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Prevalence and Risk Factors of Genital Diseases of Goats and Ewes in the far North Region of Cameroon

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Abstract:
This study was carried out at the municipal slaughterhouse of Maroua (Far-North Cameroon), in order to determine the prevalence and risk factors of the pathologies of the genitals organs of local goats and ewes. A total of 631 genital tracts were examined, including 448 and 183 for goats and ewes, respectively. Before slaughter, the animals were characterized (breed, age, weight and Body Condition Score (BCS)). After slaughter, the entire genital tract of each female was carefully examined for morphological or pathological abnormalities. The ovaries of each animal were also sampled to determine the follicular population and ovarian pathologies. The results indicated that means age (years), weight (kg) and BCS of females were 2.59 ± 1.49, 23.00 ± 2.19 and 2.74 ± 0.63, respectively. The mean follicular population was 9.96 ± 9.63 per ovary with 10.38 ± 5.48 and 9.03 ± 5.02, respectively, for the goat and ewe ($p = 0.00$). A pregnancy rate of 45.3% was observed. The overall prevalence of genital abnormalities was 36.3% with 38.20% and 31.70% respectively in goats and ewes ($p = 0.10$). The most common pathologies of the ovary were ovarian cysts (9.19%), oophoritis (4.28%), ovarian hypoplasias (3.96%); those in the uterus included metritis (6.81%), *Cysticercus tenuicollis* (3.65%) and the affections of the vagina and vulva were more represented by *Cysticercus tenuicollis* (3.32%). Non-pregnant and thin (BCS = 1-2) females at least 2 years old and raised in the dry season were the most affected ($P < 0.05$).

Keywords: Ewes, goat, genital pathologies, fertility, Maroua, Cameroon.

INTRODUCTION

Cameroon's livestock is mostly constituted of cattle, sheep, goats, pigs and poultry. Despite its importance, this herd remains insufficient to meet the demand of the Cameroonian population for animal protein. In order to meet the population's nutritional needs and generate an income for export, the Cameroon Government's 2035 strategy, in the field of animal production, is focused in the short term on the development of the breeding of species with short cycle (non-conventional breeding, small ruminants, pigs, poultry, aquaculture and fisheries). Small ruminants (sheep and goats) play an important role and have many advantages in the animal production sector. They are easy to handle because of their small size, not very demanding in fodder quality, the quantity of meat produced by an animal can satisfy the needs of a family; the conduct of breeding is easy and requires no preliminary training; no religion prohibits their consumption. They are resistant to trypanosomiasis and can be raised in all agroecological zones (Kouamo *et al.*, 2015). In addition, proportion of small ruminants in meat consumption is 17.50% in Cameroon (Letenneur *et al.*, 1995). The development of this breeding is done by the improvement environmental conditions, the use of adapted techniques of the breeding but also the implementation of a plan of prevention of all the pathologies, including those of the reproductive system (Fthenakis *et al.*, 2001). In small ruminants, congenital and acquired reproductive tract diseases in females are a source of infertility in the flock and cannot be detected by routine examination. The slaughterhouse appears to be the best source of detection of pathologies of the female genital tract (Fathalla *et al.*, 2000). Livestock species are reservoirs of many infectious diseases and there is evidence of transmission between domestic and such species (Ali *et al.,* 2017; Dyab *et al.,* 2019; Iqbal *et al.,* 2019; Muhammad *et al.,* 2015). Several studies on the prevalence and risk factors of reproductive pathologies of small ruminants have been conducted in Africa and elsewhere, but similar studies have not been conducted in Cameroon to our knowledge. It is in this context that this research was conducted with the general objective of contributing to a better knowledge of the prevalence of genital diseases of local breeds of small ruminants as well as the risk factors contributing to their appearance. Specific objectives were to characterize slaughtered goats and sheep; to determine the prevalence of genital diseases and to evaluate the effect of species, breed, BCS, age, physiological status and season on the prevalence.

