Chapter I

Introduction

Dairy farming in Bangladesh is socio-culturally and economically important because the economy of Bangladesh is mainly depended on Agriculture and Livestock which play an important role in the agricultural economy. About 36% of the total animal protein comes from the livestock products in our everyday life. In our country 25% of peoples are directly involved in livestock sector and 50% peoples are associated in livestock production. Milk production growth was increased from 4.1% to 7.4% per annum in 2000-2005 and 2005-2008, respectively (Hemme, 2008). The production of milk and meat was 94.06 and 72.60 lakh metric ton respectively (DLS, 2017-18). Development of dairy has generated considerably employment through the production and marketing of dairy and dairy products (Shamshuddoha et al 2009) The majority of the dairy cattle are in the hands of small holder dairy products. Also, dairying is the part of the mixed farming system in Bangladesh and a predominant source of income, nutrition and jobs (Haque 2009). Dairying is also considered as a strong tool to develop a village micro economy of Bangladesh in order to improve rural livelihoods and to alleviate rural poverty (Shamshuddoha et al 2007). Despite this, there is little information describing the general characteristics of the Bangladesh dairy sector in the scientific literature, so the specific information on calf welfare, disease, and mortality, as well as on management practices in the prepartum and calf-rearing periods, is lacking. But at present calf welfare and management are important issues for developing a dairy farm. That's why there is a growing agreement that welfare is an important component of the social sustainability of modern animal production systems. Under the One Health, and more recently the One Welfare concept (which encompasses health), the welfare of the farmer and his or her animals are mutually inclusive. Work routines and facilities that promote a safe working environment for farm workers are basic requirements for physical health. Importantly, the Health and Safety of anyone working on a farm should be addressed in the farm safety statement which is a statutory requirement of the Safety, Health and Welfare at Work Act, 2005 (Safety, Health and Welfare at Work (General Applications) Regulations, 2007-2016).

Typically, there are large differences among farms in the level of animal welfare achieved, which has led to several attempts to develop methods of assessing animal welfare on farm for dairy cows (e.g., Webster, 2005). Despite the importance of financial costs of rearing management (Mourits et al., 1997, Mourits et al., 1999, Pellerin and Gilbert, 2008) and the long-term effects of the rearing period in the life of the future dairy cows (e.g., Shamay et al., 2005), calf mortality and morbidity play a crucial factor in calf welfare.

Dairy calves are at an increased risk of disease and mortality in the perinatal and neonatal periods; significant animal losses can occur if management practices in these periods are suboptimal (Donovan et al., 1998; McGuirk, 2008; Bleul, 2011). Calf morbidity and mortality are indicators of poor animal welfare and are influenced by numerous factors including nutrition (Drackley, 2008; Seppä-Lassila et al., 2016; Kertz et al., 2017), health and immune status (Wells et al., 1996; Chase et al., 2008; Urie et al., 2018), hygiene (Marcé et al., 2010), neonatal care and colostrum management (Mee, 2008; Gundelach et al., 2009, Godden et al., 2019), occurrence of pathogens (McGuirk, 2008; Torsein et al., 2011), and other management practices (Jenny et al., 1981; Villettaz Robichaud et al., 2016). In production systems where parturition and calf rearing take place outdoors, weather conditions are additional factors that influence calf health and survival (Lundborg et al., 2005; Bleul, 2011; Cuttance et al., 2017b). Digestive and respiratory symptoms are the most commonly identified clinical problems in calves from birth to weaning in US dairies, with digestive issues peaking at 2 weeks of age and respiratory symptoms becoming more prevalent later in the preweaning period (Urie et al., 2018)

Describing management practices at the farm level represents an initial step in assessing animal welfare issues (Vasseur et al., 2010). Surveys designed to identify problems in the prepartum and neonatal periods and to provide information with the aim of increasing calf welfare and production have been performed in various European (Svensson et al., 2006; Gulliksen et al., 2009; Raboisson et al., 2013), North American (Vasseur et al., 2010; USDA (United States Department of Agriculture), 2014), Oceanic (Cuttance et al., 2017b; Abuelo et al., 2019), and Asian (Kayano et al., 2016) countries. Similar information from South America is scarce and is limited to a few Argentinian (INTA

