PREVALENCE OF GASTROINTESTINAL PARASITES IN GOAT (*Capra hircus*) OF MALARANI RURAL MUNICIPALITY, ARGHAKHANCHI, NEPAL

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T.U. Examination Roll No.: 451/073

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A thesis submitted in partial fulfillment of requirements for the award of the degree of Master of Science in Zoology with special paper Parasitology

Submitted to

Central Department of Zoology

Institute of Science and Technology

Tribhuvan University

Kirtipur, Kathmandu, Nepal

September, 2019

DECLARATION

I hereby declare that the 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 specifically acknowledged by reference to the author(s) or institution(s).

Date: 29 Aug 2019

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RECOMMENDATION

This is to recommend that the thesis entitled **"PREVALENCE OF GASTROINTESTINAL PARASITES IN GOAT (*Capra hircus*) OF MALARANI RURAL MUNICIPALITY, ARGHAKHANCHI, NEPAL"** has been carried out by Shrijana Khanal 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 work has not been submitted for any other degree in any institutions.

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LETTER OF APPROVAL

On the recommendation of supervisor **Mr. Pitambar Dhakal** this thesis submitted by Shrijana Khanal entitled **"PREVALENCE OF GASTROINTESTINAL PARASITES IN GOAT (*Capra hircus*) OF MALARANI RURAL MUNICIPALITY, ARGHAKHANCHI, NEPAL"** is approved for the examination and in partial fulfillment of requirements for Master's Degree of Science in Zoology with special paper parasitology.

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CERTIFICATE OF ACCEPTANCE

This thesis work submitted by Shrijana Khanal entitled **"PREVALENCE OF GASTROINTESTINAL PARASITES IN GOAT (*Capra hircus*) OF MALARANI RURAL MUNICIPALITY, ARGHAKHANCHI, NEPAL"** has been approved as a partial fulfillment for the requirements of Master's Degree of Science in Zoology with special paper parasitology.

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Thank you all.

Shrijana Khanal

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LIST OF ABBREVIATIONS

ADPC	Animals Disease and Parasitic Control Division
CDZ	Central Department of Zoology
i.e.	That is
IAAS	Institute of Agricultural and Animal Science
IIRR	International Institute of Rural Reconstruction
P. value	Probability Value
Df	Degree of freedom
Rpm	Round per minute
Sp.	Species
UVAS	University of Veterinary Animal Sciences
GI	Gastrointestinal

ABSTRACT

Gastrointestinal parasitic infection in goat is one of the causes of low productivity, morbidity and mortality. This study was conducted to determine the prevalence, intensity of infection and farm management system. Dropping samples were collected from 200 goats from Malarani Rural Municipality, Arghakhanchi, Nepal. Samples were collected in the month of February, 2019 and subjected to direct smear, sedimentation and floatation technique for coprological examination. The study revealed that of the 200 samples examined, 132 samples (66%) were found to be positive for gastrointestinal parasites covering seven genera. The most common parasites were found to be *Eimeria* sp. (59.5%), *Strongyle* sp. (33.5%), *Trichuris* sp. (23%), *Haemonchus* sp. (14.5%), *Strongyloides* sp. (13.5%), *Trichostrongylus* sp. (9%) and *Fasciola* sp. (4%). Altogether one genera of protozoa and six genera of helminths parasites were found. There was no significance difference between age wise and sex wise prevalence. Single infection was recorded as the highest (54.54%) followed by double (34.09%), triple (7.57%) and multiple (3.78%). From questionnaire survey some common risk factors were recorded during the study period, which were poor farm management system, contaminated food and water, ingestion of contaminated grasses, ingestion of moist aquatic plant near the river and grazing on contaminated field. These factors help to increase the gastrointestinal parasitic infection in goats.

1. INTRODUCTION

1.1 Background

Livestock is a group of domesticated animals that is reared in an agricultural setting (Azlan *et al*., 2018). Livestock plays a crucial role in the economy of developing country like Nepal. Goat farming is an additional source of income mostly in the rural area. Goat is one of the important livestock of our country. The importance of goat farming is that it satisfies the need as a meat product. Meat of goat is rich in protein, the body building constituent of our diet. Excreta of goat is used as manure in the agricultural fields and garden. Goat has a life span of 8-15 years. The weight of goat is approximately 20-100 kg. The gestation period is (145-155) days (Pathak, 2011).

Domestic goat is among the earliest animals domesticated by man and is worldwide distributed (Das *et al*., 2017). Livestock farming plays an important role in the farming system and goat contributes substantially in livestock sector in Nepal. Identified breeds of goat in Nepal are Chyangra, Sinhal, Khari and Tarai (Kharel, 1997). Rearing of goat is not expensive as compared to cow and buffalo. The people under the average economic range are encouraged to rear the goat so as to increase their income. In our country, people are encouraged to goat farming because demand of chevon is increasing day by day.

Gastrointestinal parasitic infection is a major cause of low productivity, unthriftness and occasionally death in the farm animals (Sood, 1981). Intestinal and stomach worms occur in all the species of young and malnourished animals of both sexes and the lactating animals are suitable for these parasites. Stomach worm mostly affects camel, goat and sheep. Different types of worm are mainly transmitted through eggs or larva. The problem is mostly common in the rainy season (IIRR, 1996).

