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Effect of Dystocia on the Productive Performance and Calf Stillbirth in Iranian Holsteins

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ABSTRACT

Calving records from April 1998 to September 2006 comprising 104,572 calving events from 16 dairy herds of Iran were used to analyze the potential effect of dystocia on calf stillbirth and productive traits in Iranian Holsteins. Statistical analyses of production traits were performed using a linear mixed model procedure. Also, a logistic regression model was constructed to analyze the effect of dystocia on calf stillbirth. The odds of stillbirth was greater after severe dystocia [P< 0.001; Odds Ratio (OR)= 29.66]. Also, the odds of stillbirth were the highest for primiparous cows which calved with severe dystocia (caesarian). Cows that experienced caesarian at calving had the lower 305-day milk yield than other classes of dystocia (P< 0.05). Cows that experienced caesarian at calving had the lower unadjusted, 305-day and mature equivalent fat yields than other classes of dystocia (P< 0.05). The results of this study indicated the scope of economic and animal welfare opportunities associated with the reduction of dystocia by management and breeding in dairy herds.

Keywords: Calving difficulty, Dairy cow, Milk yield, Mortality.

INTRODUCTION

Dystocia, more commonly known as difficult calving and defined as prolonged or difficult parturition, is a problem most dairy producers encounter (Mee, 2004; Mee, 2008). Consequences range from the need for increased producer attention to the loss of the cow and calf. Dystocia is a leading cause of calf death at or shortly after birth and leads to uterine infections, more retained placentas, and longer calving intervals. It has been estimated that between 2 and 23% of cows in a herd experience difficult calvings that require farmer or veterinarian assistance (Mee, 2008). The various factors affecting dystocia in cattle include malpresentations and uterine torsion, calf birth weight, multiple calvings, perinatal mortality, cow pelvic area, cow body weight, body condition at calving, and gestation length, cow age and parity, the year and season of calving, the place of calving, maintenance practices, disorders, nutrition, and the calf sex (Zaborski *et al.*, 2009).

In recent years, dairy cattle breeders have shown an increasing interest in selection for functional traits (Mark, 2004) and gradually the focus of selection is shifting from traits that increase profit towards traits that reduce costs (De Maturana *et al.*, 2007). For example, easy parturition is economically important trait but is not classical production trait. Since genetic selection could improve calving performance, it is important to include calving traits, such as dystocia, in genetic evaluations (Eaglen *et al.*, 2012). Although reducing dystocia rates by breeding is a slow process because of the low heritability, low estimates of heritability for dystocia means that most of the variation for this trait can be attributed to environmental or management factors (Eriksson *et al.*, 2004) and much data is needed to obtain sufficiently

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accurate estimates that have an impact on selection indices.

Dystocia is an undesirable reproductive event resulting in increased risk of calf morbidity and mortality (Bicalho *et al.*, 2007; Lombard *et al.*, 2007), reduced fertility (Lopez de Maturana *et al.*, 2007; Tenhagen *et al.*, 2007), and milk production (Berry *et al.*, 2007; McGuirk *et al.*, 2007) as well as cow survival (McClintock, 2004; Bicalho *et al.*, 2007). The total economic costs attributable to a severe case of dystocia have recently been estimated at up to €500 per case (McGuirk *et al.*, 2007). In addition, dystocia is a welfare problem considered as one of the most painful conditions of cattle (Huxley and Whay, 2006).

Prolonged hypoxia and severe acidosis are common problems in calves born after prolonged or severe dystocia. This can be immediately fatal (stillborn), or reduce long-term survival (House, 2002). Calves that experience prolonged hypoxia and survival have often experienced impaired temperature regulation (Carstens, 1994). Also, some works have focused on describing behavioral changes associated with dystocia and how these changes might be applied to improve the handling of cattle experiencing a difficult delivery (Mee, 2008; Proudfoot *et al.*, 2009).

