

Article

A study on the occurrence of calf diseases in some selected dairy farms of Bangladesh

Md. Showkat Ali^{1*}, S. M. Lutful Kabir², Jalal Uddin Ahmed¹, Nasrin Sultana Juyena¹, Mohammad Liaquat Osman Mojumder¹ and Md. Jahid Hasan¹

¹Department of Surgery and Obstetrics, Faculty of Veterinary Science, Bangladesh Agricultural University, Mymensingh-2202, Bangladesh

²Department of Microbiology and Hygiene, Faculty of Veterinary Science, Bangladesh Agricultural University, Mymensingh-2202, Bangladesh

*Corresponding author: Md. Showkat Ali, Department of Surgery and Obstetrics, Faculty of Veterinary Science, Bangladesh Agricultural University, Mymensingh-2202, Bangladesh. E-mail: showkat64@gmail.com

Received: 17 May 2015/Accepted: 16 June 2015/ Published: 30 June 2015

Abstract: The objectives were to investigate the factors (age, sex, breed and season) affecting the occurrence of calf diseases. In this study 497 cases of 0 to 3 months of age from three different farms were investigated. Calf in Savar Dairy farm (n=249), Talbag Dairy Farm (n=85) and BAU Dairy Farm (n=163) were included from April 2011 to March 2012. The occurrence of diseases were classified on the basis of breed (Local and Cross), age (≤ 3 weeks and >3 weeks), sex (Male and Female) and season (Spring, Summer, Rainy and Winter). The overall diseases were diarrhoea (20.3%), anorexia (9.7%), fever (9.1%), naval ill (8.0%), malnutrition (7.7%), indigestion (6.7%), traumatic injury (5.4%), dysentery (5.0%), myiasis (4.6%), pneumonia (3.4%), alopecia (3.4%), atresia ani (3.2%), hernia (2.8%), constipation (2.6%), abscess (2.2%), conjunctivitis (2.2%), lameness (1.8%), FMD (1.2%) and blot (0.6%). The cases of diarrhoea was higher (20.5%) than that of other diseases. The occurrence of diseases was highly significant ($p < 0.01$) in crossbred calves (77.3%) than that of local bred (22.7%). Cases of diseases were higher in male calves (51.7%) than that of female calves (48.3%) but the variation was insignificant ($p > 0.05$). The effect of breeds on diseases were found significantly ($p < 0.05$) higher in ≤ 3 weeks (55.1%) than that of > 3 weeks of age (44.9%). The occurrence of diseases in calves was significantly ($p < 0.05$) higher in rainy season (36.0%) followed by the summer (31.0%), winter (22.1%) and lowest in spring (10.9%). The results demonstrate significant effect of breed, age and season on the occurrence of diseases in calves.

Keywords: calf diseases; breed; age; sex; season

1. Introduction

Calf morbidity and mortality are perennial problems for dairy producers worldwide. Calf diseases that cause morbidity and mortality are the results of complex interaction of the management practices and environment, infectious agents and the calf itself. Scours in neonatal period and pneumonia in older calves are known to be responsible for most of calf hood morbidity and mortality (Olsson *et al.*, 1993; Debanth *et al.*, 1995; Sivula *et al.*, 1996). Several environmental and managerial factors act as risk factors for the occurrence of calf morbidity and mortality (Waltner-Toews *et al.*, 1986; Lance *et al.*, 1992; Bruning-Fann and Keneene, 1992). Crossbreeding program has been taken up as a national policy to develop dairy and livestock industries in Bangladesh. But the calf morbidity and mortality have been recognized as a serious concern affecting the

replacement rate and thereby genetic improvement in dairy animals (Debnath *et al.*, 1990, 1995; Hossain *et al.*, 1992a, b; Samad *et al.*, 2001, 2002).

