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Study of major causes and associated economic losses of carcass and organ condemnation in cattle and sheep slaughtered at two abattoirs in the north of Algeria

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ABSTRACT

Inspection at slaughterhouses is an important step for providing a safe meat for human consumption. A cross-sectional study, involving antemortem and postmortem inspection was conducted from January to April 2025 to establish condemnation reason in cattle and sheep slaughtered and inspected at two slaughterhouses of Blida, northern Algeria. A total of 1091 animals, comprising 805 sheep and 286 cattle, slaughtered during the period of the present study, 14.78% sheep and 32.51% cattle were condemned. Among the animals examined, the most dominant condemnation patterns were pneumonia (38.65%), hydatidosis (16.80%), abscess (15.96%) and respiratory strongylosis (15.96%) for sheep and tuberculosis-compatible lesions (52.68%), hydatidosis (15.05%), abscess (11.82%), and pneumonia (10.75%) for cattle. Condemnation rate of lungs, hearts, livers, and heads for sheep were 84.87%, 2.52%, 7.56% and 4.20% respectively and for cattle were 91.39%, 49.46%, 26.88%, 1.07% respectively. Also, 4.30% carcasses, 3.22% stomachs and 1.07% udders were condemned only in cattle. Main causes of lung condemnation were tuberculosis-compatible lesions (56.47%), hydatidosis (14.11%), pneumonia (11.76%), abscesses (7.05%), and emphysema (7.05%) for cattle, whereas pneumonia (45.54%), abscesses (18.81%), hydatidosis (13.86%), hemorrhagic lung (7.92%), and emphysema (5.94%) for sheep. Liver was condemned mainly associated with abscess (36%), hydatidosis (32%) and tuberculosis-compatible lesions (24%) in cattle, while hydatidosis (55.55%), hepatitis (33.33%) and abscesses (11.11%) were the main causes in sheep. For the hearts, tuberculosis-compatible lesions (97.82% for cattle and 66.66% for sheep) was the major cause of condemnations. The total estimated economic losses was **30610.00** USD. Improving slaughterhouse facilities and conditions would facilitate the work of veterinary inspectors. Similarly, analyzing the collected data would enable the development of action plans to reduce the prevalence of specific pathologies.

Keywords

Abattoir, cattle, food safety, condemnation, sheep

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Abbreviations

FAO : Food and Agriculture Organization
Cis : Confidence intervals
LSD:Lumpy Skin Disease
TRP : Traumatic reticuloperitonitis

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Introduction

Meat has high nutritional value, particularly because its rich in high-quality proteins, minerals, and other essential nutrients [1]. Ensuring the safety and wholesomeness of meat is very important for protecting public health [2]. Abattoirs play an important role, in surveillance of various diseases of public and veterinary health importance [3]. The collection of sanitary information at slaughterhouse level contributes to improving knowledge of the national epidemiological situation [4]. During ante mortem and post mortem inspection, organs and carcasses may be condemned due to various pathogens and /or pathological conditions [5]. The main causes of organ condemnation during post mortem inspection are diseases originated by parasites, bacteria and viruses [6]. Some of the pathogens are zoonotic and therefore have public health significance ; while and all causes of condemnation incur serious economic losses to the livestock industry [5].

Many studies have been carried out at the slaughterhouse level to determine the prevalence and to collect information on reasons for meat and offal condemnation [7, 8]. Reported condemnation rates vary from 0.02% [9] to 87.7% [1] and the data about the main causes of carcass and organ condemnation in different countries varies significantly [10, 11].

In the Blida region of northern Algeria, livestock farming is focused on cattle production and sheep fattening. Also, the consumption of red meat has increased with the growth of the local population. The number of cattle slaughtered in this region increased from 6,762 animals in 2021 to 27,752 in 2024, while the number of sheep slaughtered has been estimated at 106,260 in 2024 [12]. Currently, there is a limited information on occurrence of various diseases/causes and their economic losses due to organ and carcass condemnation in cattle and sheep in the north of Algeria specially the Blida region. Although similar studies have been conducted in other regions [13, 14], it is important to carry out the study because the prevalence and diseases occurrence may differ according to geographical areas. The aim of the present study is to determine the causes of organ and carcass condemnations in cattle and sheep based on ante-mortem and post-mortem inspection procedure at two abattoirs in the Blida region of northern Algeria and to evaluate the associated economic losses.

Results

Number and percentage of condemnations in slaughtered animals

A total of 212 animals were condemned for various reasons, correpresenting to a prevalence of animals with at least one condemned organ or carcass of 19.43% (95%CI: 17.1% - 21.8%). The prevalence of condemnations were higher in cattle than in sheep ($p < 0.00001$) (Table 1).

Table 1.
Number and percentage of condemnations in slaughtered animals

Animal species	Number examined	Condemnations n (%)	*95% CI*
Sheep	805	119 (14.78)32.51)	[12.3% - 17.2%]
Cattle	286	93 (32.51)	[27.1% - 37.9%]

95% CI (%) :95% confidence interval

Number and percentage of condemnations according to sex and age

Among cattle, females were slightly more affected than males, although the difference was not statistically significant. Also, the condemned animals aged ≥2 years was significantly greater than those aged <2 years ($p < 0.001$). In contrast, the condemned sheep was significantly higher in males than in females ($p < 0.0001$) and in animals younger than 1 year (Table 2).

