PREVALENCE OF GASTROINTESTINAL HELMINTH PARASITES OF HIGH ALTITIUDE DOMESTIC RUMINANTS OF MUSTANG, NEPAL

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Central Department of Zoology
Institute of Science and Technology
Tribhuvan University
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August, 2019

DECLARATION

I hereby declared that work presented in this thesis has been done by myself, and has not been submitted elsewhere for the award of any degree. All sources of information have been superficially acknowledged by reference to the authors or institutions.

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RECOMMENDATION

This is to recommend that the thesis entitled "**PREVALENCE OF GASTROINTESTINAL HELMINTH PARASITES OF HIGH ALTITUDE DOMESTIC RUMINANTS OF MUSTANG, NEPAL**" has been carried out by Anita Kumari Karki for the partial fulfillment of Master's Degree of Science in Zoology with special paper Parasitology. This is her original work and has been carried out under my supervision. To the best of my knowledge, this thesis work has not been submitted for any other degree in any institutions.

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LETTER OF APPROVAL

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CERTIFICATE OF ACCEPTANCE

This thesis work submitted by Anita Kumari Karki entitled "**PREVALENCE OF GASTROINTESTINAL HELMINTH PARASITES OF HIGH ALTITIUDE DOMESTIC RUMINANTS OF MUSTANG, NEPAL**" has been accepted as a partial fulfillment for the requirements of Master's Degree of Science in Zoology with special paper parasitology.

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ABSTRACT

High altitude domestic ruminants, meant as an important livelistock for livelihood for Nepalese farmers. Gastrointestinal parasites (GI) causes a significant impact in the heath of domesticated ruminants. The aim of this study was to determine the prevalence of gastrointestinal helminth parasites of high altitude domestic ruminants in upper (Chhusang) and lower (Kagbeni) of Mustang district. A total of 180 faecal samples including 60 goats, 60 sheeps and 60 cows from the upper and lower Mustang were collected during the month of April, 2019 in the morning time. These faecal samples were preserved in 2.5% potassium dichromate and examined by floatation and sedimentation technique. The study revealed 53.33%, 56.67% and 50% prevalence of GI helminth parasites in goats, sheep and cow respectively. A total of eight helminth parasites were recorded from all the domestic ruminants. *Haemonchus* sp. was recorded only in goats from both upper and lower Mustang. While, *Strongyloides* sp. and *Strongyle*sp.were found to be predominant in goats, sheep and cow from both places. The mode of infection was either single, double and multiple. During the study different type of parasitic infection were encountered in domestic animals. However, most of the ruminants showed single infection in greater extent than double and multiple infection. Statically there was no significant parasitic association between these three species of domestic ruminants. A questionnaire survey was carried out among 60 farmers randomly regarding the disease and use of anthelminthic. Foot and mouth disease was commonly seen in animals of Mustang district followed by diarrhoea, skin diseases, respiratory diseases, mycosis and abortion. Over 70% of the farmers use allopathic drugs to treat their animals. However, maximum people used to keep their animals in a mixed herd. The result showed maximum domestic animals are infected with helminth parasite. Hence to improve the productivity of domestic ruminants regular veterinary check up and anthelminthic treatment should be carried out by the farmers.

1. INTRODUCTION

1.1.High altitude ruminants of Nepal:

Nepal has wide range of geographical diversity. It has immensely diverse topography varied climate and vegetation which determines the wide range of distribution among ruminants. Among three geographical region there is a certain distribution among ruminants. Among animals few mammals like yak, Ibex, Tibetain gazelle vicunus, llamas, and certain birds are completely adapted to high altitude environment. Among domesticated animals mountain goat, sheep, yak chauries etc are the highest altitude dwelling animals. Certain hybridized races of cattle are also adapted to the high altitude environment.

High altitude ranges from 3000m to 8848m above the sea level and extends into Tibet Autonomous region of China and Sikkim state in India. It occupies about 15% of the total land of Nepal. There are 16 districts in Nepal which lies in the high altitude including Mustang district. Yak, Chauries, sheep, goat, jhuppa, ox, horses, mules, lulu cow etc are domesticated in these areas which are also known as high altitude domestic ruminants.

In Nepal high altitude region is good grazing land for sheep, yak and other animals (Joshi and pandey,1991). Livestock herds in trans-himalayan range and high mountains range are taken to higher altitude in summer and lower altitudes in winters for grazing purpose.

There are about 150 ruminants species (Purja, 2015) in Nepal among them cattle, buffalo, sheep, goat and chauries are dominating ruminants.The word “ruminant” is derived from the Latin word ruminare, which means “to chew over again”. Thus ruminant means a type of animals that brings up their food from stomach and chews their food over and again. Ruminant animal are mammals which are able to get their nutrition through plant base food by fermenting in a specialized stomach using microbial action.

There are about 1000 breeds of cattle in the world, among them “Dwarf lulu cattle”, *Bos taurus* type is the only breed found in Nepal, which is the native cattle of Mustang district (Tekeda, 2004). This cattle is considered as crossbreed of *Bos Taurus* and *Bos indicus* and morphologically similar with *Bos Taurus* (Fujise, *et al.,* 2003). They are mainly domesticated in the high altitudes ranges between 2800 to 4000m.

Dwarf lulu cattle are shorter in height and don’t have hump so they are also called as humpless cattle. They are small sized cows with their body weight about 68 to 153kg and are popular among people of high altitudes for milk. They produce milk about 1.6 to 2 liters per day from an early age. Lulu cow’s average life expectancy is 20 years and have shorter pregnancy period than other breeds of cows (Fujise, *et al*., 2003).

Another livestock that high altitude people prefer to domesticate for meat purpose includes sheep and goats. These people are attracted Mustang sheep and Mustang goat farming as the district has comparative advantages of accessing grazing fields as well as good market price. The demand for mountains goat meat is high in the country’s market

and the meat of the goat from the cold alpine regions is considered to be tasty. Meat of the mountain goats, which is reared in the Himalayan regions, is very popular among Nepalese as they believe the cold environment makes the meat delicious. The people also think the meat has medicinal values as the animal graze on mountains herbs.

Sheep usually grow up to 40 kg. They are especially reared for meat and manure. Their meat is of high quality and expensive. Besides meat they also provide a vast range of other products such as wools and horns. Horns of sheep are used to kept for decorative purposes while wool with skin used as mattress and wool along used to make various clothes and pillows cousins etc.

They can survive in extreme cold temperatures whereas others normal goat and sheep cannot. They are mainly reared for meat production. Their meat is rich in protein and minerals. Their production depends on types of breeding and overall management of farm, but the production of goats and sheep are unknown due to no recording system.

Goats are supposed to be the first farm domesticated animals (Zenuuver, 1968 and Devendra, 1998) for generating the cash income by farmers (Gatenby *et al.,* 1990). In Nepal, goats contribute about 20% and sheep about 3% for meat consumption (Joshi *et al.,* 2003). Sheep and goats in high altitudes are also called as Veda and Changra respectively.

Gloves, boots, jackets, and other product that require a soft hide are prepared from the skin of sheep and goats.

1.2.Major diseases of ruminants

A high incidence of disease and parasitism play an important role in reducing productivity of domestic ruminants. Although the incidence and frequency of various diseases in domestic ruminants have not been studied in depth, it is generally considered that the incidence of infectious disease is related to the poor management system. There are probably many diseases and parasites of livestock in Nepal and yet to be diagnosed. However, for parasitic diseases prevalence found to vary with altitude and management system (Joshi, 1989).