Calf mortality up to 12 months of age has been reported to be 9% under rural (Debnath *et al.*, 1990) and 13.4% under a farm (Debnath *et al.*, 1995) conditions in Bangladesh. Very limited data on the clinical aspects of calf diseases are currently available concerning the important constraints on calf health in Bangladesh. Most of the earlier reports on calf health in Bangladesh have been confined on retrospective studies on the incidence of morbidity and mortality (Hussain *et al.*, 1983; Debnath *et al.*, 1990, 1995; Hoque and Samad, 1996; Masuduzzaman *et al.*, 1999; Samad *et al.*, 2001). In addition, some reports on the etiology of calf diseases with especial emphasis to parasites (Ersaduzzaman *et al.*, 1995; Samad *et al.*, 2001) and microbes (Selim *et al.*, 1991; Alam *et al.*, 1994; Hossain *et al.*, 2002) associated with calf morbidity and mortality have been done in Bangladesh. However, Das and Hashim (1996) studied the clinical aspects of some common surgical affection in calves. But the overall diseases occurrence from birth to 3 months of age in dairy farm condition of Bangladesh are lacking. Therefore, the objectives of the current study were to investigate the factors (age, sex, breed and season) affecting the occurrence of calf diseases in some selected dairy farms of Bangladesh.

2. Materials and Methods

2.1. Study area

This study was conducted from April 2011 to March 2012 in the following area:

- a) Central Cattle Breeding and Dairy Farm, Savar, Dhaka.
- b) Talbag dairy farm, Savar, Dhaka.
- c) Dairy Firm, Bangladesh Agricultural University, Mymensingh.

2.2. Calf selection

The diseased calf from birth to 3 months of age was considered. A total of 497 cases of calf diseases in three different farms were enlisted as 249 cases in Savar Dairy farm, 85 in Talbag Dairy Farm and 163 in BAU Dairy Farm.

2.3. Data collection procedure

For collection of information required a format that was developed for keeping the records of data (appendix). The format contained the following information:

- a) Name of Disease of Calf
- b) Breed of Calf
- c) Age of Calf
- d) Sex of Calf
- e) Date of Disease Occurrence

The data were collected from the monthly report of concern veterinarian of dairy farm. The recorded diseases were diagnosed by the clinical signs, and not confirmed by further laboratory diagnosis.

2.4. Case classification

Clinical case records of 497 calves from birth to 3 months old were considered. The recorded diseases were classified into two major diagnostic groups: 1) surgical diseases and 2) Non-surgical diseases. The total diseased calves were further classified based on age, sex, breed and season.

a) Classify of case according to breed

The study calves were divided into the two breeds. These were:

- (i) Local (Indigenous): Well developed hump.
- (ii) Cross: Predominant black and white colour, ranging from all black to all white. The hump is not developed.

b) Classify of case according to sex

The sex of study calves were divided into two groups. There were:

- (i) Male calf: Based on observing the testis.
- (ii) Female calf: Based on observing the vulva.

c) Classify of case according to age

The age of study calves were determined from the resister book of farm. From birth to 3 months of diseases calves were consider and divided into the following two groups:

- (i) Birth to 3 weeks: Based on birth record from resister books.
- (ii) 4 weeks to 3 months: Based on birth record from resister books.

d) Classify of case according to Season

The seasons of diseases occurrence were divided into following four groups:

- (i) Spring season (February to April)
- (ii) Summer season (May to July)
- (iii) Rainy season (August to October)
- (iv) Winter season (November to January)

2.5. Data analysis

The data generated from this study were entered in Microsoft Excel Worksheet and descriptive statistics were performed. The diseases occurrence rate in different analysis was expressed as percentage. Statistics was performed to calculate the percentages of different variant like age, breed, sex and season. The data were analyzed by chi square test using SPSS soft ware version 17. The variation was considered significant when the P value was less than 0.05 and 0.01.

