

STUDY OF FACTORS INFLUENCING NOTIFICATION OF BOVINE ABORTIONS BY PRACTICING VETERINARIANS ON DAIRY CATTLE FARMS IN EASTERN ALGERIA.

Nadia DJELLATA

Institute of Veterinary Sciences, University of Blida 1, B.P. 270, route de Soumaa, 09000 Blida, Algeria.

Corresponding author: nadia.djellata@yahoo.fr

ABSTRACT

Bovine abortion is one of the most important causes of economic losses in Algerian cattle farms and industry. A descriptive epidemiological survey was conducted from November 2021 to November 2022 in eastern Algeria to quantify the extent of this scourge and to evaluate the risk factors for reporting abortions using a questionnaire intended for 150 practising veterinarians randomly distributed in five wilayas of eastern Algeria. The statistical analysis of the different risk factors was carried out using a univariate and then multivariate logistic regression model. The results obtained showed that 83.3% of the veterinarians audited had had an abortion rate of more than 5% during the previous 12 months. In the multivariate logistic regression analysis, one risk factor and one protective factor were identified. Indeed, all the areas studied had a very high risk of bovine abortion cases: Batna (odds ratio [OR] = 24.53; 95% confidence interval [CI]: 1.39 - 278.66), Sétif (OR= 73.08; 95% CI: 4.37-669.68), Mila (OR= 245.22; CI: 18.51 - 2306.71) and Bordj Bou Arreridj (OR= 49.09; CI: 3.57-738.69). However, the summer season (OR= 0.23; 95% CI: 0.06 - 0.48) was considered a protective factor, designated as the period of least reporting of abortions by the audited veterinarians compared to winter and autumn.

KEYWORDS

Cattle abortion, Eastern Algeria, Notification, Risk factor, Veterinary practitioner.

INTRODUCTION

In Algeria, livestock production in general represents a significant share of household income with a herd of about 2 million cattle, 31 million small ruminants and 0.35 million camels raised under a traditional extensive livestock system, although intensive livestock systems have recently been introduced in the country (Kardjadj 2016). Cattle abortions have important economic consequences in terms of reduced milk production, increased calving intervals, premature culling of the animal and even loss of the herd. When they are of zoonotic origin, they also constitute a public health risk. They are characterised by the difficulty of making an etiological diagnosis, the multiplicity of factors responsible depending on the environment in which the animals live, the non-specificity linked to the species, the diversity of associated clinical signs and the relative absence of pathognomonic lesions, the difficulty of taking samples and the lack of laboratory capacity to analyse them (Holler 2012; Waldner and others 2013). Although the declaration of contagious diseases is mandatory in Algeria (Benjedid 1988; Sifi 1995), the declaration of an abortion by veterinarians is far from being systematically carried out. The main objective of this study is to obtain a general overview of bovine abortions (prevalence, reporting practices, etc.) in eastern Algeria. To this end, two objectives were set: firstly, to estimate the rate of bovine abortions on dairy cattle farms in eastern Algeria. Secondly, to identify the various factors influencing notification of bovine abortions by practising veterinarians, with a view to improving Algeria's national system for monitoring bovine abortions.

MATERIALS AND METHODS

Ethical approval

The present survey (audit) was carried out between November 2021 and November 2022 among 150 practicing veterinarians in the northeastern region of Algeria. These veterinarians all agreed without hesitation to take part in the survey. There were no reported refusals to participate and no objections to the publication of the results obtained. The present study was approved by the Scientific Council of the Institute of Veterinary Sciences of the University of Blida (Algeria). The various stages of the present study were carried out in accordance with the fundamental rules set out in the Declaration of Helsinki 1964 and amended by the 64th General Assembly of the World Medical Association (WMA) (Fortaleza, Brazil) in October 2013, respecting the

main ethical standards applicable to the involvement of human beings in human and animal medical research.

The Scientific Board of the Blida Institute of Veterinary Sciences has specified that this investigation does not involve any intervention on human subjects or access to identifiable private information, and therefore does not require l'IRB (Institutional Review Board) review.

