeding the newborn dairy calf*

- (No. 311). Penn State College of Agricultural Sciences.
- Hotzel, M. J., Longo, C., Balcão, L. F., Cardoso, C. S., & Costa, J. H. C. (2014). A survey of management practices that influence performance and welfare of dairy calves reared in southern Brazil. *PLOS ONE*, 9(8), e104214. <https://doi.org/10.1371/journal.pone.0104214>
- Hulbert, L. E., & Moisés, S. J. (2016). Stress, immunity, and the management of calves. *Journal of Dairy Science*, 99(4), 3199–3216. <https://doi.org/10.3168/jds.2015-10183>
- Johnson, K. F., Chancellor, N., Burn, C. C., & Wathes, D. C. (2018). Analysis of pre-weaning feeding policies and other risk factors influencing growth rates in calves on 11 commercial dairy farms. *Animal*, 12(7), 1413–1423. <https://doi.org/10.1017/S1751731117003146>
- Khan, M. A., Weary, D. M., & von Keyserlingk, M. A. G. (2011). Invited review: Effects of milk ration on solid feed intake, weaning, and performance in dairy heifers. *Journal of Dairy Science*, 94(3), 1071–1081. <https://doi.org/10.3168/jds.2010-3733>
- Kerala Veterinary and Animal Sciences University. (2022). *Package of practices recommendations*. Kerala Veterinary and Animal Sciences University.
- Maiti, S., Jha, S. K., Garai, S., Nag, A., Chakravarty, R., Kadian, K. S., Chandel, B. S., Datta, K. K., & Upadhyay, R. C. (2014). Adaption strategies followed by the livestock rearers of coastal Odisha and West Bengal to cope up with climate change. *Indian Journal of Animal Sciences*, 84(6), 652–659.
- National Agricultural Research Project. (1989). *Status report*. Kerala Agricultural University.
- Patel, P. C., & Sabapara, G. P. (2019). Calf rearing practices followed by dairy farmers in Valsad district of Gujarat. *Indian Journal of Animal Production and Management*, 35(3–4), 85–90.
- Rani, K. J., Ganga Devi, P., Mercy, A. D., Syama, K., & Sujatha, K. S. (2007). Effect of restricted milk feeding on the performance of crossbred calves. *Indian Journal of Animal Nutrition*, 24(2), 130–132.
- Schwarzkopf, S., Kinoshita, A., Hüther, L., Salm, L., Kehraus, S., Südekum, K. H., Huber, K., Dänicke, S., & Frahm, J. (2022). Weaning age influences indicators of rumen function and development in female Holstein calves. *BMC Veterinary Research*,

- 18(1), 1–15. <https://doi.org/10.1186/s12917-022-03194-5>
- Stanek, S., Zink, V., Doležal, O., & Štolc, L. (2014). Survey of preweaning dairy calf-rearing practices in Czech dairy herds. *Journal of Dairy Science*, 97(7), 3973–3981. <https://doi.org/10.3168/jds.2013-7573>
- Sabapara, G. P., Desai, P. M., Kharadi, V. B., Saiyed, L. H., & Singh, R. R. (2010). Housing and feeding management practices of dairy animals in the tribal area of South Gujarat. *Indian Journal of Animal Sciences*, 80(11), 1022–1027.
- Van Amburgh, M. E., Soberon, F., Meyer, M. J., & Molano, R. A. (2019). Symposium review: Integration of postweaning nutrient requirements and supply with composition of growth and mammary development in modern dairy heifers. *Journal of Dairy Science*, 102(4), 3692–3705. <https://doi.org/10.3168/jds.2018-15787>
- Vasseur, E., Borderas, F., Cue, R. I., Lefebvre, D., Pellerin, D., Rushen, J., Wade, K. M., & de Passillé, A. M. (2010). A survey of dairy calf management practices in Canada that affect animal welfare. *Journal of Dairy Science*, 93(3), 1307–1316. <https://doi.org/10.3168/jds.2009-2425>
- Vogels, Z., Chuck, G., & Morton, J. (2013). Failure of transfer of passive immunity and agammaglobulinaemia in calves in south-west Victorian dairy herds: Prevalence and risk factors. *Australian Veterinary Journal*, 91(4), 150–156. <https://doi.org/10.1111/avj.12033>
- Yanar, M., Koçyigit, R., Aydin, R., Guler, O., Diler, A., Avci, M. A., Ozyurek, S., Kabakci, D., & Hirik, E. N. (2015). Effects of weaning ages on the growth, feed conversion efficiency and some behavioral traits of Brown Swiss × Eastern Anatolian Red F1 calves. *Journal of Agricultural Sciences*, 21(4), 492–499.
- Yang, M., Zou, Y., Wu, Z. H., Li, S. L., & Cao, Z. J. (2015). Colostrum quality affects immune system establishment and intestinal development of neonatal calves. *Journal of Dairy Science*, 98(10), 7153–7163. <https://doi.org/10.3168/jds.2015-9441>
- Zolova, A., Keidāne, D., & Zolovs, M. (2022). Prevalence of susceptibility to *Cryptosporidium* spp. among dairy calves with different feeding regimens with an emphasis on the feeding of transition milk. *Veterinary World*, 15(5), 1256–1260. <https://doi.org/10.14202/vetworld.2022.1256-1260>