KNOWLEDGE, ATTITUDES, AND PRACTICES OF BREEDERS AND VETERINARY PERSONNEL RELATING TO BOVINE HERPESVIRUSES IN NORTHERN REGIONS OF CAMEROON

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Abstract

To determine the epidemiology of Bovine Herpesviruses in three northern regions of Cameroon, a cross-sectional survey was carried out to assess the behaviour of farmers and veterinary personnel towards Bovine Herpesviruses. Therefore, a total of 484 respondents were interviewed using a semi structured questionnaire, and the responses were recorded on a binary scale. An ANOVA was used to assess significant differences in mean knowledge, attitude and practice (KAP) scores between regions, while linear regression was performed to explore the relationships between demographic characteristics and KAP. Certain demographic parameters, such as level of education, age and number of years of experience, influenced the respondents' levels of knowledge, attitudes and practices. In general, the study revealed low levels of knowledge (0.21±0.17), desirable attitudes (0.44±0.28), and inappropriate practices (0.68±0.12). The nature of the respondents was positively associated with attitudes and practices, while age was positively correlated with knowledge. Educational level was positively associated with the respondents' knowledge, attitudes and practices. This study highlights the need for continuous training of veterinary staff on the silent evolution of certain pathologies and regular awareness of breeders on disease management on their farms.

Key words: *Bovine Herpesviruses; cattle farmers; veterinary personnel; Cameroon*

INTRODUCTION

In Cameroon, with an estimated of eight million headcounts, cattle production provides 42kg/capita/year of animal protein, particularly meat and milk [1], which contributes 196 million USD (25%) to the livestock gross domestic product (GDP) and income for approximately 30% of the rural population). However, diseases, poor management, poor nutrition and breeding techniques are the main constraints hindering cattle production. The vulnerability of cattle production due to various endemic parasitic (helminthiasis, ectoparasitosis) and infectious diseases (Brucellosis, bovine Q fever) in Cameroon consistently reduced the effort of breeders [2]. Additionally, genital tract infections with high prevalence of up to 58.28% had negative impact on cattle fertility and reproduction in Cameroon [3]. Amongst, diseases that affected cattle reproduction system, Herpesviruses (Infectious Bovine Rhinotracheitis (IBR), Infectious Pustular Vulvovaginitis (IPV); Infectious Balanoposthitis (BoHV-1) complex) cause significant economic losses once they become established [4]. IBR was reported to be responsible of abortion rates of 25% to 60% in the USA) [5].

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Previous studies reported the circulation of disease in Cameroon, with a high prevalence of 38.8% [6] and 72.9% in cattle [7]. Continuous, surveillance and monitoring of Herpesviruses diseases on cattle reproductive system as well as the assessment of end-users' behaviour is of a great importance for policies and decision making in order to reduce the burden on cattle production. Therefore, this study was initiated with the aim of assessing bovine Herpesviruses among cattle farmers and veterinary personnel as a contribution to the eradication of disease in Cameroon.

MATERIAL AND METHOD

Study disign

This cross-sectional study was conducted from May 2020 to February 2022 in the Adamawa, North and Far regions of Cameroon (Figure 1) which represent the most the cattle production zone in Cameroon. Authorization were obtained from the School of Veterinary Medicine and Sciences of the University of Ngaoundere-Cameroon (2020/0164/UN/R/VRE-PDTIC/DAAC/D-ESMV/DAACRS to 21 April 2020) and the different regional delegation in charge of animal health in Adamawa North and Far North region.

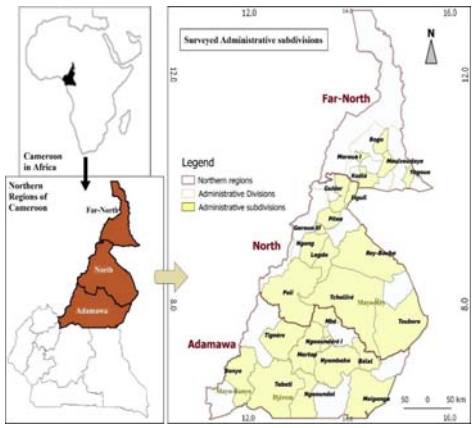

Fig. 1 Study area showing Adamaoua, North, Far North region in Cameroon [8].

