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Prevalence of gastrointestinal and liver parasites in yaks in the cold desert area of lower Mustang, Nepal

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ABSTRACT

Objective: To determine the prevalence and associated risk factors of gastrointestinal and liver parasites in yak in the cold desert area of the Mustang District, Nepal.

Methods: Fecal samples were collected over a period of three months from 96 yaks from the high Himalayan District of Mustang, Nepal. The samples were tested for the presence of parasites by direct smear, sedimentation, and floatation techniques. Yak herders were surveyed with pre-tested questionnaires by participatory appraisals to explore their knowledge and awareness of parasitic diseases and health management.

Results: Examination of fecal samples revealed that 82 were positive for one or more parasites, giving an overall prevalence of 85.42%, in which 6.25% had single and 79.17% had multiple parasitic infection. Animals with poor body condition scores and young age were more susceptible than their counterparts. Inferior body condition scores were attributed to parasitic burden. No significant difference was noted between worm burden and either the sex of the animal or the altitude.

Conclusions: A high proportion of yaks in the lower Mustang Region of Nepal suffered from the mild to moderate parasitic infection, significant enough to contaminate the pasture and spread infection to healthy animals. Complementary studies are needed to establish the impact of parasitism on productive performance. Furthermore, nutrition and health management, including regular and strategic parasite monitoring programs are needed for better health and productivity.

1. Introduction

Among 17 species of domesticated animals in Nepal, yak holds prime position in alpine context. They are a major component of Himalayan livestock farming and an important source of income for pastoral tribes living in the Nepalese highlands. Moreover, yak and yak hybrids are major sources of milk and meat and are integral to the cultural and social activities of herding societies[1,2]. There are 70 165 yaks in Nepal[3], with 4 145 in the Mustang District, including 900–1 000 yaks in lower Mustang[4]. Although yak and chauri are credited for their high tolerance or resistance to disease and the environment, parasitic infection is a major cause of production loss, mainly due to severe weight loss, poor milk and meat production, and impaired reproductive performance. Helminths are the most prevalent when the animals are in temperate and subalpine pastures between October and May. This period is followed by travel to higher land and mating, typically between June and October. However, it is unknown how travel, reproduction, diverted nutrient needs, and herd behavior dynamism are related to the parasitism cycle, but the problem is especially common in calves where parasites cause heavy mortality[5]. Helminths cause direct loss due to acute illness and indirect losses due to poor growth, poor reproductive efficiency, loss of production, and poor feed conversion (chronic cases).

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Most yaks are not involved in treatment program because worm infection does not cause any specific symptoms that might alert yak herders to the problem[6]. Information on the prevalence of gastrointestinal helminth infections is limited. Some studies have revealed an incidence of helminthic infection in chauri and yak of Nepal[2,7-10]. However, there are no data on helminth parasites in yak in the Mustang District. We therefore aimed to determine the prevalence and associated risk factors of gastrointestinal and liver parasites in the northern mountainous region of Mustang, Nepal. These data are useful for the planning measures to control gastrointestinal parasitic diseases and have a direct impact on productive performance of yak and chauri.

2. Materials and methods

2.1. Sample size estimation

The sample size was determined using Daniel[11]:

$$n = \frac{Z^2_{1-\alpha/2} \times p\,(1-p)}{e^2}$$

Where Z = 1.96, p is the expected prevalence of 5.47%[12], and e is the maximum tolerable error of 0.05. This resulted in a required sample size of 79.45, *i.e.*, 80 animals. However, we had taken 96 yak samples to increase the precision of the study.

2.2. Study area and animal population

This study was conducted in lower Mustang (Lete, Kowang, Tukuche, Marpha Village), Nepal. The study region lies between the 28°37' N, 83°36' E and 28°50' N, 83°58' E in the trans-Himalayan arid zone and is bounded to the east by Manang, the west by Dolpa, the south by Myagdi, and the north by Upper Mustang. Six herds and 50% of the population of each herd were chosen at random for sample collection. Each yak herder completed a pre-tested questionnaire to assess the variables associated with health care and awareness about parasitic diseases by farmers (n = 32).

