Research Article

Innovative Approach of Exploring Comparative Mortality Rate of Cattle Calves at Different Commercial Dairy Farms in Punjab, Pakistan

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Abstract

   This study was carried out to determine the major causes of mortality in cattle calves. Data were collected from the different commercial dairy farms in Punjab, namely SB Dairy Farm, Faisalabad, Chakwal Dairy Farm, Chakwal, Paki Shah Mardan Dairies, Mianwali and Bahadur Garh Dairy Farm, D. G. Khan. The parameters studied were overall mortality, still birth rate, abortion rate, the age of dam and calf mortality, calving season and calf mortality, birth weight and calf mortality, causes of death, the age of calf and mortality, age of calf and cause of death and weaning practices. The dams were divided into three groups, I, II and III based on their ages. Overall mortality rate was higher in SB Dairy Farm, Faisalabad, and Paki Shah Mardan Dairies, Mianwali then those of Chakwal Dairy Farm, Chakwal and Bahadur Garh Dairy Farm, D. G. Khan. It was 17.7 and 18.43, 7.5 and 8.5 and 6.94 and 6.6, 5.71 and 6.08 % in male and female, respectively. The age of the dam had a significant correlation with calf mortality. Group I and II (up to 4 year and 4-9 years) and the group I and III (up to 4 years and above nine years) were found to have a significant relationship at all the commercial dairy farms. The birth weight of calf was also found to have a significant correlation with calf mortality. Group I and III (up to 18 kg and 19-23 kg) had relationship between them significantly, while the difference between the group II and III was non-significant. Other parameters such as calving season, the age of calf, the cause of death and age of calf and causes of death showed a non-significant relationship with calf mortality in all the farms.

Keywords: Mortality; Cattle Calf; Punjab; Farms; Birth Weight; Calf Diseases

Introduction

   Dairying is one of the most important parts of the livestock sector. Heifers are a future herd of a dairy farm. They must be produced to replace the old and uneconomical females of the farm through voluntary culling [1]. Dairy farmers are facing a number problems such as high calf mortality rate and are commonly incapable to raise their dairy herds [2]. Maximum losses to farmer were due to mortality of calves because of mismanagement leading to digestive and respiratory problems, emaciation and bacterial infections such as colibacillosis and hemorrhagic septicemia [3]. Calf losses were significantly reduced by good management including on-time colostrum feeding [4].

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Due to increase in human population and their living standards, the demand for animal protein is increasing day by day but production is not increasing at the same pace, and the gap between supply and demand for quality protein food (such as milk and meat) is continuously widening. This gap can be minimized by enhancing meat and milk production in the country, which can only be achieved successfully by adopting the advanced and modern animal husbandry practices. The early death of calves affects not only the milk and meat production but also reduces the availability of males for the selection and production of quality sires and female for the future herd. Calf plays an essential role in the development and profitability of a dairy farm and dairy farmers, as future of dairy herd solely depends on the successful raising of the young calves. Healthy calves are not only essential for the sustainability of dairy farm but also necessary for preserving the excellent quality germplasm. Calf mortality is a major concern at farmer level as well as at organized farm [5]. Keeping in view the importance of young replacement stock at commercial dairy farms of Punjab, the present study has been planned to find out the factors which contribute to early calf mortality on commercial dairy farms of Punjab.Owing to the continued and fast growth rate of population in the country the gap between supply and demand for quality protein food (such as milk and meat, etc.) is continuously widening. Nutritional merit of the milk for human being is indicated by the fact that daily consumption of a quart (1.14 liter) of milk furnishes an average man approximately all the fat, Ca, P, B2 (Riboflavin), ½ protein, 1/3 Vitamin A, B1 (Thiamine), ¼ calories and all minerals except Fe, Cu, Mn and Mg. A considerable amount of Nicotinic acid and Chlorine are also provided. In Pakistan per capita, availability of milk and meat is 110 liter and 20 kg per head per annum, respectively. (Anonymous, 2016), which is far less than that of several advanced countries. Amongst the vitamins and trace elements, meat contributes significantly to the daily requirements of the Nicotinic acid, Riboflavin, Thiamine, B6, B12, and Iron in varying amounts up to 13%. Meat also supplies varying amounts of expandable calories within the limits of the eater and performance for fat (Troll and Tarjan 1954).

Owing to the continued and fast growth rate of population in the country the gap between supply and demand for quality protein food (such as milk and meat, etc.) is continuously widening. Nutritional merit of the milk for human being is indicated by the fact that daily consumption of a quart (1.14 liter) of milk furnishes an average man approximately all the fat, Ca, P, B2 (Riboflavin), ½

protein, 1/3 Vitamin A, B1 (Thiamine), ¼ calories and all minerals except Fe, Cu, Mn and Mg. A considerable amount of Nicotinic acid and Chlorine are also provided. In Pakistan per capita, availability of milk and meat is 110 liter and 20 kg per head per annum, respectively (Anonymous, 2016), which is far less than that of several advanced countries. Amongst the vitamins and trace elements, meat contributes significantly to the daily requirements of the Nicotinic acid, Riboflavin, Thiamine, B6, B12, and Iron in varying amounts up to 13%. Meat also supplies varying amounts of expandable calories within the limits of the eater and performance for fat [6].