Sampling procedures

A minimum sample of 384 was estimated using the appropriate tools, based on an estimated prevalence of 50% [9], with a confidence interval of 95% and precision set at 5%. The random number generation technique was used for the selection of cattle farmers and veterinary personnel obtained from a list of the Regional Delegations of Livestock, Ficheries and Animal Industries (RDLFAI) of the three Regions of Cameroon. A stratified random technique was used, and the cattle farmers of each region were sampled according to the proportion of the national flock size, as shown previously in [8]. The data provided by [1] allowed us to bring out the following table 1.

Table 1 Sample size

Regions	Total sample	Retained sample	Rejected sample
Adamaoua	385	241	-144
North	132	123	-9
Far-North	151	120	-31
Total	668	484	184

Once in the field, after investigaton based on the breeders' responses and their accessibility, we rejected 184 forms for unsatisfactory informations. Which made it possible to retain 438 breeders and 46 veterinary staff (depending on their avaibility and consent).

Data Collection

The data were collected using a semi structured questionnaire. Study was conducted in the same region at the same time as that of [8] with many of the participants being the same. The interviews were performed in French. When the respondent did not understand French, the local language *"Fulfude"* was used. The questionnaire was pretested for accuracy

and adaptability on a minimum of 10 farmers and three veterinary personnel out of the sample size. The questionnaire data were grouped into three categories: i) socioeconomic characteristics of the respondents (level of education, age, sex, experience) and farm characteristics, ii) knowledge and attitudes of breeders and veterinary towards the disease, and iii) disease transmission factors and practices of respondents.

The questionnaire included closed- and open-ended questions. Veterinary personnel in each region were randomly selected based on their cattle production activity.

Data Analysis

An Excel template was used to code survey responses. In each category, qualitative variables (questions) were converted into binary codes, where 1 denoted the correct response and 0 the incorrect response. Missing answers and "I do not know" responses were deemed inaccurate and assigned a value of 0. For open-ended questions, a code of 1 denoted any true response, while a code of 0 denoted a false response, as shown previously in [8]. To determine the percentage of correct answers, the total number of correct answers for each respondent was divided by the total number of questions for each category [10]**.** The descriptive statistics were used to depict the individuals' demographic features. One-way analysis of variance and Duncan's post hoc test allowed for the comparison and assessment of significant differences in mean KAP scores between regions. When comparing dichotomous variables, an independent t test was used. The knowledge, attitudes, and practices scores are presented by the mean ± standard deviation. The outcomes were then converted back into percentages for the presentation of the overall evaluation [11]. Microsoft Excel 2013 (Microsoft Corporation) and IBM SPSS version 25.0, the Statistical Package for Social Sciences, were used for data analysis.

RESULTS

Demographic Characteristics

Of the 484 respondents included in the study (Table 2), 90.5% were breeders, whereas 9.5% were veterinarians and para-veterinarians. A total of 99.0% of the respondents were male, and aged between 26 and 36 (31.8%). More than half of the respondents (73.8%) had no formal education, with experience in cattle breeding ranging from 10 to 20 years. A total of 63.4% of respondents practiced extensive livestock farming with transhumance during the dry season, 70.9% were the sole owners of their herds.

Knowledge of Bovine Herpesvirusis

Overall, the disease was best known among veterinary surgeons, whereas among livestock farmers, the level of knowledge of Herpesvirusis appeared to be lower (table 3). However, there was a significant difference in knowledge levels between the 3 regions, with the Far North seeming to have the highest level of knowledge. In addition, this study revealed that the respondents' level of knowledge of the disease increased with age, level of education and years of experience ($p < 0.05$) and seemed to be greater among those with more than 30 years of experience.

