# SOME FACTORS AFFECTING FRIESIAN CALF MORTALITY RATE FROM BIRTH TO WEANING

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## ABSTRACT

A total of 322 mortalities out of 3363 newly born Friesian calves were recorded from birth to 16 weeks of age during the period from 1983 to 2002. The effects of year and month of birth, lethal diseases, dam parity, sex of calf and birth weight on calf mortality rate (CMR) were studied. The results revealed that all the previous factors significantly ($P < 0.05$ or 0.01) affected CMR. The overall mean of CMR was 9.57% during the experimental period. Of all recorded cases 49.7% occurred during the last 4 years, and the remainder 50.3% occurred during the first 16 years. Losses in March, June and July were greater compared to other months of the year. The lowest CMR was recorded in September, October and November. The most common diseases detected in the first postnatal 16 weeks were diarrhea (37.6%), respiratory infection (47.8%), septicaemia (3.4%), navel (3.1%), general weak (3.7%) and unknown (4.3%). The first, second and eight parities of dams were associated with about seven folds as much CMR as the 5$^{th}$ parity. The probability of dying was greatest during the first week of life (50.0%) and decreased with age (mainly after the 6$^{th}$ weeks old). About 17.4% of CMR occurred from the 7$^{th}$ to the 16$^{th}$ weeks of age. Sex of calf remarkably affected the CMR which was 55.6% for male calves and 44.4% for female calves. The CMR recorded the lowest level when calves weighed between 26 and 39 kg (25.7%). Additionally, Friesian CMR was correlated positively ($P < 0.01$) with birth weight and diseases, negatively ($P < 0.05$) with birth year and insignificantly with month of birth, sex of calf and dams parity.

## INTRODUCTION

The future of dairy and beef herds depends on rearing healthy calves to replace cows that leave the herd (Roy, 1990). Animal

scientists and veterinarians should encourage ranch owners to keep accurate records. These records should be analysed using life-table models to reveal the probability of dying within a particular week, proportions of calves surviving weekly in the herds and monetary losses due to calf mortality (Martin and Schwabe, 1975a and Wittum *et al.*, 1993). Good calf-raising practices include proper feeding, bedding, sanitation, ventilation, prevention of health problem and close daily observation from the day of birth until weaning (Berger *et al.*, 1992 and Meyer *et al.*, 2000).

Survival of calves is important for replacement of slaughtered cattle in a beef herd and for the expansion of dairy herds (Umoh, 1982). Deaths of young calves may markedly increase the production costs of both dairy and dairy-beef products (Luo *et al.*, 1999).

Generally, mortality rates of newly born dairy calves in the few postnatal months averaged from 3.7 to 32.1% depending on many factors including farm, size of herd, birth month, age and sex of calf, birth weight and other factors (Mario *et al.*, 1983 and Dodenhoff *et al.*, 1998).

However, most mortality of calves occurs during the prenatal and neonatal period and may be attributed to variable genetic, environmental and management factors. These include the effects of breed, birth weight, sex of calf, parity and age of dam (Teixeira, 1978). It is well known that, the newborn calf depends upon passive immunity from colostrum to prevent neonatal mortality. Passive transfer of immunity may fail if an insufficient volume of colostrum or colostrum inadequate quality is ingested or if colostrum is fed after cessation of intestinal absorption of macromolecules (Zaremba *et al.*, 1993 and Fagan *et al.*, 1994).

The objective of this study was to measure the mortality of Friesian calves from birth to 16 weeks old and the effects of various factors such as year and month of birth, diseases, dam parity, sex of calf, and birth weight on calf mortality rate (CMR).

## MATERIALS AND METHODS

This study included 3363 records of Friesian calves born during twenty consecutive years from 1983 to 2002 at Sakha Farm belonging to the Animal Production Research Institute, Ministry of

Agriculture. This herd was imported to Egypt from the Nether Land as pregnant heifers during the period from 1959 to 1961 and stills without inbreeding or heterosis till now.

The calves were allowed to suckle their dam's colostrum for the first three days of their life, then they were artificially reared on natural milk till weaning at the age of sixteen weeks. At the third week of their age and up to 16 weeks, the calves were fed calf the concentrate ration, berseem hay and green fodder according to Animal Production Research Institute (APRI) System. The calf ration consisted of 48% yellow maize, 17% cotton-seed cake, 10% wheat bran, 10% rice starch residue, 10% lineseed meal, 2% molasses, 1% limestone, 1% bone male and 1% salt (Sodium chloride).