MATERIALS AND METHODS

Study area

The study was conducted on goats and sheep of Dargala, Kodec, Salak, Papata, Bogo and Comis markets surrounding the town of Maroua (chief division of the Far North Cameroon region). The city is located between 10°30' and 10°40' north latitude and between 14°20' and 14°30' east longitude, with a Sudano-Sahelian climate characterized by a short rainy season of about 3 months (from June to September) and a long dry season of about 8 months (October to May). Maximum temperatures (37 - 40°C) are observed between March and May, while minimum temperatures (16-18°C) are obtained between December and February.

Characteristics of animals

A total of 631 genital tracts were examined with 448 and 183 for goats and ewes, respectively. The Kirdi (360), Sahel (88), Djallonke (100), Waila (41), Oudah (17), Poulfouli (18) and Kirdi (7) breeds were determined on the basis of phenotypic characteristics as described by (Wangbitching, 1990). BCS and age (years) were assessed by estimating the extent of muscle and adipose tissue located under the transverse processes (Daget and Godron, 1995) and examining the

dentition, respectively. Two age classes were considered based on the eruption of permanent incisors; animals with no permanent incisors were classified as young and those with at least one pair of permanent incisors were classified as adults (Wondimu *et al.*, 2011). The weight (kg) was obtained from measurements of the animal's thoracic circumference as described by Boujenane and Halhaly (2015). The pregnancy status was determined by the presence of the fetus.

Examination of the genital tract

After slaughter, the entire genital tract of each female was separated from the pelvic viscera and the broad ligament, and then collected and deposited on a table for the inspection. Each part of the genital tract was incised and examined carefully for morphological and / or pathological abnormalities. The lesions were dissected and diagnosed. The left and right ovaries of each animal were also collected, kept in conical tubes containing isotonic solution (NaCl, 0.90%) supplemented with penicillin (0.50 mg / ml) and bearing the identification labels of each female. These tubes placed in a thermos at a temperature of 30-32°C (Kouamo *et al.*, 2014) and transported to the veterinary laboratory of Maroua within two (02) hours following the slaughter in order to determine the follicular population and ovarian pathologies. In the laboratory, the visible follicles on the surface of the ovaries of each female were counted, the corpus luteum, ovarian cysts and other ovarian abnormalities have been identified. Ovaries with follicles > 10 mm in diameter were considered cystic and classified as follicular cysts (thin wall and easily depressible) or luteal cysts (thicker wall) (Winter and Dobson, 1992).

Statistical analysis

Statistical analysis was performed by Statgraphic Plus software version 5.0. The Wilcoxon and Kruskal-Wallis tests were used for the mean comparison. The chi² test was used to compare prevalence. All data were represented as mean ± ESM (Standard Error of Mean) and percentage at the 5% threshold. The discriminated variables were recorded in the XLSTAT version 2016 software and these were subjected to multiple correspondence analysis (MCA).

RESULTS

Characterization of slaughtered animals

Means age (years), weight (kg) and BCS were 2.59 ± 1.49; 23.00 ± 2.19 and 2.74 ± 0.63 respectively. A pregnancy rate of 45.3% was observed. The mean follicular population was 9.96 ± 9.63 per ovary with 10.38 ± 5.48 and 9.03 ± 5.02, respectively, for goats and ewes (P = 0.00). Female weight and follicular population varied according to several factors (Table 1). The ewes were heavier than the goats (P = 0.00). The follicular population of the left and right ovaries of the goats was higher than those of the ewes (P = 0.00).

Overall prevalence of genital diseases of goats and ewes

The overall prevalence of genital pathologies in ewes and goats at the Maroua municipal slaughterhouse was 36.30%, with 38.20 and 31.70%, respectively, in goats and sheep (p = 0.10). Kirdi goats have a significantly high prevalence (P <0.05) compared to other small ruminants breeds (Figure 1). Genital diseases were significantly higher in non-pregnant females than pregnant ones, and more frequent in the dry than the rainy season (p <0.05) (Table 2).