Causes for condemnations in slaughtered cattle and sheep

Post-mortem examination showed a varity abnomalities and diseases (Table 3, Figure 1). The identified conditions included:

pneumonia (Figure 2), emphysema (Figure 2), hemorrhagic lung (Figure 2), hepatitis, pulmonary hepatization, tuberculosis-compatible lesions, actinobacillosis, actinomycosis, hydatidosis (Figure 4), respiratory strongylosis, sarcoptic mange, lumpy skin disease (LSD), traumatic reticuloperitonitis (TRP), traumatic carcasses, abscess (Figure 2), rotten and hemorrhagic carcasses.

Condemnation of meat and offal

The total of 283 condemnation events comprised 279 organ condemnations and 4 carcass condemnations were condemned in the two animal species.

Table 2.
Number and percentage of condemnations of animal slaughtered based on sex and age

Cattle				Sheep			
Category	N	%	p-value	Category	N	%	p-value
Sex							
Male	41	44.08	0.25	Male	110	92.43	<0.0001
Female	52	55.91		Female	9	7.56	
Age							
< 2ans	28	30.10	<0.001	[6 months -1 years]	93	78.15	<0.001
≥ 2 ans	65	69.89		[1 years - 5 years]	16	13.44	
				> 5 years	10	8.40	

The count is at condemnation-animal level (N=93 for bovins/ N=119 for ovins).

Table 3.
Number and percentage of causes for condemnations in slaughtered cattle and sheep

Causes for condemnations	Bovins		Ovins	
	n/93	%	n/119	%
Pneumonia	10	10.75	46	38.65
Tuberculosis-compatible lesions	49	52.68	2	1.68
Hydatidosis	14	15.05	20	16.80
Abscess	11	11.82	19	15.96
Respiratory strongylosis	2	2.15	19	15.96
Emphysema	6	6.45	6	5.04
Hemorrhagic lung	0		8	6.72
Hepatitis	1	1.07	4	3.36
Hepatization of lung	0		4	3.36
Sarcoptic mange	0		4	3.36
Actinobacillosis and Actinomycosis	1	1.07	1	0.84
Traumatic carcasses	2	2.15	0	
Lumpy skin disease (LSD)	1	1.07	0	
Traumatic reticuloperitonitis (TRP)	1	1.07	0	
Rotten carcasses	1	1.07	0	
Bleeding carcasses	1	1.07	0	
p-value	< 0.0001		< 0.0001	

The count is at condemnation-animal level (N=93 for bovins/ N=119 for ovins).

Condemnations were significantly greater (p = 0.005) in cattle 165 (58.30%) than sheep 118 (41.69%). Among the 212 animals with at least one condemned organ or carcass, the lungs (n=186) were the most affected organ, followed by the hearts (n=49), livers (n=34), heads (n=6), stomachs (n=3) udders (n= 1) (Figure 5).

The lungs were the most condemned organ in both animal species. Heart and the liver condemnations were more common in cattle than in sheep, while carcass, stomach, and udders were condemned only in cattle. Head condemnation was more recorded in sheep than in cattle (Table 4).

The lung was seized for various reasons. In cattle,

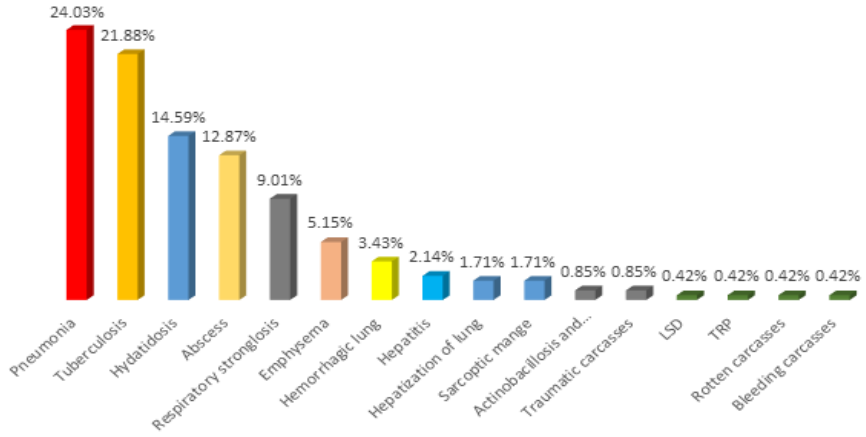


Figure 1.
Causes for condemnations in slaughtered animals.