Parasites are major causes of morbidity and mortality of human, domestic and wild animals. Besides bacterial, viral and fungal infection, wild as well as domestic animals are highly susceptible to different diseases like nematodiasis, coccidiasis, fascioliasis, schistosomiasis etc. Many diseases either that are bacterial viral or parasitic has been reported from domestic ruminants. Haemorrhagic, septicaemia, foot and mouth disease, bovine, rabies (Devleesschauwer, 2014), Fasciolosis (Ghimire, 1987), brucellosis (Jackson, *et al.,* 2014), skin diseases etc have been reported from low land domestic ruminants. Similarly, foot and mouth disease, haemorraghic, septcicemia ,brucellosis, rabies, liver fluke etc (Joshi, 1989),brisket disease (Newman *et al.,* 2016) etc had seen to affected the domestic ruminants of the high altitudes. Besides this disease different

parasitic infection of GI helminth parasites are most varied and common in occurrence. In Nepal, GI parasites are the most important constraint to reduce the productivity of sheep, goats and cattle.

Parasites play major role in an ecosystem (Esch and Fermandx,1993), host population growth and regulation (Hudson *et al.,* 1998) and community biodiversity (Hudson *et al.,* 2002). Various intestinal parasitic infection to domestic animals are the major problems for economic benefit due to high mortality, weak body condition, low productivity and high cost of drugs (Rajakaruna and Warnakulasooriya, 2011). In Nepal, GI parasitic infection is the one of the leading cause of mortality in small ruminants (Jha *et al.,* 1993 and Joshi, 1994).

Most of the infectious diseases such as bacterial diseases, viral diseases, protozoan diseases, helminthiasis and others are parasitic in origin and these infectious diseases can derive hosts population either temporarily or permanently to low number or density (De Castro and Bolker, 2005, Gerber *et al.,* 2005).

Various gastro-intestinal parasitic infections are major problem for economic benefit due to high mortality, week body condition, low productivity and high cost of drugs (Rajakaruna and Warnakulasooriya, 2011). In Nepal, GI parasitic infection is the one of the leading cause of mortality in small ruminants (Jha *et al.,* 1993 and Joshi, 1994). Economic losses are caused by gastrointestinal parasites in a variety of ways: they cause losses through lowered fertility, reduced work capacity, involuntary culling, a reduction in food intake and lower weight gains, lower milk production, treatment costs, and mortality in heavily parasitized animals (Lebbie, *et al*.,1994).

A mean rate of prevalence of enzootic Bovine, Haematuria are limited to grazing animals (cattle) in the eastern Nepalese hills (Mahato, 1983). Fasciolosis is a major disease of domestic ruminants in much of the tropic in particular area such as Nepal (Harrison,2000). Khanal*, et al.,* (2016), reported blue tongue as an one of the most economically important transboundary animal diseases which prevalence was 17.88%, 47.50%, 53%, 58.05%, and 7.62% in sheep, goats, cattle, buffaloes, yak/chauries in highland of Nepal. Similarly, babesiosis, coccidiosis, foot and mouth, hemorrhagic septicemia, black quarter, rabies, digestive disorders, fever of unknown origin, urogenital diseases (haematuria) etc were reported from cattle and buffaloes from Koshi hills of Nepal (Thakuri, 1992).

Trichostrongyloid nematode (*Ostertagiania nquingtanggulaensis* is found to be common parasites of both sheep and goats at higher altitudes in the Northern Himalayan foothills of western Nepal (Joshi, *et al.,* 2009). Mixed infection of *Haemonchus contortus, Ostertagia* sp. and *Trichostrongylus* sp. was recorded below 2,000m, only *Ostertagia* sp. was recorded above 3,500m altitude in migratory sheep and goats of Nepal (Joshi, 1997). Trematode, cestode and nematode parasites infection can cause helminthiasis in livestock. *Entamoeba* sp., *Eimeri*a sp., *Balantidium* coli, *Paramphistomum* sp., *Fasciola* sp., *Dicrocoelium* sp., *Moniezia sp., Haemonchus* sp*., Trichostrongylus* sp., *Strongyloides* sp.,

Trichuris sp., *Ascaris* sp. and hookworms are some frequently reported GI parasites of domestic ruminants were reported from lowland of Nepal (Shrestha, 2013, Tripathi, 2015, Husain, 2017). Fasciolosis was reported as the most prevalent disease from Surkhet veterinary hospital (Ghimire, 1987). Coccidians was another important disease reported from western Nepal (Nirmal, 2000). Majority of calf mortality in Sankhuwasawa was due to ascariasis, diarrhea, dysentery and poisoning (Dhakal *et al.,* 2011). Above 80% goats of Syangja and Kaski was found to be infected with Peste des petits ruminants (PPR) (Acharya, *et al.,*2018).

Bovine viral diarrhoea virus (BVDV) infection was reported from cattle and buffaloes in Chitwan and Kavreplanchock (Gaire *et al.,*2016). Trypanosomiasis was reported in domestic animals of Makawanpur district (Maharjan and Mishra, 2006). Most animals infected with coccidia are asymptomatic, but young or immunocompromised animals may suffer severe complication and death, the parasite has been reported from different ruminants such as buffalo calves (Karna, 2010), Zebu cattle and water buffalo (Feng *et al.,* 2012). Domestic ruminants of Baghmara were found harbored coccidiasis, nematodiasis, fascioliasis, paramphistomiasis and *B. coli* infection (Khanal, 2016).

1.3. OBJECTIVES OF THE STUDY

1.3.1 General objectives:

- To determine the prevalence of gastrointestinal helminth parasite of domestic ruminants of Mustang district.

1.3.2. Specific Objectives:

- To determine the prevalence of gastrointestinal helminth parasite of sheep, goat and cow of upper and lower Mustang.
- To assess the knowledge, attitude and practices (KAP) of farmers in relation to the prevalence of parasitic infection with that of husbandry practice in domestic animals.

1.4 SIGNIFICANCE OF THE STUDY:

High altitude ruminants are important livestock of Nepal. Intestinal helminth parasites are the major problems of various animals. Many researches on parasitic disease have done in ruminants at low land, but regarding high altitude ruminant studies are not sufficient yet. Therefore, this present study attempts to identify the gastrointestinal parasitic infection particularly lulu cow, sheep and goat reared in the Mustang district.

To assess the knowledge, attitude and practice of farmers a well structure questionnaire survey has been carried out. This survey will help to create awareness in farmers of the Mustang district about the use of anthelminthic drugs, cleaning of the sheds and also provide awareness for keeping the animals in separate herds to avoid the transmission of parasites from one species of animals to another.

2. LITERATURE REVIEW

Humla, Dolpa, Rasuwa, Manang, Mustang etc are the high altitudes places of Nepal. Yak, chauri and lulu cow are the high altitude domestic ruminants which are domesticated by the people to fullfill the demand of milk while the mountains sheep and goat for meat purpose. These sheep and goat are highly demanded in Nepalese Market during the festivals time as there is a belief that these sheep and goats have medicinal properties as they consume medicinal herbs in the high altitude. However, many bacterial viral and parasitic disease are seen in these animals too. Heavy parasitic infection negatively impact on these animals reducing milk yield in cow and meat production in sheep and goats. The gastrointestinal parasites cause more than 20% loss in the production and productivity of animals (Tripathi and Subedi, 2015). Gastrointestinal parasitism is associated with economic losses, lowered productivity, reduced animal performance (Badran *et al.,* 2012), morbidity and mortality (Negasi *et al.*, 2012) in farmed animals.

In global context

Large number of studies on parasitic infection of domestic animals had been carried out in case of low land but very few research studies were found on high altitude ruminants. Available reports have shown that high altitude ruminants are also found to be infected with almost similar parasites as in low land domestic ruminants.