Study area, sampling and type of survey

The study region is located in the northeast of Algeria and is composed of the wilayas of Sétif, Bordj Bou Arreridj, Jijel, Batna and Mila. It is a large agricultural plain known for the production of cereals and cattle and sheep breeding. It is bordered to the west by the wilayas of M'Sila and Bouira, to the east by the wilayas of Skikda, Constantine, Oum El Bouaghi and Khenchela, to the south by the wilaya of Biskra and to the north by the wilaya of Bejaia and the Mediterranean Sea. The climate is continental and semi-arid, characterised by hot, dry summers and rainy, cold winters.

The survey, based on a direct interview lasting about 40 minutes, was carried out from November 2021 to November 2022 among 150 veterinarians randomly selected among the 1098 veterinarians who provide health surveillance of 339126 dairy cattle, including 131099 dairy cows, distributed in 48747 herds in the five wilayas of eastern Algeria: Sétif (n = 40 vets), Bordj Bou Arreridj (n = 25), Jijel (n = 15), Batna (n = 40) and Mila (n = 30). This represents a survey rate of 13.6%. It should be noted that no veterinarian included in the survey refused to participate.

The survey questionnaire included general data on the professional experience (< 10 years, > 10 years) of the veterinarian and the wilaya of practice (Sétif, Bordj Bou Arreridj, Jijel, Batna and Mila). And more specific data relating to bovine abortions, namely the prevalence observed during the last 12 months (qualified as sporadic if the prevalence was lower than 5% and epizootic if the prevalence was higher than 5%); the preferred season of occurrence (spring, summer, autumn, winter and all year round); the stage of gestation affected (1st, 2nd or 3rd trimester); the time of contact of the veterinarian by the farmer after the abortion (3, 6, 12, 24 hours [H] or never); the fate of the runt (incineration, burial), the taking of samples from the runt (yes, no); the type of suspected causes of abortion (infectious, traumatic, parasitic, medicinal, nutritional) and finally the reporting of abortions by the veterinarian to the relevant authorities (yes, no).

Statistical analysis

Descriptive analysis

The prevalence data were estimated with their 95% confidence interval (CI) assuming an exact binomial distribution.

Logistic regression analysis

The statistical identification of the different factors associated with an increased or decreased risk of reporting bovine abortions was carried out using STATA/SE Acad. 14.2 software. Using first the univariate logistic regression model, followed by the multivariate logistic regression model that used all variables with a p-value $< 0,20$ in the univariate analysis. Ultimately, the multivariate model retained only significant variables ($p < 0,05$) and rejected any non-significant variables ($p > 0,05$).

RESULTS

Descriptive analysis

The results showed that the majority (73.3%) of the veterinarians in the survey had more than 10 years of practice. Compared to the threshold rate of abortions considered suggestive of an epizootic phenomenon, i.e. $> 5\%$ (Givens and Marley 2008), the frequency of abortions in the survey, during the last 12 months, was estimated to be higher than 5% in 83.3%. Abortions occurred mainly in the spring (33.3%) and in the last trimester of pregnancy (66.7%). According to the veterinary practitioners interviewed, abortions were mainly of infectious origin (75.3%). Veterinarians were called within 24 hours of the abortion in 60% of cases. They report 41.3% of the abortions observed to the competent authorities. Only 20.7% of veterinarians took samples to investigate the origin of the abortion using laboratory tests (Table I).

Table I: Descriptive data and results of univariate logistic regression analysis of factors influencing the reporting of bovine abortion in the study region (eastern Algeria).