The calves were loosely housed indoors in individual pens bedded with rice straw at the time of suckling and also overnight. After morning suckling, the calves were grouped according to their ages in shaded stables with open yards where they freely eat, drink and exercise.

Birth weights of calves were recorded within 24 hours after birth when the calf was dried. Calves that died underwent a post-mortem examination within 12 h of death to determine causes of death. Calf mortality was classified according to age, body weight, sex, dam parity, date and disease.

The number of calves suffering of slight or serious injuries of feet, knees, hock or other parts of the body was also recorded.

Data were statistically analyzed by the general linear models procedure of SPSS(1997) using a completely randomized split-plot ANOVA and the final statistical model was as follows:

$$Y_{ijklmn} = \mu + M_i + Y_j + S_K + B_L + C_m + P_n + e_{ijklmn} \quad (1)$$

**Where:**

$Y_{ijklmn}$ = Observation ijklmn of the trait;
$\mu$ = The overall mean;
$M_i$ = Fixed effect of the $i^{th}$ month of birth;
$Y_j$ = Fixed effect of the $j^{th}$ year of birth;
$S_K$ = Fixed effect of the $k^{th}$ sex of calf;
$B_L$ = Fixed effect of the $L^{th}$ birth weight classes;

$C_m$ = Fixed effect of the $m^{th}$ type of diseases;
$P_n$ = Fixed effect of the $n^{th}$ dam's parity and
$e_{ijklmn}$ = The random error associated with the individual record of the ijklmn observation.

To calculate the regression coefficient of CMR on dam body weight at calving (DBW), the following model (2) was used:

$$Y_{ijklm} = \mu + M_i + Y_j + S_k + B_L + C_m + b_1 (X1_{ijklm} - X1_{ijklm}) + b_2 (X2_{ijklm} - X2_{ijklm}) + e_{ijklm}$$

**Where:**

$Y_{ijklm}$ = Observation ijklm of the trait;
$b_1$ & $b_2$ = The linear and quadratic regression coefficients, respectively of CMR on DBW and $e_{ijklm}$ is the random error. The remaining symbols are defined as in model (1).

## RESULTS AND DISCUSSION

Least squares analysis for calf mortality rate (CMR) is presented in Table (1). It clearly appears that effects of month and year of birth, sex of calf, birth weight, diseases and parity on CMR were significant.

**Table (1):** Analysis of variance of factors affected mortality rate of Friesian calves.

| S.O.V. | d.F | Model 1 (with regression) | | Model 2 (without regression) | |
|---|---|---|---|---|---|
| | | M.S. | F | M.S | F |
| Month of birth | 11 | 3935.83 | 1.790* | 3876.75 | 1.776* |
| Birth year | 19 | 5735.73 | 2.609** | 5948.87 | 2.725** |
| Sex of calf | 1 | 15430.36 | 7.018** | 14932.27 | 6.840** |
| Birth weight | 5 | 6976.73 | 3.173** | 6355.68 | 2.911* |
| Diseases | 5 | 7271.57 | 3.307** | 6264.12 | 2.869** |
| Parity | 7 | 5620.29 | 2.556* | - | - |
| Regression | | | | | |
| DBW Linear (L) | 1 | 3970.61 | 1.819* | | |
| DBW Quadratic (Q) | 1 | 1470.99 | 0.674 n.s. | | |
| Residual | 271 | 2198.57 | | 2183.07 | |

* $P \leq 0.05$ ns = not significant
** $P \leq 0.05$ DBW = Body weight of dam at calving

The results of this study indicated that the overall mean of calf mortality rate during the months from September up to January were lower ($P < 0.05$) compared with those died during the months of February through August (Table, 2). However, the highest calf mortality rate was recorded in March, June and July, which agrees with the results of Martin and Schwabe (1975a), who indicated that extent of death losses in California increased during mid summer (June, July, August). This may be attributed to hot weather, which may exert a negative effect on young calves and newborn calves produce more sweet per kilogram body weight than do adult cattle. Consequently, this may lead to dehydration, which greatly reduces the ability of the calf to cool itself by the evaporative heat-loss process (Winchester, 1964). While, Williams *et al.*-(1980) reported that the overall mortality rate was higher in calves born in March, which the total serum immunoglobulins was 11.4 $\pm$ 0.7 mg/ml compared with those born in September (24.5 $\pm$ 1.0 mg/ml) at approximately seven days of age. Moreover, the present results indicated that calf mortality for September through January, which agree with those of Roy (1990), who reported that mortality rates were the highest in February, March and April. The last investigator attributed this due to poor nutrition and wide range of temperature, but seems to be a steady decrease from shortly after the beginning of the autumn calving season until the end of the winter calving seasons. Bendali *et al.* (1999) reported that the highest CMR incidence was observed in December and March (17.6 and 23.6%, respectively) and mortality rate in December was two-times higher than in other months. In addition, Meyer *et al.* (2000) reported that calf mortality rate, if a calf was born unassisted, was higher in summer months (6.8%) than those born in winter months (4.7%).