CeRBAS (Instituto Nacional de Tecnología Agropecuaria, Centro Regional Buenos Aires Sur), 2011) and Brazilian studies (Neto et al., 2004; Hötzel et al., 2014; Fruscalso et al., 2020). Given the current scenario, the aims of this study were to (1) describe the prepartum and calf-rearing systems, as well as the management practices that may influence calf welfare in dairy farms, (2) estimate the annual calf mortality risk from birth to weaning, and (3) identify the primary clinical disease syndromes shown by the calves before death.

Learning Objectives:

1. To observe the assess the overall calf welfare and management.
2. To find out the disease prevalence in different dairy farms.

Chapter II

Materials and Method

1. Study time and area

The study was conducted on calf welfare practice and disease investigation and their management on different dairy farms at Chattogram Metropolitan Area, which is the part of Chattogram division, Bangladesh. In order to collect the more purified data of various farms, an organized questionnaire was formatted (Annex-I). The study was conducted at Chattogram district in Bangladesh between May to September, 2021.

2. Selection of farm

The farms were selected on the basis of Chattogram Metropolitan Area, quality of the farm, management and their marketing strategy related to their calf welfare.

3. Collection of Data

The survey included a visit to each farm and the application of a questionnaire via a personal interview with the owner and staffs working at each farm. Staffs familiar with the day-to-day operations were present at all farm visits. Before collecting data, we developed a questionnaire related to calf welfare and management. Then data on management practices in the prepartum and calf-rearing periods were collected, including type of rearing systems, housing, staff, colostrum management, feeding practices, deworming and vaccination schedule, hygiene, health, and sanitary events (including management of sick calves, clinical signs, and data to estimate the annual mortality risk of calves from birth to weaning). For annual calf mortality risk calculation, data records kept by each farmer were retrieved and revised. Specifically, the number of dams that calved, the number of calves born dead or alive, and the number of calves that died in the rearing period (before weaning) during the study period were retrieved. Whether male and female (or only female) calves were routinely raised in the farms and, in farms that only raised female calves, whether male calves were routinely culled or sold for meat production, was also assessed.

The questionnaire was divided into different management practices that could affect calf welfare, management and disease occurrence.

Table 1: Targeted area of welfare and management of calf rearing at farms

Area of management	Variable
Colostrum management	Time of the first colostrum meal; method, quantity, number, and duration of colostrum meals.
Painful procedures	Disbudding age, method, use of analgesic and anesthetic. Castration age, method and use of analgesic and anesthetic.
Calf feeding	Milk: type, Milk feeding plan: quantity and number of meals, method of distribution. Concentrate: age at access, quantity and number of meals. Roughage: type, age and type of access, quantity.
Weaning	Criteria, age.
Calf housing	Individual housing, indoor housing, type.
Deworming and vaccination	Age, type.

4. Data analysis

After collecting all the data of individual dairy farms were analyzed on some important vital practices or issues like housing, feeding, health management, deworming and vaccination of calf, disbudding etc. Here we tried to make a comparative deviation on these key issues from a minimum standard that required for calf welfare in a dairy farm. Actually, percentage of some important practice is finding out here and represent on some contrast. Microsoft Excel-2019 was used for data analysis in this study.

Chapter III

Results and Discussion

For this study, a total of 15 farms were visited and surveyed. Surveys such as the one performed in this study allow to explore critical points in calf-rearing systems and management practices to be detected, and helps to set a benchmark to evaluate and improve calf welfare, health, and production (Vasseur et al., 2010). The well-organized questionnaire helped us to explore the existing farm level calf management practices in our study area.

Summary statistics

Among the 15 farms, average farm population was about 30 whereas the calf population was about 10. Most of the farmers had more than 5 years of farming experience yet each year more than 3 calves die per farm which may increase up to 21.