Gastrointestinal parasites affect the health status of animals and cause economic losses to the livestock industry. The results of infected animals are reduced weight gains, reduced food conversion rates infertility and reduced meat and milk production rates.

Among different types of parasitic infections, gastrointestinal disease is most varied and of common occurrence. Different types of infection with flukes, tapeworms and roundworms are responsible for marked deleterious effects that tend to lower the overall production rates by morbidity and mortality.

1.2 Endoparasite

A parasite is an organism that lives on or within another living organism. Parasites are classified as ectoparasite and endoparasite on the basis of them live on body cavity or inside the body. Parasites that live on their host are called ectoparasites (external parasites) and their presence is called an infestation. Parasites that live in their host are called endoparasites (internal parasites), and their presence is called an infection. Those organisms which are living in their hosts in the gut, liver, body cavity, gall bladder, lungs and blood and within the intestinal cavities, tissues and cell of the host are endoparasites. *Trichostrongylus* sp., *Fasciola* sp., *Schistosoma* sp., are typical example of endoparasites.

Intestinal parasites

1.3 Protozoan parasites

Protozoan parasites are microscopic, unicellular organism which have complex internal structure and perform various metabolic activities such as digestion, reproduction, respiration, excretion, etc. some protozoan parasites which commonly found in intestine of herbivorous include *Eimeria* sp., *Entamoeba* sp., *Giardia* sp.

1.4 Helminthes

1.4.1 Nematodes

Nematodes are commonly called as roundworms and found in aquatic habitats, soil, snowy tundra's, and hot deserts, inside animals and plants. It is cosmopolitan. *Trichostrongyloid* sp., *Haemonchus* sp., *Nematodirus* sp., *Trichuris* sp., *Strongyloides* sp., *Toxocara* sp., *Cappilaria* sp., *Chabertia* sp., Strongyle sp., *Bunostomum* sp., etc. are common intestinal nematode of sheep and goats. Most of the nematodes have direct life cycle consisting of an egg stage, larval stages and adult stage. Male is smaller than the female and using it's bent tail to hold female, injects sperm into the female ovary, to fertilize an egg. Nematodes are typically elongate, tapered at both ends and bilaterally symmetrical. It has a mouth, pharynx, intestine and anus.

Life cycle of nematode can be divided into two phases, free living phase in external environment and parasitic phase in the host. Anorexia, diarrhea, emaciation, anemia etc. are common clinical symptoms of the infection with gastrointestinal nematodes. Female nematodes lay eggs that pass in the manure of cattle. Within few day's larva hatches from the egg. The larva passes via second and third stage and infects the pasture. Goats get

infected when they graze on the contaminated pasture. Larva mature in the intestine, mate and starts laying eggs. Effect of these parasites is dependent on the number of parasites and nutritional status of the animal. They cause economic losses by various ways such as lowered fertility, reduced work capacity, involuntary culling, reduction in food intake and reduced weight gains, decrease milk production rate, treatment costs and mortality in heavy parasitized animals (Lebbie, 1994).

1.4.2 Trematodes

Trematodes commonly known as flukes, often live in the bile ducts or small intestine and may also affect lungs. Some are ingested and some burrow into the skin for access. Eggs of trematodes are passed in the feces of the host. *Fasciola* sp., *Schistosoma* sp., and *Paramphistomum* sp. are included in trematode (Shah and Agrawal,1990). *Fasciola* Sp., *Paramphistomum* sp., *Dicrocoelium* sp., *Schistosoma* sp. etc. are trematode species that have been reported in domestic ruminants. Trematode infections occur worldwide, Trematodes have complicated life cycles with alternating asexual and sexual developments in different hosts.

Fascioliasis is well known parasitic disease of herbivorous animals. It has worldwide in distribution on the animal reservoir host. The economic loss due to fascioliasis in Nepal was estimated to be Rs 14.2crore (Lohani and Rasaili,1995).

The life cycle of fascioliasis is complex. It involves the final host (where adult worm lives), an intermediate host (where the larval stages of worm develop) and a carrier (entailing suitable aquatic plants). The process starts with infected animals (cattle, sheep, buffaloes and other herbivores) defecate in fresh water sources. Since the worm lives in the bile ducts of such animals, its eggs are evacuated in feces and hatch into larvae that lodge in a particular type of water snail (the intermediate host), man and herbivorous animal acquire infection by the ingestion of moist and raw aquatic plants such as water cress harboring infecting metacercariae. The metacercariae mature to become adult worm and lay eggs which are passed in feces.

Rice straw which is major feed for livestock during winter months has been reported as the potential source of infection for fascioliasis (Joshi, 1994). Green grasses near from the permanent water sources of water lodging areas in monsoon are another potential source of fascioliasis infection. Therefore, in terrain region of Nepal, the major risk period of fascioliasis infestation during post monsoon and winter months. Chronic fascioliasis

occur in all seasons and clinical signs may include anemia, reduced weight gain, decreased milk production, unthriftness, submandibular oedema and possibly death. Acute fascioliasis occurs seasonally and is manifested by anemia and sudden death. The penetration of the liver capsule by a large number of young flukes result in an inflammatory response and the associated blood loss results in anemia Likewise the trematode *Dicrocoelium*, gastrointestinal trematode *Paramphistomes and Schistosomes* the blood trematodes affect the host abundantly.