Pakistan supports over 39.7 million heads of cattle and 34.6 million heads buffalo, 29.1 million of sheep and 66.6 million goats and 1 million camels, which supply about 13.706 thousand tons of milk, 626 thousand tons of beef, 610 thousand tons of mutton, 172 thousand tons of chicken meat and 4320 million egg per annum. Also, over 37 million skins and hides are available from livestock sector (Anonymous 2016). On average human diet has been reported to be 50% deficient in animal protein in Pakistan (Anonymous 2016). This gap in protein supply can be met by enhancing the meat and milk production in the country, which can only be achieved successfully by adopting advanced animal husbandry practices. Production of meat is undoubtedly the most complex operation in the food industries; it involves a contribution from a series of sub-industries starting from breeders, producers, raisers, abattoir operators, and wholesale and retail distributor [6]. Cattle raising is also necessary for permanent agriculture. When crops are fed to animals, about 80% of fertilizing elements of the feed are recover fed in the manure. This factor is of great importance in maintaining soil fertility [7]. Any program devised to increase the supply of available protein throughout the world must, of course, consider total food supply. It must also be based upon most efficient methods of production. Livestock is also relatively low in its efficiency of protein production per acre of land [8].

The early death of calves effects not only the milk and meat production but also reduce the availability of males for the selection and production of quality sires and females for future replacement. Various factors are responsible for the shortage of animal protein; unusually early calf mortality in buffaloes and cows seems to be rather important. Although the milk production of Pakistani dairy animals is low, yet it is also related to some extent with early calf mortality, especially in buffaloes. At the same, there is no specific breed in Pakistan, instead culled, old and diseased animals are slaughtered for meat purpose. Surplus males are also used in this

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job, but sufficient replacement stock for milk and meat production is also not available. The present study, has thus, been planned to find out the factors which contribute to early calf mortality in buffalo and cows. Determination of such clues may be a great tool to take an appropriate measure to reduce the death losses and to improve the source of protein availability.

Materials and Methods

Data were collected from the different commercial dairy farms in Punjab, namely SB Dairy Farm, Faisalabad, Chakwal Dairy Farm, Chakwal, Paki Shah Mardan Dairies, Mianwali and Bahadur Garh Dairy Farm, D. G. Khan (Figure 1), to determine the environmental and managemental factors causing calf mortalities at commercial and household level.

The data were collected at forms from respective record registers. Necessary Performa was devised to record the observations, firstly the postmortem register was consulted thoroughly and the observation recorded were; tag no of the dead calf (up to 1 year of age), Cause of death, Sex of death and age of calf at death. Then the birth register was used to record these observations; date of birth of a dead calf, type of birth (normal/abnormal) and (single/twin), the season of birth of a calf, birth weight, tag no. of the dam, history sheet and a number of the stillbirth and abortion. Other records noted were; the age of the dam at the time of parturition, lactation no of the dam, herd size, feeding system, housing system, vaccination schedule, weaning practices and amount of milk fed to calves. Later on, the data obtained were arranged year wise according to parameters under study to determine the effect of age of dam on calf mortality. Three age groups were suggested as follows:

- Group I= up to 4 year
- Group II= 4-9 year old
- Group III= above nine year

Similarly, three age group were used for the calf to determine the most critical stage where the mortality was found to be maximum

- Group I= less than one month
- Group II=1-6 month
- Group III= 7-12 month

To study the relationship between birth weight and calf mortality. Three groups were formed as below;

- Group I= up to 18 kg

- Group II= 19-23 kg
- Group III= above 23 kg

The difference among the age group, birth weight and the sex of calf were calculated by using Z- test as given the formula [9]:

$Z = P_1 - P_2$

Where P_1 = % mortality of group I which is calculated as;

$P_1 = D/B \times 100$

D = Total no of death

B = Total no of births

P_2= % mortality of group II calculated in the same way

$P_2 = D/B \times 100$

q_1= % birth in group I which is calculated as

q_2= % birth in group II calculated in the same way

q_2= 100- p_2

n_1= No. observation in group 1

n_2= No. observation in group

Still-birth rate (SBR) was calculated by using the formula [10]:

$$SBR = \frac{SB}{C - A} \times 100$$

Where SB = total No. of still-births

C = total No. of conceptions

A= total No. of abortions

Abortion rate (AR) was calculated with the help of formula [11]:

$$AR = \frac{A}{C} \times 100$$

Where A= total No. of abortions

C= total No. of conceptions

Results and Discussion

Overall mortality

Data were collected from four different commercial dairy farms of Punjab, (Pakistan) namely SB Dairy Farm, Faisalabad, Chakwal Dairy Farm, Chakwal, Paki Shah Mardan Dairies, Mianwali, and Bahadur Garh Dairy Farm D. G. Khan. The data of calves were analyzed, which showed that the mortality rate was 17.7, 6.94, 7.5 and