Parameter	Modality	N	%	Odds ratio (95%	P-value
Region of practice	Jijel	15	10	Reference	-
	Batna	40	26,6	2,65 (1,91-17,82)	0,02*
	Sétif	40	26,6	2,63 (1,93-16,94)	0,05*
	Mila	30	20	1,74 (0,77-8,47)	0,07
	Bordj Bou Arreridj	25	16,6	1,53 (0,44-5,07)	0,55
Professional experience	≥ 10 years	110	73,3	Reference	-
	<10 years	40	26,4	1,68 (0,74-3,34)	0,40
Frequency of abortions	> 5%	125	83,3	Référence	-
	< 5%	25	16,7	0,82 (0,37-2,09)	0,39
Abortion season	All year round	20	13,3	Reference	-
	Winter	30	20	2,87 (1,76-4,32)	0,39
	Spring	50	33,3	3,53 (1,74-4,98)	0,02*
	Summer	30	20	1,39 (0,89-2,07)	0,50
	Autumn	20	13,3	1,77 (0,91-3,37)	0,40
Gestation stage in abortions	1st quarter	12	8	Reference	-
	2nd quarter	38	25,3	2,74 (1,09-9,24)	0,20
	3rd quarter	100	66,7	6,58 (2,73-17,51)	0,07
Suspected causes of abortions	Traumatic	9	6	Reference	-
	Infectious	113	75,3	0,71 (0,25-1,91)	0,02*
	Parasite	1	0,7	0,41 (0,08-1,09)	0,06
	Medicinal	22	14,7	1,81 (0,67-2,38)	0,51
	Nutritional	5	3,3	1,60 (0,31-8,17)	0,57
Delay in calling veterinarian	3 H after	8	5,3	Reference	-
	6 H after	10	6,7	0,74 (0,28-1,98)	0,62
	12 H after	40	26,7	0,59 (0,29-1,73)	0,47
	24 H after	90	60	0,81 (0,42-1,71)	0,42
	Never	2	1,3	0,98 (0,31-2,09)	0,74
Fate of the runt	Landfill	121	80,7	Reference	-
	Incineration	29	19,3	2,27 (1,09-3,38)	0,09
Reporting abortions to the authorities	No	88	58,7	Reference	-
	Yes	62	41,3	43,25 (31,09-59,71)	0,62
Samples taken for diagnosis	No	119	79,3	Reference	-
	Yes	31	20,7	51,49 (31,72-92,56)	0,12

CI: Confidence Interval, N: number of veterinarians audited, OR: odds ratio, * $P < 0, 05$.

Logistic regression analysis

The univariate logistic regression model revealed the following significant variables: wilaya of exercise Batna ($P = 0.02$) and Sétif ($P = 0.05$), spring season ($P = 0.02$) and type of suspected cause of abortion (infectious) ($P = 0.02$) (Table I).

As for the multivariate logistic regression analysis, this allowed us to consider that the declaration or notification of bovine abortions by practising veterinarians was significantly higher in the wilayas other than Jijel, which was taken by the statistical model as a reference, namely the wilayas of Batna (Odds ratio [OR] = 24.53; 95% confidence interval [CI]: 1.39 - 278.66), Sétif (OR= 73.08; 95% CI: 4.37-669.68), Mila (OR= 245.22; CI: 18.51 - 2306.71) and Bordj Bou Arreridj (OR= 49.09; CI: 3.57-738.69). However, veterinary reporting of abortions was significantly less frequent during the summer season (OR= 0.23; 95% CI: 0.06 - 0.48) (Table II).

Table II: Results of multivariate analysis of factors influencing the reporting of bovine abortions.

Variable	Modality	OR (95% CI)	P-value
Region of practice	Jijel	Reference	-
	Batna	24,53 (1,39 – 278,66)	< 0,01*
	Sétif	73,08 (4,37-669,68)	< 0,002*
	Mila	245,22 (18,51 - 2306,71)	0,001*
	Bordj Bou Arreridj	49,09 (3,57-738,69)	0,01*
Abortion season	All year round	Reference	-
	Winter	0,65 (0,21-4,23)	0,78
	Spring	0,98 (0,43-1,03)	0,1
	Summer	0,23 (0,06 – 0,48)	0,005*
	Autumn	0,55 (0,10-3,17)	0,31

CI: Confidence Interval, OR: odds ratio, * $P < 0,05$.

DISCUSSION

According to 83.3% of the veterinarians audited, the prevalence of abortions was above 5%. This rate indicates a frequent epizootic character if we take into account the 5% threshold of bovine abortions proposed by Givens and Marley (2008). Our result is much higher than the 48.7% reported in Algeria (Djellata and others 2020) and 15.4% reported in Iran (Keshavarzi and others 2017). These abortions are mostly of infectious origin (75.3%); occur mainly during

the last trimester of gestation (66.7%) and preferentially in spring (33.3%). Our observations are in line with those reported in Algeria by Djellata and others (2020) in a survey of 331 practising veterinarians in ten wilayas of the central and northern region, where the majority of abortions were of infectious origin (53.5%), occurring particularly during the last trimester of gestation (58.3%) and during the spring season (32.6%). However, our results differ from those reported by Mammeri and others (2013) in a survey conducted in the wilaya of Biskra, a neighbouring wilaya to the study area, among 31 practising veterinarians, where a higher frequency of abortions was observed in autumn (25.8%) and during the second trimester of gestation (58%), although this study remains very limited in terms of the number of veterinarians audited ($n = 31$).