Paramphistomum sp. is one of the common parasites in the rumen of sheep, cattle and water buffaloes. The parasite causes ruminitis, irregular ruminition, unthriftness, decrease nutrition conversion rate, and loss of body condition, decrease in milk production and reduction of fertility. It is worldwide in distribution but the highest prevalence has been reported in tropical and subtropical regions, particularly in Africa, Asia, Australia, Eastern Europe and Russia (Melaku and Addis, 2012).

1.4.3 Cestodes

Cestoda (Cestoidea) is a class of parasitic flatworms of the phylum Platyhelminthes. Cestodes also called tapeworms that have a flat, ribbon like body and live in the digestive system of their hosts. Some species can be as long as 50m e.g. *Taenia solium, Taenia saginata, Moniezia species, etc.* Tapeworms have indirect life cycles that require the passage through at least one intermediate host (Insects, Mites, other Mammals) where the various developmental stages suffer considerable morphological changes. The head or scolex, has one or more hooked suckers for firm attachment to the host behind the head is the neck which is the growing region. The body consists of segments, each containing reproductive organs.

Moniezia sp. Of sheep and goats causes infection by ingesting herbage contaminated with the mites (carrier) carrying the infective stage of the parasite. *Moniezia* sp. inhabit the small intestine of mammalian host. The complete life cycle requires two hosts, ruminants as definitive hosts and mites as intermediate hosts. Eggs are passed out from the intestine of the ruminant host along the gravid proglottids in the feces into the soil. Heavy infection causes diarrhea and poor growth in lambs. *Taenia* sp. the adult tapeworm lives in the intestine of definitive hosts. The infection caused by *Taenia* sp. is called taeniasis. Humans are the definitive hosts for *Taenia saginata* (beef tapeworm) segment passes out along with the feces of human and when ingested by animals infects them.

1.5 Objectives

1.5.1 General objective

To determine the prevalence of gastrointestinal parasites in goats of Malarani Rural Municipality-1, Arghakhanchi, Nepal.

1.5.2 Specific objectives

- To determine the intensity of infection in goat.
- To assess the husbandry practice and knowledge of farmers in relation to management of goat.

1.5.3 Hypothesis

Husbandry practice may influence the parasitic prevalence in goat gastrointestinal parasites.

1.6 Significance of the study

Most of the Nepalese people depend upon agriculture and animal husbandry. The goat farming is done in poor and unhygienic manner in many places of Nepal and hence infected with different parasites including gastrointestinal parasites. In these conditions this type of study can play an important role. This study has been focused on the gastrointestinal parasites in goats of Malarani Rural Municipality. Goat farming is major source of financial resource of villagers. The infection of gastrointestinal parasite can cause significant economic loss leading to poor health. This study will be helpful to formulate effective control strategies against gastrointestinal parasites in goats for the development of strategic deworming program. In this study an effort has been made to identify the prevalence of gastrointestinal parasites. Moreover, the present study may be helpful for the future researchers and investigators to advance their knowledge.

2. LITERATURE REVIEW

Those parasites that infect the gastrointestinal tract of ruminants and other animals are called gastrointestinal parasites. The condition in which parasite infect the gastrointestinal tract of humans and other animals is known as an intestinal parasite infection. There are two types of gastrointestinal parasites, they are protozoan and helminths parasites that reside in the intestine (not all). Parasitic zoonosis occurs worldwide in distribution and also an important group of diseases affecting both human and animals. Some of the parasitic zoonosis produces significant mortality and morbidity in the human and responsible for the major economic loss by affecting animal health. Gastrointestinal parasitic infections are common in goats causing considerable economic losses as a consequence of mortality an infected animals and reduced weight gain.

2.1 Global Context

Eimeria sp.**,** *Cryptosporidium* sp., *Entamoeba* sp., *Giardia* sp., etc. are common coccidian parasites that infect ruminants. The parasitic disease caused by coccidian parasite is known as coccidiosis. Intestinal coccidian parasites are important cause of diarrhea, dysentery, poor growth rate in ruminants which have direct impact on economic sector to the farmers.

The coccidian parasite *Eimeria* sp. has been reported from goats of various countries like Kenya (Munyua *et al.*, 1990), Costa Rica (Jimenez *et al.*, 2007), Iran (Gharekhane *et al.*, 2015) etc. Similarly, farmers of several Asian countries suffer from heavy economic loss due to *Eimeria* sp. Coccidiosis has been reported from Asia continent in goats Thailand (Sangvaranond *et al.*, 2005), Iran (Khosvagtiand and Tovassoli, 2010), South American Continent e.g. (Radavelli *et al.*, 2014). *Cryptosporidium* sp. has been from Asian Continent e.g. Thailand (Sangvaranond *et al.*, 2005). From South American Continent e.g. Brazil (Radavelli *et al.*, 2014). *Giardia* Sp. has been reported from Asian continent e.g. Thailand (Sanguaranond *et al.*, 2005), Myanmar (Lay 2007), North American continent e.g. United States (Santin *et al.*, 2012), South American continent e.g. Brazil (Radavelli *et al.*,2014).