A total 322 dead calves out of 3363 born calves were subjected to post-mortem examination over 20 years (from 1983 to 2002) clinical and the results are presented n able 3). owever, calf mortality rates were recorded the lowest level at beginning of the period (0.6%) and continuously constant without large change till 1989 to record about 12.1% by 2016.7% increasing than the start level and then again decreased till 1996. From 1997, calf mortality rate began gradually increased to record the highest level of calf dying rate (16.8%) in 2002. Observation of this result, indicated that calf mortality rate was highly increased in the last years. This means

that must be carefully by calf rearing and administer drugs soon after detection of disease and listless appearance to improve will usually reduce mortality. Calf dying rates in this study were similar those reported by Umoh (1982), who found that calf mortality rates for 1105 calves born alive in Zaria and Nigeria during the first 12 weeks old for the period from 1975 to 1980 were 8.7%.

The proportion of stillbirths in the Holstein breed has increased from 1985 to 1996 by 4% per year in primiparous cows and 2% per year in multiparous cows (Meyer *et al.*, 2000, 2001), as the level of dystocia (calving difficulties) increased, this means that perinatal survival of the calf decreased and calf mortality rate increased.

The main diseases detected during post-mortem examination are shown in Table (4). The results cleared that the major cause was respiratory diseases (47.8%) followed in order by diarrhea (37.6%), septicaemia (3.4%), navel (3.1%), general weak (3.7%) and injuries and other unknown conditions (4.3%). In other words 85.4% of calf mortality could be attributed to both respiratory diseases and diarrhea, which may reflect disproper rearing, housing, suckling and ventillation. Consequently, application of appropriate calf management could minimize the mortality rate. Webster *et al.* (1985) also found that records of treatments for infections disease revealed that 50% of conditions were diagnosed as respiratory diseases. However, they added that 30% were due to septicaemia or enteric disease and 20% of calves had a brased and bruised or swollen knees. In the same field, Andrews and Read (1983) found that the most common diseases experienced up to 12 weeks of life were respiratory disease (31.2%), diarrhea (20.1%), eye infections (11.2%) and navel and joint problems (2.2%). The observation of Thomas (1973), that causes of pneumonia (respiratory disease) were resulted from a combination of viral and bacterial infection precipitated by environmental stress. On the other hand, Martin and Schwabe (1975b) demonstrated the possible roles of environmental factors in general on neonatal calf disease. Thus, calf death may be attributed to cold temperature, fluctuating cold temperature, changeable fall weather and adverse weather. Moreover, Roy (1990) suggested that death associated with pneumonia infection may be insufficient production of appreciable amounts of imunoglobulins and less immunity was derived from the dam.

**Table (2):** Summary of monthly counted calf mortality rate from 1983 to 2002.

| Month of birth | No. of born calves | No. of dead calves | Percentage of deaths | Constants ± SE |
|---|---|---|---|---|
| January | 219 | 21 | 6.5 | 2.48 ± 10.40 |
| February | 261 | 25 | 7.8 | 19.68 ± 9.60 |
| March | 418 | 40 | 12.4 | -13.34 ± 7.81 |
| April | 272 | 26 | 8.1 | 7.09 ± 9.44 |
| May | 303 | 29 | 9.0 | -12.07 ± 8.99 |
| June | 522 | 50 | 15.5 | -0.76 ± 7.12 |
| July | 408 | 39 | 12.1 | -7.01 ± 7.89 |
| August | 240 | 23 | 7.10 | -0.04 ± 9.48 |
| September | 167 | 16 | 5.00 | -5.89 ± 11.80 |
| October | 198 | 19 | 5.9 | -1.52 ± 10.89 |
| November | 136 | 13 | 4.0 | 8.41 ± 13.01 |
| December | 219 | 21 | 6.5 | 2.96 ± 10.40 |