Table 2: Demographical information of the studies farms (N= 15)

	Mean	**Minimum**	**Maximum**	**Percentile**		
Parameters				25%	50%	75%
Years of farming	7.6±1.26	3	16	3.5	6	11.5
No. of Animal	29.67±5.85	9	80	15	20	32
No. of calves	9.27±1.68	3	27	5	7	11
Calf death/year	3.13±1.55	0	21	0	0	2.5

Housing and management:

A separate dedicated space for calves would ensure calf welfare and proper calf management. Absence of calf pens was identified as a major risk factor for welfare in previous studies (Vasseur et al., 2010). Out of 15 farms, 33.33% farms (n=5) had dedicated calf pen and open space for calves (Table 3).

Housing has wide psychological and physical effects on calves as group-housed calves show significant behavioral difference in comparison to tethered calves (Le Neindre, 1993). Only two farms among 15 in this study (13.33%) arranged housing for their calves on the basis of gender and age (Table 3). Although group pens allow for better expression of animal behavior compared with individual pens (Hötzel et al., 2014), they also have inherent risks, such as a greater potential for pathogen transmission (Stull and Reynolds, 2008), as animals that share the same environment, water wells, and feeders have greater opportunities for direct and indirect contact among themselves, and with their fecal excretions, urine, and saliva. In individual systems, pathogen transmission is also possible, particularly when the rearing areas or the cages or stakes are not rotated, when the feeders are shared, or when these elements are not disinfected correctly (Marcé et al., 2010).

Table 3: Housing and grazing management of the studied farms (N=15)

Welfare Parameter	Criteria	Positive (%)	Negative (%)
Comfortable housing and management	Open Space for Calves	5 (33.33%)	10 (66.67%)
	Platform like open space	3 (20%)	12 (80%)
	Dedicated Space for Calves	5 (33.33%)	10 (66.67%)
	Housed based on age	2 (13.33%)	13 (86.67%)
	Housed based on sex	2 (13.33%)	13 (86.67%)
	Grazing Area		15 (100%)
Human Animal Relationship	Dedicated Worker	1 (6.67%)	14 (93.33%)

Only 6.67% of farms (Table 3) had staff dedicated to raising calves as their only work activity on the farm, and the remaining 93.33% of farms had the staff that raised the calves also perform other tasks, including prepartum monitoring, newborn calf care, milking, and other activities such as heat detection, insemination, or feeding the cows. Thus, understaffing, perhaps as a consequence of the relatively high labor costs in Bangladesh, possibly influenced poor human animal relationship which is causing poor calf welfare, as several time-consuming calf management practices may not have been

performed correctly. Having qualified, motivated, trained, and dedicated staff is key to succeeding in efficient calf rearing (Rodríguez et al., 2011; Schuenemann et al., 2013).

Feeding

In all 15 surveyed farms (100%) allowed calves to suckle colostrum directly from the udders of their dams, and only under certain circumstances was colostrum obtained from the dam and administered to the calves, for example, when a calf was born weak. When calves suckle colostrum directly from the dam, the volume and quality of the ingested colostrum as well as the time of ingestion, which are key in successful colostrum management programs, are not controlled (McGuirk, 2008; Godden et al., 2019). Under these circumstances, there is increased risk of failed transfer of passive immunity (FTPI). In addition, ingesting colostrum directly from the udder increases the risk of disease transmission to calves (Stewart et al., 2005).

In addition, in all 15 farms (100%) they allowed their calves to suckle milk directly from udder 2 times in a day. But in few farms, they also fed milk by feeder and the percentage was 13.33% of farms. And about 86.67% of farms didn't feed milk to their calves by feeder.

About 86.67% (n=13) farms tend to wean their calves in a variable time period. There was different weaning age in different farms and the weaning percentage were 15.38% at the age of 1 month, 30.77% at the age of 1.5 months, 23.08% at the age of 2 months, 30.77% at the age of 3 months. But abrupt weaning is stressful for calves (Vasseur et al., 2010) and should be discouraged to improve calf welfare.