Jitendra *et al.*, (2001) conducted a research on prevalence of gastrointestinal parasites in sheep and goats of Himanchal Pradesh, India and found the prevalence in sheep and goats respectively., *Fasciola* 9.65%, 8.8%; *Amphistomes* 3.8%, 2.5%; *Dicrocoelium* 7.2%, 2.5%; *Schistosoma* 1.2%, 0.6%; *Moniezia* 2.7%, 1.3%; *Strongyles* 91.6%, 100%;

Strongyloides 4.8%, 5.1%; *Dictyocaulus* 1.2%,1.3%; and *Trichuris*14.3%,1.3%. Wanjana *et al.*, (2002) Studied in 150 sheep and 150 goats during wet season (May-June) and dry season (August-September) from pastoral community in Narok district, Kenya which revealed that 5.2% animals were infected. The most prevalent genera of helminths identified were *strongyl* group. In Bangladesh Mondal *et al.*, (2002) reported Six species of nematode and one cestode from cow calves and goats. The nematode species were *Haemonchus contortus*, *Trichostrongylus axei*, *Measstocirru digitaus*, *Oesophagostomum* Sp., *Trichuris* sp., and *Bunostomum* sp. The cestode was one of the genus *Moniezia.*

Regasa *et al.*, (2003-2004) conducted a study on epidemiology of gastrointestinal parasites of goats in Western Oromia, Ethiopia. This study showed that the overall prevalence of gastrointestinal parasites was 84% in goats. Nematodes of group *Strongyle* and *Eimeria* from protozoan were the most prevalent parasites. In Machackos district, Kenya, Waruiru, Otieno and Mutune (2005) revealed the overall prevalence were *Strongyloides* (51.6%), *Fasciola* sp. (31.5%), Coccidian (28.0%), *Moniezia* sp. (2.5%), Haemonchus (58.0%) the most prevalent nematodes followed by *Trichostrongylus* (29%) and *Oesophagostomum* (13%). Yadav et al., (2006) studied out of 520 fecal samples from 245 sheep and 275 goats were examined 83.07%were positive in Jammu district, India which revealed that gastrointestinal parasitic infection in sheep, lambs hoggets, goats and kids were 83.24%, 80.00% ,84.72% and 80.55% respectively. *Strongyles* (44.62%) were predominant followed by *Amphistomes (*8.07%), E*imeria* sp. (6.73%), *Fasciola* sp. (3.08%), *Trichuris* sp. (3.08%), *Dicrocoelium* Sp. (1.92%), *Strongyloides* sp. (1.15%) and *Moniezia* sp. (0.96%). Mixed infection with one or more gastrointestinal ova was detected in 13.46% of animals. Seasonal variation was recorded throughout the year and was highest during rainy season (88.54%) followed by summer (83.15%) and winter (76.01%).

Shirale and Maske (2007) revealed that out of 1173 fecal samples of goat examined 65.47% (768) were positive in Nagpur, India. They also found prevalence was high during peak monsoon. Rajapakse et al., (2008) conducted a research on gastrointestinal tracts of 218 crossbred goats. Representing the dry zone of silence during a year study period 217 (more than 99%) of the animals examined are infected with one or more species of nematodes. Five species of nematodes were found in the abomasum and intestine. They were *Oesophagostomum colambiamum* (88%), *Haemonchus contortus* (81%), *Trichostrongylus colubriforms* (76%), *Trichostrongylus* axei (59%) and *Trichuris*

ovis (59%). Domke *et al*., (2013) reported trematode infection from sheep and goats of European Continents from Norwey. Singh *et al*., (2015) carried out a research on prevalence of gastrointestinal parasitic infection in goat of Madhya Pradesh, India. Total of 960 samples were examined, 907 samples were found positive for one or more gastrointestinal parasite, where infection of coccidian was predominant (82.4%0 f0ll0wed by followed by *Strongyles.*

Zvinorova *et al*., (2016) carried out a survey on prevalence of gastrointestinal parasitic infections in goats in low-input, low –output farming system in Zimbabwe. Highest prevalence was determined by *Eimeria* oocysts followed by *Strongyles (*31%) and lower levels in trematode and cestodes. Das *et al*., (2017) conducted a research on gastrointestinal parasitism of goats in hilly region of Meghalaya, India.834 fecal samples of goats were examined and found overall prevalence of gastrointestinal parasitic infections in goat was 28.65%. highest infection was recorded during rainy season (34.92%) followed by cool (26.87%), hot (26.62%) and cold (20.39%). Helminths and protozoa infections were recorded in 63.60% and 23.02% animals, respectively. Azlan, Yusaf and Mohammad (2018) reported that out of 120 fecal samples of goat examined 74.17% (89) were positive in Pahang, Malaysia. The species found were *Haemonchus contortus*, *Trichostrongylus* spp., *Trichuris ovis*, *Oesophagostomum* spp., *Ostertagia* spp., and *Strongyloides papillosus*.