In American continents many research had been carried out to find out the parasitic states of sheep, goat and cattle. Argentina, Brazil and Uruguay showed high frequency of resistance for anthelminthic in sheep, North United States of America, parts of Mexico and Costa Rica also show similar resistance while other parts of American continents show low frequency (Acosta *et al.*,2012). In Sertao region of Paraiba State, Brazil, 79.3% goats were parasitized with large number of GI helminth parasites where *Haemonchus* sp. was found to be most prevalent (Vieira *et al.,* 2014). Similarly, 16 species of helminths were recorded from Western Canada in Bighorn sheep (Uhazy and Holmes, 1971). *Strongyloides* eggs were found in 64.6% of the cattle in Maine dairy cattle (Yazwinski and Gibbs, 1975). *Haemonchus* sp., *Nematodirus sp.* and *Trichostrongylus* sp. were found as predominant parasites in growing sheep of Argentina's Western Pampas (Saurez and Busetti, 1995). Age and type of animal's exploitation are the most relevant risk factors to the development of these parasites (Vieira *et al.,* 2014). *Strongyle* type, *Nematodirus sp.* and *Trichuris* eggs are found in 85.6% samples of Beef cows in United states (Stromberg *et al.,* 2015). Similarly, *Capillaria bovis, Cooperia punctate ,Haemonchus contortus and Trichostrongylus* sp. infected the most domestic cattle in Island of Molakai, Hawaii (Mckenzie and Davidson,1989). Although 15 species of nematodes recorded in Southwestern United States, *Cooperia punctate* was most prevalent species occurring in 91% of the cattle (Porter, 1942). However, *Haemonchus sp.* was recorded as most prevalent in Wisconsin dairy cattle (Cox and Todd, 1962). Poorly managed farm had significantly higher level of parasitism than those as having fair or good management (Yazwinski and Gibbs, 1975).

In European countries many studies have been conducted in case of sheep, goat and cow. In Switzerland, Italy and Ireland prevalence of *Haemonchus contortus* varies by 77% 73% and 4% respectively (Rinaldi *et al.,* 2015). All sheep of Galicia (NW Spain) were reported to be infected with several GI parasites (Pedreira *et al.,* 2006). However, only about 80% goats were infected with at least one genus/species of parasites in Poland (Gorski *et al.*,2004). Similarly, 90% of dairy goats in French were found infected with helminth parasites (Chartier and Reche, 1992). In Norway*, Haemonchus contortus* and *Nematodirus* sp. showed wider geographical distribution (Domke *et al.,* 2013). While, *Haemonchus contortus* and *Ostertagia circumcinta* were present in 44-50% in goats of Bulgaria (Zurliiski and Rusev, 1990). Similarly, helminth eggs were detected only in 7.9% samples of sheepand goats in Greek Temperatre Mediterrian (Kantzourva *et al.,* 2012). *Trichostrongyle* sp. was found in both sheep and goat in Poland (Gorski *et al.,*2004) but in Norway, *Trichstrongyles* eggs were highly excreted in sheep than in goats (Domke *et al.,* 2013). Treatment against helminths were performed annually in 73.63% of goats in Northern Italy (Zanzani *et al.,*2014). In Ireland, liver of culled cows were found to be infected with *Fasciola hepatica* (Murphy *et al.,* 2006). While in Greece helminth eggs, *Strongyle sp., Strongyloides sp., Toxocara sp., Moneizia sp.,* etc were recorded from beef cattle (Kantzoura *et al.,*2012). Similarly cattle in Northern Britain were affected by ringworm (Mcpherson, 1957).

Over 70% of the cattle in Queensland Australia were infected by *Haemonchus contortus*, *Oestergia ostertagi, Bosicolaradiatum, Coopera pectinate and Coopera punctate* (Roberts, 1939). Cattles of New Zealand were also recorded as definitive host for at least 27 nematodes (Bisset,1994). Abomasal nematode *Skrjabinagia bovie* was first time reported from Australia from both cattle and buffaloes (Bryan *et al.,* 1976). Although 20 helminth were recorded in goats from south Australia, *Trichostrongylus* sp. was dominant (Beveridge *et al.,* 1987). The most important GI nematodes recorded in small ruminants (sheep and goats) in Australia were from order *Strongylida* i.e. *Haemonchus contortus, T. circumcinata and Trichostrongylus* sp. (Roeber *et al*., 2013). But in cattle *Ostertagi ostertagi, Trichostrongylus axei* and *Cooperia onchophora* were most prevalent (Bisset,1994). About 1 million cattle were suspected to be infected with *C. bovis* in Victoria and Tashmania (Fewster,1967). According to Banks (1958), *Trichostrongylus* sp. was the only parasite of regular importance in sheep in South Australia. While *Haemonchus contortus, Trichostrongylus* sp. *and Chaberti aovina* were most important parasites in Western Australia (Gordon, 1958).

In African continents large number of studies had been carried out particularly in sheep, goat and cattle. Over 50% of sheep goat and cattle had been reported to be infected with different parasites from Colombian Northeast Mountain region (Leon, 2019). Similarly, parasitic prevalence was reported from another African countries like Kenya (Wanjela,2002), Ethopia (Regasa, 2000), Sengel (Ndao *et al.,* 1991), Nigeria (Opara *et al.,* 2005). The sheep and goats of Kenya were found to be infected more with *Strongyle* (Wanjela *et al.,*2002). In Sengal, sheep and goats were reported to be infected with large number of helminth parasites most importantly *Fasciola* sp.*, Schistosoma* sp.*,*

Amphistomum sp., *Moneizia* sp., *Strongylloides* sp., *Strongyle* sp. etc (Ndao *et al.,*1991). About 90% of goats and sheep were found to be infected with various GI parasites in South Western Ethopia (Terefas *et al.,* 2010). Ragasa (2005), reported *Strongyle* and *Eimeria* sp. as most predominant parasites with similar prevalence in Western Ormia, Ethopia. Similarly, cattle of Eithopia were also found to be infected by various GI parasites where *Paraamphistomum* sp., *Ascaris* sp., *Trichuris* sp., *Strongyle* sp., *Nematodirus* sp. were found to be predominant (Bedasa *et al*., 2016).

All sheep were found to be infected with various helminth parasites in North Sumatra Indonesia (Dorny *et al*., 1996). Similarly, sheep and goats in Kashmir were also found to be highly infected with GI parasites (Bashir,2009). Mondal *et al. (*2000) reported *Haemonchus sp., Trichostrongyloide sp., Trichuris sp., Cistorcirrus Oesophagostamum and Bunustomum* sp. from Bangladesh. Likewise, Mamum *et al.,* (2011) identifies *Toxocara* sp., *Strongyle* sp., and *Strongyloides* sp. from Bangladesh. From Srilanka (Rajapakse *et al*., 2008), and Mongolia (Sharkhuu, 2001) five species of nematodes were identified. However, Farooq et al., (2012) reported 18 different nematodes species from Pakistan. Coccidiasis was also reported from Thailand (Sangvaranond *et al.,* 2010), Iran (Tovassoli and Khoshvagali, 2010), Bangladesh (Saifal *et al.,* 2008) and Myanmar (Lay,2007). In Nilgiri Hills Tamil Nadu, India, domestic cattle and Gaur were highly infected by GI parasites (Allwin *et al.,* 2016). Above 80% of sheep and goats were reported to be affected in Jammu (Yadav *et al.,* 2006). In Palmpur, Himalchal Pardesh, *Strongyloides* sp., *Trichostrongylus* sp., *Haemonchus* sp., *Oesophagostomum* sp., *Fasciola* sp. *and Schistosoma sp.* were found to be predominant in sheep and goats (Jitendran, 2000). Domestic ruminants in Weyanand South India were found to be infected with Schistomiasis (Ravindaran *et al*., 2008). About 65% of sheep goat and cattle were reported to be infected in various parts of India Shirale and Maske (2008), Shirale (2008), Asief *et al*., (2008) and Singh *et al., (*2008). Similarly, various nematodes parasites affected the ruminants of Nagpur (Chavhan *et al*., 2008). Among the helminth parasites *Strongylus* sp. showed the higher prevalence in small ruminants at Mhow (Bansal *et al.,* 2015).