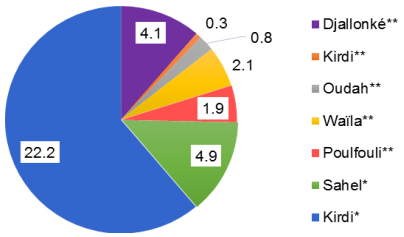

Fig. 1. Prevalence of genital pathologies by breed. * = goat; ** = sheep

Table 1. Variation in weight of slaughtered females and ovarian follicular population by species, breed, BCS, age, physiological status and season.

		N	Mean ± ESM [Min – Max] of the weight of females	Mean± ESM [Min –Max] of follicular population /ovary		
				Mean	Left	Right
Species	Caprine	44	21.91 ± 2.08[a]	10.38±5.48 [a]	10.24±5.49[a]	10.52±5.47[a]
		8	[15.9 – 27.8]	[0 – 35]	[0 – 35]	[0 – 34]
	Ovine	18	26.08 ± 3.40[b]	9.03±5.2 [b]	8.84±5.15[b]	9.23±4.89[b]
		3	[16.7 – 38.0]	[0 – 28]	[0 – 26]	[2 – 28]
	P-value		**0.00**	**0.00**	**0.00**	**0.004**
Caprine breed	Kirdi**	36	22.51±1.81[a]	10.34±5.63[a]	10.19±5.58[a]	10.50±5.68[a]
		0	[17.1 – 27.8]	[0 – 35]	[0 – 35]	[0 – 34]
	Sahel**	88	19.43±1.04[b]	10.56±4.86[a]	10.54±5.15[a]	10.59±4.57[a]
			[15.9 – 20.4]	[0 – 31]	[0 – 31]	[3 – 25]
Ovine breed	**P-value**		**0.0001**	**0.51**	**0.37**	**0.66**
	Djallonké*	10	24.50±2.37[a]	8.71±4.68[a]	8.63±4.94[a]	8.79±4.42[ab]
		0	[16.7 – 28.2]	[2 -28]	[2 – 25]	[2 -28]
	Waïla*	41	29.62±2.38[b]	10.03±5.14 [ab]	9.53±4.6[ab]	10.53±5.68[b]
			[22.0 – 38.0]	[1 – 28]	[1 – 26]	[2 – 28]
	Oudah*	17	28.29±3.09[b]	11.40±4.6[b]	11.64±4.30[b]	11.17±4.90[b]
			[21.2 – 32.7]	[4 – 22]	[5 – 22]	[4 – 20]
	Poulfouli*	18	25.73±3.70[a]	8.10±5.59[ab]	8.88±6.51[ab]	7.33±4.65[a]
			[20. 4 – 32.2]	[0 – 25]	[0 – 25]	[2 – 20]
	Kirdi*	7	23.54±2.78[a]	7.71±4.89[ab]	7.28±4.94[a]	8.14±4.84[ab]
			[20.0 – 27.3]	[2 – 25]	[2 – 25]	[2 – 14]
	P-value		**0.0001**	**0.06**	**0.06**	**0.07**
BCS	Thin	22	2106±1.90[a]	9.57±5.48[a]	9.55±5.57[a]	9.59±5.39[a]
	(1-2)	8	[15.9 – 29.4]	[0 – 34]	[0 – 27]	[0 – 34]
	Normal	34	23.50±2.60[b]	10.22±5.42[a]	10.05±5.38[a]	10.39±5.47[a]
	(3)	0	[17.1 – 32.2]	[0 –35]	[0 –35]	[0 – 32]
	Fat	63	28.11±3.16[c]	9.87±5.25[a]	9.87±5.39[a]	9.88±5.12[a]
	(4-5)		[15.9 – 38.0]	[2 – 35]	[2 – 35]	[2 – 28]
	P-value		**0.00001**	**0.30**	**0.38**	**0.23**
Age	Adult (>1.5 ans)	43	23.53 ± 3.29[b]	10±5,65[a]	9.89±5.62[a]	10.12±5.68[a]
		4	[15.9 – 38.0]	[0 – 35]	[0 – 35]	[0 – 34]
	Young (≤1.5	19	22.21 ± 2.67[a]	9.85±4.81[a]	9.81±4.84[a]	9.90±4.79[a]
	ans)	7	[16.7 – 31.4]	[0 – 31]	[0 – 31]	[0 – 25]
	P-value		**0.000**	**0.87**	**0.78**	**0.97**
Physiological status	Pregnant	28	22.97±2.96[a]	10.07±5.42[a]	9.97±5.48[a]	10.17±5.37[a]
		6	[15.59 – 38.0]	[0 – 35]	[0 – 35]	[0– 34]
	Non pregnant	34	23.26±3.35[a]	9.84±5.38[a]	9.76±5.30[a]	9.92±5.47[a]
		5	[16.3 – 35.5]	[0 – 32]	[0 – 27]	[0 – 32]
	P-value		**0.30**	**0.72**	**0.81**	**0.64**
Season	Dry	40	23.00 ± 2.19[a]	10.10±5.72[a]	9.95±5.70[a]	10.26±5.74[a]
		4	[16.7– 31.4]	[0– 35]	[0– 35]	[0 – 34]
	Rainy	22	23.33 ± 4.20[b]	9.7±4.77[a]	9.72±4.78[a]	9.68±4.77[a]
		7	[15.9 – 38.0]	[0 – 31]	[0 – 31]	[0– 25]
	P-value		**0.0001**	**0.71**	**0.44**	**0.98**