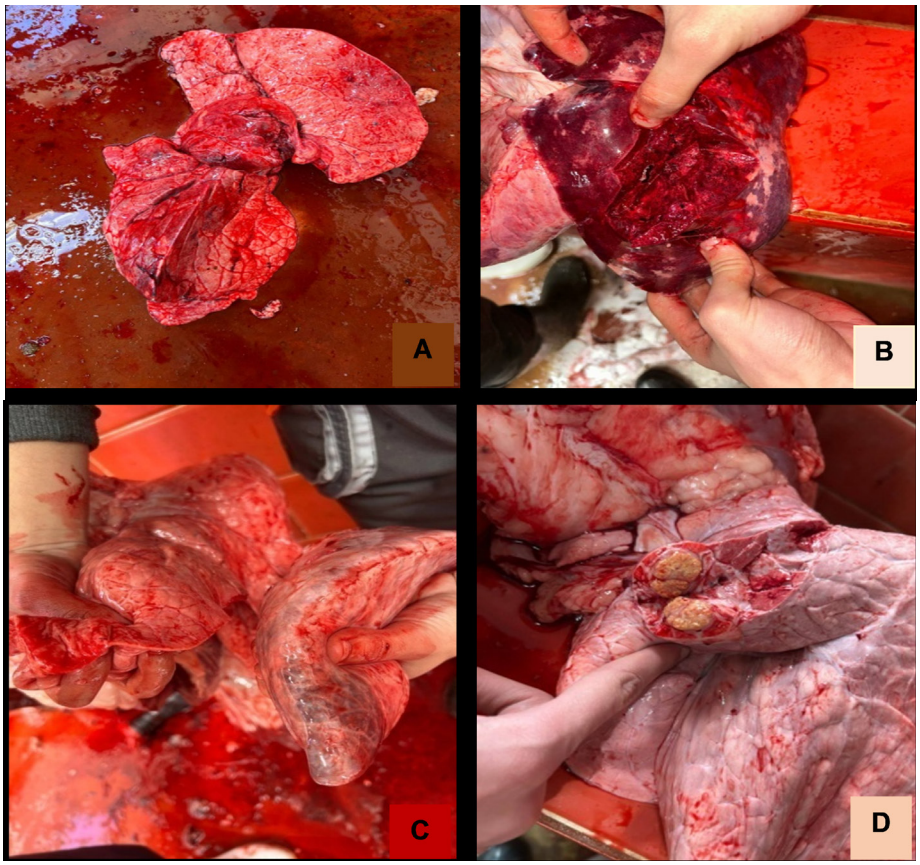


Figure 2.
Main pulmonary lesions encountered in the two animal species.
(A); Pneumonia, (B); Hemorrhagic lung, (C); Emphysema, (D); Abscess in the lung.

the main cause for lung condemnation was tuberculosis-compatible lesions and the least reason was TRP. In sheep, pneumonia was the most pathology recorded, while lower condemnation rates were recorded for tuberculosis-compatible lesions and strongylosis (Table 5).

In the case of liver condemnation, abscess for cattle and hydatidosis for sheep were the most frequently recorded causes, whereas TRP for cattle and abscess for sheep were the lowest recorded causes (Table 6).

Among the condemned hearts, tuberculosis-compatible lesions was the predominant cause in both species (Table 7).

Regarding head condemnation, four cases of sarcoptic mange, and one case of actinobacillosis were recorded in sheep. While in cattle, only one case of actinomycosis was recorded. The other organs were seized in cattle for tuberculosis, these are 3 cases for

Figure 3.
Tuberculosis lesion.
(A); Tuberculosis in bovin carcass,(B); Tuberculous lymph node (black arrow).

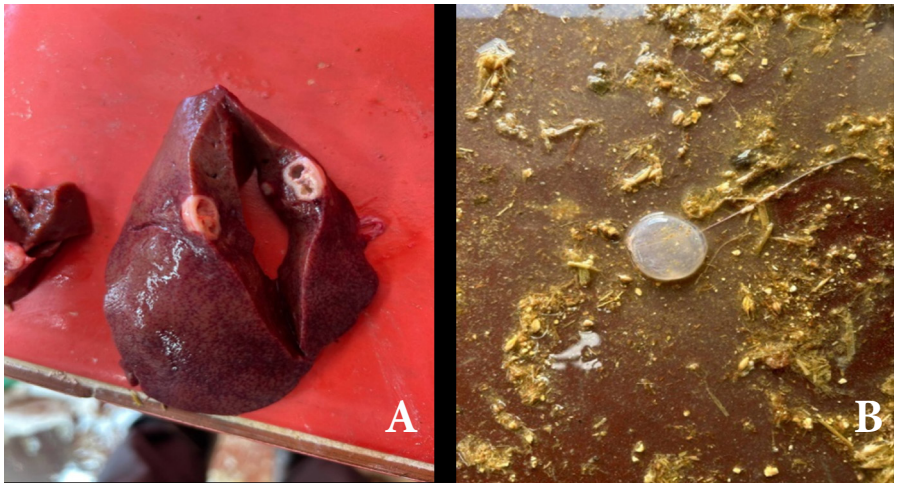
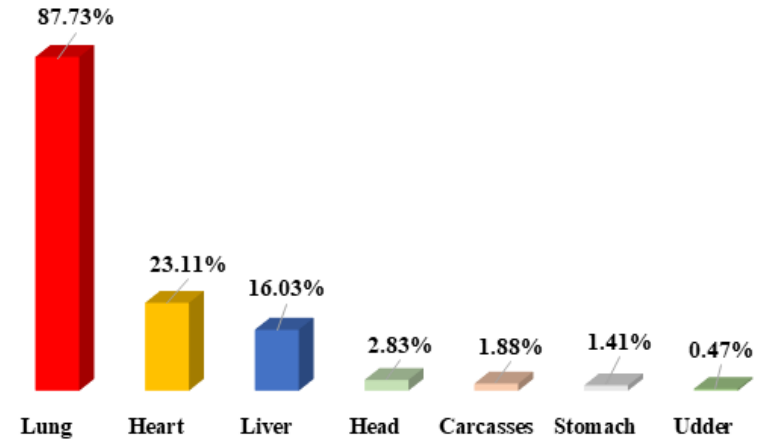


