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## Epidemiological study of diseases outbreak in sheep of Lumle, Nepal

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### Abstract

A cross-sectional study was conducted in the 150 sheep of Directorate of Agricultural Research (DoAR), Gandaki during fiscal year 2019/20. The breeds were Baruuwal, Bhyanglung and their crosses with exotic breeds. During the study period the disease record book was maintained which determines Nematodiasis (54.0%; 81/150) as the most prevalent disease followed by Contagious Ecthyma (33.3%; 50/150). Similarly, Lameness, (2.6%; 4/150) was the least prevalent diseases followed by bloat (8.6%; 13/150) in sheep. The Nematodiasis, Pneumonia and Scabies were observed highest during the summer, rainy, and winter season, respectively. Out of Nematodiasis, *Hemonchus contortus*, 1898 was the most frequent parasites and coccidiosis was the most frequent protozoa measured by mean egg per gram number. This study suggests that appropriate precaution measures should be applied before the peak season, based on above findings to prevent Nematodiasis, Pneumonia, and Contagious ecthyma.

**Keywords:** Coccidiosis, pneumonia, *H. contortus*, Nematodiasis, sheep

### 1. Introduction

In Nepal total population of sheep is 7,89,216 <sup>[1]</sup>. The sheep is reared for meat and wool purpose. The sheep had only 1.52% (2,656 Mt) contributions to the total meat (1,73,906 Mt) production in Nepal whereas the wool production by sheep was 586848 kg in the fiscal year of 2013/14. The indigenous breeds of sheep are Baruwal, Bhyanglung, Kage, and Lampuchhre and are distributed according to different geographical regions. The sheep population is larger in the mountain region than in terai region. Out of the national sheep population in Nepal, about 60%, especially mountain sheep are reared under the transhumance system <sup>[2]</sup>. They are grazed in lower belt during winter season whereas during summer season they are taken to the high altitude alpine pasture. The basic of this rearing system is based upon availability of pasture, environmental stress and agricultural system of farmers. During winter, sheep herd is grazed under crop by products left after harvest of summer crops. This system also adds manure of sheep which is the first step of preparation of land for farming. The transhumance system imposes stress factors on sheep which is revealed by the changes in hematological patterns which affects health and thus decreases productivity <sup>[3]</sup>. The population of sheep in Nepal is in decreasing trend <sup>[1]</sup>. Different factors are responsible for this decreasing trend, such as overgrazing, toxic plants, diseases and low availability of pasture. The sheep herd are kept in group and grazed in groups so diseases occurrence and spread is the easy matter. Farmers are less aware about the vaccination, deworming and diseases of sheep. Due to lack of knowledge and availability of technical person, once the sheep gets infected farmers are supposed to bear heavy losses in herd. There has been less study yet done in Nepal to determine the diseases occurrence patterns in sheep which has established a knowledge gap in both farmers and technical personnel. The sheep herd was managed under semi-intensive management system in DoAR, Lumle to determine the diseases affecting health which will provide an epidemiological picture on sheep's health.

### 2. Materials and Methods

#### 2.1 Description of the study area

The experiment was conducted at Directorate of Agricultural research, Gandaki which is situated at Annapurna Rural Municipality ward no. 2, Kaski District, Gandaki Province, Nepal.

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The flock of farm comprised of 150 sheep. The study location is situated in mountainous region with the altitude range from 1500-1700 meter above sea level. The DoAR-Gandaki has an agro-meteorological station within its boundary and the weather parameters are recorded every day. During the year 2019/20, the hottest and the rainiest month was August (average of maximum temperature = 24.98°C, average minimum temperature = 17.72°C, average monthly temperature = 21.35°C and average rainfall measuring 1441.60 mm). The coldest month was January (average of maximum temperature = 12.69°C, average minimum temperature = 3.95°C and average monthly temperature = 8.32°C) and the most dry month was November (average precipitation = 10 mm). The average 12-months' maximum and minimum temperature were 19.78 and 11.55 °C, respectively.