[a, b, c] percentages in a column with different superscripts are significant at P <0.05. ** = goat; * = sheep.

Table 2. Overall prevalence of genital diseases of ewes and goats based on age, BCS, physiological status and season.

Characteristic of cows		Animals examined	Positive	Percentage (%)	OR	CI (95%)	P value
Age	Adults	434	160	25.40 [a]	1.08	[0.76-1.54]	**0.30**
	youngs	197	69	10.90 [a]	//	//	
BCS	Thin (1-2)	228	83	13.20 [a]	0.90	[0.66-1.33]	**0.70**
	Normal (3)	340	126	20.00 [a]	//	//	
	Fat (4-5)	63	20	3.20 [a]	0.70	[0.43-1.38]	
Physiological Status	Pregnant	286	73	25.50[a]	0.40	[0.29-0.58]	
	Non Pregnant	345	156	45.20[b]	//	//	**0.00****
Season	Dry	404	158	25.00 [a]	//	//	**0.02***
	Rainy	227	71	11.30 [b]	0.70	[0.49-0.98]	

[a, b, c] percentages in a column with different superscripts are significant at P <0.05. CI = confidence interval. OR=Odds ratio. * = p <0.05. * * = p <0.01.

Overall prevalence according to the portions of the genital tract

The pathologies of the ovarian, oviduct, uterine and copulatory (vagina and vulva) portions were 21.6% (n = 136); 4.44% (n = 28); 12.20% (n = 77) and 3.80% (n = 24) cases, respectively. The ovary was the most affected. Table 3 presents the main pathologies according to the portions of the genital tract. Luteal cysts (7.29%) and metritis (6.81%) were the most common genital diseases of the ovary and uterus, respectively. Metritis was characterized by hypervascularization of the uterus, an inflammation of the uterine lining, with a reddish appearance. The follicular population varied significantly between segmental aplasia and hydrometer (P <0.05) (Table 4).

Prevalence of concomitant pathologies

A total of 34 females carried concomitant pathologies (Table 5). Hydrosalpinx associated with ovarian adhesion and ovarian cysts associated with metritis were the most represented, with a prevalence of 0.63% (n = 4). Two associations of three pathologies have been identified in low proportion, namely: hydrosalpinx associated with ovarian adhesion and ovarian cysts (0.32%; n = 2), and the paraovarian cyst associated with ovarian hypoplasia and metritis (0.16%; n = 1).