Table 4: Feeding and Weaning practice and welfare at studied farms (N= 15)

Welfare parameter	Criteria	Positive (%)	Negative (%)
Freedom from hunger and thirst	Weaning	13 (86.67%)	2 (13.33%)
	Milk Replacer Given	1 (6.67%)	14 (93.33%)
	Feeding milk by feeder	2 (13.33%)	13 (86.67%)

Table 5: Diet management of the calves at the studies farms (N= 15)

Age group	Feed type	Mean (Kg)	Minimum	Maximum	Percentile		
					25%	50%	75%
1-6 months	Concentrates	2.33±0.35	1.5	6	1.5	2	2
	Grass	12.73±0.79	5	18	12	12	15
>6 months	Concentrates	3.1±0.45	1.5	8	2	2.5	3
	Grass	11.8±0.99	5	20	10	10	13.5

Deworming and Vaccination:

The vaccinations applied to prevent neonatal viral and bacterial diseases in all dairy farms and they also maintained deworming schedule to prevent parasitic infestation. In this context, it is likely that the immunity generated by cows due to the vaccine is not properly transferred passively to calves through colostrum (Chase, 2008; Godden et al., 2019).

Pain management:

Research has shown clearly that dehorning and disbudding are painful and that a combination of local anesthetics and longer lasting analgesics are necessary to reduce both the pain during the operation and postoperative pain (Stafford and Mellor, 2005). After 3 months, dehorning must be performed by surgery (Sylvester et al., 1998). Disbudding when the calf is less than 3 weeks of age is recommended (National Farm Animal Care Council, 2009) because it allows the use of less-painful methods such as chemical paste, for which pain is easier to control (Vickers et al., 2005). In 13.33% farms did disbudding of calves by using chalk or paste (Table 5) and 86.67% farms didn't do disbudding of calves. In addition, castration of male calves was not performed in any surveyed farms (Table 6).

Table 6: Pain Management after disbudding (N=15)

Welfare Criteria	Parameter	Managed (%)	Not managed (%)
Pain management	Disbudding	2 (13.33%)	13 86.67%)

Disease and Death:

The clinical symptoms or disease conditions that farmers reported calves displayed were diarrhea (80% of farms) pneumonia (40% of farms) naval ill (40% of farms), alopecia (13.33% of farms). Ectoparasites were present in 5 farms (33.33%) and absent in 10 farms (66.67%). Several infectious and parasitic etiologic agents may be involved in diarrhea or respiratory disease, as well as management practices that favor exposure to these agents or FTPI. In studies on neonatal diarrhea in dairy calves of up to 30 days of age, the main agents found were Cryptosporidium spp., rotavirus, and, to a lesser extent, Salmonella enterica, Escherichia coli, and bovine coronavirus (Caffarena, 2017; Casaux, 2018; Castells et al., 2018).

Navel antisepsis in newborn calves was performed in 100% of farms (Table 7) and this was done by liquid Viodin in 73.33% farms and by potassium per manganate in 26.67% farms.Otherwise omphalitis can occur and lead to delayed growth, septic arthritis, and umbilical hernias (Mee, 2008). Jorgensen et al. (2017) observed that farms practicing navel disinfection in newborn calves had a lower mortality risk (average = 3.0%) than those not following the practice (average = 7.3%).

Table 7: Disease prevalence in the studied farms in last 12 months (N= 15)

Welfare Criteria	Symptoms	Positive (%)	Negative (%)
Freedom from diseases and discomfort	Naval Ill	6 (40%)	9(60%)
	Pneumonia	6 (40%)	9(60%)
	Diarrhea	12 (80%)	3 (20%)
	Alopecia	2 (13.33%)	13 (86.67%)
	Ectoparasite	5 (33.33%)	10 (66.67%)