## 2.2 Study Design and sampling techniques

A cross-sectional investigation on ovine disease was carried out during fiscal year 2076/77(2019/2020) in the farm. They were managed under semi-intensive system. They were being fed with concentrate of 24.98% crude protein and grazed for four hours daily. The fecal examination from 30% of herd was done every month to determine the egg per gram(epg) and gastro-intestinal parasites, and the positives were treated accordingly. A total of 45 fecal samples were collected randomly to examine the internal parasitic eggs every month. Other diseases were diagnosed based on the history, clinical examination, post-mortem examination and lab test. The disease record book was maintained properly throughout the year.

## 2.3 Fecal sample examination

The fecal samples were collected per rectum from the sheep. Five grams of each fecal sample was collected in clean

polythene bag containing 10% formalin as preservative. The samples were properly labeled and brought to veterinary laboratory. The samples were tested microscopically for the presence of trematode and nematode eggs using sedimentation and floatation techniques respectively. At least three smears were prepared for each sample. Presence of one or more egg in a sample was considered as positive result. Based on fecal examination result, regular drenching schedule was updated and followed. The recommended dose of Albendazole and Fenbendazole were administered against nematodes and cestodes. Similarly, Oxytoclozanide and Levamisole were administered against trematodes.

## 2.4 Management of external parasites

The shearing of sheep was done twice a year once during Ashwin and next during Falgun to reduce heat stress and external parasites burden in sheep. The dipping of sheep in malathion solution (10ml/2 liter water) was then done twice a year after shearing.

## 2.5 Vaccination

The sheep were vaccinated against Peste des petits in Ruminants (PPR) and Foot and Mouth Disease (FMD) diseases.

## 2.6 Data management and analysis

All the obtained data were compiled and enter into Microsoft Excel. Microsoft Excel database system was applied for data analysis. The prevalence of different diseases was calculated as the number of infected individuals divided by the number of individuals sampled x 100.

## 3. Result

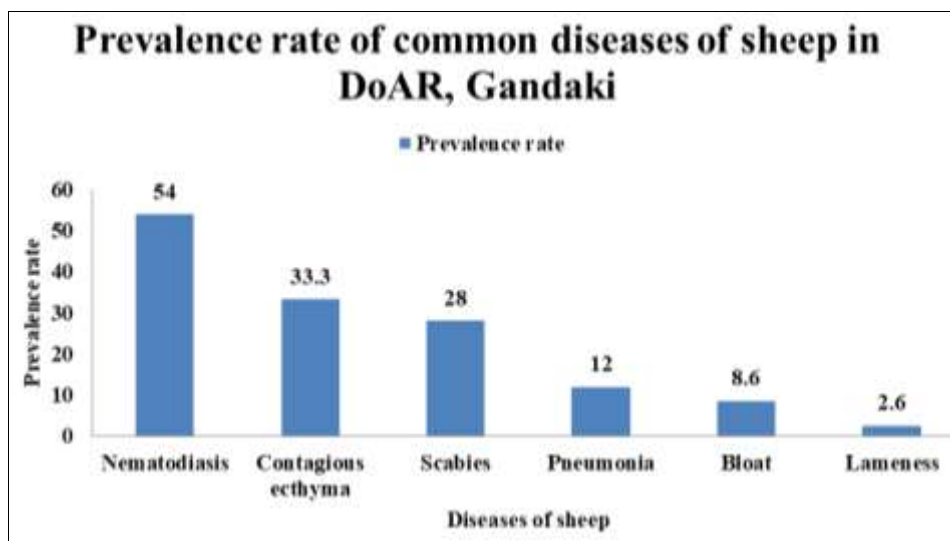


Fig 1: Showing prevalence rate of disease in sheep at DoAR Lumle.

Based on annual disease record book maintained, the prevalence rate of Nematodiasis was 54.0% (81/150) and was the most prevalent disease, while the lameness (2.6%; 4/150) was the least prevalent in sheep of DoAR, Lumle with prevalence rate of 2.6% (4/150). Out of all diseases,

Nematodiasis (54.0%; 81/150), contagious ecthyma (33.3%; 50/150), scabies (28.0%; 42/150), and Pneumonia (12.0%; 18/150) were found to be most prevalent diseases in the sheep herd. Thus, on determination of the incidence of those diseases according to month gave the line graph as below;