Figure 4.
Hydatid cyst in the liver.
(A); Dead and calicified cyst (B) Living cyst.



The count is at condemnation-animal level (N=212).

Figure 5.
Meat and organs seized from both animal species

the stomach and a single case for the udders. The four cases of carcasses condemnation were recorded for tuberculosis-compatible lesions associated with traumatic carcasses, abscess associated with traumatic carcasses, bleeding carcasses associated with LSD and finally rotten carcasses.

The partial and total organs and carcasses condemnations

Of the 283 condemned organs and carcasses, 162 (57.24%) cases underwent total condemnation, whereas 121 cases (42.76%) underwent partial condemnation. The type of condemnations according to

Table 4.
Organ-specific condemnation among cattle and sheep.

Seized meat and offal	Bovins		Ovins		p-value
	n/93	%	n /119	%	
Carcasses	4	4.30	0		/
Lung	85	91.39	101	84.87	0.24
Heart	46	49.46	3	2.52	<0.0001
Liver	25	26.88	9	7.56	0.0061
Head	1	1.07	5	4.20	0.22
Stomach	3	3.22	0		/
Udder	1	1.07	0		/

The count is at condemnation-animal level (N=93 for bovins/ N=119 for ovins).

Table 5.
The percentage of causes for lung condemnation..

Cattle (N=85)			Sheep (N=101)		
Causes for condemnations	n (%)	**p-value**	Causes for condemnations	n (%)	**p-value**
Tuberculosis-compatible lesions	48 (56.47)	<0.0001	Pneumonia	46 (45.54)	<0.0001
Hydatidosis	12 (14.11)		Abscess	19 (18.81)	
Pneumonia	10 (11.76)		Hydatidosis	14 (13.86)	
Abscess	6 (7.05)		Hemorrhagic lung	8 (7.92)	
Emphysema	6 (7.05)		Emphysema	6 (5.94)	
Respiratory strongylosis	2 (2.35)		Hepatization of lung	4 (3.96)	
TRP	1 (1.17)		Tuberculosis-compatible lesions	2 (1.98)	
			Respiratory strongylosis	2 (1.98)	

The count is at condemnation-organ level (N=85 for cattle/ N=101 for sheep).

Table 6.
The percentage of causes for liver condemnation.

Cattle (N=25)			Sheep (N=9)		
Causes for condemnations	n (%)	p-value	Causes for condemnations	n (%)	**p-value**
Abscess	9 (36)	0.02	Hydatidosis	5 (55.55)	0.26
Hydatidosis	8 (32)		Hepatitis	3 (33.33)	
Tuberculosis-compatible lesions	6 (24)		Abscess	1 (11.11)	
Hepatitis	1 (4)				
TRP	1 (4)				

The count is at condemnation-organ level (N=25 for cattle/ N=9 for sheep).

Table 7.
The percentage of causes for heart condemnation.

Cattle (N=46)			Sheep (N=3)		
Causes for condemnations	n (%)	p-value	Causes for condemnations	n (%)	**p-value**
Tuberculosis-compatible lesions	45 (97.82)	<0.0001	Tuberculosis-compatible lesions	2 (66.66)	-
TRP	1 (2.17)		Emphysema	1 (33.33)	

The count is at condemnation-organ level (N=46 for cattle/ N=3 for sheep).

the affected organs or carcasses are shown in figure 6.

Estimation of financial losses associated with organs and carcasses condemnation

For the economic loss, it was estimated according to the weights of the condemned organs and carcass, and their corresponding market pricees per kg of meat in the Blida region. Out of 1091 cattle and sheep carcasses inspected, 1200kg of carcasses and 485kg of organs were seized. Therefore, the total economic loss of both organs and carcasses was estimated at **30610.00** USD, as shown in Table 8.

Table 8.
Partial and total condemnations and estimation of economic losses.