**Table (3):** Least squares constants of calf mortality rate of Friesian calves as affected by year of birth.

| Birth year | No. of born calves | No. of dead calves | Percentage of deaths | Constants ± SE |
|---|---|---|---|---|
| 1983 | 21 | 2 | 0.6 | 50.94 ± 32.18 |
| 1984 | 31 | 3 | 0.9 | -11.56 ± 26.39 |
| 1985 | 31 | 3 | 0.9 | -22.56 ± 26.39 |
| 1986 | 73 | 7 | 2.2 | -10.71 ± 17.57 |
| 1987 | 63 | 6 | 1.9 | 5.77 ± 18.90 |
| 1988 | 178 | 17 | 5.3 | -2.09 ± 11.74 |
| 1989 | 407 | 39 | 12.1 | 1.05 ± 8.39 |
| 1990 | 52 | 5 | 1.6 | -32.36 ± 20.62 |
| 1991 | 42 | 4 | 1.2 | 79.44 ± 22.96 |
| 1992 | 146 | 14 | 4.3 | 48.65 ± 12.79 |
| 1993 | 52 | 5 | 1.6 | -0.16 ± 20.62 |
| 1994 | 94 | 9 | 2.8 | -15.23 ± 15.63 |
| 1995 | 220 | 21 | 6.5 | 17.19 ± 10.73 |
| 1996 | 21 | 2 | 0.6 | -44.06 ± 32.18 |
| 1997 | 115 | 11 | 3.4 | -29.11 ± 14.25 |
| 1998 | 146 | 14 | 4.3 | -4.35 ± 12.79 |
| 1999 | 282 | 27 | 8.4 | 5.96 ± 9.67 |
| 2000 | 303 | 29 | 9.0 | -4.94 ± 9.39 |
| 2001 | 522 | 50 | 15.5 | -17.46 ± 7.67 |
| 2002 | 564 | 54 | 16.8 | -14.40 ± 7.47 |

**Table (4):** Friesian calf mortality rate as affected by infection with various diseases.

| Type of disease | No. of dead calves | Percentage of deaths | Constants ± SE |
|---|---|---|---|
| Diarrhea | 121 | 37.6 | 11.31 ± 6.18 |
| Respiratory | 154 | 47.8 | 7.73 ± 5.94 |
| Septicaemia | 11 | 3.4 | 25.37 ± 13.18 |
| Navel | 10 | 3.1 | -15.62 ± 13.74 |
| General weakness | 12 | 3.7 | 15.34 ± 11.91 |
| Injury and unknown conditions | 14 | 4.3 | 13.46 ± 12.70 |

Bendali *et al.* (1999) found that the incidence calf mortality rate from diarrhea in beef calves from birth to 30 days of age was 14.6%. Out of them 20.3% were due to *Escherichia coli*, 47.4% rotavirus, (16.5) coronavirus and (16.5%) cryptospondium after isolation from faecal samples.

Results from this study show that CMR recorded the lowest percentage for dams in the 5$^{th}$ parity (2.8%) followed in order by the 4$^{th}$ (4.3%), the 3$^{rd}$ (7.1%) and the 6$^{th}$ (12.1%). While, the highest percentage of calf mortality recorded in the first, second and eight parities (Table, 5), which were in agreement with Auran (1972), who reported that a 50% higher frequency of calf mortality for Norwegian dairy heifers than for cows. Moreover, Philipson (1976) for different dairy breeds in Sweden, found 6.5% of calf mortality for heifers versus 2.5% for cows. On the other hand, calf mortality in this study was higher than those reported by Teixeira (1978), who found that calf mortality rates were 8, 5.5 and 2.5% for American Holstein dams of the first, second and third or greater parity, respectively. Similarly, Mario *et al.* (1983) showed that calf mortality in the first parities of dams was greater about two times than for later (the fifth parity) parities (10.5 vs. 54.6%). Berger *et al.* (1992) reported that stillbirth rate in Holstein was 10.5% in the 1$^{st}$ parity, 5.5% in 2$^{nd}$ parity and 5.7% in 3$^{rd}$ parity. These results are similar to those of Meyer *et al.* (2001).