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8.5 respectively in male calves at SB Dairy Farm, Faisalabad, Chakwal Dairy Farm, Chakwal, Paki Shah Mardan Dairies, Mianwali and Bahadur Garh Dairy Farm D. G. Khan, whereas the corresponding figure for female calves were 18.43,6.6,8.5 and 6.08% at SB Dairy Farm, Faisalabad, Chakwal Dairy Farm, Chakwal, Paki Shah Mardan Dairies, Mianwali, and Bahadur Garh Dairy Farm D. G. Khan respectively (Table 1; Table 2). A non¬-significant relationship was observed between the sexes of the calves. As for as overall mortality is concerned the results of the present study are compared to the others. Many research workers conducted their studies on calf mortality in different regions of the world. The results of present study are in line with the findings of [12-17], found that annual calf mortal¬ity averaged 13.7% in 379 Michigan dairy farms [5] analyzed 20 years data of a herd kept at the Institute of Agriculture. Allahabad and calculated the overall mortality in the female which was % 21.69% on average [14] conducted his studies on 5991 pregnancies and reported that the calf death rate was 15.6% before six months of age [17] obtained the data of 16 dairy farms and studied the meteorologica1 and managemental factors on calf mortality rate at California. The average calf mortality was found to be 18.7% with a large variation among different farms (3.7-32.1%) [15] observed 14.3% calf mortality among 2084 dairy calves at 8 Agricultural Institute farms during 1976-1978 [16] analyzed the data of three cross-bred cattle farms in different climatic zones during 1971-1973 and found average annual calf mortality rate of 9.52, 8.32 and 10.36%, respectively. On the other hand, many other workers conducted the same research and found different results concerning this study [15,18-22] studied 260 households kept 1003 animals and found 33.6% calf mortality. Average mortality of 0.89% was reported by [20] in the calves ranging from the 6-12 month of age. It was the highest (4.95%) during the first month of life [21] reported that in Jersey's calves the mortality during 1-3, 3-6, 6-9 and 9-18 months of age was 6.20, 2.41, 1.93 and 0%, respectively [22] reported 4.2 and 5.2% calf mortality in two groups of calves. The differences in the results of the above review and the present study may be due to environmental fluctuations, managemental practices or the difference in the feeding regimes at various farms. Among all the commercial dairy farms under discussion, only at one cattle farm higher mortality was found in male than in a female, i.e. Chakwal Dairy Farm, Chakwal [14] reported that overall postnatal mortality rate was higher in male 17.21% than in female calves 15.21% [23] stated that mortality rate was higher in the male from 0 - 30 days of age than in female of the same age group [16] reported that mortality rate was higher in male calves than in the female [17] also found that mortality was

higher for male (20.4%) than for female (16.4%), while in another study his findings were opposite. He reported in 1979 that female calves had a higher mortality rate than males which supports the findings farms under study.

Farm	Birth	Death	Mortality %
SB Dairy Farm Faisalabad	180	32	17.7
Chakwal Dairy Farm Chakwal	118	17	6.94
Paki Shah Mardan Dairies Mianwali	60	8	7.5
Bahadur Garh Dairy Farm Dera Ghazi Khan	40	7	5.71

Table 1: Overall mortality in male.

Farm	Birth	Death	Mortality %
SB Dairy Farm Faisalabad	255	47	18.43
Chakwal Dairy Farm Chakwal	160	24	6.6
Paki Shah Mardan Dairies Mianwali	128	15	8.5
Bahadur Garh Dairy Farm Dera Ghazi Khan	73	12	6.08

Table 2: Overall calf mortality in female.

Stillbirth

The stil1-birth obtained at SB Dairy Farm Faisalabad, Chakwal Dairy Farm, Chakwal, Paki Shah Mardan Dairies, Mianwali and Bahadur Garh Dairy Farm, D. G. Khan were 1.1 and 1.56, 2.54 and 0.625, 3.33 and 1.56 and 2.50 and 4.1 percent in male and female calves respectively out of 180 and 255, 118 and 160, 60 and 128 and 40 and 73 male and female of total calving. Sex of the calves did not affect sti11-births. The statistical analysis also showed non-significant differences among the farms (Table 3 and 4). The highest still-birth rate in male was in Paki Shah Mardan Dairies, Mianwali and female calves was found at Bahadur Garh Dairy Farm, D. G. Khan (3.33 and 4.10) and minimum still-birth rate in male at SB Dairy Farm Faisalabad and in female at Chakwal Dairy Farm, Chakwal (1.11and 0.625), More males were still-born at Paki Shah Mardan Dairies, Mianwali (3.33%) while the situation was reverse at SB Dairy Farm, Faisalabad (1.11%). The herd size was found maximum at SB Dairy Farm, Faisalabad while the management was considered most efficient at Chakwal Dairy Farm, Chakwal. Usually Paki Shah Mardan Dairies, Mianwali had to suffer a feed shortage problem once or twice a year. Due to the semi-arid area, the