2.2 National Context

Thakur and Thakuri (1992) reported that the prevalence of parasitic infection in goats was 100% during the month of July in Western Nepal. Dhakal and kharel (1998) analyzed the hospital cases at Chitwan veterinary hospital and reported the incidence of liver fluke in sheep and goats to be 26%and 58% and incidence of nematode to be 14% and 5% respectively. Nirmal (2000) conducted a research on study of major diseases of goats in far western region of Nepal and reported that 71% cases were positive as parasitic diseases, among which 61% due to coccidians and 54.6% due to *strongyloides*. Parajuli (2007) studied intestinal helminthes parasite of goat (*Capra hircus*) and revealed that 181(81.53%) positive samples among 222 total samples from Khasi bazzar of Kalanki, Kathmandu. Acharya (2008) conducted a research on gastrointestinal parasite of goat in IAAS livestock farm and recorded *Haemonchus*, *Chabertia*, *Ostertagia*, *Strongyloides, Nematodirus* were the common parasites. The fecal samples examination showed that out

of 20 samples collected from goats of IAAS farm, 90% were positive for eggs of one or more types of Gastrointestinal parasites.

Bashir (2009) carried out a study to determine the seasonal prevalence of intestinal helminth parasites of goat (*Capra hircus*) and found (46%) infected cases in winter out of 100 samples and 112(90.3%) sample were found positive in summer out of 124 samples. Rijal (2010) studied to determine the seasonal prevalence of helminth parasites in goats of khiljee, Arghakhanchi. During examination of samples of summer, winter and rainy season170 hosts were found to be infected out of 250 hosts. Overall outcome of the study was 68% prevalence. This study showed 48.82% trematode infection, 26.47% cestode infection and 74.70% nematode infection. Pathak (2011) carried out a study to determine the prevalence of intestinal parasite of goat from Khasi Bazzar, Kathmandu. Out of the 202 samples,161 samples were found positive for parasitic infection. The infection with nematode was highest 69.30% followed by trematode 5.94% and lowest was cestodes 4.45%. Neupane (2012) reported *Strongyloides* and *Haemonchus* were found high in goats. Karki *et al*., (2012) carried out a research on seasonal prevalence of helminths parasites in goat (*Capra hircus*) in kalanki (khasi bazzar), Kathmandu Nepal. Highest prevalence of *Dictyocaulus* (43.54%) followed by *Oesophagostomum* was 1.61% during summer season. Purja (2015) conducted a study to determine the gastrointestinal parasite in goat of Puranchour VDC, Pokhara. Highest prevalence of *Eimeria* sp. (89.54%) was found. In Kapilvastu, Tripathi (2015) identified that 67.2%of goats were infected with gastrointestinal parasites predominated by *Toxocara* sp. (16.66%) followed by *Fasciola* sp. (15.97%), *Taenia* sp. (9.72%), *Oesophagostomum* sp. (8.33%), *Strongyloides* sp.(6.25%), *Chabertia* sp.(4.16%), *Haemonchus* sp., *Dicrocoelium, Paramphistomum* (2.77%), *Capillaria* sp., *Cooperia* sp., *Trichuris* sp., *Ostertagia* sp. and *Nematodirus* sp. (0.69%). Husain (2017) conducted a study on prevalence of gastrointestinal parasites of goat (*Capra hircus*) in Tilottama, Rupandehi, Nepal. The general prevalence of gastrointestinal parasites and mixed infection were found 70.83% and 67.05% respectively. Highest prevalence of *Eimeria* with micropyle (60.83%) was found and lowest prevalence was recorded in *Toxocara* sp. (2.5%).

3. MATERIALS AND METHODS

3.1 Study area

Arghakhanchi district lies in province number five of Nepal with total area of 1,193 sq.km. The altitude of the district varies from 305 to 2,515 meter above the sea level. 68% of the district is in the Mountainous Mahabharat Range and the rest is Siwalik Hills. The district head quarter is Sandhikharkha. The study was conducted in Malarani Rural Municipality-1, Arghakhanchi district.