3. Results and Discussion

This study was conducted to investigate the occurrence of diseases in neonatal calves (birth to 3 months) and the effect of age, sex, breed and season on calf diseases. A survey was conducted in dairy farms. Data regarding the overall diseases occurrence in neonatal calves in three farms are presented in Table 1. The diseases were diarrhoea, anorexia, fever, navel ill, malnutrition, indigestion, traumatic injury, dysentery, myiasis, pneumonia, alopecia, atresia ani, hernia, constipation, abscess, conjunctivitis, lameness, FMD and blot. Among the diseases, highest number of diarrhoeal cases (20.3%) was recorded in calves. Similar result was reported by Samad *et al.* (2002). Diarrhea occurs due to enteritis. Although there are specific diseases in which enteritis is produced, a sudden change of diet or the feeding of unsuitable or fermentative material gives rise to diarrhea. The parasitic (Samad, 2001 b) and bacterial (Hossain *et al.*, 2002) agents associated with diarrhoea were identified. However, dietary diarrhoea is more common in the neonatal animals which ingest sudden too much milk or a diet which is indigestible. Several studies reported that calf diarrhoea incidence was reduced from 36% to 11% within a year by the introduction of early colostrums feeding and improved housing hygiene (Cockram and Rowan, 1989; Lance *et al.*, 1992). We observed 9.7% calves suffered with anorexia. This result is in support with the earlier report of Samad *et al.* (2002) who found second highest cases (11.0%) of anorexia. Moreover, results regarding the occurrence of other diseases like fever (9.0%), navel ill (8.0%), malnutrition (7.7%), indigestion (6.7%), injury (5.4%), dysentery (5.0%), myiasis (4.7%), and pneumonia (3.4%) are almost similar to the report of Samad *et al.* (2002).

The effects of breeds on disease occurrence are presented in Table 2. This study showed significantly ($p < 0.01$) higher occurrence of diseases in crossbred calves. Hailemariam *et al.* (1993a) also found higher calf morbidity in exotic breeds than locals. Taurine breeds and their crosses are generally more susceptible to diseases in tropical climates. The occurrence of diarrhoea found to be higher in crossbred calves (17.3%) and variation was significant ($p < 0.01$) between two breed groups. Similarly, dysentery, navel ill, anorexia, fever, malnutrition, alopecia, conjunctivitis, significantly ($p < 0.01$) affected more crossbred calves. These results might be resulted from the availability of more high milk producing cross breed dairy animals in farm condition, which are more susceptible to the diseases occurrence compared to the local breed.

Occurrence of calf diseases in regarding to sex is presented in Table 3. Considering the occurrence of diseases in regard to sex, insignificant ($p > 0.05$) differences were found between two sex groups. Occurrence of diseases was higher in male calves (51.7%) than that of female calves (48.3%). The value of atresia ani was higher in male calves in comparison to female calves. Atresia ani is regarded to be hereditary and due to single, autosomal recessive gene. The diarrhoea, dysentery, navel ill, anorexia, indigestion, atresia ani were found relatively higher in male calves but the malnutrition, lameness, alopecia, abscess diseases were found higher in female calves. Variations were are not significant statistically ($p > 0.05$).

Table 1. Overall diseases occurrence in calves of three farms.

Diseases	Savar Dairy Farm	Talbag Dairy Farm	BAU Dairy Farm	Total	(%)
Non-surgical					
Diarrhoea	50	18	33	101	20.3
Anorexia/Inappetence	25	11	12	48	9.7
Fever	23	9	13	45	9.1
Navel Ill	24	6	10	40	8.0
Malnutrition/weak calf	14	5	19	38	7.7
Indigestion	17	6	10	33	6.7
Dysentery	11	6	8	25	5.0
Pneumonia	7	4	6	17	3.4
Alopecia	9	2	6	17	3.4
Constipation	8	1	4	13	2.6
Conjunctivitis	5	2	4	11	2.2
Conjunctivitis	5	2	4	11	2.2
FMD	4	-	2	6	1.2
Surgical					
Traumatic injury	22	1	4	27	5.4
Myiasis	9	3	11	23	4.6
Atresia Ani	8	3	5	16	3.2
Hernia	4	4	6	14	2.8
Abscess	4	2	5	11	2.2
Lameness/arthritis	5	2	2	9	1.8
Blot	-	-	3	3	0.6
Overall	249	85	163	497	100

Table 2. Effect of breeds on diseases in calves.