In national context

Common domestic ruminants found in high altitude of Nepal includes yak, chauri, jhuppa, sheep, goat and lulu cow. These ruminants were found to be infected with various helminth parasites. Many studies have been conducted in sheep goats and cattle in lower region of Nepal however, only few studies had been conducted in case of higher ruminants.

Above 80% of the yak were found to be infected with GI parasites in Lehe, VDC, Manasulu Conservation Area (Byanju *et al.,*2011) and old desert area of lower Mustang (Acharya *et al.,* 2016). Similarly, 90% chauries in Ramechaap district, Nepal reported to be infected either with single or mixed group of parasites (Shrestha and Bindari, 2013). Similar prevalence was recorded from Chauries in Langtang National Park, Rasuwa Nepal (Achhami, 2016). In Anarnami VDC of Jhapa many cattle were found to be

infected by *Dipylidium* sp., *Schistosoma* sp., *Trichostrongylus* sp., *Dicrocoelium* sp., *Fasciola* sp. (Dhakal, 2008). Over 80% of sheep were found to be infected with various parasites in Ghanpakha, Lamjung (Acharya,2017). The most prevalent nematodes reported among sheep and goats of Nepal were *Haemonchus* sp. *Trichostrongyloides* sp., and *Nematodirus* sp. (Kushwaha, 2000), Karki *et al.,*2011, Rijal, 2010, Dhital, 2006). But the prevalence of *Haemonchus* sp. was found to be least in goats of Rushi, Municipality-11,Nepal (Sukupayo and Rayamajhi, 2018), and in western Chitwan, Nepal (Adhikari *et al.,* 2017). At low hill village of Western Nepal 28% morbidity was due to GI parasites among them *Haemonchus contortus* was recorded as main parasite for infection (Joshi, 1994). In Pathivara VDC, Sankhuwasawa district all sheep and 85% of goats were reported to be infected with various parasites (Dhakal, Jha and Basnet, 1996). Joshi (1997), recorded 20 nematodes species from the Western Nepal. Fascioliasis was reported to be the most prevalent disease from Surkhet veterinary Hospital (Ghimire, 1987). In Western region of Nepal71% cases were found to have parasitic disease among which 61% due to coccidians and 54.6% due to *Strongyloides sp.* (Nirmal, 2000). Sheep and goats of IAAS farm were found to be infected by *Haemonchus* sp., *Ostertagia* sp., *Chaberia* sp., *Strongyloides* sp., *Trichostrongylus* sp., *Oesophogostomum* sp. *and Cooperia* sp. (Acharya, 1999). Maximum goats were reported to be infected with numerous parasites in Karnali, Nepal (Khakurel *et al*., 2005). More than 65% of sheep and goats were seemed to be infected in Khiliijee, Arghakhachi, Nepal (Rijal, 2010) and in Shivraj Municipality Nepal (Tripathi and Subedi, 2015). About 80% of goats which are brought to khasibazar, Kalanki, Kathmandu for slaughter purpose were found to be infected by various GI parasites (Parajuli, 2007 and Bashir, 2009).

3. MATERIALS AND METHODS:

3.1 Study area :

Kagbeni is a village in the upper Mustang of the Himalayas, in Nepal, located in the valley of Kali Gandaki river. Kagbeni is a village development committee in Mustang District in Dhaulagiri zone in northern Nepal. It is situated at an altitude of 2800m, latitude 28° 50′ 42″ N, longitude 83° 47′ 53″ E. (Figure: 1).

Figure 1: Map of Nepal showing study area (Kagbeni)

Chhusang is a village development committee in Mustang district in the Dhaulagiri zone of northern Nepal, which is located on the upper Mustang at the junction of Narshing river and the Kali Gandaki. It is situated at an altitude of 3022m and latitude 28°55’48”N and longitude of 83°54’36”E. (Figure: 2).

Figure 2: Map of Nepal showing study area (chhusang).

3.2.Materials :

The materials that has been used during our research work were listed below.

3.2.1 Materials for laboratory:

i. Beakers
ii. Electric microscope
iii. Volumetric flask
iv. Dropper
v. Ocular micrometer
vi. Test tube
vii. Test tube rack
viii. Centrifuge machine
ix. Toothpicks
x. Glass rod
xi. Centrifuge tubes
xii. Stage micrometer
xiii. Cover slips
xiv. Slide

3.2.2Materials for field:

i. Map,
ii. Notebook,
iii. Pen
iv. Sterile vials

3.2.3 Chemicals:

Potassium dichromate, normal saline, saturated NaCl solution, distilled water, methylene blue, zinc sulphate , 70% alcohol, 25%KOH.

3.2.4 Sample size :

A total of 180 fecal sample of domestic ruminants were collected from the Kagbeni and Chhusang village.

3.2.5 Collection of samples :

Fresh fecal samples of 60 sheep, 60 goat and 60 cow (Photo: 1) were collected from the Kagbeni and Chhusang village during the morning time (6-7) in April 2019. Collection was done by direct hand keeping method immediately after their defecation and kept in sterile vials using gloves and each samples were visually confirmed to be different from different individuals.

3.2.5 Preservation of the samples:

The fecal sample was preserved in 2.5% potassium dichromate that helps in maintain the morphology of parasite and preventing further development of some helminthic eggs and larvae.

After collecting the sample from the study area, the samples were transported to laboratory of Central Department of Zoology, Tribhuvan University, Kritipur for further processing.

3.2.6 Sample processing:

The samples were processed in the laboratory for detection of GI helminth parasites using concentration methods which includes floatation and sedimentation technique,

3.2.6.1 Floatation techniques:

Nematode and cestode eggs present in domestic ruminant's faeces are detected through this method. This method ensures the egg float in the floatation liquid (conc. NaCl solution), which helps to identify the egg (Arora, 2014).

Approximately 3 gm of faecal sample was taken in a beaker and added 20 ml of water then the sample was grinded lightly with the help of mortars and pestle and filtered the solution by tea strainer. The filtrate solution was poured into a centrifuge tube of 15 ml and centrifuged at 1000 rpm for 5 minutes. The tube's water was replaced with saturated sodium chloride solution and again centrifuged.

After centrifuge more saturated sodium chloride solution was added to develop convex surface at the top of the tube and one drop of methylene blue was added where a cover slip was finely placed for a few minutes (15 min.) and then cover slip was removed and placed on a slide and examined at 10X and 40X. Photographs of eggs of parasites were taken and identified based on morphological characters.

3.2.6.2 Sedimentation techniques:

Concentration of intestinal parasite by sedimentation techniques, using either gravity or centrifugation, leads to a good recovery of eggs of Trematodes. Eggs of parasites settle and are concentrated at the bottom because they have greater density than the suspending medium (Arora, 2014).

A drop of deposited materials deposited at the bottom of test tube was taken with the help of pipette and placed on the slide, and added a drops of methylene blue into it and examined under the microscope at 10X and 40X (Photo: 2).

3.2.7Questionnaire survey:

A questionnaire survey was conducted among each 30 farmers from upper and lower Mustang. The questionnaire was divided into three sections to assess the knowledge, attitude and practices of the farmers (Photo: 3, Photo:4).

3.2.8 Identification of eggs and larvae of parasites :

Eggs and larvae of parasites were identified on the basis of morphological characters compared with publish articles, reports and thesis (Purja,2015, Achhami,2016)

3.2.9 DATA ANALYSIS:

The presence and absence of parasites data were entered in Ms Excel 2008, from where prevalence was identified, and chi-squire and p value were calculated in R-software.