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environmental conditions remained on extreme during both the seasons, i.e., summer and winter, As far as, housing is considered, and the best-designed housing sheds were available at Chakwal Dairy Farm, Chakwal. There was a fluctuation in managemental practices at Bahadur Garh Dairy Farm, D. G. Khan, and Paki Shah Mardan Dairies, Mianwali depending upon the availability of staff because technical staff had usually avoided being posted there. While Chakwal Dairy Farm, Chakwal was the charming spot due to research allowance, so there was no problem of staff and hence the efficient management. The herd size was maximum at SB Dairy Farm, Faisalabad, while minimum at Bahadur Garh Dairy Farm, D. G. Khan. Well-designed housing sheds had been provided at Chakwal Dairy Farm, Chakwal and Bahadur Garh Dairy Farm D.G. Khan where the animals were kept under the shady trees during summer. The meaning was Chakwal Dairy Farm, Chakwal while the direct suck¬ling method was a daily routine at Bahadur Garh Dairy Farm, D. G. Khan. Many research workers found various results concerning stil1-birth under different environmental and managemental conditions [14] studied 5991 pregnancies and reported 9.2% calves were aborted or still-born [19] analyzed 1063 calves born at Haryana and reported that sti11-birth rate varied from 0.67-1.03% and the mortality rate was higher in males than in females [15] studied 2824 calves and reported 36 another probable reason could be the plane of nutrition of the dam during pregnancy. Housing system and managemental practices could also be responsible for the differences in still-birth rate [24] reported that management at calving affected dystocia and mortality, and feed given to animals around the time of service affected pregnancy rate. Still-birth is also an inherited problem caused by detrimental or lethal genes which may come from either of both parents* finder such conditions, the pedigree of both the parents must be investigated and after finding positive results, the animal with all of its collaterals, sibs, kins, etc. should be culled altogether. The control of heavy exercises and fighting among the pregnant animals may also bring about a positive change in the results of still-birth rate.

Farm	Birth	Death	Mortality %
SB Dairy Farm Faisalabad	180	2	1.11
Chakwal Dairy Farm Chakwal	118	3	2.54
Paki Shah Mardan Dairies Mianwali	60	2	3.33
Bahadur Garh Dairy Farm Dera Ghazi Khan	40	1	2.5

Table 3: Still-birth in male.

Farm	Birth	Death	Mortality %
SB Dairy Farm Faisalabad	255	4	1.56
Chakwal Dairy Farm Chakwal	160	1	0.625
Paki Shah Mardan Dairies Mianwali	128	2	1.56
Bahadur Garh Dairy Farm Dera Ghazi Khan	73	3	4.1

Table 4: Still-birth in female.

Abortion rates

The total number of abortions during the three years has been given in Table 5 and 6. The percentage of abortion cases was 0.55 and 0.78, 1.69 and 2.5, 0 and 0.78 and 2.50 and 2.74 in male and female calves at SB Dairy Farm, Faisalabad, Chakwal Dairy Farm, Chakwal, Paki Shah Mardan Dairies, Mianwali, and Bahadur Garh Dairy Farm D. G. Khan respectively. The non-significant relationship was obtained between the sex of the calves and even among the farms. The maximum abortion rate was found at Bahadur Garh Dairy Farm, D. G. Khan, while it was minimum at Paki Shah Mardan Dairies, Mianwali. It is obvious from table 5 and 6, that abortion rate of female calves was relatively higher than that of males at all farms. The variations noted in each breed may be attributed to the managemental practices. Also, the feeding regime and the age of the dam seem to have contributed in this regard [25] determined that significantly more progeny of heifers died before weaning than the progeny of cows. They further reported that the progeny of heifers that prenatally had greater birth weight than those survived to one week of age [24] suggested that diet around the time of service affected the pregnancy rate. Various diseases also contribute to high abortion rate [15] reported that abortion due to brucellosis listeriosis, salmonellosis and mummified-fetuses, 5, 2 and 4%, respectively. From the data collected from 8 Agricultural Institute farms [15] found 3.1, 7.2 and 4.6% abortion, still-birth and mortality, respectively during the investigation of Agricultural Institute farms [26]. found 5.35 and 5.78% fetal death in cattle and buffalo, respectively. (Parekh and Singh 1981) found 1.3 and 0.89% abortion in male-female calves, respectively [5] analyzed 27 years data and found that abortion rate varied significantly ranging from 1.36 and 6.53%.