Diseases	Local		Cross	
	No.	%	No.	%
Non-surgical				
Diarrhoea	15	3.02	86	17.3**
Dysentery	4	0.80	21	4.3**
Navel Ill	11	2.21	29	5.8**
Pneumonia	3	0.60	14	2.8**
FMD	0	0.00	6	1.2
Conjunctivitis	2	0.40	9	1.8*
Fever	14	2.82	31	6.2*
Malnutrition	11	2.21	27	5.4**
Inappetence	11	2.21	37	7.4**
Indigestion	9	1.81	24	4.8**
Alopacia	1	0.20	16	3.2**
Constipation	3	0.60	10	2.0*
Surgical				
Atresia Ani	5	1.00	11	2.2
Hernia	4	0.80	10	2.0
Myiasis	7	1.41	16	3.2*
Abscess	3	0.60	8	1.6
Traumatic injury	7	1.41	20	4.0*
Lameness	2	0.40	7	1.4
Blot	1	0.00	2	0.6
Overall	113	22.73	384	77.3**

* Significant at (p<0.05)

**Significant at (p<0.01)

Table 3. Occurrence of diseases in calves in regarding to sex.

Diseases	Male		Female	
	No.	%	No.	%
Non-surgical				
Diarrhoea	52	10.5	49	9.7
Dysentery	15	3.0	10	2.0
Navel Ill	23	4.6	17	3.4
Pneumonia	10	2.0	7	1.4
FMD	2	0.4	4	0.8
Conjunctivitis	6	1.2	5	1.0
Fever	21	4.3	24	5.2
Malnutrition	17	3.4	21	4.4
Inappetence	27	5.4	21	4.2
Indigestion	17	3.4	16	3.2
Alopacia	6	1.2	11	2.2
Constipation	5	1.0	8	1.6
Surgical				
Atresia Ani	12	2.4*	4	0.8
Hernia	4	0.8	10	2.0
Myiasis	14	2.8	9	1.8
Abscess	5	1.0	6	1.2
Traumatic injury	16	3.2	11	2.2
Lameness	4	0.8	5	1.0
Blot	1	0.2	2	0.4
Overall	257	51.7	240	48.3

* Significant at (p<0.05)

Table 4. Effects of age on diseases in calves.

Diseases	≤ 3 weeks		> 3 weeks	
	No.	%	No.	%
Diarrhoea	69	13.9**	27	6.4
Dysentery	20	4.0*	5	1.0
Navel Ill	31	6.3**	9	1.8
Pneumonia	6	1.2	11	2.2
FMD	1	0.2	5	1.0
Conjunctivitis	9	1.8*	2	0.4
Fever	14	2.8	31	6.2*
Malnutrition	13	2.6	25	5.0*
Inappetence	17	3.4	31	6.2*
Indigestion	11	2.2	22	4.4*
Alopacia	10	2.0	7	1.4
Constipation	10	2.0	3	0.6
Atresia Ani	15	3.0**	1	0.2
Hernia	9	1.8	5	1.0
Myiasis	18	3.6*	5	1.0
Abscess	4	0.4	7	1.8
Traumatic injury	11	1.8	16	3.6
Lameness	6	1.2	3	0.6
Blot	0	0.0	3	0.6
Overall	274	55.1*	223	44.87

* Significant at (p<0.05)

**Significant at (p<0.01)

Table 5. Effects of season on diseases in calves.

