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Gross Reproductive Organs Abnormalities in Rams and Bucks Slaughtered at Luna Export Abattoir, Eastern Shewa Zone, Ethiopia

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Abstract: A cross sectional study was conducted on randomly selected 618 male small ruminants (358 bucks and 260 rams) slaughtered at Luna export abattoir during the period from November 2014 to June 2015 to determine prevalence of gross reproductive tract abnormalities and to evaluate the association of breed, age and body condition and gross reproductive organs abnormalities in bucks and rams. Ante mortem and post mortem examinations were conducted in the study animals. Out of 618 male small ruminants (358 bucks and 260 rams) examined 18.5% (17.6% bucks and 19.6%) were affected by various gross reproductive organs abnormalities among which testicular hypoplasia (6.8%) was the most common followed by cryptorchidism (4.4%), Orchitis (2.8%) and Epididymitis (2.1%). There was no statistically significant variations detected in prevalence of all gross reproductive tract abnormalities between bucks and rams ($p>0.05$). Paraphimosis was significantly highest ($p<0.05$) in Afar breed than in Arsi-bale and black head Ogaden breeds of ram. However, other abnormalities were not significantly varied among breeds of ram ($p>0.05$). In bucks, orchitis and epididymitis were significantly different among breeds of bucks ($p<0.05$) and other abnormalities were not influenced by breed of the bucks ($p>0.05$). Orchitis was common in Hararghe highland breed whereas, epididymitis was significantly higher in Arsi-bale breed ($p<0.05$). None of these gross abnormalities were significantly different between age and body condition groups of bucks and rams ($p>0.05$).

Key words: Small ruminants · Testicular hypoplasia · Cryptorchidism · Breed · Ram · Bucks

INTRODUCTION

Small ruminants are economically important livestock in Ethiopia [1], where sheep and goat have a multipurpose role for farmers as sources of income, meat, skin, manure and coarse wool [1, 2]. Ethiopia is home to about 25.5 million sheep (73.57% females and 26.43 % males) and 24.06 million goats (71.06 % females and 28.94 % males) [3]. At the national level, sheep and goat account for about 90% of the live animal/meat and 92% of skin and hide export trade value [4].

Small ruminant production and productivity in Ethiopia is constrained by many factors such as fertility which is affected by factors like diseases, nutrition and age [5]. The cause of reproductive failures is varied and often poorly understood but testicular hypoplasia and cryptorchidism are easily evident [1]. The male reproductive system is essential for domestic animals' species propagation and survival [6] whereas pathological conditions affecting the male reproductive system have been known to affect the function of the system which leads to the development of infertility or sterility in farm animals [7] due to this rams and bucks with genital abnormalities could be sources of poor fertility in tropical small ruminants farming [8]. Abattoir surveys are cost-effective in providing reliable information on prevalence of the abnormalities of the reproductive system [9, 10]. Despite, the importance of information on the abnormalities of genital organs in diagnosing infertility and treatment of genital diseases few studies has been done on gross abnormalities of reproductive tract of bucks and rams breeds in Ethiopia. Therefore, there is a need to study the incidence of gross abnormalities of the reproductive system in bucks and rams. Thus this study

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was conducted to determine prevalence of gross reproductive organs abnormalities in bucks and rams and to evaluate the association of breed, age and body condition and gross reproductive organs abnormalities in bucks and rams slaughtered at Luna export abattoir.

MATERIALS AND METHODS

The study was conducted at Luna export abattoir located in Modjo town, Lume district, Eastern Shewa Administrative Zone of Oromia Regional State, central Ethiopia. Modjo is located 73 kilometers South-east of Addis Ababa. Luna Export Abattoir supplies fresh chilled meat, mainly goat and sheep meat to the Middle East and African countries.

A cross sectional study was conducted on randomly selected rams and bucks slaughtered at Luna Export Abattoir during the period from November 2014 to June 2015. A total of 618 animals (358 bucks and 260 rams) originated from different parts of the country with diverse agro-ecological Zones including Arsi, Bale, Afar, Borana, Harar and Somali region of Ethiopia brought to the abattoir for slaughtering were examined during the study period.