Offal and Meat condemned	Total weight (kg)	Unit price in USD	Estimated loss in USD
Carcasses	1200	18.77	22524
Lung	215	18.02	3874.3
Heart	30	22.53	675.9
Liver	80	37.54	3003.2
Head	150	3.00	450
Stomach	5	15.02	75.1
Udder	**5**	1.50	7.5
Total			**30610.00**

Discussion

Many surveys conducted to investigate conditions and abnormalities have been performed in different countries abattoir [10] and numerous studies have investigated the causes and rates of carcass and organ condemnation in different countries, with considerable variation reported among studies. For example, a carcass condemnations rate of 0.37% was reported in cattle in Namibia Mbiri et al. [8]. In Iran, the rates of carcass and offal condemnations were 0.21% in cattle and camels and 0.02% in sheep and goats [9]. In Zambia, a condemnation rate of 0.55% was reported for cattle carcass and offal [7], whereas in Turkey, rates of 0.32% for carcasses and 2.33% for offals were reported in both sheeps and cattle [15]. In the USA, a cattle carcass condemnation rate of 2.01% was reported [16], while in Benin, the cattle carcass condemnation rate was 12.17% [17]. In Italy, condemnation rates of 2.77% in sheep and 23.87% in cattle were reported for both carcass and organs [18]. In Ethiopia, Ahmed et al. [2] reported an organ condemnation rate of 39.06% in cattle, while Sheferaw and Abdu [5] reported a rate of 69.2% for organ and carcass condemnations. In Algeria, a condemnation rate of 46.20% for sheep organ and carcass was reported [4] whereas in Egypte, rates of 8.7% in sheep and 87.7% in cattle were reported for both meat and offal [1]. These results must be carefully evaluated because the substantial difference among these studies may be explained by several factors like differences between the prevalence of diseases, the characteristics of the slaughterhouse, the data source, the study period, experimental design, geographical location, season, the meat inspection technique and the periode during which the studies were conducted [8, 10]. In the present study, parasitic lesions were more frequently associated with condemned organs in sheep than in cattle, which it's in agreement with other research works [2, 5, 9, 13, 14, 18, 19, 20]. This means that parasites may be responsible for considerable losses of meat, and especially offal, in sheep, more so than other diseases [11]. This could be mainly due to the presence of stray dogs and cats which can excrete parasites and contaminate plants and food intended for livestock [11]. This possible explanation or hypothesis was not evaluated in the current study, but stray dogs are frequently involved in environmentally transmitted diseases, particularly soil- and water-borne parasites, due to uncontrolled defecation and opportunistic behavior [21].

In the present study, sheep were more infested with parasites than cattle. This can be explained by the fact that sheep are raised in groups in extensive

farms in close and constant contact with stray dogs and cats [10, 22]. In the present study, the most frequent reason for condemnation for cattle was tuberculosis-compatible lesions 52.68%, consistent with the active circulation of *Mycobacterium* in algerian herds, particularly in old animals. Nevertheless, the high prevalence is explained by airborne transmission between animals, overcrowding of animals, the prolonged persistence of the bacillus in the environment, as well as by gaps in screening and eradication strategies [23]. In the present study, we acknowledg the lack of laboratory confirmation for these lesions but *M. bovis* infections account for a high amount of granulomatous lesions detected in Algerian slaughter cattle during standard meat inspection at Algiers and Blida abattoir [24]. Indeed, Sahraoui et al. [24] reported that from gross visible granulomatous lesions isolated from 100 cattle in the abattoirs of Algiers and Blida, *M. bovis* was isolated from 88 of them. The economic importance and public health significance of this zoonotic disease have been established in many countries [17]. Several previous studies have similarly identified tuberculosis-compatible lesions as the principal cause of condemnation [5, 7, 13, 17]. The third causes for condemnation for the both animal species was abscess. This corroborates with observations made by many authors [4, 7, 19, 20]. Abscess formation may result from infections involving a variety of bacterial pathogens, including *Corynebacterium pseudotuberculosis-compatible lesions, Staphylococcus aureus, Streptococcus spp*. These infectious agents can be transmitte to animals by breeding equipment [25]. Pneumonia have also been recorded in the present study, some authors have previously reported similar results [2, 4, 14, 16, 19, 20]. Others respiratory pathologies, including emphysema, hemorrhagic lung, hepatization, were also observed in the present study. The interlobular structural organization of the lungs in ruminants (lack of collateral ventilation), especially in cattle, could makes these animals more susceptible to respiratory diseases [26]. Some factors were reported in the literature such as poor ventilation in the sheepfolds, overcrowding in the livestock building, exhaustion during the dry season due to long treks in search of pasture and water, climate change, exposure to dust and parasitism may also play a role in the emergence of these respiratory diseases [4, 19, 26]. Because of these factors, lungs are may be the most condemned organ in the abattoirs [25]. This is observed in the present study and corroborates with various investigations in different countries [4, 9, 17, 25, 27]. However, others investigations [2, 5, 19, 20] have identified the liver as the most condemned organ. According to Grist [28], the liver and lung were highly infested and more susceptible than other organs because they are highly vascularized and function as a filter organ, potentially making them frequent sites for the localization of infectious agents. In the present study, lung condemnation in cattle was frequently associated with bovine tuberculosis-compatible lesions, which is consistent with observation reported by García-Díez et al. [10]. The thoracic cavity is known to be the main location of bovine tuberculosis-compatible lesions [10]. Similarly, inflammation of lung tissue and certain parasitic pathologies such as hydatidosis have also been considered as the most frequently encountered causes of lung condemnation [5, 10, 19, 20, 27]. Hydatidosis, the major parasitosis found in the present study, was reported to be the principal pattern of liver condemnation [19]. Condemnation for hepatitis and abscesses is expected because parasitic infestation can cause degeneration of liver tissue [10]. Heart condemnation in the present study was mainly associated with tuberculosis-compatible lesions and emphysema, while a very low percentage was associated with TRP. García-Díez et al. [10] reported that the heart damage was usually secondary to respiratory problems. The economic losses incurred in abattoir survey were **30610.00** USD according to the conversion rate used in the study. This economic loss was higher than those reported in some previous studies [8, 20, 26]. Differences between studies may be explained by variation in study plan, slaughterhouse output, price of meat and offal among countries, prevalence of different pathologies, rejection rate of organs [19, 20], currency conversion and year of estimation. However, no matter how significant these losses are, they always have a negative effect on meat production, abattoir income and the economy in general [8].