Photo 1:Collection of stool of cow

Photo 2: Microscopic observation of slide

Photo 3: Questioning with farmers.

Photo 4: Questioning about lulu cow

4.RESULTS

4.1: Prevalence of helminth parasites in domestic ruminants of upper and lower Mustang:

Domestic ruminants of Mustang, either reared as meat purpose (sheep and goat) or reared as milk purpose(cow) were found to be infected with maximum helminth parasites. In three of them helminth parasites prevalence rate was found more than 50% (Figure: 3). Parasitic prevalence rate in these three species of domestic ruminants were found to be insignificantly associated (χ^2 =0.25 and p value=0.88).

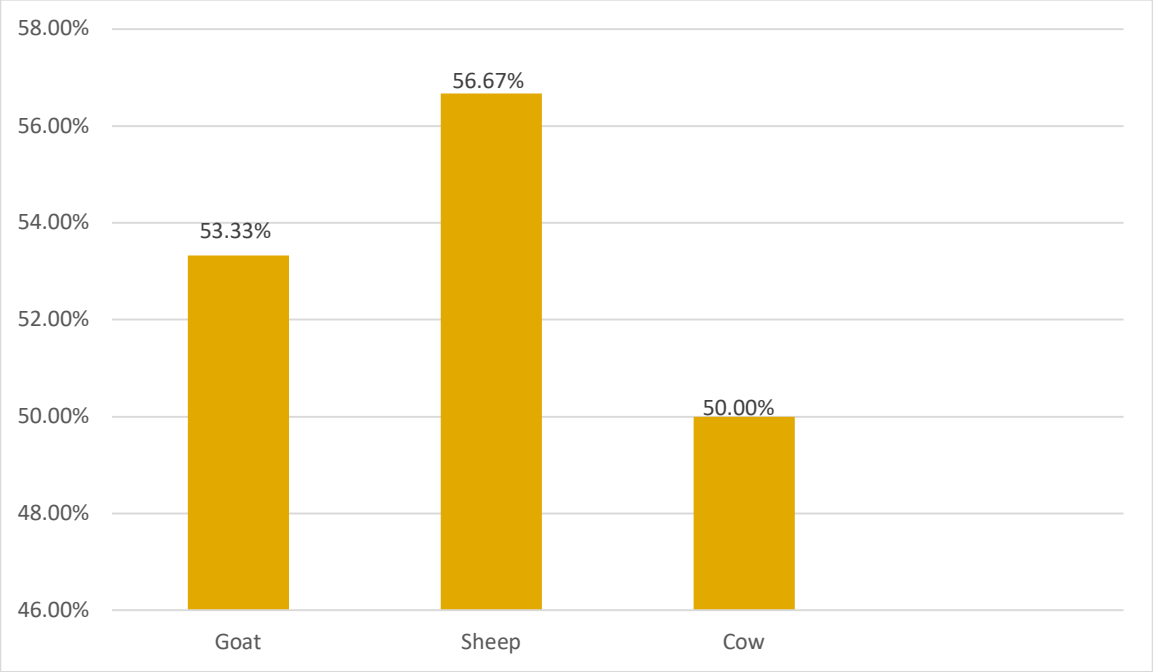

Figure 3- General prevalence of helminth parasites among domestic ruminants of upper and lower Mustang.

In order to find out the parasitic prevalence between the domestic ruminants of upper and lower mustang, the results were compared. The result showed almost similar prevalence rate of parasitic infection in all domestic ruminants of upper and lower mustang (Figure: 4)

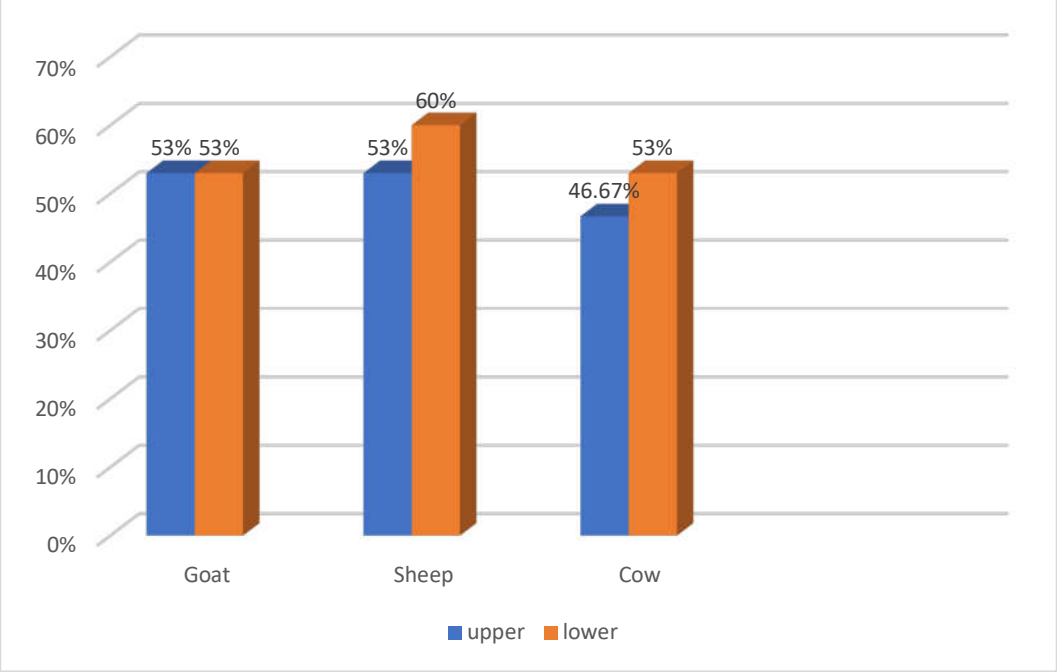

Figure 4- Comparison of helminth parasites among domestic ruminants of upper and lower Mustang.

Although there is similar parasitic prevalence among the domestic ruminants of upper and lower mustang, single host can be infected with either single parasites or more than one parasites. Multiple infection of the parasites can cause serious health impact. To find out the concurrency of parasitic infection single, double and multiple infection was checked. The result showed that one host was infected with more than one type of genera of nematodes parasites. Among the domestic ruminants goat were mainly infected by *Strongyloides* sp (Photo: 5) and showed the highest prevalence of single infection by 33.333%. Similarly, sheep were more infected by group of parasites like *Strongyloides* sp., *Muellerius* sp. *(*Photo:6*), Strongyle* sp. *(*Photo:7*), Trichuris* sp. *(*Photo: 8*), etc* and revealed the highest prevalence of multiple infection by 15% (Figure: 3).