At ante mortem examination study animals were identified using ear tags and were grouped into young (under 1 year of age in goats and 1 year and 3 months in sheep) and adult (above or equals to 1 year of age in goats and 1 year and 3 months in sheep) based on dentition [11, 12]. In addition rams and bucks were classified in to two groups based on their body condition namely poor and good. The study animals were also subdivided into different groups based on their breeds which have been well described by Gatenby [11].

During ant mortem examination genital organs of each animal was cautiously examined. The incidences of asymmetric, big or small sized scrotum abnormalities were examined. The softness or firmness and the mobility of testicle in the scrotum were also examined. Cryptorchidism was determined upon palpating the inguinal rings [8]. Abnormalities such as phimosis, Paraphimosisi and urethral blockage were examined and recorded.

After the rams and bucks were slaughter, genitalia including the penis, prepuce, testes, epididymis and scrotal sac were examined for indication of any gross pathological abnormalities. Visually gross changes in size, texture and consistency of the testes were used to identify testicular gross abnormalities such as bilateral testicular hypoplasia, unilateral hypoplasia, unilateral and bilateral cryptorchidism and epididymitis. Cryptorchidism was identified on the basis of retention of one testicle (right or left) either in the abdominal or inguinal cavities [8, 13 and 14]. Change in shape, deep palpation to evaluate the consistency in terms of softness, firmness and serial and systematic dissection in to the parenchyma of the testes were performed to determine the presence and the extent of gross pathological changes [8].

Statistical Analysis: Collected data were entered into Microsoft Excel 2003 spreadsheets (Microsoft Corp., Redmond, WA, USA) and analyzed using SPSS for Windows version 15.0 (SPSS Inc., Chicago, IL, USA). The animals were divided into different groups: based on their breed for ram: Afar, Arsi-bale and black head Ogaden breeds and for Buck: Afar, Long Eared Somalis, Arsi-Bale and Hararghe highland breeds and on the base of body condition score as poor and good body condition groups. The Major gross reproductive organs abnormalities of rams and bucks were calculated by using percentage values and a chi-square test was used to examine possible association between incidence of major gross reproductive organs abnormalities and breed, age and body condition score of ram and bucks. Differences were considered significant at values of $P<0.05$.

RESULTS

Out of 618 small ruminants (358 bucks and 260 rams) examined 18.5% (17.6% bucks and 19.6%) were affected by gross reproductive organs abnormalities. Testicular hypoplasia was the most common gross abnormality with overall prevalence rate of 6.8% followed by cryptorchidism (4.4%), orchitis (2.8%) and Epididymitis (2.1%). There was no statistically significant variations detected in prevalence of all gross reproductive tract abnormalities between bucks and rams ($P >0.05$). Unilateral testicular hypoplasia (UTH) (4.5%) was the most prevalent abnormality in bucks followed by unilateral cryptorchidism (UC) (4.2%), orchitis (2.2%), epididymitis and bilateral testicular hypoplasia (BTH) (2.0%) while, in rams unilateral testicular hypoplasia (UTH) (5.0%) was common followed by orchitis (3.5%), epididymitis (2.3%), bilateral testicular hypoplasia (BTH) (2.3%), unilateral cryptorchidism (UC) (1.9%) and bilateral cryptorchidism (BC) (1.5%). Other reproductive organs abnormalities observed included phimosis (1.0%), paraphimosis (0.8%) and urethral obstruction (UO) (0.6%). The type and prevalence of gross reproductive tract abnormalities of the 618 bucks and rams examined are summarized in Table 1.