In the present study, it was hypothesized that calving difficulty had a negative effect on the productive performance and calf livability at birth. Thus, considering that there were few published reports about the potential effects of dystocia on the performance of Iranian Holsteins, the objective of this study was to evaluate the effect of dystocia on the calf stillbirth and production of Iranian Holsteins.

MATERIALS AND METHODS

Data Set

Calving records from April 1998 to September 2006 comprising 104,572 calving events from 31,356 dairy cows in 16 dairy herds of Iran were included in the data set. Information for individual calving records, including herd identification, cow identification, unadjusted milk and fat yields, 305-day milk and fat yields, mature equivalent milk and fat yields, calving date, parity, multiple births, calf gender, calf birth weight, calf stillbirth, abortion, and calving difficulty were included in the data set. The data were screened several times and defective and doubtful data were deleted. Outliers and out of range productive records were deleted from the analyses. Months of birth were grouped into four seasons: April through June (Season 1= Spring), July through September (Season 2= Summer), October through December (Season 3= Fall), and January through March (Season 4= Winter). Also, calving years were grouped into three classes: 1998 through 2000 (Y1), 2001 through 2003 (Y2), and 2004 through 2006 (Y3). Calvings were scored on a 5-point system of difficulty with increments of 1, where Score 1= Unassisted, Score 2= Slight assistance, Score 3= Considerable assistance, Score 4= Considerable force needed, and Score 5= Caesarian. Stillbirth was defined as a calf loss from day 260 until the 24 hours of life. Stillbirth was coded as *A* for calves born alive and *D* for calves born dead. First-parity cows represented 31.2%, whereas second-, third-, and fourth- and greater parities accounted for 24.9, 17.6, and 26.3% of the calving records, respectively.

Statistical Analyses

A multivariable logistic regression model was used to analyze stillbirth using the maximum likelihood method of the LOGISTIC procedure of SAS software (SAS Institute, 2002). The model specification was based on the backward elimination method, and the fit of all statistical models was evaluated by using the Hosmer and Lemeshow goodness-of-fit test of SAS (Hosmer and Lemeshow, 2000) by including the “lackfit” option in the model statement. Variables (main effects or interaction terms) which were significant by the Wald statistic at $P< 0.05$ were included in the model. In addition, statistical analysis of milk yield, fat yield, and fat percentage were performed as a linear mixed model (Proc Mixed) with the best fitted covariance structure of SAS (SAS Institute, 2002). The error covariance structure used for the repeated measures was the first-order heterogeneous autoregressive structure as it resulted in the smallest Akaike's information criterion. Differences among least-squares means were tested using Tukey adjustment method.

The general equation of logistic regression model was defined as follows:

$$\text{Logit}(\pi) = \alpha + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_n X_n \quad (1)$$

Where, π is the probability of stillbirth; α is the intercept parameter; β_1 to β_n are the logistic regression coefficients (parameter estimates) for the explanatory effects (X_1 to X_n) included in the statistical model. The model used to analyze calf stillbirth included the fixed class effects of herd, calving year, parity of dam, birth type (2 *vs*. 1), dystocia, parity by dystocia, year by dystocia and parity by year interaction effects. The model equation for the analysis of mature equivalent fat yield was as follows:

$$y_{ijklmnqr} = \mu + a_i + h_j + s_k + f_l + d_m + p_n + b_{1q} \times DIM_q + b_{2q} \times \left(DIM_q\right)^2 + \left(s \times d\right)_{km} + \left(f \times d\right)_{lm} + \left(s \times p\right)_{kn} + e_{ijklmnqr} \quad (2)$$