Of the 150 veterinarians audited, 41.3% reported bovine abortions to the competent authorities and 20.7% took samples to investigate the cause of the abortion using laboratory tests. These figures show a positive evolution in the reporting and management of bovine abortions in recent years in Algeria, since according to the study by Djellata and others (2020), 33.2% reported bovine abortions to the authorities and 19.0% took a sample to determine the cause. In fact, despite the fairly high and significant prevalence of bovine abortions in Algeria, which ranges from 22.7% (Derdour and others 2017) to 41.3% (Kardjadj 2018), few veterinary practitioners report or take samples from the runt or the mother to investigate possible causes. This practice differs from one wilaya to another. Among the reasons why veterinary practitioners do not report cases of bovine abortion and do not take samples, the non-identification of the abortifacient agent in most cases and the lack of resources such as the availability of specialised laboratories.

According to the results of our study, the majority of farmers (98.6%) do however call the veterinarian when cases of bovine abortion occur at different intervals (3H, 6H, 12H and 24H). Our result is better than the 95.2% reported in Algeria (Djellata and others 2020), reflecting the awareness of farmers of the importance of this call, given that in 2010 another study mentioned calling the veterinarian only in case of placental retention (Dechicha and others 2010).

The declaration of bovine abortions by the veterinary practitioners audited was very high in all the wilayas studied: Batna (OR= 24.53), Sétif (OR= 73.08), Mila (OR= 245.22) and Bordj Bou

Arreridj (OR= 49.09). Our result is similar to that reported by Djellata and others (2020), where all wilayas in the study area (ten wilayas in northern and central Algeria) showed a very high prevalence of bovine abortions. This leads us to sound the alarm about this scourge which is rife among cattle farms in Algeria and whose socio-economic repercussions are harmful to the country's economy.

In addition, the reporting of an abortion by veterinarians was lower in the summer (OR= 0.23, $P = 0.005$) than in the other seasons of the year. This may be explained by a lower frequency of abortions during this season compared to the winter season or by a decrease in observations during this period. Our result is similar to that reported in Algeria where the frequency of notification of bovine abortions by practising veterinarians was lower in summer (OR= 0.14; $P = 0.007$) (Djellata and others 2020). The lower prevalence of bovine abortions in summer compared to other seasons has also been reported in Ireland (Mee and others 2008), Mexico (Segura-Correa and others 2009), the United States (Silva and others 2007) and Nigeria (Yakubu and others 2015), where the risk of abortion was found to be higher in winter. However, our result differs from that reported in Iran by Ansari-Lari (2007), where calf mortality within 24 hours of calving was higher in summer and lower in winter, a difference that was nevertheless not significant. Also those reported by Carpenter and others (2006), Norman and others (2012) and Manriquez and others (2020) who reported a high frequency of bovine abortions in July, and a decrease from October to February. However, the increased frequency of bovine abortions in summer can be explained by the high summer temperatures, humidity and heat stress depending on the geographical and climatic conditions of the study areas.

CONCLUSION

Although bovine abortion is a notifiable disease in Algeria, veterinarians do not seem to be sufficiently aware of its negative impact on the economic and health levels. It is true that its etiological diagnosis is not an easy thing to make. From another point of view, taking samples to investigate the suspected abortifacient agent requires quality samples that must be accompanied by good anamnesis as well as the availability and capacity of existing laboratories to make a diagnosis. Hence the rapid and desired intervention of the services concerned by stimulating veterinarians to declare the cases of bovine abortions encountered by improving the

capacity of laboratories to analyse the causes of abortion. And also the farmers, who represent the key element in the declaration of bovine abortions on the farms, by strengthening the financial means to encourage the notification of abortions, such as increasing the compensation paid to the farmer when a bovine animal is lost due to an abortion in order to facilitate the purchase of a replacement bovine animal, and covering part or all of the costs related to the diagnosis of abortions. This study is limited in the number of veterinarians audited. Nevertheless, the results obtained constitute a good starting point for future studies on a larger scale aimed at containing the problem of bovine abortions in Algeria.

CONFLICT OF INTEREST

The author declare no conflicts of interest associated with this manuscript.

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