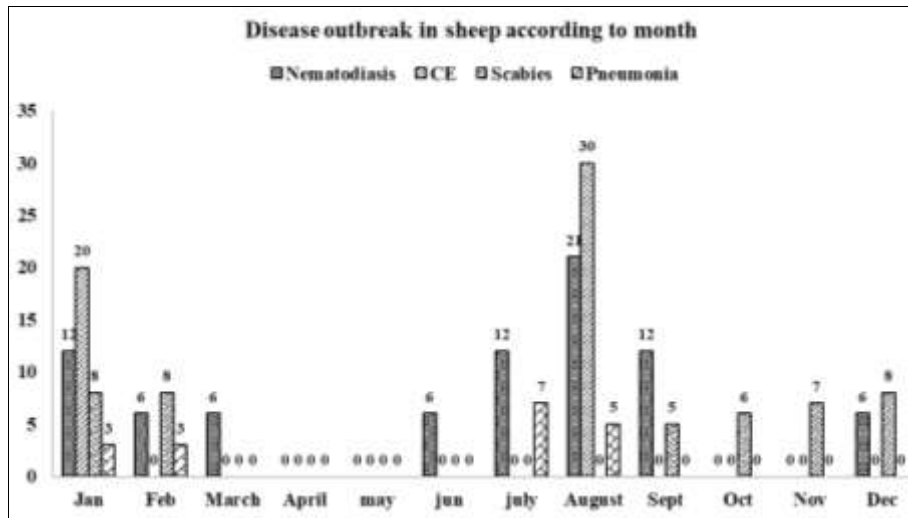


Fig 2: Diseases outbreak in sheep by month in DoAR, Lumle.

The Fig. 2 indicates that the incidence rate of Nematodiasis was the highest in the month of August and the lowest in October, November, April, and May. Thus, Nematodiasis attained peak counts in August in sheep. From the results it was indicated that environmental conditions during summer were favorable for the development and completion of

nematodes' life cycle that corresponds with rainfall pattern of Lumle. The outbreak of contagious ecthyma was highest in the month of August followed by January. Similarly, the outbreak of pneumonia was the highest in July followed by August. Equal frequency of scabies was observed for the months September to February.

Table 1: Different parasites number in sheep during 2076/77 in DoAR, Lumle

Parasites Egg Type	No. of fecal samples	Egg per gram Mean number
<i>H. contortus</i>	81	1774.1
Strongyle	81	182.7
Other nematode	80	76.3
Monezia	80	311.3
Coccidiosis	81	2553.1
Ascaris	81	23.5
EPG	81	4908.6

\*EPG = Parasites' Egg Per Gram of fecal sample

Table 1 indicates that Coccidiosis and Hemonchosis were the most frequently observed protozoa and parasites, respectively, whereas Ascaris was the least observed gastro-intestinal

parasites in sheep. The *Haemonchus contortus* egg number pattern follows the environmental condition being higher in the month of summer.

Table 2: Pearson's correlations among the EPG and other parasites in sheep of different age, sex and months (N = 80)

	Month	Sex	Age	Breed	H	S	ON	M	C	A	EPG
Month		0.00	0.37**	0.31**	0.00	0.00	0.00	0.10	-0.20	-0.10	-0.20
Sex			0.00	0.2	-0.20	0.00	0.25*	-0.10	-0.10	-0.10	-0.20
Age				0.23*	0.10	0.00	0.10	0.10	0.10	0.00	0.10
Breed					0.00	-0.10	0.10	0.00	-0.10	-0.10	-0.10
H						-0.10	-0.10	0.30**	0.00	0.27*	0.37**
S							0.00	0.10	-0.10	0.00	0.00
N								0.00	0.00	0.00	0.00
M									0.00	0.20	0.20
C										0.00	0.91**
A											0.10
EPG											

\*\* Correlation is significant at  $\alpha = 1\%$ , \*significant at  $\alpha = 5\%$

H=Hemonchus, S=Strongyle, A=Ascaris, ON=other nematode, C=Coccidiosis, M=Monezia

EPG = Number of Parasites' eggs per gram of faecal sample

Table 2 indicates a positive correlation between the Coccidian oocytes and EPG. It means that coccidian oocyte was the most responsible parasite to increase the number of EPG in sheep. Similarly, correlation of other parasites with EPG can be observed from the above table.