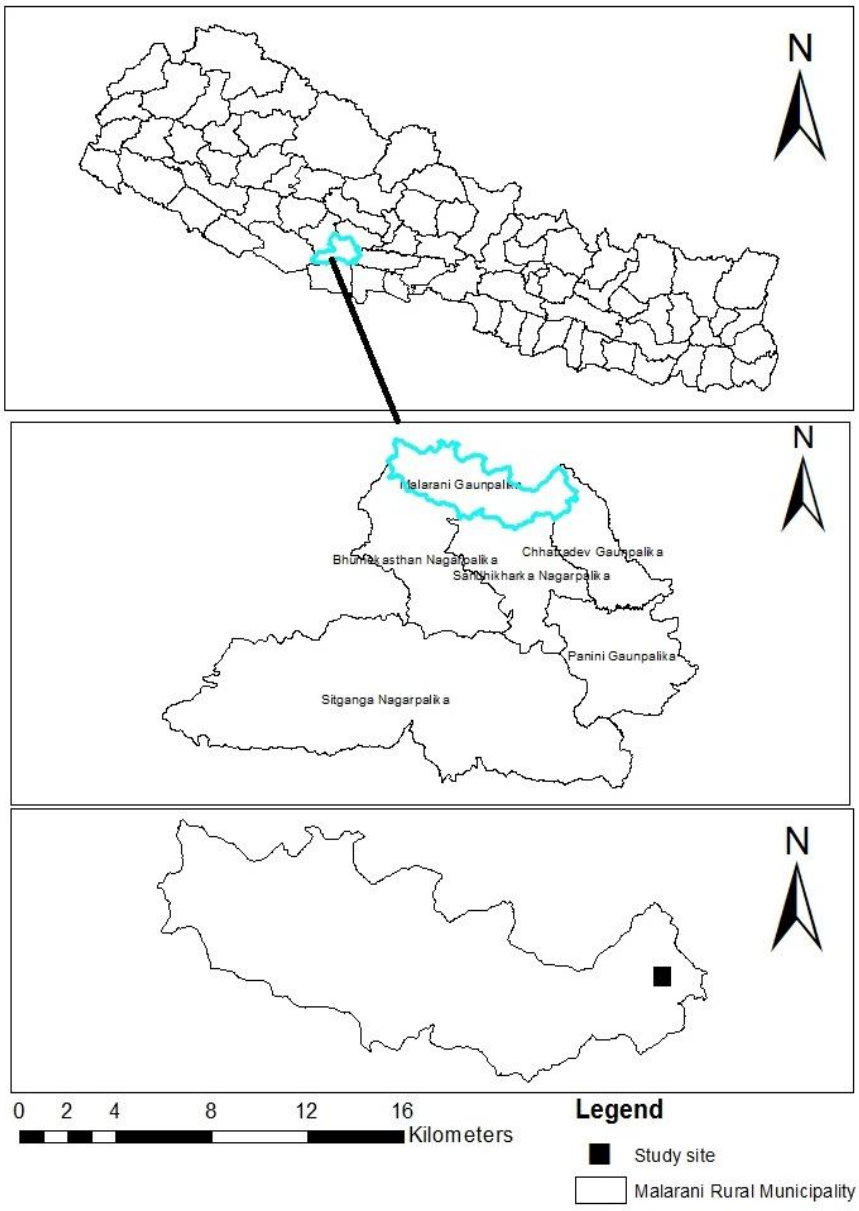

Figure 1: Map of the study area

3.2 Study design

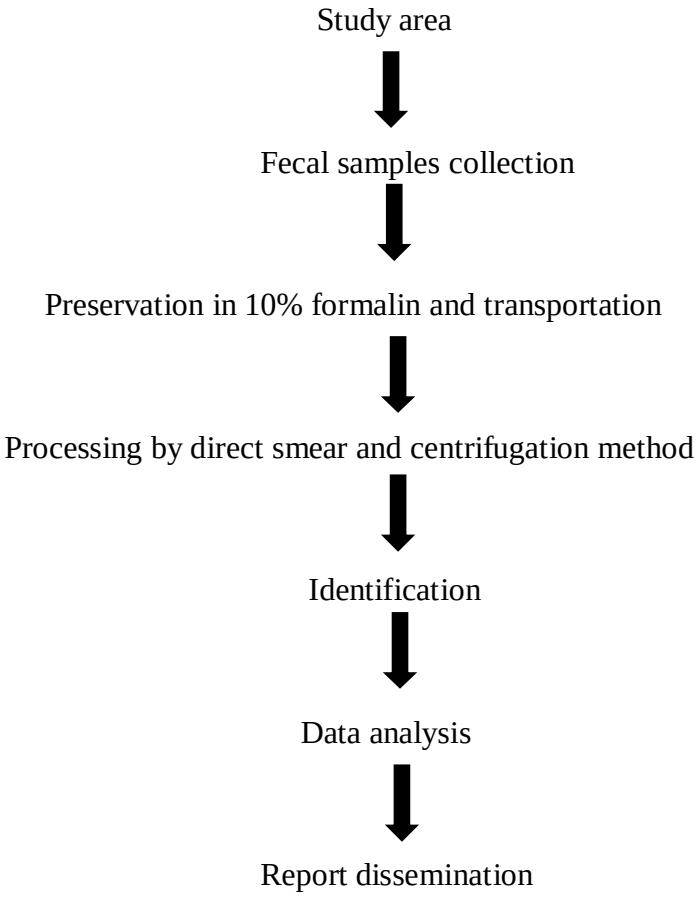

Figure 2: Flow chart showing study design

3.3 Materials

Following materials have been used during the research work:

i. Centrifuge tube

ii. Sterile vials

iii. Stage micrometer and Ocular micrometer

iv. Measuring cylinder

v. Centrifuge machine

vi. Compound microscope

Chemicals Requirements

10% formalin, Normal saline, Distilled water, Lugol's iodine solution, Methylene blue and saturated Sodium chloride (NaCl).