Correlated effects between animal characteristics and genital pathologies

Figure 2 represents the correlation between animal characteristics and genital pathologies. The F2 axis discriminates between the Kirdi and Sahelian goat breeds on the left and the Poulfouli, Waïla, Djallonke sheep breeds on the right. It can be interpreted essentially as the axis of opposition between goat and sheep species. On the F1 axis, the most important contributions were those of season, breed, pregnancy status, age and BCS variables. There was a clear discrimination between pregnant and non-pregnant females. The closest variables within the same class were strongly correlated with each other. Four (4) classes have been obtained:

- Class 1: non-pregnant goats with BCS 3 were strongly correlated with metritis, uterine abscess and ovarian cysts;

- Class 2: adult females in the dry season were strongly correlated with *Cysticercus tenuicollis*, oophorite, ovarian adhesions;

- Class 3: young females with a BCS 1-2 were strongly correlated with *Cysticercus tenuicollis*.

- Class 4: pregnant ewes with BCS 4 and 5 were correlated with ovarian hypoplasia.

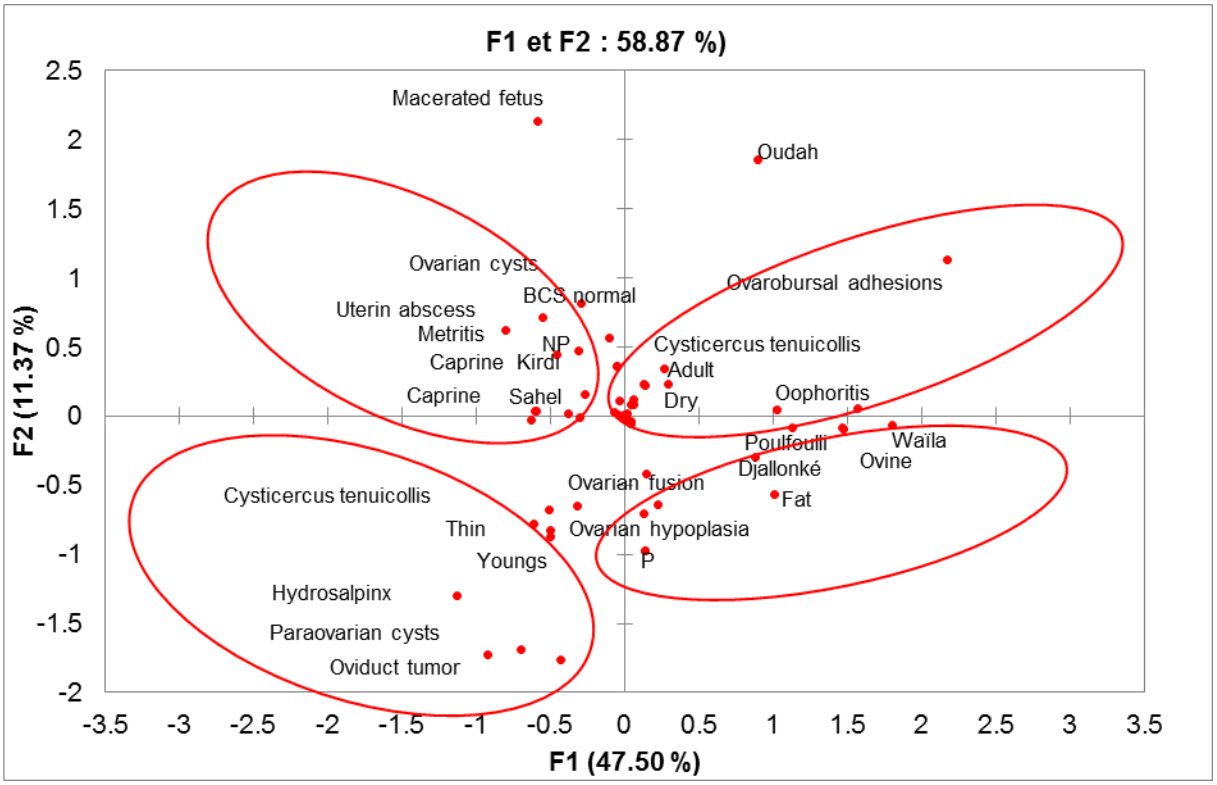

Fig. 2. Genital diseases correlated to the cow characteristics.
P: pregnant. NP: Non pregnant