Where, $y_{ijklmnqr}$ = Observation for mature equivalent fat yield; μ = Overall mean; a_i = Random effect of animal; h_j = Fixed effect of herd; s_k = Fixed effect of calving year; f_l = Fixed effect of calving season; d_m = Fixed effect of dystocia; p_n = Fixed effect of parity; b_{1q} and b_{2q} = Regression coefficients on the two orders for days in milk (DIM_q); $\left(s \times d\right)_{km}$ = Calving year by dystocia interaction effect; $\left(f \times d\right)_{lm}$ = Season by dystocia interaction effect; $\left(s \times p\right)_{kn}$ = Parity by year interaction effect; $e_{ijklmnqr}$ = Random residual effect. The model used to analyze raw fat yield was similar to the model for mature equivalent fat yield, but excluded the effects of season, parity, and interaction effect of season by dystocia. The model used to analyze 305-day fat yield was similar to the model for mature equivalent fat yield, but excluded the effects of calving year, parity, and linear and quadratic effects of days in milk. The models used to analyze raw and mature equivalent milk yields were similar to the model for mature equivalent fat yield, but excluded the effect of parity and interaction effect of season by dystocia and included the parity by dystocia interaction effect.

In addition, the model used to analyze 305-day milk yield was similar to the model for mature equivalent fat yield, but excluded the effect of parity and interaction effect of season by dystocia and included the parity by dystocia interaction effect.

RESULTS

Table 1 shows the incidences of stillbirth for singleton births of dairy cows by parity of dam and different dystocia classes. Also, Table 2 shows the number of calf stillbirth for twin births of dairy cows by parity of dam and different dystocia classes. The overall incidence of stillbirth was 4.9%. The odds of stillbirth was greater after severe dystocia (P< 0.001; Odds Ratio (OR)= 29.66; caesarian class vs. no problem class; Table 3). Greater odds of stillbirth existed for calves born from primiparous cows than

Table 1. The number of calf stillbirth for singleton births of dairy cows from 1998 to 2006 by parity of dam and different dystocia classes.

Dystocia class[a]	Parity of dam									
	1		2		3		>= 4			
	A[b]	D[b]	A	D	A	D	A	D	Total A[c]	Total D[c]
1	20941	877	18525	414	12971	273	19035	436	71472 (97.3%)	2000 (2.7%)
2	1387	119	456	33	295	20	449	50	2587 (92.1%)	222 (7.9%)
3	4043	719	1185	182	757	121	1114	171	7099 (85.6%)	1193 (14.4%)
4	418	335	92	77	51	48	96	65	657 (55.6%)	525 (44.4%)
5	16	33	12	8	7	4	13	7	48 (48.0%)	52 (52.0%)
Total	26805 (92.8%)	2083 (7.2%)	20270 (96.6%)	714 (3.4%)	14081 (96.8%)	466 (3.2%)	20707 (96.6%)	729 (3.4%)	81863	3992

[a] 1: No problem; 2: Slight assistance; 3: Considerable assistance; 4: Considerable force needed, 5: Caesarian; [b]A= Calves born alive, D= Calves born dead; [c] Total A= Total number of calves born alive, Total D= Total number of calves born dead.

Table 2. The number of calf stillbirth for twin births of dairy cows from 1998 to 2006 by parity of dam and different dystocia classes.

Dystocia class[a]	Parity of dam														
	1			2			3			>= 4					
	AA[b]	DA[b]	DD[b]	AA	DA	DD	AA	DA	DD	AA	DA	DD	Total AA[c]	Total DA[c]	Total DD[c]
1	181	29	19	709	72	40	704	72	42	974	126	53	2568(85.0%)	299 (9.9%)	154 (5.1%)
2	13	2	3	40	7	9	45	14	5	86	14	11	184 (73.9%)	37 (14.9%)	28 (11.2%)
3	37	14	22	91	32	25	77	22	12	122	37	33	327 (62.4%)	105 (20.0%)	92 (17.6%)
4	2	3	5	1	0	6	1	3	2	5	4	8	9 (22.5%)	10 (25.0%)	21 (52.5%)
5	1	0	0	0	0	1	2	0	0	3	1	1	6 (66.7%)	1 (11.1%)	2 (22.2%)
Total	234 (70.7%)	48 (14.5%)	49 (14.8%)	841 (81.5%)	111 (10.7%)	81 (7.8%)	829 (82.8%)	111 (11.1%)	61 (6.1%)	1190 (80.5%)	182 (12.3%)	106 (7.2%)	3094	452	297