Table 1: Gross abnormalities of the reproductive organs in bucks and rams

Species	Bucks	Rams	x^2	P value	Total
No. examined	358	260			618
Orchitis	8(2.2%)	9(3.5%)	0.85	0.36	17(2.8%)
Epididymitis	7(2.0%)	6(2.3%)	0.09	0.76	13(2.1%)
UTH	16(4.5%)	13(5.0%)	0.10	0.76	29(4.7%)
BTH	7(2.0%)	6(2.3%)	0.09	0.76	13(2.1%)
UC	15(4.2%)	5(1.9%)	2.47	0.12	20(3.2%)
BC	3(0.8%)	4(1.5%)	0.66	0.42	7(1.1%)
Phimosis	4(1.1%)	2(0.8%)	0.19	0.66	6(1.0%)
Paraphimosis	2(0.6%)	3(1.2%)	0.67	0.42	5(0.8%)
UO	1(0.3%)	3(1.2%)	1.79	0.18	4(0.6%)
Total abnormalities	63(17.6%)	51(19.6%)			114(18.5%)

UTH:Unilateral testicular hypoplasia; BTH: Bilateral testicular hypoplasia; UC: Unilateral cryptorchidism; BC: Bilateral cryptorchidism; UO: Urethral obstruction

Table 2: Gross abnormalities of reproductive organs in different breeds of ram

Breed	Afar	Arsi-bale	Black head Ogaden	x^2	P value	Total
[1] examined	85	48	127			260
Orchitis	1(1.2%)	3(6.3%)	5(3.9%)	2.62	0.29	9(3.5%)
Epididymitis	1(1.2%)	1(2.1%)	4(3.1%)	0.84	0.86	6(2.3%)
UTH	4(4.7%)	4(8.3%)	5(3.9%)	1.58	0.48	13(5.0%)
BTH	3(3.5%)	-	3(2.4%)	1.33	0.57	6(2.3%)
UC	1(1.2%)	2(4.2%)	2(1.6%)	1.71	0.41	5(1.9%)
BC	-	1(2.1%)	3(2.4%)	2.01	0.40	4(1.5%)
Phimosis	1(1.2%)	1(2.1%)	-	2.70	0.26	2(0.8%)
Paraphimosis	3(3.5%)	-	-	6.25	0.04	3(1.2%)
UO	2(2.4%)	1(2.1%)	-	2.90	0.23	3(1.2%)

UTH:Unilateral testicular hypoplasia; BTH: Bilateral testicular hypoplasia; UC: Unilateral cryptorchidism; BC: Bilateral cryptorchidism; UO: Urethral obstruction

Gross abnormalities of reproductive organs in different breeds of rams are summarized in Table 2. There was no statistically significant difference variations detected in prevalence of all gross reproductive abnormalities among breeds of ram (P >0.05), except in the case of paraphimosis which was significantly highest in Afar breed (3.5%) and no case of paraphimosis was observed in Arsi-bale and Black head Ogaden breeds of ram (x^2=6.25; P=0.04). Unilateral testicular hypoplasia (UTH) was prevalent in all breeds of rams which accounted for 4.7%, 8.3% and 3.9% in Afar, Arsi-bale and Black head Ogaden breeds of ram respectively. Orchitis was highest in Arsi-bale (6.3%) followed by Black head Ogaden breed (3.9%) and Afar (1.2%) but there was no statistically significant variation. There were no cases of Phimosis and Urethral obstruction (UO) observed in Black head Ogaden breed of ram.

Prevalence of reproductive organs gross abnormalities in young and adult rams was also computed Table 3. None of these gross abnormalities were significantly different between young and adult rams (P>0.05). Prevalence rate of unilateral testicular hypoplasia (UTH) (6.0%), Orchitis (3.7%) and bilateral testicular hypoplasia (BTH) (2.8%) are higher in adult rams as compared to younger rams but, unilateral cryptorchidism (UC) was observed to be high in young rams 2(4.5%). There were no cases of unilateral testicular hypoplasia (UTH), bilateral testicular hypoplasia (BTH), bilateral cryptorchidism (UC), phimosis, paraphimosis and urethral obstruction (UO) observed in younger rams.

Gross abnormalities of the reproductive organs were not significantly affected by rams' body condition Table 4. Unilateral testicular hypoplasia (UTH), bilateral testicular hypoplasia (BTH), bilateral cryptorchidism (BC), phimosis and urethral obstruction (UO) were not observed in rams of poor body condition.