Attitudes of farmers towards Herpeviruses

An analysis of farmers' attitudes towards pathological cases of Bovine Herpesviruses (Balanoposthitis, Vulvovaginitis, Herpetic Ulcerative Thelitis, IBR and FCM) showed that 36.5%, 24.7%, 15.8% and 24% of farmers preferred to sell or kill their affected males; 23.3%, 34.9%, 37.2% and 25.3% replied that they treated the animal themselves without separating it from the others; 6.8%, 7.3%, 7.5% and 6.8% contacted the veterinarians (vet) and separated the affected male from the others; and 2.5%, 5.5%, 26%, and 5.3% contacted the veterinarians. without separating the affected animal from the others.

Table 2 Distributions of socio-demographic characteristics of respondents according to region

Characteristics		Adamawa (N = 241)	North (N = 123)	Far North (N=120)	Total (484)
		N (%)	N (%)	N (%)	N (%)
Nature of respondents	**Farmers**	110 (45.6)	79 (64.2)	68 (56.7)	257 (53.1)
	Breeders	103 (42.7)	34 (27.6)	44 (36.7)	181 (37.4)
	Veterinary nurses	15 (6.2)	5 (4.1)	4 (3.3)	24 (5.0)
	Veterinary technicians	3 (1.2)	1 (0.8)	2 (1.7)	6 (1.2)
	Veterinary doctors	10 (4.1)	4 (3.2)	2 (1.7)	16 (3.3)
Sex	**Male**	238 (98.8)	122 (99.2)	119 (99.2)	479 (99.0)
	Female	3 (1.2)	1 (0.8)	1 (0.8)	5 (1.0)
Age range (years)	**[15-25]**	37 (15.3)	17 (13.8)	23 (19.2)	77 (15.9)
	[26-36]	83 (34.4)	42 (34.1)	29 (24.2)	154 (31.8)
	[37-47]	78 (32.4)	29 (23.6)	34 (28.3)	141 (29.1)
	[48-58]	39 (16.2)	32 (26.0)	31 (25.8)	102 (21.1)
	[59-70]	4 (1.7)	3 (2.4)	3 (2.5)	10 (2.1)
Educational level	**None**	161 (66.8)	98 79.7)	98 (81.2)	357 (73.8)
	Primary	50 (20.7)	15 (12.2)	13 (10.8)	78 (16.1)
	Secondary	17 (7.1)	4 (3.2)	7 (5.8)	28 (5.8)
	Higher	13 (5.4)	6 (4.9)	2 (1.7)	21 (4.3)
Experience in cattle breeding	**< 10**	35 14.5)	20 (16.3)	22 (18.3)	77 (15.9)
	[10 – 20]	83 (34.4)	38 (30.9)	45 (37.5)	166 (34.3)
	[21 – 30]	58 (24.1)	30 (24.4)	24 (20)	112 (23.1)
	> 30	37 (15.3)	25 (20.3)	21 (17.5)	83 (17.1)
	None	28 (11.6)	10 (8.1)	8 (6.7)	46 (9.5)

N: number

Table 3 Distribution of mean knowledge scores of Bovine Herpesvirus infection according to demographic characteristics (n= 484) in the Adamawa, North and Far North Regions of Cameroon

Factors	Variables	N	Knowledge	
			Mean ± SD	*p* Value
Regions	Adamawa	241	0.23 ± 0.16^{b}	0.000
	Far North	120	0.24 ± 0.18^{b}	
	North	123	0.15 ± 0.17^{a}	
Respondents	Cattle farmers	438	0.18 ± 0.15^{a}	0.000
	Veterinary doctors	16	0.62 ± 0.12^{c}	
	Veterinary nurses	24	0.39 ± 0.10^{b}	
	Veterinary technicians	6	0.28 ± 0.15^{a}	
Educational level	None	357	0.19 ± 0.15^{a}	0.000
	Primary	78	0.15 ± 0.13^{a}	
	Secondary	28	0.32 ± 0.16^{b}	
	Higher	21	0.57 ± 0.14^{c}	
Age range (year)	[15 - 25]	77	0.10 ± 0.11^{a}	0.000
	[26 - 36]	154	0.21 ± 0.20^{b}	
	[37 - 47]	141	0.24 ± 0.17^{b}	
	[48 - 58]	102	0.25 ± 0.14^{b}	
	[59 - 70]	10	0.26 ± 0.18^{b}	
Experience in cattle breeding (years)	< 10	123	0.21 ± 0.22^{b}	0.000
	[10 - 20]	166	0.18 ± 0.15^{a}	
	[21 - 30]	112	0.23 ± 0.15^{b}	
	> 30	83	0.25 ± 0.14^{b}	
Sex	Male	479	0.21 ± 0.17	0.049
	Female	5	0.40 ± 0,21	