[a] 1: No problem; 2: Slight assistance; 3: Considerable assistance; 4: Considerable force needed, 5: Caesarian; [b] AA= Both calves born alive; DD= Both calves born dead, DA = Only 1 of the calves survived; [c] Total AA= Total number of AA; Total DA= Total number of DA, Total DD = Total number of DD.

from multiparous cows (P<0.001) and for calves born as twins than singletons (OR= 6.05; P< 0.001; Table 3). Also, the odds of stillbirth increased over the years from Y1 to Y3 (P=0.007; OR= 1.23; Table 3). The effect of herd was significant on the incidence of stillbirth (P<0.001). There were significant parity by dystocia, year by dystocia, and parity by year interaction effects on the incidence of stillbirth in dairy cows (P<0.001). The odds of stillbirth was the highest for primiparous cows that calved at calving year Y3. Also, the odds of stillbirth was the highest for primiparous cows that calved with severe dystocia (caesarian). The odds of dystocia was the highest for dairy cows that calved at calving year Y3 and with severe dystocia.

The least-squares means and their standard errors for the 305-day milk and fat yields, unadjusted milk and fat yields and mature equivalent milk and fat yields of Holstein dairy cows are shown in Table 4. Cows with normal calvings had significantly higher unadjusted milk yield than cows with different degrees of difficulty at calving (P<0.05). On the other hand, cows that experienced caesarian at calving had lower 305-d milk yield than other classes of dystocia (P<0.05). Cows in the fourth and fifth classes of dystocia had significantly lower mature equivalent milk yield than other groups (P<0.05). Cows that experienced caesarian at calving had lower unadjusted, 305-day and mature equivalent fat yields than other classes of dystocia (P<0.05). Second parity cows and primiparous cows had the highest unadjusted and mature equivalent milk yields, respectively (P<0.05), but cows in their second and third parities had greater 305-day milk yield than other parities (P<0.05). On the other hand, primiparous cows had the greater mature equivalent fat yield than other parities (P<0.05). The results of this study indicated a significant increase in 305-day milk and fat yields, mature equivalent milk, and fat yields and unadjusted fat yield over the years from calving year Y1 through calving year Y3 (P<0.05). But, cows in calving year Y2 produced higher unadjusted milk yield than other calving years (P<0.05). Also, cows that calved at fall and winter had significantly higher 305-day fat yield and cows that calved at winter had higher mature equivalent fat yield than other cows (P<0.05). Herd had significant effect on all productive traits in this study (P<0.05). The

Table 3. Estimated odds ratios (OR) and their 95% confidence intervals (CI) and parameter estimates for the effects of calving year, parity of dam, calf number and dystocia on the reported stillbirth of Holstein cows from 1998 to 2006**.**

Effect	Class	Estimate±SE	Odds ratio	95% CI	*P*-value
Intercept	-	-0.88 ± 0.05	-	-	< 0.001
Year[a]	1	-	1	-	0.007
	2	0.03 ± 0.02	1.11	1.03-1.21	
	3	0.05 ± 0.02	1.23	1.14-1.33	
Parity of dam	1	-	1	-	< 0.001
	2	-0.10 ± 0.03	0.65	0.60-0.71	
	3	-0.14 ± 0.03	0.63	0.57-0.70	
	>= 4	-0.08 ± 0.02	0.67	0.62-0.73	
Birth type	1	-	1	-	< 0.001
	2	0.90 ± 0.02	6.05	5.51-6.66	
Dystocia	1	-	1	-	< 0.001
	2	-0.87 ± 0.06	2.61	2.29-2.98	
	3	-0.21 ± 0.04	5.05	4.69-5.43	
	4	1.36 ± 0.06	24.20	21.40-27.37	
	5	1.56 ± 0.15	29.66	20.13-43.69	

[a] Year 1: 1998-2000; Year 2: 2001-2003, Year 3: 2004-2006.