Conclusion

In conclusion, data collected at the two slaughterhouses of the Blida region made it possible to identify the main diseases affecting cattle and sheep. Among cattle, tuberculosis-compatible lesions is the most common, followed by hydatid cysts, abscesses, and pneumonia. In sheep, pneumonia predominates, followed by hydatid cysts, abscesses, and respiratory strongyles. These results highlight the need to step up upstream measures to prevent the occurrence of these conditions.

Limitations

The importance of the present study reveals that it is among the very rare abattoir survey study in the north of Algeria specially the region on Blida region.

However, several limitations should be considered when interpreting the findings. First, the limited number of visits per week (only 4 days) and the relatively short sampling period limits the ability of the study to show long-term trends and the rare events or pathogen spikes might be missed. Second, the study was conducted at only two abattoirs and the findings may not be representetive of all slaughterhouses in northern Algeria or the whole country, because each region may have distinct farming, hygiene, or processing conditions. Another important limitation is the possible effect of seasonal variation, beacause the present study was conducted during a single season which can missed high or low risk periods throughout the year, the weather and temperature change across the year which can affect microbial growth and animal health. In addition, study population may not perfectly represent the wider livestock population in Algeria.

Materials and Methods

Declaration of Generative AI and AI-assisted technologies in the writing process

There is no generative AI and AI-assisted technologies used in the writing process.

Ethical approval

This study involved routine ante-mortem and post-mortem inspection of animals slaughtered for commercial purposes and did not involve experimental procedures or additional interventions on animals.

Study area

This study was conducted from January to April 2025 in two slaughterhouses, Zaouia et Boufarik, located in Blida region of northern Algeria. Blida city is situated about 45 km southwest of the capital of Algiera, at an altitude of 190 m above sea level. The region has Mediterranean climate, with an average annual temperature of 17.9 °C and an average annual rainfall of 791 mm. The study area broadly fall within agricultural zone with significant production, farm animals are also diversified (cattle, sheep and goats).

Study population

The sample size for this study was determined based on the actual throughput and availability of animals brought to the slaughterhouse during the sampling period. Due to the lack of comprehensive pre-existing data on the local livestock population and to reflect real sample size, we chose to include all slaughtered animals that were accessible. This convenience sampling approach maximized the number of subjects included, given the facility's logistical and seasonal constraints. A total of 1091 animals, comprising 805 sheep and 286 cattle, intended for local consumption were included in the study. Animals were selected, with every fifth cattle and every tenth sheep, selected for examination. The selected animals were identified according to age and sex during ante mortem inspection. Cattle were classified into two age groups: < 2 years and ≥2 years, while sheep were classified into three groups: [6 months -1year], [1year- 5 years], ≥ 5 years. The animals' ages were provided by the breeders and, when possible, verified by examination of the animals' teeth. The cattle included local breeds and crossbreeds. Slaughter animals were transported to the abattoirs by road on approved transport vehicles and they were brought for slaughter from different districts around Blida region. It should be noted, The sum of the percentages for some measures exceeds 100% because individual animals may have been associated with more than one condemnation or cause of condemnation.

Study design and data collection

A cross-sectional study was conducted to determine the causes of condemnation in cattle and sheep and to estimate economic lossse. In this study each week four days visit was made for the examination of slaughtered animals which correspond to the days of highest slaughter volumes occuring over the two-days weekend period (Friday, Saturday), and on the two livestock market days (Monday, Wednesday). The animals were selected bby systematic sampling techniques and on each visit day, about 50-55 sheep and 17-18 cattle were examined. Accordingly, a total of 805 sheep and 286 cattle were examined. The study was conducted using previously designed questionnaires. The questionnaire collects and provides information on the slaughtered animals (age, sex, species), the type of lesion, organ affected, and the weight of the different condemned organs.