Diseases	Spring		Summer		Rainy		Winter	
	No.	%	No.	%	No.	%	No.	%
Diarrhoea	12	2.4	29	5.8	39	7.9**	21	4.2
Dysentery	1	0.2	8	1.6	11	2.2*	5	1.0
Navel Ill	2	0.4	20	4.0**	14	2.8	4	0.8
Pneumonia	0	0.0	4	0.8	3	0.6	10	2.0*
FMD	0	0.0	1	0.2	3	0.6	2	0.4
Conjunctivitis	1	0.2	7	1.4*	3	0.6	0	0.0
Fever	5	1.0	14	2.8	19	3.8*	7	1.4
Malnutrition	9	1.8	10	2.0	7	1.4	12	2.4
Lameness	0	0.0	3	0.6	5	1.0	1	0.2
Inappetence	6	1.2	15	3.0	18	3.6	9	1.8
Indigestion	7	1.4	9	1.8	13	2.6	4	0.8
Alopecia	1	0.2	5	1.0	4	0.8	7	1.4
Constipation	0	0.0	6	1.2	2	0.4	5	1.0
Artesia Ani	3	0.6	2	0.4	6	1.2	5	1.0
Hernia	2	0.4	4	0.8	3	0.6	5	1.0
Myiasis	1	0.2	9	1.8	13	2.6**	0	0.0
Abscess	0	0.0	3	0.6	7	1.4	1	0.2
Traumatic injury	4	0.8	5	1.0	11	2.2	7	1.4
Blot	0	0.0	0	0.0	2	0.4	1	0.2
Overall	54	10.9	154	31.0	179	36.0*	110	22.1

* Significant at ($p < 0.05$)**Significant at ($p < 0.01$)

Effects of age of calves on diseases are presented in Table 4. The occurrence of overall diseases was significantly ($p < 0.05$) higher in calves of ≤ 3 weeks (55.1%) than that of calves of ≥ 3 weeks (44.9%). This study supports the reports of Virtala *et al.* (1996a) who reported higher calf morbidity rate during the first month and decrease in mortality rate with the increase in age. Diarrhoea, dysentery, navel ill, artesia ani were found significantly ($p < 0.05$) higher in ≤ 3 weeks of calves. The malnutrition, fever, anorexia, indigestion etc. diseases found significantly ($p < 0.05$) higher in ≥ 3 weeks of calves. Many calves do not acquire enough immunoglobulins during the first hours of life (Besser *et al.*, 1991). This fact is probably the greatest risk factor for calf diarrhoea during the first weeks of life. Survey on the incidence of umbilical infection showed that the age of calves for its occurrence is usually in the first week of life (Virtala *et al.*, 1996b). According to Britney *et al.* (1984), it is one of the disease conditions which has serious effect on future survival and productivity of calves.

Occurrence of diseases in neonatal in relation to season is presented in Table 5. This study reported higher occurrence of diseases in rainy season (36.0%) compared to summer (31.0%), winter (22.1%) and spring (10.9%) and values differed significantly ($p < 0.05$). This observation agrees with the findings of Haque and Samad (1996) who recorded diseases occurrences in rainy season (41.3%), summer (33.3%) and winter (25.2%). The cases of diarrhoea were recorded significantly ($p < 0.01$) higher in rainy season in comparison to other seasons. This report supports the result of Samad *et al.* (2004) who recorded higher number of cases of diarrhea in rainy season. Similarly, more cases of dysentery, fever and myiasis was found in rainy season. The navel ill and conjunctivitis recorded significantly ($p < 0.05$) higher in summer season compared to rainy, winter and spring. As the condition is seen commonly during the summer months, it is suspected that ultraviolet light, dust and flies act as predisposing factors (Watson, 2004). One of the most important external factors is the time of year, the number of cases being greater in summer than in winter (Rowlands *et al.*, 1983; Cook, 2003) most likely reflecting the fact that most calf are housed in the winter. Wet weather conditions are also conducive to maintaining high bacterial levels. Lameness in calf tends to increase about three weeks after heavy rainfall (Williams *et al.*, 1986). The pneumonia found significantly ($p < 0.05$) higher in winter. There are seasonal differences in the absorption of immunoglobulins in newborn calves and this could be accounted for the variation in the occurrence of diseases in different seasons (Norheim and Simensen, 1985).