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Table 4. Least-squares means and their standard errors for 305-day milk and fat yields, unadjusted milk and fat yields and mature equivalent milk and fat yields in Holstein cows according to the effects fitted into the statistical models.^{a}

Effect	Class	Trait: Milk yield (kg)			Trait: Fat yield (kg)		
		Unadjusted	305-d	Mature equivalent	Unadjusted	305-d	Mature equivalent
Parity	1	9488.4± 13.2^{c}	8502.1± 13.1^{c}	11002.9± 12.9^{a}	-	-	337.7± 0.6^{a}
	2	9693.7± 15.7^{a}	9238.0± 13.6^{a}	10619.3± 13.4^{b}	-	-	331.9± 0.8^{b}
	3	9541.5± 16.3^{b}	9231.4± 14.8^{a}	9737.5± 14.2^{c}	-	-	303.5± 1.0^{c}
	>= 4	8962.2± 14.4^{d}	8704.0± 14.2^{b}	8819.4± 13.8^{d}	-	-	276.6± 0.5^{d}
Calving year^{b}	1	9185.8± 16.1^{c}	8539.9± 17.5^{c}	9744.6± 16.7^{c}	263.5± 0.4^{c}	243.1± 0.4^{c}	277.8± 0.7^{c}
	2	9704.9± 14.2^{a}	8821.9± 16.0^{b}	10125.3± 15.2^{b}	303.8± 0.5^{b}	273.6± 0.7^{b}	312.3± 0.9^{b}
	3	9297.4± 12.8^{b}	9141.1± 15.3^{a}	10524.7± 14.0^{a}	310.3± 0.4^{a}	302.0± 0.8^{a}	346.0± 0.6^{a}
Calving season	Spring	-	-	-	-	264.0± 0.5^{b}	306.0± 1.1^{c}
	Summer	-	-	-	-	263.9± 0.8^{b}	298.8± 0.7^{d}
	Fall	-	-	-	-	286.8± 0.7^{a}	326.3± 0.6^{b}
	Winter	-	-	-	-	288.9± 0.7^{a}	332.5± 0.7^{a}
Dystocia^{c}	1	10211.9± 13.5^{a}	8881.8± 13.0^{a}	10866.8± 13.6^{a}	329.6± 0.3^{a}	276.4± 0.8^{a}	351.3± 0.4^{a}
	2	9721.0± 13.0^{b}	8881.3± 13.3^{a}	10526.0± 13.3^{a}	317.7± 0.4^{ab}	289.4± 0.9^{a}	342.2± 0.5^{ab}
	3	9695.1± 13.8^{b}	8865.6± 14.2^{a}	10474.5± 13.1^{ab}	293.1± 0.9^{b}	264.2± 0.4^{a}	316.6± 0.7^{bc}
	4	9545.7± 13.3^{b}	8690.8± 13.5^{a}	10117.9± 13.7^{bc}	292.5± 0.3^{b}	287.4± 0.6^{a}	312.5± 0.8^{c}
	5	9373.4± 13.9^{b}	8265.0± 13.8^{b}	9924.5± 13.8^{c}	230.8± 0.7^{c}	197.5± 0.5^{b}	226.8± 0.6^{d}

^{a} Least-squares means within a column that do not have a common superscript (a–d) are significantly different ($P< 0.05$); ^{b} Year 1: 1998-2000; Year 2: 2001-2003, Year 3: 2004-2006; ^{c} 1: No problem; 2: Slight assistance; 3: Considerable assistance; 4: Considerable force needed, 5: Caesarian.

