RISK FACTORS FOR DIARRHEA IN CALVES UNDER ONE MONTH OF AGE

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Summary

The study was conducted in four regions from Algeria and involved 816 veal belonging to 53 randomly selected beef herds in order to determine the prevalence of diarrhea and mortality and the association of a number of suspected risk factors among calves less than 30 days of age. A questionnaire has been provided to report diarrhea onset, mortality and risk factor correlated with. The morbidity rate was of 29.17 % and the death rate of 11.76 %. Using logistic regression analysis, it appeared the significant risk factors were age, season, nursing area, multiparity and navel disinfection. However, maternal nutrition and sex of newborn are likely to not be risk factors for diarrhea onset.

Keywords: Algeria, cattle, digestive trouble; newborn, study.

Calves production is an essential outlet for breeding as it provides consumers with meat and industrial dairy products. Starting at the crucial birth, the calf is subjected to attacks from the outside environment where numerous pathogenic agents can colonize the respiratory and digestive systems leading to several diseases (1; 2).

Neonatal diarrheas occupy an important place among the young calf diseases with 60 to 80 % of total affections in newborn (3); this is also one of the most murderous diseases (4). This mortality is determined by various factors including economic losses due to therapeutic expenses often ineffective, long convalescence period, costs due to stunting and delayed calving (5; 6).

The disease severity and outcome result also from interactions between intrinsic factors specific to the animal (calf age, time of colostrum intake, its quantity, and quality, stress) and environmental factors (litter renewal, overcrowding, hygiene, individual stall).

Some elements (age at the diarrhea onset, dehydration, mortality, appearance of feces, general signs associated) suggest a cause rather than another but there are no peculiar signs allowing knowing exactly the responsible agent.

Indeed, knowledge of herd management and environmental factors would improve the ability to control and prevent diarrhea on herd health and productivity (7).

Therefore, the main objective of the present study was to determine the prevalence of diarrhea in veal calves less than one-month-old in four regions in Algeria and to analyze the association between diarrhea rate with age, sex, and other factors.

Material and Methods

A descriptive survey was conducted during two years starting October 2011, on 816 veal no more than one-month-old.

Fifty-three (53) randomized dairy farms from four Algerian regions: East, Center, West, and South were chosen for this study.

All cattle farms were Friesian breeds was carried out in four Algeria regions. The size of the dairy cattle herd varied from 3 to 21 (mean: 10 ± 4) according to the herd

The identification of the diarrhea affections was based mainly on symptomatic statements (watery stools).

Data on potential risk factors were obtained using a questionnaire comprising: practices of breeding (livestock housing, hygiene measures, availability of calving area and individual pens, maternal nutrition/vaccination, parity, dry cow stage, colostrum intake, navel disinfection and the cattle sex; onset of diarrhea (1st, 2nd, 3rd or 4th week) and the season (autumn, winter, spring or summer).

Definitions:

Morbidity rate: the number of diarrheic veal divided by the number of total veal.

Cases fatality rate = the number of death divided by total number of diarrheic calves.

Death rate = the number of deaths divided by total calves.

The descriptive and statistical analyses were made by means of two Microsoft Excel Service 2007 software and SAS Version 8.2 (Cary, n.c).

Results and discussion

Among studied livestock, two hundred and thirty-eight (238) calves were classified as cases (diarrheic). Of these, 107 had diarrhea during the first week, 89 the second week, 31 the third week and finally eleven the fourth week (Table 1). Diarrhea was mainly recorded during the first week (13.12 %) and then decrease gradually.

In calves, neonatal gastroenteritis has multiple etiologies; they remain a complex and multifactorial pathological entity due to several causative agents: *Escherichia* coli, *Rotaviruses*, Coronaviruses and *Cryptosporidium* (8, 9, 10). It is

one of the most common diseases in young animals, causing huge economic and productivity losses to the bovine industry worldwide (11). However, *Cryptosporidium* was the most frequent pathogens that induces diarrhea at calves, mostly associated with coronaviruses (12, 13).

Table 1

Distribution of diarrheas and mortality by age

	Week 1	Week 2	Week 3	Week 4	Total
Diarrheic calves	107	89	31	11	238
Morbidity rate (%)	13.811	10.90	3.80	1.35	29.17
Deaths	61	35	00	00	96
Cases fatality rate (%)	25.63	14.7	00	00	40.34
Death rate (%)	7.47	4.29	00	00	11.76

The overall prevalence observed (29.17%) is close to the one reported by Schumann et al. (13) with 21.98%.

However, in Algeria Ouchene et al. (14) reported the lowest prevalence with 15 % while Boussenna and Sfaksil (15) found a higher one (64%) in the Eastern region. The difference in morbidity seems correlated to the hygiene respect and bred management.