Values within a column with $^{(a; b; c)}$ differ significantly at p< 0.05. SD: Standard deviation. N: number

When faced with an abortion, 31.1% of the farmers looked for the cause, while over half (68.9%) did not. Regarding the fate of the aborted cows, 58.4% continued to leave the cow in the herd, while 3.4% withdrew the cow from the herd. A total of 62.6% threw the abortion into the wild.

Based on the attitude levels of breeders in each region (Figure 2) according to the KAP evaluation grid, on average, 0.9%, 6.2% and 8.9% of farmers in Adamawa, North and Far North, respectively, had a fair attitude towards bovine herpesviruses.

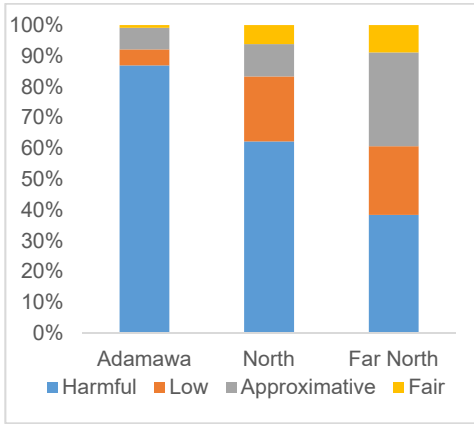

Fig. 2 Level of attitudes of breeders according to the three regions (N=438).

Attitudes of veterinarians towards Herpeviruses

The attitudes of veterinary staff toward Bovine Herpesviruses show that when faced with a case, all replied that they separated the animal from the others to avoid contamination of the others. However, when faced with abortions, 32.6% replied that they looked for the cause, 76.1% continued to leave the aborted cow in the herd, but all buried the run.

A total of 3.6% of the attitude levels of veterinary staff in Adamawa had a low quality (Figure 3); 46.6%, 30% and 25% of those in Adamawa, Nord and Far North, respectively, had a fair quality of attitude towards bovine herpesviruses.

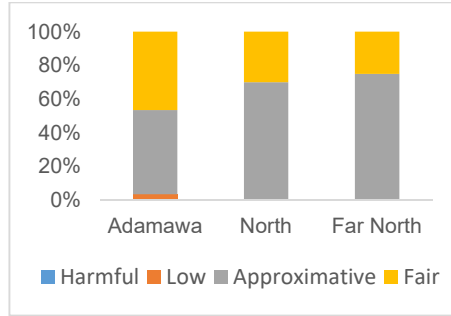

Fig. 3 Attitudes of veterinary staff according to the three regions (N=46).

Practices of farmers towards Herpesviruses

In our survey of Herpesvirus practices, 30.6% of the farmers interviewed said they borrowed breeding bulls. Of the 438 individuals interviewed, 34.5% said that their cattle cohabited with small ruminants, and all replied that their cattle did not cohabit with wild beast. For the introduction of new animals, 59.8% mixed these new animals directly with the others, and 97.0% mixed unsold animals directly with the others.

The measures taken by farmers were to limit the entry of disease into their farms (Figure 4). All farmers replied that they took part in vaccination campaigns, and all housed their animals in pens. Some, however, limited cohabitation with other animal species: 25.4% in Adamaoua, 28.3% in the North and 18.8% in the Far North.

Although breeders' practices were inadequate (Figure 5), 4.7%, 7.9% and 5.4% of breeders in the Adamaoua, North and Far North Regions, respectively, reported being harmful to Bovine Herpesviruses.