3.4 Preservation and transportation

Collected fecal samples of goats were preserved immediately in sterile airtight vials containing 10% formalin at 4ºC temperature by using ice box and preserved sample were safely transported to the laboratory of Central Department of Zoology.

3.5 Laboratory examination

After preservation and transportation of fecal samples, examination of all samples was processed at the laboratory of Central Department of Zoology, T.U. Kirtipur, Kathmandu. The fecal samples were examined under microscope for trophozoite, cysts, oocysts, eggs and larvae of gastrointestinal parasites by stained smear preparation and concentration method viz. floatation and sedimentation techniques (Soulsby, 1982; Zajac and Conboy, 2012). The Stoll's count technique was used to determine mix infection and intensity of parasites.

3.5.1 Stained smear preparation

Preparation of smear is required for many laboratory procedures. The purpose of making smear is to fix the parasitic cysts/ova/eggs onto the slide. It is useful to study the nuclear character and identification of protozoan cysts. A small portion of fecal sample was picked up with a clean bamboo toothpick and emulsified with Lugol's iodine solution on a clean glass slide and covered with a cover slip. The smear was examined under compound microscope at 10X and 40X.

3.5.2 Concentration methods

The concentration procedures include floatation and sedimentation techniques for the detection of eggs/cysts/trophozoites/larva of parasites (Soulsby, 1982; Zajac and Conboy, 2012). In case of heavy infection, parasites can be easily seen in smears but in case of light infection it is difficult to detect the parasitic form in smears or mounts. Hence, in the study, concentration method (Floatation and Sedimentation) were carried out.

a. Floatation Techniques

This technique is based on the principle that lighter eggs of helminthes and protozoans float on the medium having greater density. About 1 gm of feces was taken in a glass pestle and a little quantity of water was added and mixed well. Suspension was strained to remove the debris. The suspension was centrifuged at 1000 revolution per minute (rpm) for 5 minutes. The tube's water was replaced with super saturated NaCl solution and again centrifused. After centrifused, more saturated NaCl solution was added to develop convex meniscus at the top of the tube and one drop of Methylene blue was also added. The eggs and cysts float to the top and were collected by placing a cover slip on the surface of the meniscus at the top of the tube. The surface layer was examined under low power microscope. The presence of eggs was identified through their morphological characteristics (Bowman, 1999).

b. Sedimentation Technique

This method is used for trematode eggs but not suitable for protozoan cysts. About 1gm of feces was taken in a glass pestle and a little quantity of water was added to it and mixed well. Suspension was strained to remove the debris and poured into a centrifuge tube up to an inch below the brim. Centrifuged at 1000 revolutions per minute (rpm) for 5 minutes. The supernatant was discarded and form the sediment. Iodine wet mount was prepared for each sample by mixing 1-2 drops of the sediments with Lugol's iodine solution in a glass slide and examined under low power objective (10X) by covering with a cover slip. The presence of eggs was identified through their morphological characteristics (Bowman, 1999).

3.6 Identification of oocysts, eggs and larvae of parasites

Oocysts, eggs and larvae were identified on the basis of morphological characters (shape and size) by using Soulsby (1982), other published and unpublished articles and also from internet sources. Calibration obtained using ocular and stage micrometer was used to measure length and breadth of eggs, oocysts.

3.7 Determination of age and sex of goats

Direct observation and questionnaire survey were carried out for identification of sex and age of goats respectively.

3.8 Determination of parasitic intensity

Intensity of gastro-intestinal parasites was calculated depending on the number of eggs/oocysts and larvae found per gram.

Light infection= <2 eggs/oocysts/larvae per gram

Mild infection= 2-4 eggs/oocysts/larvae per gram

Moderate infection= 4-6 eggs/oocysts/larvae per gram

Heavy infection= > 6 eggs/oocysts/larvae per gram

3.9 Questionnaire survey

Questioners were prepared for farmers in Malarani Rural Municipality-1, Arghakhanchi which asks them about grazing site; either forest, riverside, field or zero grazing, farm management system; either good (well-managed, clean, separate site for stool collection from loafing shed), medium (separate loafing shed from house but no separate site for stool collection) or poor (Unmanaged farming, direct association with other animals), used type of drugs; allopathic or ayurvedic. For four fecal sample from single household, there was only one questioner representing them, for total of 200 goat sampled in this area, only 50 questioners were asked.

3.10 Data analysis

Since, the study was focused on identification of different intestinal parasites, the data were analyzed by using MS-Excel 2007 and statistical analysis was performed using "R", version 3.5.2 with chi-squared test. In all cases 95% confidence interval (CI) and $P<0.05$ was considered for statistically significant association.

4. RESULT

4.1 General Prevalence of gastrointestinal parasites in goats

Of the 200 dropping samples of goats, 132 (66%) samples were found to be positive for gastrointestinal parasitic infection in goats of Malarani Rural Municipality-1, Arghakhanchi, Nepal.