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Age of dam and calf mortality

It was observed that mortality rate in each of the three groups was 47.49, 51.43% and 6.18 at SB Dairy Farm, Faisalabad and 42.07, 43.48 and 3.87 percent at Chakwal Dairy Farm, Chakwal, it was 44.04, 44.91 and 4.15 percent at Paki Shah Mardan Dairies, Mianwali, whereas 39.1, 41.03 and 3.77 percent at Bahadur Garh Dairy Farm, D. G. Khan in group I, II, and III, respectively (Table 7). After applying Z-test on the data, it was found that the groups 1 and 2 and groups 2 and 3 were significantly different from each other, while there was non-significant difference between groups 1 and 3 at each of the four farms. However, the mortality percentage was relatively higher in group 2 than in group 3. These results showed 47.49, 51.43 and 6.18% mortality in each group respectively at SB Dairy Farm (Table 7) while at Chakwal Dairy Farm, Chakwal it was 42.07, 43.48 and 3.87% mortality in group I, II and III groups respectively. Statistically significant relationship was observed between the groups I and II and II and III. Likewise, non-significant relationship was found in group I and III. However at the same time, like cattle, mortality rate was relatively higher in group I than in group III. Special attention must be given to the heifers, while the aged animals should be replaced simultaneously [22] carried out survey on 150 villages for mortality in bovines and found that the main cause of death in cattle was old age (36.34%) [27] investigated 2975 calves born during 1953-63 reported that there was non-significant correlation between age, milk yield and uterine involution in the dams and mortality off their calves [28] studied 33299 parturitions cases and found that effect of month of calving, age of dam and breed of dam was high significant. While studying 5258 purebred and crossbred animals [29], reported that the effect of breed group and of sire breed were highly significant, while age of dam and season of calving had non-significant effect. Therefore, it may be considered that nutrition along with hygienic conditions and freshwater availability should be improved so that heifer may attain a proper body size at maturity as discussed by [25].

Farms	Birth	Death	Mortality %
SB Dairy Farm Faisalabad	180	1	0.55
Chakwal Dairy Farm Chakwal	118	2	1.69
Paki Shah Mardan Dairies Mianwali	60	0	0
Bahadur Garh Dairy Farm Dera Ghazi Khan	40	1	2.50

Table 5: Abortion rate male.

Farms	Birth	Death	Mortality %
SB Dairy Farm Faisalabad	255	2	0.78
Chakwal Dairy Farm Chakwal	160	4	2.5
Paki Shah Mardan Dairies Mianwali	128	1	0.78
Bahadur Garh Dairy Farm Dera Ghazi Khan	73	2	2.74

Table 6: Abortion rate female.

Farms	I Upto 4 years %	II 4-9 years %	III Above 9 years %
SB Dairy Farm Faisalabad	47.49	51.43	6.18
Chakwal Dairy Farm Chakwal	42.07	43.48	3.87
Paki Shah Mardan Dairies Mianwali	44.04	44.91	4.15
Bahadur Garh Dairy Farm Dera Ghazi Khan	39.1	41.03	3.77

Table 7: Age of dam and calf mortality.

Calving season and calf mortality

TTwo seasons i.e. breeding season (July - October) and off-breeding season (November - June) were selected in cattle and observations were made on 180 and 255, 118 and 160, 60 and 128 and 40 and 73 male and female cattle calves at SB Dairy Farm Faisalabad, Chakwal Dairy Farm Chakwal, Paki Shah Mardan Dairies Mianwali and Bahadur Garh Dairy Farm Dera Ghazi Khan respectively. The results obtained are given in Table 8 and 9 and 10. Mortality rate observed under the breeding season (July – October) at SB Dairy Farm, Faisalabad, Chakwal Dairy Farm, Chakwal, Paki Shah Mardan Dairies, Mianwali and Bahadur Garh Dairy Farm, D. G. Khan was 14 and 5.88, 9.79 and 8.96, 12.07 and 14.98 and 8.06 and 7.05% respectively in male and female calves, with statistically non-significant relationship between the sexes of calves. Under the off breeding season on the same experimental stations it appeared as 8.86 and 8.62, 9.40 and 10.47, 1o.54 and 12.58 and 7.56 and 8.99% respectively at each of the four commercial dairy farms with the non-significant difference between the sexes as well. Both season were found to be non-significantly correlated with each other however relatively higher mortality rate was observed in breeding season (July-October) at SB Dairy Farm and Paki Shah Mardan Dairies, Mianwali in both male and female calves (14 and 5.88 and 12.07 and 14.98%, whereas it was relatively greater in off breeding

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season at Paki Shah Mardan Dairies Mianwali (10.54 and 12.58%). At the same time, in the breeding season (July- October) male showed greater mortality rate than female (14 and 5.88%) at SB Dairy Farm Faisalabad. While it was reverse at Paki Shah Mardan Dairies Mianwali (12.07/14.98%). In the off breeding season (November – June) female calves showed more susceptibility to death than males at Chakwal Dairy Farm Chakwal and Paki Shah Mardan (9.40/10.47% and 10.54/12.58%), while the reverse was found at SB Dairy Farm Faisalabad (8.86/8.62%).