4. Conclusions

Various diseases such as diarrhoea, anorexia, fever, navel ill, malnutrition, indigestion, dysentery, traumatic injury, myiasis, atresia ani, alopecia, pneumonia, constipation, conjunctivitis, hernia, lameness, abscess, FMD and blot were common in farm condition of Bangladesh. The occurrence of diarrhoea was higher in dairy farms. More affection was observed in crossbred calves. The occurrence of diseases in calves was higher in male than that of female. Calves with ≤ 3 weeks of age were affected more than > 3 weeks of age. The occurrence of diseases in calves was higher in rainy season. The results demonstrate significant effect of breed, age and season on the occurrence of diseases in calves. Good management is essential to reduce the diseases of new born calf. Therefore; further study is needed to identify the management factors that are responsible for calf diseases which could be improved by changing the management system.

Conflict of interest

None to declare.

References

- Alam MM, AKMF Tuque, S Niger, M Hague, NS Chowdhury and MU Ahmed, 1994. Rotavirus infection in children and calves in association with acute gastroenteritis. *Bangladesh Veterinary Journal*, 28: 35 - 40.
- Besser TE, CC Gay and L Pritchett, 1991. Comparison of three methods of feeding colostrums to dairy calves. *J. Am. Vet. Med. Assoc.*, 198: 419-422.
- Britney JB, SW Martin, JB Stone and RA Curtis, 1984. Analysis of early calthood health status and subsequent dairy herd survivorship and productivity. *Prev. Vet. Med.*, 3:45-52.
- Bruning-Fann C and JB Kaneene, 1992. Environmental and management risk factors associated with morbidity and mortality in perinatal and preweaning calves: a review from an epidemiological perspective. *Veterinary Bulletin*, 62: 399-403.
- Cockram MS and TG Rowan, 1989. Effects of air temperature, air velocity and feeding level on apparent digestibility, water intake, water loss and growth in calves given a milk substitute diet. *Animal Production*, 48: 51-65.
- Cook NB, 2003. Prevalence of lameness among dairy cattle in Wisconsin as a function of housing type and stall surface. *J. Am. Vet. Med. Assoc.*, 223:1324-1328.
- Das BR and MA Hashim, 1996. Studies on surgical affections in calves. *Bangladesh Veterinary Journal*, 30: 53 - 57.
- Debnath NC, BK Sil, SA Selim, MAM Prodhana and MMR Howlader, 1990. A retrospective study of calf mortality and morbidity on smallholder traditional farms in Bangladesh. *Prev. Vet. Med.*, 9: 1-7.
- Debnath NC, MJFA Taimur, AK Saha, M Ersaduzaman, M Helaluddin, ML Rahman, DK Roy and MA Islam, 1995. A retrospective study of calf losses on the central dairy cattle breeding station in Bangladesh. *Prev. Vet. Med.*, 24: 43 - 53.
- Ersaduzaman M, SZH Chowdhury, MM Huq, MF Rahman, MMH Mondal and MJ Karim (1995). Prevalence of coccidia in calves at village and farm levels of Bangladesh. *Indian Vet. Med. J.*, 19: 51 - 55.
- Hailemariam M, K Banjaw, T Gebre Meskel and H Ketema, 1993. Productivity of Boran cattle and their Friesian cross at Abernosa ranch, Riftvalley of Ethiopian. I. Reproductive performance and preweaning mortality. *Trop. Anim. Health Pro.*, 25, 239-248.
- Hoque MS and MA Samad, 1996. Prevalence of clinical diseases in dairy cross-bred cows and calves in the urban areas in Dhaka. *Bangladesh Veterinary Journal*, 30: 118- 129.
- Hossain KMM, S Saha, MA Samad and KA Choudhury, 2002. Isolation and characterization of Enterobacteria from diarrhoeic calves with their pathogenicity in mice and in-vitro sensitivity to antibiotics. *Bangladesh Veterinary Journal*, 36: 43-49.
- Hossain MI, MM Hossain, BM Hannan and A Wadud, 1992b. A note on mortality in young calves due to gastro-intestinal helminthiasis in and around Bangladesh Agricultural University campus. *Bang. J. Anim. Sci.*, 21: 127 - 130.
- Hossain MI, MM Hossain, BMA Hannan, AHM Kamal, MMH Mondal and A Wadud, 1992a. Mortality of calves associated with gastro-intestinal helminth infection. *Bangladesh Veterinary Journal*, 9: 7-13.
- Hussain MA, M Shahidullah and MA Ali, 1983. Surgical disease and reproductive disorders recorded at the Veterinary Hospital of Bangladesh Agricultural University, Mymensingh. *Bangladesh Veterinary Journal*, 20: 1-5.