Gross abnormalities of the reproductive organs in different breeds of bucks are summarized in Table 5. Orchitis and epididymitis were significantly different among breeds of bucks (P<0.05) while other abnormalities were not influenced by breed of the bucks. Orchitis was common in Hararghe highland breed (6.5%) followed by

Table 3: Gross abnormalities of the reproductive organs by age of rams

Age	Young	Adult	x^2	P value	Total
No. examined	44	216			260
Orchitis	1(2.3%)	8(3.7%)	0.22	0.64	9(3.5%)
Epididymitis	1(2.3%)	5(2.3%)	0.00	0.99	6(2.3%)
UTH	-	13(6.0%)	2.79	0.10	13(5.0%)
BTH	-	6(2.8%)	1.25	0.26	6(2.3%)
UC	2(4.5%)	3(1.4%)	1.93	0.17	5(1.9%)
BC	-	4(1.9%)	0.828	0.363	4(1.5%)
Phimosis	-	2(0.9%)	0.41	0.52	2(0.8%)
Paraphimosis	-	3(1.4%)	0.62	0.43	3(1.2%)
UO	-	3(1.4%)	0.62	0.43	3(1.2%)

UTH:Unilateral testicular hypoplasia; BTH: Bilateral testicular hypoplasia; UC: Unilateral cryptorchidism; BC: Bilateral cryptorchidism; UO: Urethral obstruction

Table 4: Gross abnormalities of the reproductive organs by body condition of rams

Body condition	Poor	Good	X^2	P value	Total
No. examined	37	223			260
Orchitis	1(2.7%)	8(3.6%)	0.07	0.79	9(3.5%)
Epididymitis	1(2.7%)	5(2.2%)	0.03	0.86	6(2.3%)
UTH	-	13(5.8%)	2.27	0.13	13(5.0%)
BTH	-	6(2.7%)	1.02	0.31	6(2.3%)
UC	1(2.7%)	4(1.8%)	0.14	0.71	5(1.9%)
BC	-	4(1.8%)	0.67	0.41	4(1.5%)
Phimosis	-	2(0.9%)	0.33	0.56	2(0.8%)
Paraphimosis	1(2.7%)	2(0.9%)	0.91	0.34	3(1.2%)
UO	-	3(1.3%)	0.50	0.48	3(1.2%)

UTH:Unilateral testicular hypoplasia; BTH: Bilateral testicular hypoplasia; UC: Unilateral cryptorchidism; BC: Bilateral cryptorchidism; UO: Urethral obstruction

Table 5: Gross abnormalities of the reproductive organs in different breeds of bucks

Breed	Afar	Long Eared	Arsi-Bale	Hararghe highland	x^2	P value	Total
No. examined	75	109	128	46			358
Orchitis	2(2.7%)	3(2.8%)	-	3(6.5%)	7.25	0.03	8(2.2%)
Epididymitis	-	1(0.9%)	6(4.7%)	-	5.49	0.04	7(2.0%)
UTP	5(6.7%)	5(4.6%)	4(3.1%)	2(4.3%)	1.56	0.67	16(4.5%)
BTP	2(2.7%)	2(1.8%)	2(1.6%)	1(2.2%)	0.82	0.95	7(2.0%)
UC	2(2.7%)	5(4.6%)	5(3.9%)	3(6.5%)	1.29	0.74	15(4.2%)
BC	1(1.3%)	1(0.9%)	1(0.8%)	-	1.01	1.00	3(0.8%)
Phimosis	-	1(0.9%)	3(2.3%)	-	1.98	0.56	4(1.1%)
Paraphimosis	-	-	2(1.6%)	-	2.38	0.50	2(0.6%)
UO	-	1(0.9%)	-	-	2.71	0.64	1(0.3%)

UTH:Unilateral testicular hypoplasia; BTH: Bilateral testicular hypoplasia; UC: Unilateral cryptorchidism; BC: Bilateral cryptorchidism; UO: Urethral obstruction