2.3. Fecal sample collection and examination

During February to March 2014, a total of 96 fecal samples (10% of population of yaks) were collected from yaks in lower Mustang. Samples were collected either directly from the rectum or freshly voided feces early in the morning. Each fecal sample was immediately put into a zip-lock plastic bag, stored in an icebox, transported to the regional veterinary laboratory of Pokhara, and stored in a refrigerator until further processing. Fecal samples were examined by the direct smear, sedimentation, and flotation methods as per standard techniques[13]. Quantitative fecal examination was carried out by a modified McMaster technique[14] with a sensitivity of 50 eggs per gram (EPG)/oocyst per gram. For the floatation technique, saturated zinc sulfate solution (specific gravity 1.15) was used for trematodes and saturated sodium chloride solution (specific gravity 1.2) was used for cestodes and nematodes. Helminth eggs were identified by low and high power microscopy according to the size of the eggs and morphological characteristics[13].

2.4. Statistical analysis

Differences in individual parasitic burden between altitude, body condition score, age, and sex were determined using ANOVA test from contingency tables. Analysis was performed using IBM SPSS version 19.0. The infection prevalence and questionnaires were also analyzed using descriptive statistics.

3. Results

Out of 96 fecal samples, 82 were positive for one or more parasites; thus, the overall prevalence was 85.42%, in which 6.25% were single parasitic infections, and 79.17% were multiple parasitic infections. Ten different types of parasites were found: strongyles (46.87%), *Toxocara* (29.17%), *Haemonchus* (18.75%), *Taenia* (18.75%), *Fasciola* (16.67%), *Moniezia* (15.62%), *Dicrocoelium* (11.46%), *Paramphistomum* (9.37%), *Trichuris* (9.37%), and *Nematodirus* (2.08%) (Table 1).

Table 1
Prevalence of helminthes and protozoan parasites in yak of lower Mustang, Nepal.

Parasites	Examined yaks	Positive yaks [*n* (%)]
Gastrointestinal strongyle	96	45 (46.87)
Toxocara	96	28 (29.17)
Hemonchus	96	18 (18.75)
Trichuris	96	9 (9.37)
Nematodirus	96	2 (2.08)
Fasciola	96	16 (16.67)
Paramphistomum	96	9 (9.37)
Dicrocoelium	96	11 (11.46)
Moniezia	96	15 (15.62)
Taenia	96	18 (18.75)
Eimeria	96	19 (19.79)

Parasite prevalence was higher in females, animals residing at lower altitudes, those with poor body condition, and those either younger or older than their counterparts (Table 2).

Table 2
Percentage prevalence of gastrointestinal and liver parasites in desert area of Lower Mustang, Nepal.

Parameters		Examined samples (*n*)	Infected animals (*n*)	Infection (%)
Age	Below 2 years	24	20	83.33
	2–7 years	65	55	84.61
	Above 7 years	7	7	100.00
	Total	96	82	85.42
Sex	Male	29	23	79.31
	Female	67	59	88.05
	Total	96	82	85.42
Body condition	Thin (< 2.5)	15	11	73.33
	Moderate (2.5 ⩽ 3.0)	81	71	87.65
	Total	96	82	85.42
Altitude	Below 3000 m a.s.l (TP)	37	34	91.89
	3000–4000 m a.s.l (SA)	46	39	84.78
	Above 4000 m a.s.l (AP)	13	9	69.23
	Total	96	82	85.42

a.s.l: Above sea level; TP: Temperate pasture; SA: Subalpine area; AP: Alpine pasture.

Of the isolated parasites, nematodes were most prevalent (78.13%) followed by trematodes (35.42%) and cestodes (34.38%) (Table3).

Of the overall prevalence of 85.42%, 22.92% were recorded in animals with a history of anthelminthic treatment and the remainder (62.5%) were recorded in animals with no history of