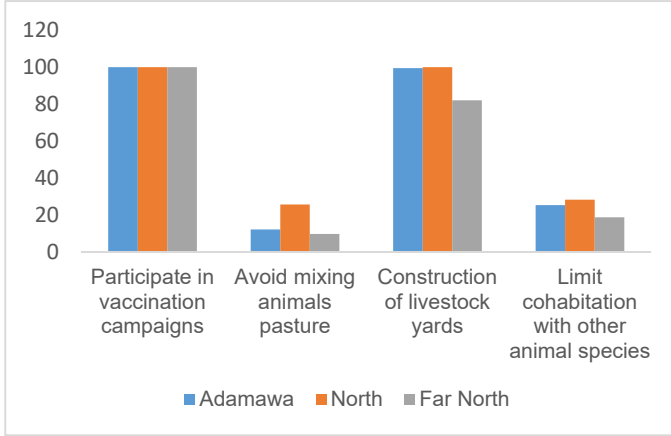

Fig. 4 Measures to limit access to diseases (N=438)

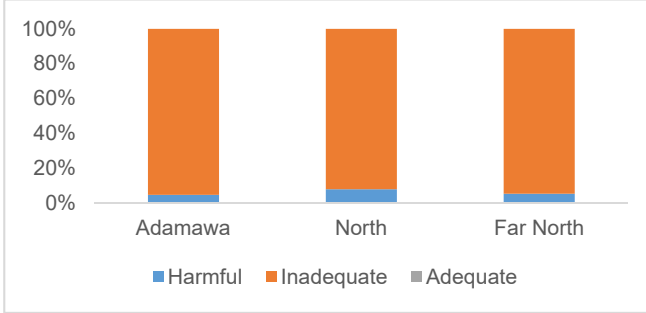

Fig. 5 Level of practice of breeders according to the three regions (N=438)

Practices of veterinarians towards Herpeviruses

The majority (78.3%) of veterinary staff monitoring livestock farms carried out deworming at the start of the dry and rainy seasons; 4.3% did so twice a month, and 15.2% did so every month. All had similar responses, suggesting that farmers vaccinate their animals, contact them in the event of pathology, quarantine new animals and avoid interspecies mixing.

We obtained a significant difference between the rank of veterinary staff and the quality of attitudes, with veterinary doctors having the highest score (0.91 ±0.10). Adequate levels (Figure 6) of practice for Bovine Herpesviruses by veterinary staff in the three regions are shown in the following figure.

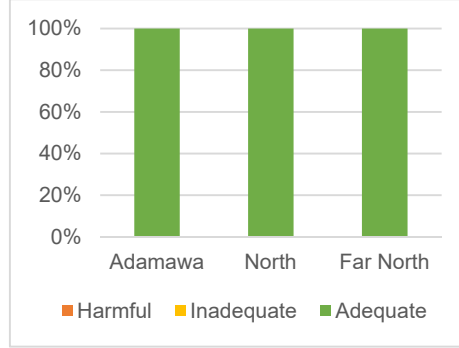

Fig. 6 Level of practice of veterinary staff according to the three regions (N=46).

Breeders' attitudes and practices according to demographic characteristics

Table 4 below represents the average score of breeders' attitudes and practices. According to the analysis, the average

percentage of breeders who reported being harmful was 0.36 ± 0.26% (36%). However, the average of the practices of these breeders based on the KAP evaluation grid was inadequate at 0.65 ± 0.07 (65%). We obtained a significant difference in attitudes depending on the region (P<0.05), with the Far North having a high score (0.35 ± 0.24). Furthermore, depending on age, level of education and duration of cattle farming, we obtained a significant difference in the level of attitudes, which was high among breeders aged 48–58 years old with no level of education but with more than 30 years of experience.

Veterinarians' attitudes and Practices according to demographic characteristics

The attitudes and practices of veterinary staff regarding Bovine Herpesviruses are listed in Table 5. We obtained a significant difference between the rank of veterinary staff and the quality of attitudes, with veterinary doctors having the highest score (0.91 ±0.10).