Table 3. Prevalence of pathologies of the genital tract according to the localization.

Location	Disease condition	Number of specimens	Percentage (%)
Vulva and vagina	Total	24	3.80
	Vaginal abscess	1	0.16
	Vaginal *Cysticercus tenuicollis*	21	3.32
	Vaginal tumor	1	0.16
	Urovagin	1	0.16
Uterus	Total	77	12.20
	Uterine *Cysticercus tenuicollis*	23	3.65
	Uterin abscess	2	0.32
	Segmental aplasia of the uterus	1	0.16
	Endometritis	2	0.32
	Hydrometra	1	0.16
	Metritis	43	6.81
	Macerated fetus	5	0.8

Oviduct	Total	28	4.44
	Hydrosalpinx	8	1.27
	Paraovarian cysts	18	2.85
	Tumor	2	0.32
Ovary	Total	136	21.6
	Ovarobursal adhesions	24	3.80
	Ovarian fusion	2	0.32
	Ovarian hypoplasia	25	3.96
	Follicular cysts	12	1.90
	Luteal cysts	46	7.29
	Oophoritis	27	4.28

Table 4. Variation of the follicular population according to the genital pathologies.

Portions of genital tract	Disease condition		Mean ±ESM of follicular population	Coefficient of variation (%)
Glandular (ovary)	Ovarobursal adhesions		7.95±7.48[a]	94.08
	Ovarian fusion		16.00±1.40[abc]	8.83
	Ovarian hypoplasia		16.00±8.19[b]	51.22
	Follicular cysts		22.00±8.43[bc]	38.20
	Luteal cysts		20.00±9.59[bc]	47.97
	Oophoritis		22.33±10.28[c]	46.04
	P-value	**0.00**		
Tubular (uterus and oviduct)	Uterine *Cysticercus tenuicollis*		17.86±11.23[a]	62.84
	Uterin abscess		18.00±1.41[a]	7.85
	Segmental aplasia of the uterus		50.00[b] //	//
	Endometritis		8.00±7.07[a]	88.38
	Hydrometra		10.00[a] //	//
	Metritis		19.75±9.96 [a]	50.43
	Macerated fetus		18.75 ±2.5[a]	13.33
	P-value	**0.02**		
	Hydrosalpinx		21.87 ±9.56[a]	43.74
	Paraovarian cysts		22.55±11.00[a]	48.84
	Tumor		22.00 ±15.55[a]	70.71
	P-value	**0.77**		
Copulatory (vulva and vagina)	Vaginal abscess		17.00[a] //	//
	Vaginal *Cysticercus tenuicollis*		21.30 ±13.86[a]	65.26
	Vaginal tumor		16.00 //	//
	Urovagin		34.00 //	//
	P-value	**0.25**		

[a, b, c] means in a column with different superscripts are significant at P <0.05