Table 6: Gross abnormalities of the reproductive organs by age of bucks

Age	Young	Adult	X^2	P value	Total
No. examined	68	290			358
Orchitis	2(2.9%)	6(2.1%)	0.19	0.66	8(2.2%)
Epididymitis	1(1.5%)	6(2.1%)	0.10	0.75	7(2.0%)
UTH	1(1.5%)	15(5.2%)	1.77	0.18	16(4.5%)
BTH	1(1.5%)	6(2.1%)	0.10	0.75	7(2.0%)
UC	3(4.4%)	12(4.1%)	0.01	0.92	15(4.2%)
BC	1(1.5%)	2(0.7%)	0.40	0.53	3(0.8%)
Phimosis	1(1.5%)	3(1.0%)	0.10	0.76	4(1.1%)
Paraphimosis	-	2(0.7%)	0.47	0.49	2(0.6%)
UO	-	1(0.3%)	0.24	0.63	1(0.3%)

UTH:Unilateral testicular hypoplasia; BTH: Bilateral testicular hypoplasia; UC: Unilateral cryptorchidism; BC: Bilateral cryptorchidism; UO: Urethral obstruction

Table 7: Gross abnormalities of the reproductive organs by body condition of bucks

Body condition	Poor	Good	X2	P value	Total
No. examined	61	297			358
Orchitis	2(3.3%)	6(2.0%)	0.37	0.55	8(2.2%)
Epididymitis	1(1.6%)	6(2.0%)	0.04	0.85	7(2.0%)
UTH	3(4.9%)	13(4.4%)	0.04	0.85	16(4.5%)
BTH	-	7(2.4%)	1.47	0.23	7(2.0%)
UC	2(3.3%)	13(4.4%)	0.15	0.70	15(4.2%)
BC	-	3(1.0%)	0.62	0.43	3(0.8%)
Phimosis	1(1.6%)	3(1.0%)	0.18	0.67	4(1.1%)
Paraphimosis	1(1.6%)	1(0.3%)	1.55	0.21	2(0.6%)
UO	-	1(0.3%)	0.21	0.65	1(0.3%)

UTH:Unilateral testicular hypoplasia; BTH: Bilateral testicular hypoplasia; UC: Unilateral cryptorchidism; BC: Bilateral cryptorchidism; UO: Urethral obstruction

Long Eared Somali (2.8%) and Afar (2.7%) breeds. There was no case of orchitis in Arsi-bale breed of bucks. Epididymitis was significantly higher in Arsi-bale (4.7%) ($P<0.05$) compared to Long eared Somlai (0.9%), Afar and Hararghe highland breed of bucks in which no case of epididymitis was observed.

Gross abnormalities of the reproductive organs were not significantly different with age of bucks ($P>0.05$) Table 6. All gross abnormalities of the reproductive organs were observed in adult bucks but Paraphimosis and Urethral obstruction (UO) were not occurred in young bucks. Incidence rate of unilateral testicular hypoplasia (UTH) (5.2%) was higher in adult bucks compared to young bucks (1.5%).

Gross abnormalities of the reproductive organs were not significantly varied between body condition score of bucks ($P>0.05$) Table 7. There were no cases of bilateral testicular hypoplasia (BTH), bilateral cryptorchidism (UC) and urethral obstruction (UO) observed in bucks of poor body condition.

DISCUSSION

In this study, out of 618 male small ruminants examined 18.5% were affected by one or more gross reproductive tract abnormalities of unidentified causes. This incidence level of gross reproductive tract abnormalities in small ruminants observed in current study is higher than previous study by Yusuf *et al.* [14], who reported 15.08% in Shale goat in Nigeria but it is lower than the reports of Regassa *et al*. [8] who reported 20.8% incidence rate in small ruminants in Debre Ziet, Ethiopia.

Sixty three (17.6%) bucks were affected by different reproductive tract abnormality which is similar to 17.8% [8] and fifty one (19.6%) rams were also affected but is much lower than 28.1% reported by Regassa *et al*. [8] in Debre Ziet. In this study testicular hypoplasia (6.8%), cryptorchidism (4.4%), orchitis (2.8%) and epididymitis (2.1%) were the most common abnormalities in male small ruminants.