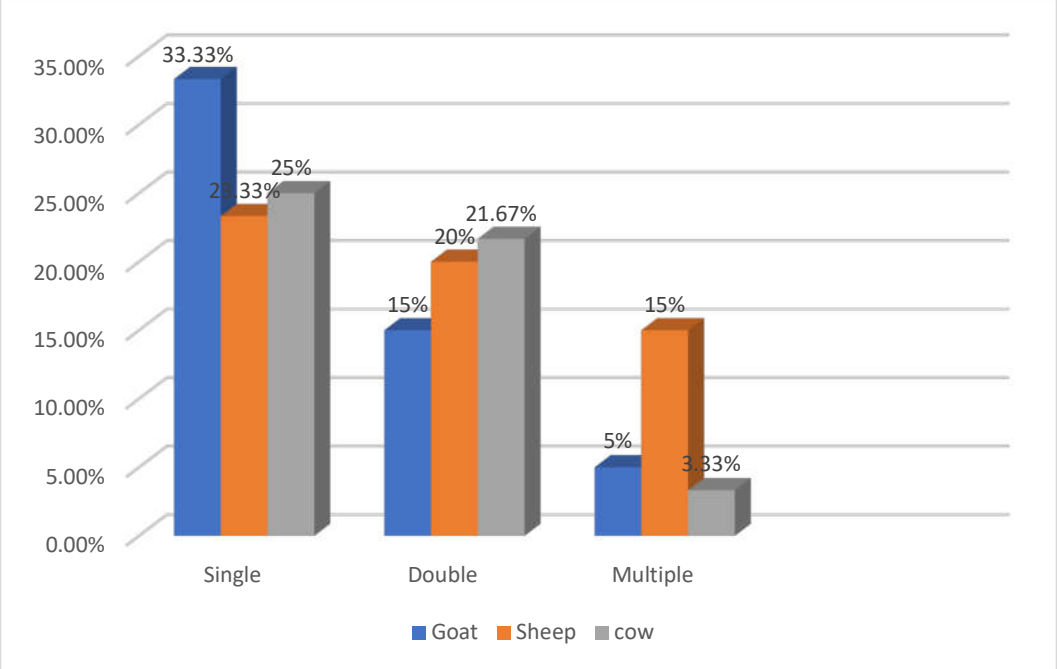

Figure 5: Mixed infection of parasites among domestic ruminants

Altogether eight nematode parasites were reported from both upper and lower mustang. *Strongyloides* sp. from hookworm family shows the highest prevalence in all domestic ruminants in both upper and lower Mustang, although there is no significance association between them (Table:1). Another species from hookworm family i.e. *Strongyle* sp. showed the similar prevalence as *Strongyloides* sp. in all domestic animals. However, *Haemonchus* sp. (Photo: 9) is only reported from goat in both upper and lower Mustang. The *Muellerius* sp., lung nematode parasites were also found to be highly infected in all domestic ruminants of Mustang. Although the statistical association was not significant goats of both upper and lower Mustang were found comparatively highly infected with this parasites than sheep and cow (Table:1).

Table 1: Prevalence of gastrointestinal helminth parasites in goat, sheep and cattle of upper and lower Mustang

SN	Parasites	Upper Mustang					Lower Mustang				
		Goat	Sheep	Cow	χ^2	P-value	Goat	Sheep	Cow	χ^2	P-value
1	*Strongyloides* sp.	16.67%	23.33%	20%	0.33	0.84	23.33%	26.67%	23.33%	0.090	0.95
2	*Strongyle* sp.	13.33%	26.67%	13.33%	2	0.37	10%	26.67%	20%	2.23	0.32
3	*Ascaris* sp.	6.67%	10%	6.67%	0.29	0.87	3.33%	3.33%	3.335	0	1
4	*Nematodirus* sp.	6.67%	16.67%	6.67%	3.25	0.96	6.67%	10%	6.67%	0.28	0.86
5	*Muellerius* sp.	23.33%	16.67%	6.67%	2.7	0.25	13.33%	10%	3.33%	1.75	0.41
6	*Haemonchus* sp.	3.33%	-	-	2	0.36	3.33%	-	-	2	0.36
7	*Trichostrongyloides* sp.	-	3.37%	6.67%	2	0.36	3.33%	-	10%	2	0.36
8	*Trichuris* sp.	6.67%	20%	16.67%	2	0.36	13.33%	23.33%	16.67%	3.5	0.17

Table 2: Comparative prevalence of GI helminth parasites among goat, sheep and cow

SN	Parasites	Goats of upper and lower Mustang		Sheeps of upper and lower Mustang		Cows of upper and lower Mustang	
		χ^2	P-value	χ^2	P-value	χ^2	P-value
1	*Strongyloides* sp.	0.33	0.56	0.067	0.79	0.07	0.78
2	*Strongyle* sp.	0.14	0.76	0	1	0.4	0.52
3	*Ascaris* sp.	0.33	0.56	1	0.31	1	0.31
4	*Nematodirus* sp.	0	1	0.5	0.47	0.33	0.56
5	*Muellerius* sp.	0.81	0.36	0.5	0.47	1	0.31
6	*Haemonchus* sp.	0	1	-	-	-	-
7	*Trichostrongyloides* sp.	1	0.31	1	0.31	0.2	0.65
8	*Trichuris* sp.	0.66	0.41	0.78	0.78	0	1

4.2: Parasitic prevalence in domestic ruminants of Mustang in relation to KAP

The knowledge, attitude and practices of farmers have direct as well as indirect relation in their domestic ruminant health status, knowledgeful farmers can take good care of their livestock to keep them healthy. Since most of the helminth parasitic transmission is related to the farmers practices on their feeding, grazing etc of their livestock . farmers attitude and practices towards the diseases have direct influence on getting their livestock infected with helminthic parasitic infection. In order to assess parasitic prevalence KAP survey was carried out.

Table 3: General prevalence of GI helminth parasites in livestock in relation to knowledge and attitude of the farmers.

Questionnaire	Option	No of farmers(60)	P-value	Parasitic prevalence		
				Goat	Sheep	Cow
Common disease	Foot and mouth	33.67%	0.00016	55.35%	54.29%	33.23%
	Diarrhea	28.67%	0.009823	35.5%	26.33%	25.25%
	Skin disease	18.33%	1.344e-08	16.67%	20%	11.67%
	Respiratory problem	10%	0.0001585	25%	25%	18.33%
	Mycosis	6.67%	0.0006113	8.33%	6.67%	10%
	Abortion	3.37%		-	3.33%	8.33%
Ectoparasites in livestock	Yes	33.33%		6.67%	6.67%	10%
	No	66.67%	0.009823	38.33%	36.67%	41.67%
Role as vector	Yes	86.67%		8.33%	11.67%	6.67%
	No	13.33%	1.344e-08	31.67%	25%	18.33%
Grazing land as source of disease transmission	Yes	58.33%		41.67%	33.33%	31.67%
	No	25%	0.0001585	13.33%	11.67%	13.33%
	Don't know	16.67%		8.33%	8.33%	6.67%
Mixed herd as a source of disease transmission	Yes	56.67%	0.0006113	16.67%	20%	11.67%
	No	20%		25%	20%	18.33%
	Don't know	23.33%		8.33%	6.67%	8.33%

Structured questionnaires were prepared to assess the knowledge attitude and practice of the farmers. According to the farmers most commonly seen disease in Mustang district was foot and mouth disease. It was seen in highest rate in goat and sheep compared to cow. Along with foot and mouth disease another prevalent disease was observed for diarrhea. However, abortion was also seen in few extent in sheep and cow but completely absent in goat. Survey revealed that domestic ruminants were more likely to be infected with endoparasites than by ectoparasites. Although 86.67% of farmer believe ectoparasites play an role as a vector for disease transmission. Farmers also believe grazing land and mixed herd are also the source for disease transmission (Table.3).

Table 4: General prevalence of GI helminth parasites in livestock in relation to husbandry practice of the farmers.