Table 5. Prevalence of concomitant diseases

Disease condition	Number of specimens	Percentage (%)
Ovarian cysts + Metritis	4	0.63
Hydrosalpinx + Ovarobursal adhesions	4	0.63
Ovarobursal adhesions + *Cysticercus tenuicollis*	3	0.47
Ovarian hypoplasia + *Cysticercus tenuicollis*	3	0.47
Paraovarian cysts + Metritis	2	0.32
Hydrosalpinx + Ovarobursal adhesions + Ovarian cysts	2	0.32
Ovarobursal adhesions + Metritis	2	0.32
Cysticercus tenuicollis + Metritis	2	0.32
Oophoritis + Metritis	2	0.32
Paraovarian cysts + Oophoritis	1	0.16
Paraovarian cysts + Ovarian cysts	1	0.16
Paraovarian cysts + Ovarian hypoplasia + Metritis	1	0.16
Ovarian hypoplasia + Metritis	1	0.16
Paraovarian cysts + Macerated fetus	1	0.16
Urovagina + Metritis	1	0.16
Ovarian cysts + *Cysticercus tenuicollis*	1	0.16
Paraovarian cysts + Ovarobursal adhesions	1	0.16
Oophoritis + *Cysticercus tenuicollis*	1	0.16
Total	**34**	**5.43**

DISCUSSION

The percentage of pregnant females (45.30%) was higher than that observed by Manjeli *et al.* (1996) in the slaughterhouses of Garoua and Maroua (38.60%), and Benchaib (2007) in Algeria (26.00%). However, the rate is lower than those reported by Kheradmand *et al.* (2006) in Iran (56.50%) and Pitala *et al.* (2012) in Togo (80.10%). This difference could be related to the study period, breed and sample size. Small ruminants in the tropics do not experience seasonal anestrus, but goats and ewes in temperate regions experience a variation in ovarian activity depending on the season.

The average weight of the animals was higher than that reported by Ngona *et al.* (2012) in the Democratic Republic of Congo (20.50±4.90 kg) and lower than that reported by Bosso *et al.* (2007) in West Africa (24.50 kg). The average BCS, slightly higher than that reported by Ngona *et al.,* (2012), would be related to the period of the study especially in the rainy season, during which time feed availability was not lacking. The average age of the animals (2.59 ± 1.49 years) is consistent with the ages recorded by Benchaib (2007) and Dawood (2010). In fact, the poor financial situation of livestock farmers plays a major role in the premature sale of animals (Pitala *et al.,*, 2012). The raising of small ruminants in general is easily mobilized savings (ITRA, 2005).

The overall prevalence of genital pathologies (36.30%) is lower than the result recorded by Dawood (2010) in IRAQ (56.12%); but superior to the studies conducted by Benchaib (2007), Mutebi (2009), Khammas *et al.* (2013) and Sharma *et al.* (2014) who reported prevalences of 25.50%, 20.90%, 20.22% and 19.20%, respectively. The difference may be due to different study context, breed, number of animals studied, environmental and nutritional factors. Some feeds such as soybean and clover may increase the prevalence of genital abnormalities (Dawood, 2010).

Ovarian pathologies were the most frequently encountered (21.60%), in agreement with the work of Moghaddam and Gooraninejad (2007) and Mutebi (2009) who reported prevalences of 20.10% and 41.20%, respectively. The prevalence of ovarian cysts was higher than that reported by Dawood (2010), Mutebi (2009) and Regassa *et al.* (2009) respectively 1.86%, 1.10%, 4.30% in ewes. The difference may be due to breed and diet. One of the important causes of cyst formation is the lack of a hypothalamic or pituitary response to the positive effect of estrogen secreted by the dominant follicle (Wiltbank *et al.*, 2002). The development of cysts has been associated with many causes, including clinical, nutritional (phosphorus deficiency in goats), environmental, stress, hereditary and uterine infections (Peter *et al.*, 1989; Smith *et al.*, 1998). The effect of the season on the occurrence of ovarian cysts is similar with previous studies in cows that reported ovarian cysts were more common in December, January and February (Morrow, 1986). In the dry season, the lack of feed availability leads to a significant energy deficit. Hepatic metabolism is then increased, resulting in greater elimination of estradiol and progesterone, which causes frequently ovarian cysts.