4. Discussion

Contagious ecthyma (CE) is an exanthematic disease caused

by virus of genus parapox and subfamily Chordopoxvirinae and family Poxviridae [4]. It is a contagious disease with zoonotic implication and affect wide range of animal species in addition to its natural hosts; sheep and goats [5]. The CE is found under OIE (Office International des Épizooties) listed diseases that are zoonotic and present in veterinary laboratories [6]. The disease usually occurs in a mild form characterized by formation of a large benign tumor-like

vascularized lesion, causing a significant morbidity rate and productivity losses. The mortality rate is lower in adults whereas it may range from 10 to 90% in lambs and kids [7] due to their inability to suckle milk and secondary bacterial infections [8, 9]. The prevalence rates of CE were 12.2% in sheep in Malaysia [10] which is lesser than the finding of this study.

Pneumonia is a common disease of sheep. Lamb losses are generally connected with bacterial infections leading to pneumonia, diarrhoea, and subsequent sepsis, which are potential complications of pneumonia [11]. Age, geographic location, nutrition and climate are determining factors on the type of microorganism causing pneumonia. The lungs of 42 (4.2%) sheep were affected at gross level by various types of pneumonia and pulmonary abscesses. The bacteriological examination revealed presence of *Pasteurella multocida* Trevisan, 1887 (24.53%), *Staphylococcus aureus* Rosenbach, 1884 (20.75%), *Klebsiella pneumoniae* Trevisan, 1887 (15.09%), *Corynebacterium pseudotuberculosis* Buchanan, 1911 (7.55%) and *Actinomyces pyogenes* Harz, 1877 (1.89%). The most common form of pneumonia was suppurative bronchopneumonia with moderate amounts of fibrin deposits on the pleural surface and inside the bronchioles and alveoli [12]. The Pneumonia is found to be the frequent cause of kid death similar to the study of Spain (28.7%) in which *Mannheimia haemolytica* was the main microorganism isolated (60%) usually related to the fibrinous bronchopneumonia pattern followed by *P. multocida*, commonly associated with a septicaemic pattern [13]. In this study more pneumonic lambs were reported during July and August, as June and July were breeding month of sheep in Lumle leading to small lambs during July and August. Also the months are known for the rainy months similar to the study of Lacasta [13].

The prevalence rate of mange mites' infestation in sheep was 4.55% affecting adult male more [14]. The *Sarcoptes scabiei* Linnaeus, lives on the surface of the skin and bites the animal to feed on its skin fluids. The *S. scabiei* is more common in rams causing active lesions in their ears and/or on their bodies [15]. The distribution of mites on animals varies according to season, the infection being quiescent in reservoir sites such as axillae, groin, infra-orbital fossa and auditory canal during spring, summer and early autumn [16] and most outbreaks occur in cold months supporting the result of this study. Every year, Psoroptic scabies has affected sheep during stable period, when the lowest temperatures of the season were reached [17] which supports the finding of this study.

The most common causes of mortality for older lambs (n=28) were parasitism (25%; 57% *H. contortus*, 43% *F. hepatica*) [18]. The overall prevalence of GIT nematodes in sheep in fiscal year 2076/77 was 54.0% with *Haemonchus* being the most prevalent in sheep which is similar to the findings of the study of Kashmir valley [19]. The maximum nematode infection was observed in summer season and lowest in winter similar to the study done by Tariq [19].

## 5. Conclusion

Out of all diseases, Nematodiasis (54.0%, 81/150), contagious ecthyma (33.3%; 50/150), scabies (28%; 42/150) and Pneumonia (12%; 18/150) were found to be most prevalent diseases in the sheep herd. Though they were the most prevalent diseases, pneumonia and Hemonchosis were life threatening diseases whereas scabies and contagious ecthyma had low mortality rate but high morbidity rate. So, effective preventive measures should be applied during or before rainy

season to protect lamb against pneumonia. Similarly, anthelmintic should be administered at the beginning of rainy season and winter season focusing *H. contortus* to minimize the loss. Also, effective preventive measures should be applied against contagious ecthyma and scabies to reduce economic loss.

## 6. Acknowledgement

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**Ethical matters:** In this study no humans and experimental animals' subjects were used.

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