Table 4 Average scores of breeders' attitudes and practices towards Bovine Herpesviruses according to demographic parameters (N=438)

Factors	Variables	Attitudes		Practices	
		Average	**P value**	**Average**	**P value**
Regions	Adamawa	0.26^{a}±0.21	0.000	0.65 ±0.07	0.655
	North	0.39^{b}±0.26		0.66 ±0.07	
	Far North	0.53^{c}±0.24		0.65 ±0.06	
level of education	None	0.38 ± 0.26	0.001	0.65 ±0.07	0.873
	Primary	0.26 ± 0.32		0.66 ±0.08	
	Secondary	0.29 ± 0.20		0.65 ±0.08	
Age range (year)	[15 – 25]	0.31 ± 0.29	0.006	0.66^{b}±0.08	0.011
	[26 – 36]	0.32 ± 0.23		0.66^{b}±0.07	
	[37 – 47]	0.37 ± 0.27		0.66^{b}±0.07	
	[48 – 58]	0.43 ± 0.25		0.64^{b}±0.07	
	[59 – 70]	0.39 ± 0.22		0.59^{a}±0.06	
Duration in cattle farming (year)	< 10	0.32^{a}±0.28	0.029	0.65^{b}±0.08	0.005
	[10 – 20]	0.34^{a}±0.26		0.66^{b}±007	
	[21 – 30]	0.37^{b}±0.26		0.66^{b}±0.06	
	> 30	0.43^{b}±0.23		0.63^{a}±0.07	

Values within a column with ($^{a, b, c}$) differ significantly at P< 0.05. SD: Standard deviation.

Table 5 Average scores of attitudes and practices towards Bovine Herpesviruses of veterinary staff according to demographic parameters (N=46)

Factors	Variables	Attitudes		Practices	
		Average	**P value**	**Average**	**P value**
Region	Adamawa	0.82 ± 0.10	0.960	1.00 ± 0.00	1.00
	North	0.81 ± 0.11		1.00 ± 0.00	
	Far North	0.81 ± 0.12		1.00 ± 0.00	
Rank	Doctors	0.91^{b}±0.10	0.000	1,00 ± 0,00	1.00
	Nurses	0.78^{a}±0.07		1.00 ± 0.00	
	Technicians	0.75^{a}±0.00		1.00 ± 0.00	
Age range (year)	[15 – 25]	0.75 ± 0.00	0.122	1.00 ± 0.00	1.00
	[26 – 36]	0.84 ± 0.12		1.00 ± 0.00	
	[37 – 47]	0.78 ± 0.06		1.00 ± 0.00	
	[48 – 58]	0.75 ± 0,00		1.00 ± 0.00	
	[59 – 70]	0.39 ± 0.22		1.00 ± 0.00	
Sex	Male	0.82 ± 0,10	0.173	1.00 ± 0.00	1.00
	Female	0.80 ± 0.07		1.00 ± 0.00	

Values within a column with ($^{a, b, c}$) differ significantly at P< 0.05. SD: Standard deviation.

Level of knowledge, attitudes and practices measured according to the demographic characteristics of cattle farmers and veterinary personnel

The nature of the respondents was positively associated with attitudes and practices, while age was positively correlated with knowledge. Educational level was positively associated with the knowledge, attitudes and practices of respondents (Table 6).

Table 6: Linear regression model of knowledge, attitudes and practices measures versus demographic characteristics of cattle farmers and veterinary personnel (N= 484) in the Adamawa, North and Far North regions of Cameroon

Factors	Knowledge Estimates (95%CI)	Attitude Estimates (95%CI)	Practices Estimates (95% CI)
Respondents	-0.013 (−0.054; 0.029)	0.194** (0.128; 0.260)	0.099** (0.079;0.120)
Regions	0.004 (−0.012; −0.020)	0.122 * (0.097 ; 0.148)	0.001 (−0.007; 0.009)
Age range (Year)	0.058** (0.033; 0.083)	0.038 (−0.002; −0.078)	0.005 (−0.008; 0.017)
Educational level	0.084** (0.062; 0.107)	0.065 ** (0.029; 0.101)	0.043** (0.032;0.054)
Sex	0.012 (−0.159; −0.183)	−0.041 (−0.314; 0.232)	0.003 (−0.082; 0.088)
Duration in cattle farming (years)	0.000 (−0.028; 0.027)	0.002 (−0.042; 0.046)	-0.010 (−0.024;0.004)
Constant	0.012 (-0.163; 0.186)	-0.124 (-0.402; 0.155)	0.555 * (0.468; 0.641)
N = 484	R^2 = 0.291	R^2 = 0.406	R^2 = 0.656

**p< 0.01; *p< 0.05; CI: confidence interval

DISCUSSIONS

The present KAP study was carried out in northern Cameroon (Adamaoua, North and Far North) to conduct an epidemiological investigation by assessing the level of knowledge, attitudes, practices and risk factors for Bovine Herpesvirus transmission among livestock farmers and veterinary staff.