Most of the observed cases (82.35 %) appeared during the first two weeks; in line with other research (14; 16; 17), reporting gastrointestinal disorders during the first 15 days of life, essentially during the first week.

Deaths were recorded only during the first and second week affecting more than 40 % of diarrheic animals.

Highly significant differences were found between seasons ($p = 0.0095$). The diarrhea was maximal in spring (8.95 %) and minimal in summer (4.66 %) (Table 2).

Table 2

Distribution of diarrheas according to the season

	Winter	Springs	Summer	Autumn	Total
Diarrhea	65	73	38	62	238
Morbidity rate	7.96	8.95	4.66	7.6	29.17

Breeding practices: Colostrum intake was subjectively judged on a description by the farmer as to how he evaluated the intake of colostrum for each calf.

The risk of diarrhea is significantly increased by the absence of calving room, the absence of individual pen, poor hygiene, multiparity and mastitis (Table 3). A number of risk factors for neonatal calf diarrhea were identified in this study.

Indeed, certain parameters as calving room, individual pens, and cow parity have a significant effect ($p<0.05$), similarly to other works (18; 19; 20).

In that connection, livestock housing maintenance and hygiene are important to reduce the risk of disease transmission (21).

Table 3

Risk factors frequencies

Variable	Category	Frequency	%	P
Calving room	Yes	47	19.7	
	No	191	80.25	0.0070
Individual pens	Yes	51	21.43	
	No	187	78.57	0.0002
Stable hygiène	Good	31	13.03	
	average	149	62.61	0.0000
	Poor	58	24.37	
Maternal nutrition at the end of gestation	balanced	128	53.78	
	Unbalanced	110	46.22	0.0073
Dry cow stage	7th month	71	29.83	
	8th month	133	55.88	0.0000
	9th month	34	14.29	
Cow parity	Primiparous	60	25,21%	
	Multiparous	178	74.79	0.026
Mastitis	Yes	102	42.86	
	No	136	57.14	0.000
Prepartum vaccination (against rotavirus, coronavirus,ECV	Yes	10	4,20	
	No	228	95.80	0.014
Deworming	Yes	231	97.06	
	No	7	2.94	0.0017
Sex of the newborn	Male	125	52.52	
	Female	113	47.48	0.0000

It is interesting to note that, either maternal nutrition and sex at the birth are not risk factors.

The no navel disinfection in 60.08 % of calving, was significantly linked with diarrhea onset and time of first colostrum was during the first 6 hours in 76.47 % of calving and no probe was used to feed the veal (Table 4).

Another factor that appears to strongly influence the risk of diarrhea is the time of the first take, which is very important for the passive transfer of immunoglobulin (22; 23;24). The majority of farmers (76.47%) reported that calves received colostrum within 6 hours after birth; delays in the colostrum intake are due to dystocic calving (or caesarean) therefore the mother cannot breastfeed its

product and/or the calf cannot reach the mother teats also nocturnal deliveries especially when the mother is tied.

Table 4

Association between diarrhea onset and calve nutrition/treatment

Variable	Category	Frequency	%	P
Navel Disinfection	Yes	95	39.92	0.0026
	No	143	60.08	
Time of first colostrum	< 6h	182	76.47	0.0014
	> 6h	43	18.07	
	12h later	13	5.46	
Administration mode	Suckling	225	94.54	0.0289
	Feeding Bottle	13	5.46	
	Probe	0	00	

Maternal feeding was balanced in 53.78 % of calving cows, however, this factor was not significantly associated with diarrheas (p=0.71) similarly to another work (15).

In almost all visited farms, the calves suckled their dam, which could be a risk factor when associated with a poor passive immunoglobulin transfer (25). In our study, these factors had a significant effect on the occurrence of diarrhea.

Mastitis was significantly associated with diarrhea, which may be due to poor hygiene (20); a parameter often neglected by breeders.

Maternal feeding and drying can decrease significantly (P <0.05) occurrence of diarrhea as reported by Bendali et al. (16) due to proteins intake and subsequent antibody production.

Vaccination was not performed for more than 95.8 % of calving cows, which significantly increase diarrhea cases, in agreement with experimental evidence (17; 26). Gonzalez et al. (27) confirmed vaccination against enteropathogens was associated with decreased odds of liquid feces.

Males newborn cattle were more subjects to diarrhea than females similarly to another work (28), but further studies are needed to assess this difference.

Conclusions

The morbidity and fatality were very high due to several factors such as management (calving area, individual boxes), hygiene, multiparity, vaccination, deworming and mastitis confirming their multifactorial nature.

Although these factors favoring the onset and rapid progression of diarrhea should be taken into account, the management including hygiene improvement is essential keys to improve the treatment and especially the prevention of this disease.

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