linear and quadratic effects of days in milk had significant effect on unadjusted milk and fat yields and mature equivalent milk and fat yields (P< 0.05). The regression coefficients of unadjusted milk yield per one unit change in linear and quadratic effects of days in milk were 31.6 and -0.0091 kg, respectively. Also, the regression coefficients of mature equivalent milk yield per one unit change in linear and quadratic effects of days in milk were 11.01 and -0.0089 kg, respectively. The regression coefficients of unadjusted fat yield per one unit change in linear and quadratic effects of days in milk were 0.03 and 0 kg, respectively. In addition, the regression coefficients of mature equivalent fat yield per one unit change in linear and quadratic effects of days in milk were 0.03 and 0 kg, respectively. There were significant parity by year, parity by dystocia and year by dystocia interaction effects on unadjusted, 305-day and mature equivalent milk yield of dairy cows (P< 0.05). On the other hand, there were significant interaction effects of season by dystocia, year by dystocia, and parity by year on 305-day fat yield (P< 0.05), year by dystocia, and parity by year on unadjusted fat yield (P< 0.05) and year by dystocia, season by dystocia, and parity by year on mature equivalent fat yield (P< 0.05).

DISCUSSION

Consistent with the results of this study, Tenhagen *et al.* (2007) reported the proportion of stillbirths was significantly higher in cows with dystocia compared with their controls. Lombard *et al.* (2007) reported significant interaction effect between parity and dystocia on calf stillbirth. Similar to the current results, Olson *et al.* (2009) reported twins were 7.80 times more likely to be stillborn than single births. Also, Silva del Río *et al.* (2007) found that twins were 6.5 times more likely to be stillborn than single births. Recent studies have shown that any calving assistance (from slight to veterinary assistance) is associated with increased risk of stillbirth (Bicalho *et al.*, 2007) and even slight calving assistance alone (by one person) is associated with increased risk of stillbirth (McGuirk *et al.*, 2007). Thus, breeding and management programs that reduce not just dystocia but also unnecessary calving assistance will improve dairy herd productive, reproductive, and financial performance. Because dystocia has been shown to have detrimental effects on adaptation of calves to extrauterine life, calves exposed to dystocia required additional attention than calves delivered without assistance. The main patho-physiological effects of dystocia on calves are trauma and asphyxia. In turn, this can result in postnatal metabolic and respiratory acidosis, hypoxemia, failure of passive transfer, and hypothermia. Severe dystocia has been associated with reduced body temperature, decreased concentrations of blood cortisol, and increased blood glucose (Bellows and Lammoglia, 2000). These effects can usually be minimized through easily implemented on-farm procedures. Education of farm personnel should be targeted at minimizing dystocia impacts with appropriate delivery methods, identifying compromised calves, administering fluids and oxygen to calves with acidosis, warming chilled calves, and delivering high quality colostrum immediately after birth. Standard operating procedures on dairies should be to treat every calf that was exposed to dystocia as a compromised calf. Perhaps some of the calves that died within 24 hours after birth could have been saved by implementing these simple interventions (Lombard *et al.*, 2007).

Three general causes of dystocia are fetal-maternal size mismatch, fetal malpresentation, and maternal related causes (Roughsedge and Dwyer, 2006; Lombard *et al.*, 2007). Dystocia incidence in primiparous dams is most often due to mismatched fetal-maternal size, whereas dystocia in multiparous cows is more frequently secondary to fetal

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malpresentation or maternal causes. One explanation for increase in calf stillbirth when herd size increased may be that individual cows are less intensively managed during calving in larger herds. Bicalho *et al.* (2007) and Meyer *et al.* (2001) reported a significant decreasing trend in the incidence of stillbirth by parity in Holstein dairy cows, but the results of this study showed only a significant difference between primiparous and older cows. Consistent with the results of this study, Meyer *et al.* (2001) reported the percentage of stillborn calves increased from 1985 to 1996 in dairy cows and Hansen *et al.* (2004) reported the overall frequency of stillbirth in Danish Holsteins increased during 1985 to 2002. Consistent with current findings, previous studies of Holstein herds reported stillbirth rates for singleton births between 3.2 and 7.3%, and for calves born as twins between 12.9% and 15.7 % (Lombard *et al.*, 2007; Day *et al.*, 1995).