Farm	% off breeding season	% of Off breeding season
SB Dairy Farm Faisalabad	14	8.86
Chakwal Dairy Farm Chakwal	9.79	9.40
Paki Shah Mardan Dairies Mianwali	12.07	10.54
Bahadur Garh Dairy Farm Dera Ghazi Khan	8.06	7.56

Table 8: Calving season and calf mortality in male.

Farm	% Off breeding season	% of Off breeding season
SB Dairy Farm Faisalabad	5.88	8.62
Chakwal Dairy Farm Chakwal	8.96	10.47
Paki Shah Mardan Dairies Mianwali	14.98	12.58
Bahadur Garh Dairy Farm Dera Ghazi Khan	7.05	8.99

Table 9: Calving season and calf mortality in female.

Farm	Up to 18 kg %	19-23 kg %	Above 23 kg %
SB Dairy Farm Faisalabad	47.55	8.32	5.74
Chakwal Dairy Farm Chakwal	49.69	10.34	6.03
Paki Shah Mardan Dairies Mianwali	50.94	5.79	11.70
Bahadur Garh Dairy Farm Dera Ghazi Khan	46.4	6.05	8.77

Table 10: Birth weight and calf mortality.

Birth weight and calf mortality

AA lot of research had been conducted in this regard at many research workers had found nearly the same result as [12] surveyed 379 Michigan dairy farms and found that winter and summer death losses were 17.1 and 10.3% respectively [19] after surveying 1063 buffalo calves reported that the death losses were relatively higher from Oct-Feb [30]. suggested that summer and winter had non-significant effects, although tendency to higher losses did exist. After investigating the managemental effects on calf mortality on 16 dairy farms [31] reported that the mortality increased during mid-summer (Jun-Aug) and mid-winter (Nov-Jan), the rate being 20% higher in winter than summer [22] reported while studying 794 Gir calves that there was highly significant difference between years in calf mortality but season had no effect [32] reported that season of the birth and sexes of calf were not significantly correlated with mortality [23] observed 36.42, 29.29 and 34.29% mortality during summer, rainy and winter seasons respectively and described that season of birth had significant effect on calf mortality [20] reported that season had non-significant effect on mortality. During the analysis of 470 male and 465 female calves [30], observed that month had a significant influence on mortality rate which ranged from 1.43% in July to 22.42% in April. It is, therefore, recommended to intensify the management at the time of breeding and calving in each season to avoid losses as proposed by [24]. The mortality observed were 47.55, 8.32 and 5.74 SB Dairy Farm Faisalabad 49.69, 10.34 and 6.03% at Chakwal Dairy Farm, Chakwal, 50.94, 5.79 and 1.70% at Paki Shah Mardan Dairies, Mianwali and 46.4, 6.05 and 8.77% Bahadur Garh Dairy Farm, Dera Ghazi Khan. There was statistical significant relationship between group I and II and Group I and III, but group II and III did not differ statistically at each of the four farms however, mortality percentage was somewhat higher in group II than in group III at SB Dairy Farm Faisalabad and Chakwal Dairy farm Chakwal, while it was relatively lower in group II than in group III at Paki Shah Mardan Dairies, Mianwali and Bahadur Garh Dairy Farm, Dera Ghazi Khan. It was the fact that, cattle group 1 included maximum birth weight from 12-15Kg. very few calves born with birth weight from 15-18 kg [25] described that for progeny of heifers, those that died prenatally had greater birth weights (30.3 ± 0.9kg) than those surviving to one week (30.3 ± 0.3) for progeny of cows, those that died prenatally had a lower birth weights (31.3 ± 1.0 kg) than those survive to one week (349 vs 396 kg) [33]

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studied 15 years data and found that for scores of 1, 2, 3 and 4% losses within score was 52.6, 6.7, 30.8 and 9.9, respectively (p < 0.05) and birth weight was 33,9, 36.1, 39.2 and 37.4 kg. (p < 0.05). Among the cattle farms the maximum mortality due to birth weight was observed in group 1 (up to 18 kg.) at Paki Shah Mardan Dairies Mianwali (50.94%) and then Chakwal Dairy Farm Chakwal, SB Dairy Farm Faisalabad and Bahadur Garh Dairy Farm Dera Ghazi Khan in the order of 49.69, 47.55 and 46.40 percent, respectively. As it was discussed already that the managemental side of Bahadur Garh Dairy Farm Dera Ghazi Khan was somewhat loose due to scarcity of fodder once or twice a year at one hand and shortage of staff another, owing to lack of interest of the people at that station may be suitable cause. In addition, culling pattern was not justified and too old and weak animals were also present in abundance may be another reason for low birth weight and high mortality rate in the calves [24] reported that diet around the time of service affected pregnancy rate and growth rate during rearing of Friesian heifers and subsequent milk yield. It is, therefore, suggested to provide extra ration a pregnancy allowance to meet the increasing demand for growth and development to become a viable and strong calf. Forage scarcity could be met by introducing new varieties of more productive forages/grasses as had been discussed already in the section "Age of Dam and Calf Mortality" or by adopting the methods of hay and silage making on scientific basis. Age and body size/weight of the dam should also be kept in mind while breeding the animals as described by [25] and [33]. Fresh, clean and aseptic drinking water availability along with cleanliness, ventilation and hygienic conditions at the farm are included in the important husbandry and managemental tools.