Dematawewa and Berger (1997) and Meyer *et al.* (2000) recorded greater mortality rate for large calves at first parity and for small calves at parities greater than one. In later parities size of the birth canal is less restrictive, thus giving preference to larger and well developed calves, in contrast to greater risk in primiparous cows.

**Table (5):** Variations in calf mortality rate by parity of dams.

| Dam parity | No. of dead calves | Percentage of deaths | Constants ± SE |
|---|---|---|---|
| 1 | 67 | 20.8 | -2.64 ± 6.38 |
| 2 | 64 | 19.9 | -4.81 ± 9.72 |
| 3 | 23 | 7.1 | 7.28 ± 7.58 |
| 4 | 14 | 4.3 | 13.47 ± 12.13 |
| 5 | 9 | 2.8 | -9.84 ± 14.90 |
| 6 | 39 | 12.1 | 1.47 ± 7.80 |
| 7 | 42 | 13.0 | 9.03 ± 7.55 |
| 8 | 64 | 19.9 | -6.62 ± 6.45 |

The results of this study further indicated that the Friesian calf mortality rates were 44.5% during the first 72 hours after birth and mounted to 51.0% during the first week of age. This means that about half of calf mortality occurred in the first postnatal week and the other half of mortality achieved during the remainder period till weaning (Table, 6). These results are consistent with those of Martin and Schwabe (1975a), who reported that the risk of death for calves was greatest in their the 1st week of life. They found that of all death 55% occurred during the 1st week of life versus 27% occurred during the 2nd week and the death loss in calves between 5 weeks and 3 months old was less than 2%. Williams *et al.* (1980) working on Grossbred Friesian calves, found that of all mortality 39% occurred when the calves were between 11 and 17 days of age. This may be due to serum immunoglobulin levels in died calves were lower ($P < 0.01$) than the levels detected in calves that survived. From the present results, calf mortality between 8 and 16 weeks of life was greatly lower (17.4%) than those lost during the earlier ages of calves. These results are in agreement with those reported by Umoh (1982), who noted that the probability of calf dying decreased with age after the fourth postnatal week and attributed to more adaptability to the environment. While, Roy (1990) demonstrated that calf mortality during the first month of life was largely due to respiratory disease, whereas digestive diseases caused more deaths between 3 and 6 months of age. In addition, John *et al.* (1996) found that the majority of calf deaths occurred at the 5th day of life, this

may be associated with lower serum IgG concentration, as a result of severe diarrhea and dehydration. Meyer *et al.* (2000) reported that of all calf losses up to weaning 57.4% occurred during the first 24 h and 65.7% occured during 48 h postpartum. Meyer *et al.* (2001) demonstrated that during the final few days of gestation, a dramatic increase in the activity of the fetal hypothalamic-pituitary adrenal axis initiates an endocrine cascade culminated in the process of birth. So that in some cases the cow is not adequately prepared to give birth, when the calf signals that it is ready to be born. Consequently, it would increase calf mortality rate during the few first days of life.

It seems that the variation of calf mortality could be also related to the sex of calf, whereas the CMR was greater for male calves (55.6%) than female calves (44.4%) within the experimental period from birth to weaning at 16 weeks of life (Table, 7).

**Table (6):** Effect of age of the growing Friesian calf dying from birth to 16 weeks.

| Calf age | No. of dead calves | Percentage of deaths % |
|---|---|---|
| At birth | 11 | 3.4 |
| 24 h | 16 | 5.0 |
| 48 h | 51 | 15.9 |
| 72 h | 65 | 20.2 |
| 1 wk | 21 | 6.5 |
| 2 wk | 34 | 10.6 |
| 3-4 wk | 34 | 10.6 |
| 5-6 wk | 33 | 10.3 |
| 7-8 wk | 7 | 2.2 |
| 9-10 wk | 9 | 2.8 |
| 11-12 wk | 8 | 2.5 |
| 13-14 wk | 11 | 3.4 |
| 15-16 wk | 21 | 6.5 |

Results of Teixeira (1978) also indicated greater CMR of male calves experience up to 2.5 times as much as female calves. However, Mario *et al.* (1983) further found that calf mortality was greater for male calves (7.62%) than for female (5.65%) for all combined parities. In the same trend, Ranatunga (1974) found that

bull calves were significantly more likely to die before six months of age than did the heifer calves. This may be reasonably due to heavier weights for male calves than for females which leads to calving difficulties and associated with greater calf mortality. In contrary, Umoh (1982) noted that Friesian and their cross bred bull and heifer calves have almost equal chances of survival or dying during the period from birth to 12 weeks of age.