- Lance SE, GY Miller, DD Hancock, PC Bartlett, LE Heider and ML Moeschberger, 1992. Effects of environment and management on mortality in preweaned dairy calves. *J. Am. Vet. Med. Assoc.*, 201: 1197-1202.
- Masuduzzaman M, MJ Bhuiya and M Shahabuddin, 1999. Calf diseases in hilly areas of Chittagong. *Bangladesh Veterinary Journal*, 16: 52-57.
- Norheim K and E Simensen, 1985. An epidemiological study of factors affecting serum IgG levels in dairy calves. *Nordisk Veterinary Medicine*, 37:121-135.
- Olsson SO, S Viring, U Emanuelsson and SO Jacobsson, 1993. Calf disease and mortality in Swedish dairy herds. *Acta. Vet. Scand.* 34: 263-269.
- Rowlands GJ, AM Russell and LA Williams, 1983. Effects of season, herd size, management system and veterinary practice on the lameness incidence in dairy cattle. *Vet. Rec.*, 113: 441-445.
- Samad MA, 2001. Epidemiological studies on gastro-intestinal parasitosis in calves under traditional management in Bangladesh. *Bangladesh Veterinary Journal*, 35 : 9-18.
- Samad MA, MA Islam and MA Hossain, 2002. Clinical survey of calf diseases in the district of Mymensingh in Bangladesh. *Bangladesh Veterinary Journal*, 36: 1-5.
- Samad MA, MA Taleb, MA Kader and S Saha, 2001. Epidemiological studies on calf diseases associated with morbidity and mortality on large and smallholder traditional farms in Bangladesh. *Bangladesh Veterinary Journal*, 35: 121-129.
- Selim SA, KMS Aziz, AJ Sarker and H Rahman, 1991. Rotavirus infection in calves in Bangladesh. *Vet. Res. Comm.* 15:327-333.
- Sivula NJ, TR Ames and WE Marsh, 1996. Management risk factor for morbidity and mortality in Minnesota Dairy Heifers. *Prev. Vet. Med.*, 27: 173-182.
- Vitala AM, GD Mechor, YT Gröhn and HN Erb, 1996a. Morbidity from nonrespiratory diseases and mortality in dairy heifers during the first three months of life. *J. Am. Vet. Med. Assoc.*, 208:2043–2046.
- Vitala AM, GD Mechor, YT Grohn and HN Erb, 1996b. The effect of calthood diseases on growth of female dairy calves during the first 3 months of life in New York State. *J. Dairy Sci.*, 79:1040–1049.
- Waltner-Toews D, SW Martin, AH Merk and I McMillan, 1986. Dairy calf management, morbidity and mortality in Ontario Holstein herds. *Prev. Vet. Med.*, 4: 103-124.
- Watson CL, 2004. Eye disease in the growing animal - can we prevent it? *Cattle Practice*. British Cattle Veterinary Association, Frampton-on-Severn, UK 12: 3, 213-218.
- Williams LA, GJ Rowlands and AM Russell, 1986. Effect of wet weather on lameness in dairy cattle. *Vet. Rec.* 118: 259-261.