Causes of death and calf mortality

The results obtained are given in table 11 and 12 the data revealed that 3.02 and 2.79, 2.75 and 3.04, 3.48 and 2.85 and 2.85 and 3.16% deaths in were due to pneumonia, 2.24 and 3.09, 3.16 and 3.38, 1.55 and 2.38 and 3.38 and 2.80% due to enterotoxemia, 1.95 and 2.59, 0.55 and 0.90, 1.06 and 0.76 and 2.59 and 0.50% due to gastroenteritis, 2.24 and 1.99, 0.00 and 0.00, 1.93 and 0.47 and 1.99 and 1.87% due to retention of urine and 2.53 and 2.49, 2.41 and 2.76, 1.83 and 1.71 and 2.76 and 2.65% death were due to miscellaneous causes in male and female calves at SB Dairy Farm, Faisalabad, Chakwal Dairy Farm, Chakwal, Paki Shah Mardan Dairies, Mianwali and Bahadur Garh Dairy Farm, D. G. Khan respectively.

Farm	Pneumonia %	Enterotoxaemia %	Gastroenteritis %	Retention of urine %	Hemorrhagic septicemia %	Miscellaneous %
SB Dairy Farm Faisalabad	3.02	2.24	1.95	2.24	0	2.53
Chakwal Dairy Farm Chakwal	2.75	3.16	0.55	0	0	2.41
Paki Shah Mardan Dairies Mianwali	3.48	1.55	1.06	1.93	0	1.83
Bahadur Garh Dairy Farm Dera Ghazi Khan	2.85	3.38	2.59	1.99	0	2.76

Table 11: Causes of death in male.

Farm	Pneumonia %	Enterotoxaemia %	Gastroenteritis %	Retention of urine %	Hemorrhagic septicemia %	Miscellaneous %
SB Dairy Farm Faisalabad	2.79	3.09	2.59	1.99	0	2.49
Chakwal Dairy Farm Chakwal	3.04	3.38	0.90	0	0	2.76
Paki Shah Mardan Dairies Mianwali	2.85	2.38	0.76	0.47	0	1.71
Bahadur Garh Dairy Farm Dera Ghazi Khan	3.16	2.80	0.50	1.87	0	2.65

Table 12: Causes of death in female.

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Z-test showed a non-significant relationship between the sex of calf and among the causes of death. However, greatest losses were observed due to enteritis at, Chakwal Dairy Farm (3.162 and 3.384% in male and female). The male calves showed relatively greater susceptible to death due to pneumonia than females at SB dairy farm and Chakwal dairy farm (3.02/2.79% and 3.48 / 2.85%) while at Paki shah Mardan Dairies and Bahadur Garh Dairy Farm was reversed (2.75/3.04%) whereas in enteritis females were more prone to death than males (2.24/3.09%, 3.16/3.38%, and 1.55/2.38%) at all the commercial dairy farms. More females were affected by gastroenteritis at SB Dairy Farm Faisalabad and Chakwal Dairy Farm Chakwal (1.95/2.59% and 0.55/0.90% respectively) while at Paki Shah Mardan Dairies Mianwali male showed greater susceptibility to gastroenteritis (1.06/0.76%). No case of retention of urine was observed at Chakwal Dairy Farm Chakwal observed at Chakwal Dairy Farm while its occurrence was more in male than female at SB Dairy Farm Faisalabad and Paki Shah Mardan Mianwali (2.24/1.99% and 1.93/0.47%). The miscellaneous cases of death included some cases of hemorrhagic septicemia, heat stroke, heart attack, tympani, diarrhea, white scour, hepatitis and snake bite, etc. [34] analyzed 20 years data from Institute of Agriculture Allahabad and found that major causes of death were weakness and general debility (39%) tympani (14%) foot and mouth disease (7%) and pneumonia (4%) [19] studied 1063 buffalo calves born; at different government buffalo farms at Haryana and reported that the major causes of death were pneumonia (41.3%) and gastroenteritis (32.1%) [35] observed calf mortality in 5 herds comprising 731 pregnancies and reported that the most common causes of postnatal death were a neonatal weakness, foot, and mouth disease, septicemia, parasitic gastroenteritis and pneumonia (14.8, 12.7, 9.2, 7.0 and 6.3%, respectively) [30] reported that most serious cause of calf death was gastroenteritis (26.43%) followed by milk indigestion (21.83%) [36]. Found enteritis and pneumonia as main cause of death among 1370 cross bred cattle calves. The main reason for variation between the results of this study and the findings of early researchers in mortality rate was the formula with which it was calculated:

$$MR = \frac{D}{Dt} * 100 \qquad \text{(used by early researchers)}$$

Where   D = Total number of deaths with the specific cause of death

Dt = Total number of deaths

While in the present study the mortality rate was calculated out of total birth using formula given below:

$$MR = \frac{D}{B} * 100$$

Where   D = Total number of deaths with the specific cause of death

B = Total number of births

The following suggestions may be helpful in lowering death rate in claves: Special hygienic measures should be adopted while rearing the young calves« The use of muzzle would be helpful in preventing the calves to lick or eat undesirable material. Proper housing would prevent the calf from extreme weather. Colostrum feeding should be essentially resorted to milk be in a proper amount to produce immunity in the calf while overfeeding may lead to diarrhea. Prophylactic measures to save the calves from various infections should be adopted.

Age of calf and mortality

To determine the specific age which is critical for the calf. All breeds of cattle present at four farms were brought under observation and three age groups were found for the analysis of data in this respects

- Group 1   = Up to 1 month.
- Group 2   = 2-6 months
- Group 3   = 7-12 months

The results are given as under.

The mortality observed under each group was 5.3, 4.9 and 1.5, percent at SB Dairy Farm Faisalabad and 3.20, 3.3 and 2.8 percent at Chakwal Dairy Farm Chakwal, while it was 2.92, 2.060 and 2.0 percent respectively at Paki Shah Mardan Dairies Mianwali and Bahadur Garh Dairy Farm Dera Ghazi Khan are 5.42, 2.05 and 2.80 (Table 13). On analyzing non-significant relationship was found among three age groups. However, the least mortality was found in group III (above 3 months) at SB Dairy Farm Faisalabad and Paki Shah Mardan Dairies Mianwali (1.5 and 2.0% resp.), whereas it was maximum (2.8%) in the same age group at Chakwal Dairy Farm Chakwal and Bahadur Garh Dairy Farm Dera Ghazi Khan. Maximum mortality was noticed in group I at Bahadur Garh Dairy Farm Dera Ghazi Khan (5.42%). There were also non-significant correlations among the farms [18] reported that at Michigan farm the deaths between birth to 2 weeks and 2 weeks to 2 months of age were 8.5 and 2.8% respectively [14] studied 5991 pregnancies and found that of all the deaths in calves (4.5, 3.5, 2.9, 1.4, 1.5 and 1.8%) oc-

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curred during first, second, third, fourth, fifth, and sixth months of age [30] observed that the greatest losses during the first month of life and declined thereafter [37] studied buffalo calves and reported mortality rate in calves aged less than 1, 1-2, 2-3, 3-4, 4-5, 5-6, and 6-12 months was 8.6, 4.6, 4.1, 2.6, 4.4, 2.2 and 4.4 percent, respectively [21] stated that the mortality in Jersey calves was 6.20, 2.41, 5.35 and 0%, respectively during 0-3, 3-6, 6-9 and 9-18 months of age [38] after investigating 407 herds, reported that the frequency of mortality upto 3 months of age was 6.9%. The present study showed that group 1 (upto 1 month) may be critical period for the calf in both the species. This may be due to the change in prenatal and postnatal environment and calf takes some time to adopt. It is, therefore, recommended intensify the management upto 1 month of age, give proper amount of colostrum, save from the extreme of temperatur (high or low) especially the cold draft in winter. The drinking utensils (nipple, pale, bucket, etc.) should be thoroughly cleaned and disinfected while weaning is practiced. In case of skimmed milk, limited whole milk or dried milk feeding system, calf starter should be provided from early life of the calf. Clean luke warm milk should be fed in proper amount. Wash and disinfect the udder and teats of the dam before the calf is allowed to suckle it if weaning is not in practiced, but it is very necessary to avoid overfeeding.

Farm	Up to 1 month %	2-6 months %	7- 12 months %
SB Dairy Farm Faisalabad	5.3	4.9	1.5
Chakwal Dairy Farm Chakwal	3.20	3.3	2.8
Paki Shah Mardan Dairies Mianwali	2.92	2.06	2.0
Bahadur Garh Dairy Farm Dera Ghazi Khan	5.42	2.50	2.8

Table 13: Age of calf and mortality.

Conclusion

The objectives of this study to find out the relationships of morbidity and mortality with individual calf and management variables. Since management has a rather abstract meaning, is complex in nature and its impact is difficult to measure, the application of epidemiological approaches may contribute to a better understanding of disease and disease patterns. Moreover, the risk quantification might support the setting of priorities and fields of attention in herd health and production-control programs..

Competing Interest

Authors declare that there is no conflict of interest.

Author contribution

MZF and MY conceived and designed the study, MY and HIA extracted the data, MZF and MY analyzed the data. MZF and HIA wrote the manuscript. MZF, MY and HIA revised the paper.

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