Meyer *et al.* (2001) reported that female calves had 7% lower odds of a stillbirth than male calves from primiparous cows and 12% lower odds of a stillbirth than male calves from multiparous cows, this may be a smaller odds for a stillbirth female than a stillbirth male.

**Table (7):** Calf mortality rate as affected by sex of Friesian calves.

| Sex of calf | No. of dead calves | Mortality % | Constant ± SE |
|---|---|---|---|
| Male | 179 | 55.6 | 1.84 ± 1.80 |
| Female | 143 | 44.4 | -2.02 ± 2.81 |

Data in Table (8) indicate that CMR was recorded the highest for calves weighed at birth ≤ 20 kg (22.7%) or ≥ 40 kg (36.0%) and the lowest CMR was noted when birth weight was 26 and 39 kg. This may suggest that the proportionate size of dam to size of calf at birth is important in reducing calf losses. These results agreed with those of Mario *et al.* (1983), who found that more calf mortality for very small and very large calf birth weight. Therefore, the effect of birth weight of calf on calf mortality may be from longer gestation period or vice versa. Moreover, Lawlor *et al.* (1984) indicated that calving difficulty and calf mortality increased at an increasing rate for greater birth weight. This may be attributed to the smaller pelvic size of the dam and the size of the calf relative to dam weight. In the same trend, Roy (1990) reported that calf mortality rate was greater when calves weighed < 36 kg or > 50 kg, so calf mortality was higher in calves of both low and heavier birth weight. On the other hand, Luo *et al.* (1999) considered calf size to be a more cause of calf death in very early calving Friesian heifers, as difficulties only occurred with calves weighing more than 35 kg.

It seems from the data presented in Table (9) that the experimental Friesian CMR during the first 16 weeks of life was

highly significantly ($P < 0.01$) and positively correlated with birth weight and diseases, agreeing with the results of Philipson (1976), who found that birth weight had a positive correlation with CMR, so the correlation coefficients between calf livability and birth weights was -0.4. But the correlation coefficients between CMR and birth year was negative and significant ($P < 0.05$). In this trend, Martin and Schwabe (1975a) reported that a significant and negative correlation coefficients of -0.39 and -0.33 were found between calf mortality and both winter months and summer months, respectively. A similar trend was reported by Mario *et al.* (1983), who found that sex of calf, dam parity, month of calving and birth weight were correlated significantly with CMR.

**Table (8):** Number of deaths and percentage of Friesian calf mortality rate affected with various birth weight distribution.

| Birth weight (kg) | No. of dead calves | Percentage of deaths | Constants ± SE |
|---|---|---|---|
| ≤ 20 | 73 | 22.7 | -3.67 ± 5.74 |
| 21-25 | 50 | 15.5 | 11.95 ± 6.57 |
| 26-30 | 30 | 9.3 | 16.94 ± 8.06 |
| 31-35 | 20 | 6.2 | -14.49 ± 9.61 |
| 36-39 | 33 | 10.2 | -3.74 ± 7.76 |
| > 40 | 116 | 36.00 | -7.00 ± 4.97 |

**Table (9):** Summary of correlation coefficients between different factors affecting calf mortality rate during the first 16 weeks of life.

| | Month of birth | Birth year | Birth weight | Sex of calf | Diseases | Parity |
|---|---|---|---|---|---|---|
| Month of birth | | | | | | |
| Birth year | -0.112* | | | | | |
| Birth weight | -0.028 | 0.124* | | | | |
| Sex of calf | -0.010 | 0.210** | -0.038 | | | |
| Diseases | 0.086 | 0.156** | -0.006 | -0.020 | | |
| Parity | -0.040 | 0.037 | 0.001 | 0.036 | 0.001 | |
| Mortality | -0.025 | -0.142* | 0.11** | 0.038 | 0.136** | 0.090 |

* $P \leq 0.05$ ** $P < 0.01$

However, birth year was correlated positively with birth weight ($P < 0.05$) and sex of calf ($P < 0.01$) and negatively with disease ($P < 0.01$) and mortality ($P < 0.05$). In this field, Lawlor *et al.* (1984) reported that interaction between sex of calf and parity was significant for late survival and percentage weaned and the tend was opposite to that for calving difficulty.