Chapter IV

Conclusion

In Bangladeshi dairy farms, several flaws in management procedures that impair animal welfare during the prepartum and calf-rearing periods have been observed. This could explain why calves have such a high annual mortality risk between birth and weaning. At the farm level, efforts should be made to improve data collection and analysis, as well as colostrum management, feeding, hygiene, biosecurity, and disinfection methods, and vaccines. It would also be desirable to have suitable, motivated, and trained employees in the prepartum and calf-rearing sectors to care for the newborns and raise the calves according to established protocols. To reinforce these concepts and improve the outcome of calf rearing, extension initiatives to disseminate excellent management practices in calf rearing, as well as developing national technologies that are made available to dairy farmers, are vital instruments. Colostrum management and how potential risk factors effect calf mortality in dairy farms require more research.

Chapter VI

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BIOGRAPHY

Aslam Hossain, Son of Mr. Emdad Hossain and Mrs. Kanchon Mala. He is an intern veterinary doctor under the faculty of Veterinary Medicine (FVM) in Chattogram Veterinary and Animal Sciences University (CVASU). He passed his Secondary School Certificate (SSC) Examination in 2013 from Chittagong board followed by Higher Secondary Certificate (HSC) Examination in 2015 from Chittagong board. In future he would like to do research work about Veterinary Epidemiology, Zoonotic diseases and animal welfare those take public health significance in the world regarding one health framework.

Appendix-I

Questionnaire for data collection

Date: Time:

1. Farm name

2. Owner name:

3. Years of dairy farming:

4. Farming is primary/secondary occupation

5. Total number of animals

6. Number of calves: (<10 months)

7. Dedicated space for calves: Yes/ No

8. If yes, the area space is …….. square feet i) It is an open space for calves: Yes/No ii) The space is like platform: Yes/No iii) Calves are housed on different age group: yes/no or sex group: Y/N iv) if not, please describe how the calves are kept:

9. Calves are weaned/not weaned.

10. Weaning age:

11. Calves are allowed to drink milk from udder until_____ days

12. Milk replacer is given- Yes/No. If yes from …… day and ….. times a day.

13. Calves are fed milk by feeder: Yes/No

14. Measuring the demand of the calf: By body weight/By assumption/By body weight assumption

15. Weighing of the calves: Performed/Not performed. If yes, last weight taking date and future date.

16. Supplying milk to the calves _____times a day.

17. Supplying colostrum to the calves: Yes/No

18. If yes, how frequently? After every half an hour/every one hour/every 2 hours/…….

19. When the colostrum is given to the calves after birth: without delay? 15 minutes later/30 minutes later/1 hour later/4 hours later/ …….

20. Disinfection procedure and agent of umbilical cord after birth:

21. Castration is performed for male calves: Yes/No

22. If yes, who perform this? VS/Private Vet/Field assistant/AI/Quack.

23. Which method- Burdizzo's/Open method

24. Sale of male calves: Yes/No. If yes, which age? _____

25. Dedicated worker for calves: Yes/No

26. Feed ingredients and amount for old calves (> 6 months age):

27. Feed ingredients and amount for medium aged calves (1-6 months age):

28. Feed ingredients and amount for young calves (< 1 month age):

29. First deworming age and agent:

30. Deworming type: Whole herd/All calves only/Single calf

31. First vaccination age and agent:

32. Vaccination style: Whole herd/All calves only/Single calf

33. Grazing area/roaming area for calves:

34. Disbudding: performed/not performed

35. Disbudding by: chalk/Hot iron disbudder

36. Death within 12 months:

Calf number	Age during death	Sex	Cause	Rx given or not, for how many days, who gave Rx

37. Calf information

Calf No	Age	Sex	Weight (Measured =M, Assumpt = A	Diarrhea Present/ absent	Hair coat Smooth/ rough	Alopecia Present/ Absent	Naval ill Occurred/ No	Pneumonia Occurred/Not & which age	Joint ill Occurred/ No	Bloody feces (coccidia) Occurred/Not & which age	Rx by	Present BCS	MM	Dehyd-ration %	Ecto-Parasites Present/ Absent