Questionnaires	Option	N(60)	P-value	Goat	Sheep	Cow
Source of food	Grass+ supplementary	100%	-	56.67%	53.33%	50%
Source of water	Tap water	75%	0.0001075	43.33%	41.67%	38.33%
	River water	25%		25%	25%	21.67%
Veterinary check up	Twice a year	21.67%	1.95	8.33%	6.67%	6.67%
	Once in a year	66.67%		13.33%	13.33%	11.67%
	Never	11.67%		35%	33.33%	38.33%
Type of treatment	Veterinary	73.33%	3.958e-10	8.33%	8.33%	6.67%
	Traditional	15%		10%	10%	10%
	None	11.67%		38.33%	36.67%	41.67%
Cleaning of sheds	Daily	28.33%	0.001369	8.33%	6.67%	11.67%
	In a week	43.33%		8.33%	6.67%	10%
	In a month	20%		16.67%	20%	11.67%
	In a year	8.34%		25%	20%	18.33%
Type of shed	Mixed	75%	0.0001075	45%	48%	40%
	separate	25%		35%	39%	32%

Among the respondents, maximum farmers provides tap water to their livestock compared to river water but parasitic prevalence was found maximum in sheep, goats and cows. Those ruminants that are never checked up in veterinary as well as treated with any types of drugs were more infected while ruminants treated in veterinary once a year were less infected than those never treated animals. Similarly, those animals which are checked up in veterinary twice a year seemed to be less infected with parasites. Cleaning interval of sheds also plays a significant role to get infected with parasites. Those farmers who clean their sheds once a week have less infected animals than those who clean their shed once a year. Most of the farmers (25%) had separate sheds for cows but they used to kept sheep and goats together. (Table:4)

Photo 5: *Strongyloides* sp.

Photo 6: *Mullerius* sp.

Photo 7: *Strongyle* sp.

Photo 8:*Trichuris* sp.

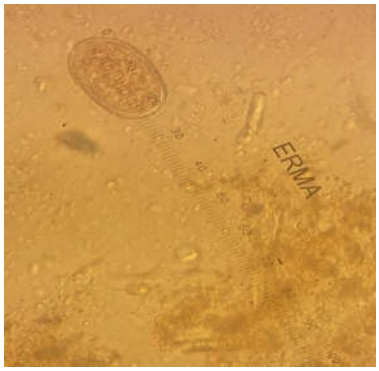

Photo 9: *Haemonchus* sp.

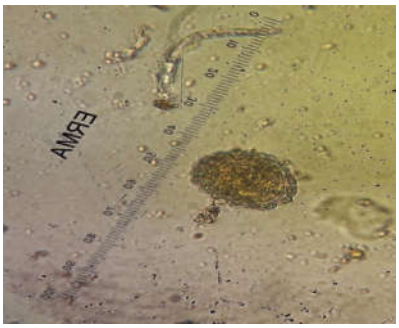

Photo 10: *Ascaris s*p.

Photo 11:*Trichostrongylus* sp.

Photo 12: *Nematodirus* sp.

Table 5: Morphometric characteristics of parasites for their identification

S.N	Name of parasites	Morphological characters	Reference values (Soulsby, 1982)
1.	*Strongyloides* sp.	Eggs are oval with rounded, edges or ellipsoidal, thin shelled and contain fully developed larvae that can be seen under low power	40-60 µm X 20-40µm
2.	*Trichostrongylus* sp.	Irregular ellipse dissimilar, kidney-shaped not very wide poles, one of which was more rounded than the other dissimilar side-walls.	70-108µm X 41-54 µm
3.	*Haemonchus* sp.	Eggs are oval, thin-shelled, and grayish in color.	70-85 µm X 41-48 µm
4.	*Ascaris* sp.	Eggs are elongated covered with rough, blumpy outer surface.	50-75µm X 40-50µm
5.	*Trichuris* sp.	The eggs are lemon (or barrel) shaped with a characteristic plug at either end giving it a tea tray appearance, brown in stool samples	70-80µm X 30-42µm
6.	*Nematodirus* sp.	swollen head preceded by a thin neck, large size and length and the filamentous shape at the ends of the sheath tail.	152-182 µm X 67-77µm
7.	*Muellerius* sp	Posterior end of body often curled	70-90µm X 40-45 µm
8.	*Strongyle* sp	Thin-shelled. Broad ellipse. Barrel-shaped side walls.	75-92X µm X 41-54 µm

5. DISCUSSION

One of main economic source of people living in mustang district is agriculture besides tourism. Along with agriculture they also reared sheep and goat for meat purpose and cow for milk purpose. The Mustang region people is seeing an increase in the commercial production of mountains sheep and goats (Republica,2016). Lulu cow is native to Mustang district and is popular among people as they give more milk which is sufficient for a family.

Various disease reduces the productivity of livestock. Among the livestock diseases helminth parasites infections of animals cause direct as well as indirect effect economic losses to the farmers. The economic losses are closely associated with some extent to the pathogenic effect of helminth parasites. In Nepal a checklist of 168 species of helminth parasites has been compelled with 33 species belonging to trematodes, 67 species to the nematodes and 36 to the cestodes (Gupta,1997).

Sheep and goat that are reared in mustang district for meat purpose are infected with helminth parasites and showed the prevalence more than 50%. This result is relatively higher than the report on intestinal helminth parasites in goats of Roshi rural municipality-11, Nepal (Sukupayo and Rayamajhee, 2018), their finding showed 17.34% prevalence. While it is lower than the report on sheep in Ghanpokhara, Lamjung (78.31%) (Acharya,2017). This difference might be attributed to the difference in animal species and environmental condition for the parasitic stage of larvae growth. In Mustang region lulu cow were domesticated for purpose of milk which were infected by the parasitic prevalence of 50%. But in other mountainous region yak were domesticated for the milk production and they are also affected with parasites. This result is lower than the report on yaks of Ghumdel, VDC, Ramechhap which is 90.38% (Shrestha, 2013). This could be due to effect of environmental condition for the existence of parasites. Information on the prevalence of gastrointestinal helminth infection in high altitude ruminants is limited. Although some research revealed some helminth infection in sheep goat yak and chauries but there is no information for lulu cow.

Present study recorded lower prevalence of gastrointestinal parasites in goats compared with the study carried out by Pandey (2008), Parajuli (2007), Tripathi and Subedi (2015), and Rijal (2010), who recorded 80%, 81.53%, 67.92%, and 65% helminthaitis from Birgha, VDC, Syangja, Khasibazar, Kalanki (Kathmandu), Shivraj, Municipality, Nepal and Khilijee Argakhachi Nepal respectively. In Karrnali, Nepal 87.5% sheep were infected with GI parasites (Khakural *et al.,* 2008) which is higher than present study. Similarly, Dhakal (2008) and Dhakal (2011), showed highest prevalence on cattle than present study 75.5% and 70% from Anarmani VDC, Jhapa and Mukundapur VDC,02 Nawalparasi.

A study carried out in seasonal prevalence of GI parasites of sheep and goats of Kenya showed 52% prevalence with *Strongyle* sp. as highly prevalent parasites (Wanejala *et al.,*2002). This result is relatively similar to present result however, present result shows

Strongyloides sp. group as most prevalent genera. Similarly, present result is lower than the result of Regasa *et al,*. (2006) that showed 84% in western Oromia, Ethiopia. in goats. Bedasa *et al.,* (2016) conducted a study on helminth parasites of cattle in Central Ethiopia and found that the overall prevalence of gastrointestinal helminthes parasites was found to be 68.2%, which is little bit higher than present findings. Allwin *et al.,* (2015) conducted a study in gastrointestinal parasites in Gaur and domestic cattle in Nilgiri Hills, in Tamil Nadu, India and revealed that the prevalence was 63.3% and 80% in wild Gaur and domestic cattle respectively. This result also showed higher prevalence than present study. Sylvia *et al.*, (2014) conducted survey to evaluate the presence of cattle in Indonesia and revealed 38.3% cattle were infected with gastrointestinal parasites, which is lower than the present results.

A study conducted on helminth parasites in Ganderbal, Kashmir on sheep and goats revealed 64.08% in sheep and 83.64% in goats (Bashir, 2009). This result showed higher prevalence than the present study. Similarly, 53.33% sheep and 66.45% goats were detected positive for GI parasites in Rawalpindi and Islamaba, Pakistan (Gandhi, 2009), which is almost similar for sheep and slightly higher in case of goats. Findings of Sultan (2016), was similar (50%) to present findings in case of sheep in Kafrelsheikh, governorate, Egypt. Likewise, a study conducted by Shirale *et al*., (2008), was higher who found 66.28% prevalence in cattle in Western Vidarbha region with *Strongyle* sp. as predominant species. Prevalence of helminth parasites of cattle in Delta North, Delta state, Nigeria was similar to present report (58.46%) (lemy and Egwunyenga, 2018). Similarly, Kashyap *et al.,*(2014) reported 40.3% prevalence in Madhya Pardesh which lower than the present results.