Inconsistent with the results of this study, Rajala and Gröhn (1998) reported no association of dystocia with 305-day milk yield in dairy cows, but similar to current results, Atashi *et al.* (2012), Gaafar *et al.* (2011), Berry *et al.* (2007) and Dematawewa and Berger (1997) reported milk yield was less in cows that experienced dystocia at calving compared with those that did not. Also, inconsistent with current results, Thompson *et al.* (1983) reported no significant effect of dystocia on 90-day milk yield or mature equivalent milk yield and Tenhagen *et al.* (2007) also reported there were no obvious effects of severe dystocia on monthly test day milk production. The discrepancies between studies might result from the different statistical methods and milk measures used to estimate the milk loss and also from differences in whether the effects of other diseases were accounted for in the analysis. Also, different definitions of dystocia could be a source of the discrepancies. Similar to the current study, some reports use dystocia scores, usually from 1 to 5, to indicate the level of difficulty of the calving; others report only assisted calving. It seems that there is a lot to be gained concerning economics and animal welfare if the incidence of severe cases of dystocia can be reduced by management and breeding in dairy herds.

For the purposes of this study, it was assumed that calving assistance was provided similarly to that on most dairy herds. Many variables that could not be measured in this study could influence the outcome of dystocia, including magnitude of traction applied, skills, and judgment of those involved and timing of intervention. Herdsmen subjectively evaluated the dystocia scores and many dairy personnel indicated difficulty in correctly identifying the small differences among adjacent score categories. This causes to report most of the births as 1 or 5, with very few scores of 2, 3, or 4, or reporting of scores that are more or less equally distributed across all five categories. The use of large data set was the positive point of the current study. In addition, the other positive aspect of this study was the logistic analysis of large data set for stillbirth, considering dystocia scores, in Iranian Holsteins.

CONCLUSIONS

Occurrence of dystocia on the 16 dairy herds in Iran was strongly associated with calf stillbirth so that the odds of stillbirth increased with increase in the severity of the dystocia in dairy cows. Cows with normal calvings had significantly higher unadjusted milk yield than cows with different degrees of difficulty at calving. On the other hand, cows which experienced caesarian at calving had lower 305-day milk yield than other classes of dystocia. Cows in the fourth and fifth classes of dystocia had significantly lower mature equivalent milk yield than other dystocia groups. Cows that experienced caesarian at calving had lower unadjusted, 305-day and mature equivalent fat yields than other classes of dystocia.

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بررسی اثر سخت زایی بر عملکرد تولیدی و مرده‌زایی گاوهای هلشتاین

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چکیده

از ۱۰۴۵۷۲ رکورد زایش ۱۶ گلهٔ گاو شیری متعلق به فاصلهٔ زمانی فروردین ۱۳۷۷ تا شهریور ۱۳۸۵ برای تجزیهٔ اثر بالقوهٔ سخت زایی بر مرده‌زایی و صفات تولیدی گاوهای هلشتاین ایران استفاده شده بود. تجزیه‌های آماری صفات تولیدی با استفاده از رویه مدل مختلط خطی صورت گرفت. همچنین، مدل تابعیت لجستیک برای تجزیهٔ اثر سخت‌زایی بر مرده‌زایی استفاده شده بود.احتمال مرده‌زایی پس از بروز سخت‌زایی شدید بیشتر بود [P<۰/۰۰۱؛ احتمال خطر (OR)=۲۹/۶۶]. همچنین، احتمال مرده‌زایی برای گاوهای شکم زایش اول که دارای سخت‌زایی شدید (سزارین) بودند بالاترین بود. گاوهایی که سزارین را تجربه کرده بودند دارای تولید شیر ۳۰۵ روز کمتری نسبت به گاوهای موجود در گروه‌های دیگر سخت‌زایی بودند (P<۰/۰۵). گاوهایی که سزارین را تجربه کرده بودند دارای تولید چربی تصحیح نشده، تولید چربی ۳۰۵ روز و تولید چربی معادل بلوغ کمتری نسبت به سایر گروه‌های سخت‌زایی بودند (P<۰/۰۵). نتایج این مطالعه بهبود فرصت های اقتصادی و رفاه حیوان را در صورت کاهش سخت‌زایی توسط اعمال مدیریت و پرورش در گله‌های شیری نشان داد.

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