In the general Herpesvirus knowledge component, the overall level was negative, as 96.7% of those interviewed had never heard of bovine Herpesviruses. The 3.3% who had heard most of it during their training were all veterinary surgeons with higher education. These results can be explained by the fact that, unlike major epizootics such as contagious Bovine PleuroPneumonia and Foot and Mouth Disease, Bovine Herpesviruses do not receive much media coverage in Cameroon. Moreover, the majority (73.5%) of farmers had no formal education at all. These assertions corroborate those of [4] in Chad, who classified IBR, for example, as a secondary type of disease, since few figures are available on its prevalence, and its impact is less spectacular than that of the major epizootics.

In terms of knowledge of infectious Bovine Rhinotraheitis (IBR), 3.5% of those surveyed had heard of IBR (mainly veterinary staff), and 3.7% of farmers, after being shown images of the disease, recognized the clinical signs and identified the season and age group of affected animals. These results differ from those obtained by [7] as part of his veterinary medicine thesis in Cameroon, who obtained zero knowledge of IBR in 2018 among farmers in the Benoue Department, North Cameroon Region. This could be explained

by the use of a different survey methodology than that of the present study, which used images during interviews with herders. Moreover, this low level of knowledge is not the case in free countries such as Austria, Norway, Switzerland, etc., or in other countries with eradication programs involving close collaboration between veterinary services and breeders, such as Italy, Germany, Belgium and France [12].

As mentioned above, the average scores for the level of attitudes and practices of breeders based on the KAP evaluation grid in [10] revealed poor attitudes and an inadequate level of practices towards Bovine Herpesviruses. This is perhaps due to their poor knowledge of Bovine Herpesviruses and lack of training in animal husbandry, as breeders rely much more on their years of experience in pathology management. On the one hand, these low KAP levels can be considered risk factors for the transmission of Bovine Herpesviruses, and on the other hand, they contribute to an increase in risk factors, which include cohabitation with sheep, direct mixing of new and other animals, animal movements, releasing cows with abortions from the herd, throwing the abortus out into the open herd, continuing to leave animals with these Herpesviruses in the herd, borrowing breeding bulls and not investigating the causes of abortions.

Among animal health workers (veterinary staff), the significant difference in knowledge levels among doctors, nurses and veterinary technicians may be due to their professional training. For most of them, this was the first time they had heard of these pathologies. In addition, as with breeders, these diseases are not truly publicized in our context. In spite of this, when faced with situations exposing them to Bovine Herpesviruses, more than half had an approximate level of attitude and an adequate level of practices. This can be explained by the fact that they had all received training in animal health and knew how to limit the introduction of diseases into a farm, even if they were not all familiar with these diseases. However, when faced with abortions, 67.4% did not seek the exact cause of the abortion because breeders were unaware of the agent responsible and sometimes preferred to sell or fatten the cow. However, when it came to managing runts, everyone buried them.

In the course of this study, it should be noted that although some farmers did their best to recognize the different types of Herpesviruses through the symptoms shown on the images presented to them, most of them confused them with other diseases. Among other factors, this involved a differential clinical diagnosis with PPCB, FMB, IBR and FCM.

CONCLUSIONS

This study highlights a low level of knowledge, especially among farmers, and a desirable attitude and appropriate practices among veterinary staff. The level of knowledge of the disease increased with age, level of education and years of experience of the respondents, appearing to be greater among those with more than 30 years of experience. The nature of the respondents was positively associated with attitudes and practices, while age was positively correlated with knowledge. Educational level was positively associated with the respondents' knowledge, attitudes and practices. This study highlights the need for continuous training of veterinary staff on the silent evolution of certain pathologies and regular awareness of breeders on disease management on their farms.

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