Olsson *et al.* (1993) found that CMR in Swedish dairy herds was influenced by season, damage, diseases and breed.

From this study, it could be recommended that more attention have to be given to management system of dams and newly born calves particularly to minimize calving difficulties (dystocia), optimize birth weight of calf, month of birth and age of dam at calving. Furthermore, this study indicates the need of further researches to reduce incidence of diarrhea and respiratory diseases, which together caused about 85.4% of early calf mortality. In the last years, the calf mortality rate was highly increased, so this point needs more carefully investigation.

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## الملخص العربى

## بعض العوامل المؤثرة على معدل نفوق عجول الفريزيان من الميلاد وحتى الفطام

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بفحص ٣٣٦٣ سجل لعجول الفريزيان الرضيعة وذلك خلال الفترة من ١٩٨٣ حتى ٢٠٠٢ وجد أن ٣٢٢ عجل نفــق خــلال هــذه الفــترة. وبدراسة أهم العوامل التى أثرت على نسبة النفوق والتى تشمل سنة وشــهر الميلاد الأمراض موسم الحليب جنس المولود ووزن الميلاد تبين الاتى:

أظهرت النتائج أن جميع العوامل السابقة ذات تأثير معنوى علـــى معدل نفوق عجول الفريزيان. وكان معدل النفوق خلال مدة الدراسة حوالى

٩,٥٧% كما وجد أن ٤٩,٧% من إجمالي العجول النافقة حدثت خلال السنوات الاربع الاخيرة (١٩٩٧-٢٠٠٢) أما النسبة الباقية (٥٠,٣%) فكانت خلال الستة عشر سنوات الأولى من البحث (١٩٨٣-١٩٩٦). كما وجد أن معدل النفوق كان يرتفع خلال أشهر مارس ، يونيه ويوليو بينما أقل معدل للنفوق فسجل خلال أشهر سبتمبر ، أكتوبر ونوفمبر. وعند فحص أهم الأمراض التي أدت إلى النفوق خلال الستة عشر أسبوع الأولى من عمر الحيوان وجد أن أهمها امراض الجهاز التنفسي (٤٧,٨%) والاسهال (٣٧,٦%) والتسمم الدموي (٣,٤%) والسرة (٣,١ ) والضعف العام (٣,٧%) وحالات أخرى لم تحدد (٤,٣%).

كما وجد أن نسبة النفوق في العجول لأمهات بالموسم الاول ، الثاني والثامن تعادل سبعة أضعاف نسبة النفوق للعجول الناتجة من أمهات في الموسم الخامس. وكان لعمر العجول تأثير كبير على نسبة النفوق حيث بلغت نسبة النفوق خلال الأسبوع الأول من عمر العجول حوالى ٥٠% من إجمالى نسبة النفوق خلال مدة الرضاعة وإنخفضت تلك النسبة مع زيادة العمر حيث بلغت حوالى ١٧,٤% خلال الفترة من عمر ٧-١٦ أسبوع.

يضاف إلى ذلك أن معدل النفوق في الذكور (٥٥,٦%) كان يفوق معدل نفوق الاناث (٤٤,٤%). كما ارتفع معدل النفوق عندما كانت أوزان الميلاد تساوى أو تقل عن ٢٥كجم وكذلك عندما تساوى أو تزيد عن ٤٠كجم بينما كانت أقل معدلات للنفوق عندما يتراوح وزن الميلاد ما بين ٢٦-٣٩كجم.

كما أظهرت النتائج أن هناك ارتباط معنوى موجب بين معدل النفوق وكل من وزن الميلاد والأمراض وارتباط معنوى سالب مع سنة الميلاد كما ظهر عدم وجود ارتباط معنوي بين معدل النفوق وكل من شهر الميلاد وجنس المولود موسم الحليب.

ومن هذه الدراسة يوصى باعطاء اهتمام كبير في رعاية الامهات والعجول حديثة الولادة حتى يمكن تقليل معدل نفوق العجول حديثة الولادة وخاصة لزيادتها خلال السنوات الاخيرة كما يجب اعطاء اهتمام اكبر للامراض التي تتعرض لها وخاص امراض الجهاز التنفسي والهضمى ولتى تسبب نفوق حوالى ٨٥,٤% من مجموع العجول النافقة والاهتمام بتغذية الامهات حتى نحصل على اوزان مناسبة للعجول عند ولادتها وتقليل نسبة الفاقد منها.