Methods of inspection (examination)

Routine examination was carried out by the qualified veterinary hygiene inspector assistants. Decisions were made to confirm or cancel the slaughter of the animals. The technical methods used to achieve reliable results followed the logic below :

Antemortem inspection

Before slaughter, each animal was examined for its general condition, nutritional status and the presence of any abnormalities or clinical sign. This inspection is carried out according to the following steps:

- Presentation of a slaughter authorization certificate is mandatory for any animal entering the slaughterhouse. This documentation allowed the health officer to distinguish between sanitary and ordinary slaughter, with verification of the animal's identification and ear tag numbers, where available ;
- An initial remote examination allowed the health officer to identify certain pathologies ;
- If necessary, the veterinarian performed a detailed clinical examination on certain animals.

Decisions were taken according to the actions specified by FAO [22]. Sick or infected animals, as well as the overworked were isolated in the designated holding area when required, while, animals considered suitable for slaughter proceeded to the slaughter process.

Postmortem inspection

This inspection was conducted approximately one hour after slaughter and it was carried out according to the following steps:

- A general inspection : to obtain a first impression of the animal's health after slaughter.
- Inspection of the viscera and organs: to detect any internal abnormalities in appearance, shape, color, consistency of all organs, especially the liver, lung, heart, kidneys. The examination of the viscera followed a systematic procedure, as indicated in the table 10. Pathological lesions were differentiated and the following judgment were used:
- Accepted for humain consumption : Meat and organs showing no disease or contamination and are safe for human consumption.
- Partial Condemnation: Only a small, localized part or single organ is removed, while the healthy rest is kept.

Table 9.
Gross pathological criteria used for classification of lesions [23, 31].,

Pathological conditions	Diagnostic of specific criteria
Tuberculosis compatible lesions	-Visual and palpation of yellowish-white, encapsulated granulomas with caseous or gritty calcified centers in target organs like lungs and associated lymph nodes (including the bronchial and mediastinal) as well as retropharyngeal and mesenteric nodes.
Pneumonia	-Visual and palpation of areas of dark red or grey consolidation (characterized by firm, heavy, non-collapsed lung tissue), often in the cranioventral lobes or fibrinous pleurisy adhesions on the lung surface. - In the airways: Presence of catarrhal, purulent, or bloody exudate inside opened bronchi and the trachea.
Hydatidosis	-Visual and palpation of fluid-filled vesicular cysts of varying sizes embedded in the tissue or bulging on the organ surface predominantly in the lungs and liver. - On incision: A distinct external white germinal/laminated wall with clear hydatid fluid and sometimes gritty brood capsules inside.
Respiratory trongylosis	-Visual and palpation of small nodular, subpleural gritty foci (Mullerius) or generalized rubbery worm-filled large bronchi (Dictyocaulus). -In the airways: Slicing major bronchi and the trachea reveals slender, thread-like white adult nematodes mixed with mucus or focal chronic bronchitis.
Emphysema	-Visual appearance: Pale pink to grayish-yellow, overinflated, bulbous lung lobes with visible subpleural air bubbles or pearl-like bullae. - On Palpation: Puffy texture with a characteristic spongy or crepitant feel.
Hemorrhagic lung	-Visual appearance: Focal, multifocal, or diffuse dark-red to black patches on the pleural surface and deep parenchyma. - On Palpation: Firm or spongy areas that ooze dark, unclotted or partially clotted blood upon incision.
Hepatitis	-Visual appearance: Alterations in normal reddish-brown color (pale, yellow-brown, or bright red), swelling, and presence of white/gray foci, fibrous scars, or migratory parasitic tracts. -Palpation and Incision: Increased organ consistency (firmness), rounded borders, and gritty or caseous textures upon cutting into portal lymph nodes or hepatic parenchyma.
Hepatization of lung	-Visual appearance: Lungs resemble liver tissue (heavy, solid, and airless). Divided into red hepatization (dark red, hyperemic, firm) and gray hepatization (grayish or pale yellow, dry, highly dense) stages typical of fibrinous or bacterial pneumonia. Palpation and Incision: Firm, heavy, and non-crepitant consistency; sinking in water. Cut surfaces display a dry, granular appearance without bubbling air.
Sarcoptic mange	-Thickened, wrinkled, and hyperkeratotic skin with crusts, papules, and large folds, predominantly starting around the head, neck, and shoulders.
Actinobacillosis	Firm, hard, nodular granulomatous swellings and suspected cases of abscesses containing thick, sticky, grayish-white or greenish-yellow pus. Primarily affects soft tissues, especially the tongue, lips, and associated head lymph nodes (infrequent in sheep)
Actinomycosis	Gritty pus or tissue scrapings show characteristic hard sulfur granules Involves hard bony tissues, characteristically the mandible or maxilla of cattle.
Traumatic carcasses	Visual assessment of asymmetrical tissue damage, hemorrhage in musculature, fractured bones, and torn or lacerated soft tissues.
lumpy skin disease	Subcutaneous nodules clearly visible after skinning; characteristic nodules and ulcers found across the mucous membranes of the digestive tract, trachea, and lungs.
Traumatic Reticulo-Peritonitis (TRP)	-Presence of metallic or sharp foreign objects, such as nails or wire, penetrating the reticular wall. -Localized peritonitis, fibrinous or purulent adhesions between the reticulum, diaphragm, and adjacent organs (liver or spleen).
	-Abnormal, foul, putrid, or sour odors emanating from the meat, body cavities, and musculature. -Discoloration of the flesh (greening, darkening, or hyperemic blood pooling), loss of muscle tone, and gas accumulation or bloating in uneviscerated parts.
Bleeding carcasses	- Presence of marked blood congestion in subcutaneous, axillary, and intercostal blood vessels are full of blood and congested. - Presence of an abnormal dark, dull, or wet meat appearance (instead of a bright, well-set, dry surface).