The prevalence of ovarian adhesions (3.80%) was similar to that observed by Saberivand and Haghighi (2006) but higher than that reported by Ibrahim (2004). Lower prevalences were reported by Khammas *et al.,* (2013) (7.72%). Uterine and salpingeal infections are strongly suspected to be the cause (Kennedy and Miller, 1993). Adhesions cause infertility by interfering with ovulation and / or egg passage in the oviduct and cystic degeneration of the follicles. Cases of ovarian hypoplasia (3.96%) were comparable to those recorded by Benchaib (2007) in Algeria (3.91%) and higher than those reported by Beena *et al.* (2015) in India (0.15%).

Uterine diseases (12.20%) in this study are comparable to those recorded by Saberivand and Haghighi (2006), but lower than that reported by Rahman *et al.* (2008) and Regassa *et al.,* (2009). The variation of the different prevalences observed may be dependent on nutritional deficiencies and parasite infestations. The endometrial epithelium is more easily damaged by mild inflammation (Acland, 2001; Bollo *et al.*, 1990). The cases of endometritis (0.32%) were similar to those of Sudhakar *et al.* (2010). Higher prevalences were recorded by Dawood (2010). Infection of the uterus may be specific or nonspecific; microbes associated with endometritis generally arrive by the ascending pathway, either after a natural service or after parturition or abortion (Rebhun, 1995). Endometritis occurs during the luteal or postpartum phase (Dawood, 2010), probably due to the suppression of uterine immune function during the luteal phase in ewes and cattle (Ramadan *et al.*, 1997). The variation in the prevalence of endometritis may probably be due to differences in the management system in which the animals were maintained.

The hydrometer prevalence (0.16%) was comparable to that reported by Khammas *et al.,* (2013) but lower than that of Winter and Dobson (1992). This prevalence is related to the luteotropic role of prolactin in pseudopregnant goats. A change in the secretion of prolactin could possibly play a role in the development of hydrometer and the persistence of a corpus luteum. The prevalence of macerated fetuses (0.80%) was comparable to that recorded by Mutebi (2009). The macerated fetus may be indirectly related to mechanical lesions, nutritional imbalances, action of pathogens and directly to cervical opening following regression of the corpus luteum. The prevalence of metritis was higher than that reported by Mutebi (2009), Khodakaram-Tafti and Davari (2013) and Beena *et al.,* (2015) with 2.00%, 0.30% and 1.36%, respectively. This high prevalence may be attributed to births under unsanitary conditions. Moreover, sample collection was carried out during the rainy season, favoring the survival and proliferation of many microorganisms.

The prevalence of *Cysticercus tenuicollis* (5.70%) was significantly higher than that recorded by Khodakaram-Tafti and Davari (2013) in Iran (0.15%). This difference may be due to the fact that our study area is highly infested with *Cysticercus tenuicollis*. In addition, the existence of stray and wandering dogs, the system of rearing with small ruminants in wandering, the lack of systematic deworming of animals, would increase the risk of the occurrence of this pathology. The difference in infestation rates between young and adult ewes and goats can be explained by the fact that adults lived longer and consumed more parasite eggs during grazing.

Several authors have reported lower (0.90%, (Khodakaram-Tafti and Davari, 2013)) and higher prevalences (3.18%, (Khammas *et al.,*, 2013)) for parovarian cysts. Lower (0.93%, (Dawood, 2010)) and higher (2.55%, (Khammas *et al.,*, 2013)) prevalences of hydrosalpinx were also reported. Cantero *et al.* (1996) found that parovarian cysts can be induced in alfalfa grazing sheep over a prolonged period. The importance of this condition is questionable and its presence seems to have an effect on reproductive function only if it induces pressure on the oviduct (Morris *et al.*, 1999).

CONCLUSION

Genital diseases are a source of infertility in goat and sheep farming in Cameroon. In order to reduce the negative impact of these pathologies on the production of small ruminants, we recommend the improvement of the breeding conditions, the treatment of animals especially concomitant abnormalities and respect of the prophylactic measures.

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CONFLICT OF INTEREST

All the authors have declared that no conflict of interest exists.

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