The prevalence of testicular hypoplasia previously reported in male small ruminants was 10.5% in Debre ziet, Ethiopia [8]. In contrary in this study it was 6.8% which is lower. In bucks the prevalence of testicular hypoplasia was 6.5% which is higher than previous reports of 4.2% in Nigeria [14] and 3% in Algeria [15] but, it is lower than 9.7% reported in Ethiopian [8]. In rams, an incidence of 7.3% of testicular hypoplasia was much higher than 1.2% reported by Hibret *et al.* [13] in Ethiopian Menz rams and 3% in Algerian local breed [15] and is lower than 12.6% reported by Regassa *et al*. [8] in Debre Zeit, Ethiopia.

The incidence of cryptorchidism was higher in goat than in sheep which agreed with the report of Regassa *et al.* [8]. The prevalence of cryptorchidism in bucks was 5.0% (4.0% UC and 0.8% BC). Prevalence of UC was 4.0% which is higher than the previous reports of 0.6% [16] and 1.24% in Nigeria [14] and 1.5% in Algeria [15] but, it is almost similar to 4.5% in Ethiopia [8]. The prevalence of BC in bucks in this study was 0.8% which is almost similar with 1.0% [8].

Cryptorchidism was observed in 3.4% cases in rams of which 1.9% was unilateral and 1.5% was bilateral which is somehow lower than 4% reported from Algeria [15], but much higher than o.6% in Nigeria [16] and 1.8% in Ethiopia [16].

Orchitis was reported in 2.8% cases of all animals examined in this study. In other related studies the prevalence of orchitis in small ruminants was 1.9% [8] and 4.1% [13] in Ethiopia. Orchitis cases were higher in rams (3.5%) than in bucks (2.2%) which agreed with the report of Regassa *et al*. [8] who reported 5.4% in rams and 1.7% in bucks. In rams, 3.5% incidence of orchitis is lower than 4.1% [13]; 5.4% [13] and 7.5% [17] in Brazil but, higher than 0.6% in Algeria [15]. Where as in bucks 2.2% prevalence of orchitis in this study is higher than 1.7% [8] but is lower than 10.4% in Iran [18].

An overall prevalence of epididymitis was 2.1% in this study which is lower than 7.9% [8]. In rams, epididymitis was observed in 2.3% cases which is lower than 12.0% [8]; 9.4% in Brazil [17] and 4.5% [13] while in bucks 2.0% incidence of epididymitis was observed which is lower than 6.2% [8] and 3.7% in Iran [18].

Breed did not have a significant effect on the occurrence of gross genital abnormalities in ram except in the case of paraphimosis which was significantly highest in Afar breed (3.5%) and did not observed in Arsi-bale and black head ogaden breeds of rams. The prevalence of testicular hypoplasia in Afar and Arsi-bale breeds of ram was 8.2% and 6.3% respectively which is slightly lower than 9.5% in Afar breed [8] but, much higher than 1.2% in Menz breed of sheep [13]. On other hand, 8.3% incidence of testicular hypoplasia in black head Ogaden is lower than 15.8% in the same breed of ram [8]. Cryptorchidism has been reported in different breeds of ram 3.7% in black head Ogaden by [8] and 4.0% in Algerian local breed [15], which is similar to 4.0% in black head ogaden observed in this study but higher and lowers than 1.2% in Afar and 6.3% in Arsi-bale breeds in this study.

In this study age of ram did not have a significant effect on occurrence of gross reproductive tract abnormalities but, there were no cases of testicular hypoplasia, bilateral cryptorchidism, phimosis, paraphimosis and urethral obstruction in young ram as opposed to 8.8%, 1.9%, 0.9%, 1.4% in adult ram respectively which is somehow agreed with the report of Regassa *et al*. [8] who observed that these abnormalities are prevalent in ram above 1 year old.

In bucks breed had significant effect on occurrences of orchitis and epididymitis where orchitis (6.5%) was prevalent in Hararge highland and epididymitis (4.7%) was prevalent in Arsi-bale breed of bucks. It was also reported that epididymitis is associated with breed in bucks [8]. Age of bucks had no effect on incidence of abnormalities and all abnormalities were observed in both young and adult bucks with varying prevalence. Similarly, body condition of ram and bucks had no significant effect on prevalence of genital abnormalities. In conclusion this study revealed that gross reproductive tract abnormalities were common in different breeds of bucks and rams.

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