Yadav *et al.,* (2006) conducted a study in GI parasite in Jammu found 83.24% in sheep and 80% in goats which is higher than our results. The prevalence of parasitic infection was higher in cattle 75% as compared to present findings (Marskole *et al.,* 2016). Leon (2019), conducted a study in Colombian Northeastern Mountain and found higher prevalence in sheep (63%) and similar case of cattle (50.5%). the overall prevalence of GI helminth parasites in cattle in Adekokwok, Lira District, Uganda was 32.2% which is lower as compared to the present study (Kagenda, 2018). Kemal (2013), findings was also lower than the present study (39.6%), in Gedebano Gutazer, Wolene district, Ethiopia.

In the present investigation, three types of infection i.e. single, double and multiple infection were observed. Among the goats single infection was found to be 33.33% and multiple infection 5%, which contradicts to the finding of Purja (2015) in Puranchaur VDC, Pokhara where single infection were recorded to be low (8.18%) and multiple infection was high (91.81%). Findings of Shiris (2018) was similar (39.47%) for single infection but higher (79.70%) in case of mixed infection in goat. According to findings of Neupane (2012), single infection was lower (24.03%) while mixed infection was higher (75.95%). Similarly, for sheep 33% single infection 20% double infection and 15% multiple infection was seen which is slightly different to the finding of Shiris(2018) in Devdaha, Municipality-3, Rupendahi, Nepal. Yak from Lehe VDC of Manasalu

conservation area showed highest infection with strongyle (47.23%) and the pattern of infection was both mixed (52.78%) and single infection (47.23%) (Byanju,2012). But present finding shows highest infection with *Strongyloides* sp. (25%) and pattern of infection single 25% and mixed 33%. The result of prevalence GI parasites of yak in lower Mustang shows 85.42% prevalence of parasites in which 6.25% single and 79.17% had multiple parasitic infections (Acharya et.al., 2016). Similarly, result on GI parasites in chauries in Ghumdel VDC, Ramechhap showed 42.55% single infection and 57.44% mixed (Shrestha, 2013).

A study conducted on intestinal helminth parasites of cattle in Anarmani VDC of Jhapa revealed higher result than present findings 14% single infection and 86% with mixed infection (Dhakal, 2008). Parajuli (2007) conducted a study on intestinal helminth parasites on goats in khasibazar, kalanki (Kathmandu) showed 71.82% mixed infection and 28.17% single infection which is almost similar for single infection and higher for mixed infection than present study. Dhakal (2011) found 50.76% single infection and 49.23% double infection on cattle of Mukundapur VDC, 02, Nawalparrsi.

Gandhi (2009), reports 42.22% single infection and 50.32% multiple infection in sheep and goats in Rawalpindhi and Islambha, Pakistan which is higher than present report. Similarly, Shirale (2008), found 62.29% single infection and 6% mixed infection on cattle of Western Vidarbha, region which is higher in case of single infection but similar for mixed infection.

All the farmers of Mustang districts feed supplementary foods along with the grass to their animals. In Banke, Nepal only 97% farmers provide supplementary foods (Neupane,2012). According to Hussain (2017), 94% of farmers provide supplementary foods to their goats in Tilottama Municipalty,17, Rupandehi. Similarly, in Devdaha, Municipality-3, Rupandehi only 90% of farmers provide supplementary foods to their goats (Shris, 2018). In Mustang 33.33% had seen ectoparasites in their animals however, 86.67% believed these ectoparasites play an role as a vector for disease transmission. Farmers of Mustang 75% provide tap water to their livestock but 50% provide clean water to their goats in Rupendekhi (Hussain,2017) and by 90% of farmers in Rupendahi (Shris, 2018). Only 73.33% of farmers used allopathic drugs in Mustang however, 100% 90%, and 90% of farmers used allopathic drugs in Banke, Nepal (Neupane, 2012) and Devdaha, Municiality-3, Rupendahi (Shris, 2018), puranchour VDC, Pokhara (Purja,2015).

6. CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion :

The present study was conducted to assess the prevalence of helminth parasites of high altitude domestic ruminants from upper (Chhusang) and lower (Kagbeni) of Mustang district. The over all prevalence rate of helminth parasites in goats sheep and cow was found to be 53.33%, 56.67% and 50% respectively. Altogether eight genera of parasites were found in this study. The most common encountered helminth parasites were *Strongyloides* sp., *Strongyle* sp., *Muellerius* sp. while the least common parasites were *Trichostrongylus* sp. and *Haemonchus* sp. However, there is no parasitic association between these three species of ruminants. Almost similar parasitic prevalence was seen between the lower and upper domestic ruminants.

The questionnaire survey conducted among the peoples of Mustang districts revealed that 33.33% had seen ectoparasites in their animals and 86.67% believed these ectoparasites play an role as a vector for disease transmission. Over 50% of the farmers had knowledge about mixed herd and grazing land play an role for transmission of disease. Majority of the farmers treat their animals with anthelminthic drugs once a year. While most of the farmers kept their livestock together which may be the reason for the similar parasitic prevalence in these animals. Cleaning interval of shed may also supports for the parasites transmission.

6.2 RECOMMENDATIONS

On the basis of our result and conclusion the following recommendation are made to reduce the risk of the gastrointestinal helminth parasites.

- Knowledge about use and benefits of deworming should be provided to the farmers.
- Regular check up of domestic ruminants should be carried out time to time.
- Common parasites may be due to sharing the same shed of sheep, goat and cow hence, need to be separated

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ANNEX

QUESTIONARE

Location:…… Spot: …….

Knowledge of the people :

Q .1 What are the common diseases of the animals?

1……. 2…….. 3…….. other ……

Q.2 Have you seen ectoparasites in your animal?

1. Yes 2.No

Q.3 What are they ……?

1. Lice. 2. Tick 3. Flea 4.Flies 5. Other

Q.4 Do these parasites transmit disease?

Yes/ Lice …… Tick ……. Flea ……. Flies …….. Other …….

Q.5 Have you ever seen worm in fecal matter?

1. Yes 2. No

Yes 1. Round. 2. Flat 3. Tape worm

Attitude of the people

Q.1 Do you think ectoparasites causes disease?

1.Yes 2. No

Q.2 What type of problem ectoparasites causes to the animals?

1. Disease. 2. Kill 3. Weak 4. affect on milking

Q.3 How ectoparasites transmitted from one animal to another?

……..

Q.4 Do you think grazing site play role for transmission of disease?

1. yes 2. No

Q.5 What type of pathology shown by the animal infected by endo parasites?

1. Thin 2. weak 3. loss of appetite. 4. other

Q.6 Do you think mixed herd helps to transfer disease?

1. yes. 2. No

Practices of people

Q.1 What type of shed?

1. separate. 2. Mixed

Q.2. How frequently you clean the shed of animals?

Daily 2. Weekly 3. monthly 4. yearly

Q.3 What type of food you feed your animals?

1.Grass. 2. other supplementary food. 3. Both

Q.4 What source of water you give to your animals?

1. tap water 2. River water

Q.5 How do you treat animal infested by ectoparasites?

1. Allopathic 2.Ayurvedic grasses

Q.6 Where do you treat animal infected with endoparasites?

1. Vet hospital 2. Home

Q.7 How frequently you treat animal infected with endo parasites?

1.twice a year 2. Once a year 3. Never