All lesions were classified on the basis of gross post-mortem examination. The laboratory confirmation is not done.

Table 10.
Visceral inspection technique [30].

Organ/System	Steps of examination
Heart and pericardium	-Visual examination of the pericardial sac (parietal pericardium); -Visual observation and palpation of the heart; -Incision of the pericardium and observation of the fluid; -Longitudinal incision to open the ventricles and penetrate the interventricular septum
Lungs, trachea, esophagus	-Visual examination of the lungs: appearance, volume, color, etc.; - Palpation of all lobes, from the hilum to the periphery; - Incision and examination of the tracheobronchial, mediastinal, and apical lymph nodes; - Incision of the trachea and bronchi and of each lung and examination of the pulmonary parenchyma; - Visual examination and palpation of the esophagus.
Liver	- Visual examination ; - Palpation of both surfaces ; - Palpation and incision of the hepatic lymph nodes ; - Two incisions on the visceral surface : • A long and shallow incision between the right and left lobes ; • A short and deep incision involving the caudate lobe.
Spleen	-Visual examination and palpation ; - Incision when necessary.
Kidney	-Visual examination and palpation ; - Incision along a sagittal plane ; - Incision and examination of the renal lymph nodes.
Digestive tract	- Visual examination : rumen-reticulum junction, mesentery, omentum, intestinal wall ; - Palpation, incision when necessary of the gastric and mesenteric lymph nodes.
Uro-genital tract	-Visual examination of the genital organs and uterine contents; - Palpation and incision when necessary (without contaminating the carcass); - Incision of the scrotal nodes in males.
Head, tongue	-Visual examination of the external surfaces of the head ; -Incision of the mandibular (submandibular), parotid, and lateral and medial retropharyngeal lymph nodes. - Visual examination and dorsoventral palpation of the tongue.

The inspection procedure was adopted from the order of 17 March 1992. Official Journal of the French Republic;1992.

-Total Condemnation: The entire carcass and all organs are destroyed due to widespread disease or toxic risks [29].

Estimation of economic losses attributed to organ and/or carcass condemnations

The estimation of economic losses was calculated according to the weight of condemned organs and meat and their average local market prices (per kg) during the study period. The unit prices were obtained from Commercial Services Directorate for the Blida Region– April 2025.These prices represented the butcher prices and were applied to all animal species. During the study period, the prices for the liver, lung,heart,beef,head, stomach, udder was 37.54 USD, 18.02 USD, 22.53 USD, 18.77 USD, 3.00 USD, 15.02 USD and 1.5 USD respectively. The total economic loss was calculated using the following equation:

Total loss = (C * PC) + (Lu * PLu) +(H * PH) + (L * PL) + (He * PHe) + (S * PS) + (U * PU). Where in kg, C = Carcasses total condemned weights, Lu = lung total condemned weights, H = heart total condemned weights, L = liver total condemned weights, He = total condemned weights, S=Stomach total condemned weights, U = Udder total condemned weights Where in USD, PC = Unit price of carcasses, PLu = Price of lung, PH = Price of heart, PL = Price of liver, PHe = Price of head, PS = Price of stomach, PU = Price of udder.

Statistical analysis

For statistical analysis, software program Microsoft Excel 2010 and IBM SPSS Statistics Version 20 (© IBM Copyright, IBM Corporation and its licensors 1989.2011 IBM., USA) was used. The collected data were analyzed according to animal species (cattle and sheep), gender, age, and other relevant factors based on the number and percentage of animals slaughtered and recorded in the slaughterhouses. Confidence intervals (CIs) at a 95% confidence level were calculated using SPSS. The Chi-square test of homogeneity was applied to compare the different factors. Statistical significance was set at $p \leq 0.05$.

Data-availability statement

The datasets generated and/or analyzed during the current study are available from the corresponding author on reasonable request.

Authors' Contributions

A.D Concept and design of the study, recording data, drafting of the manuscript, data analysis, interpretation of the results, and prepared the final draft of the manuscript. S.Z performed the statistical analysis, revising the manuscript and final approval of the paper following critical editing. All authors read and approved the final manuscript for publication.

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Competing Interests

The authors declare that there is no conflict of interest.

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