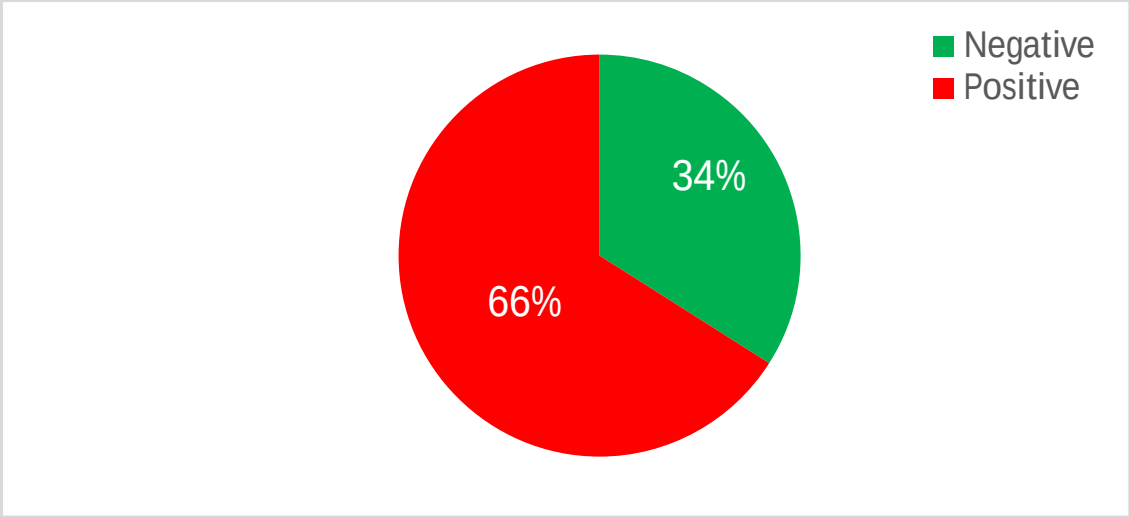

Figure 3: General prevalence of gastrointestinal parasite

4.2 Class wise prevalence of gastrointestinal parasites

Out of the 200 samples examined, seven genera of parasites including one protozoan, one trematode and five nematodes were identified as gastrointestinal parasites. Prevalence of sporozoa was found to be 59.5%, nematode 52.50% and trematode 4%.

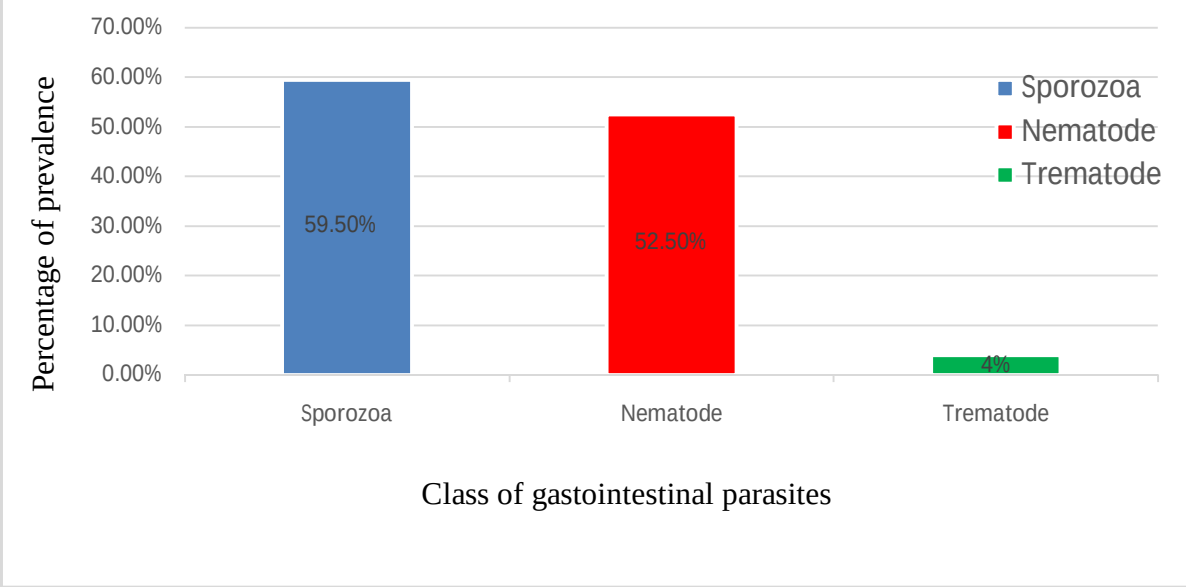

Figure 4: Protozoan and helminth wise prevalence

4.3 Genera wise prevalence of gastrointestinal parasites

Among 200 goat dropping samples examined, 132 (66%) samples were found to be positive with one or more species of parasites. All age groups were affected. The most common parasites found were *Strongyle* sp. (33.5%), *Trichuris* sp. (23%), *Haemonchus* sp. (14.5%), *Strongyloides* sp. (13.5%), *Trichostrongylus* sp. (9%), *Fasciola* sp. (4%) and also protozoan parasites *Eimeria* sp. (59.5%).

Table 1: Genera wise prevalence of gastrointestinal Parasites

S.N.	Class	Genera	No. of infected Samples	Prevalence (%)
1	Protozoa	*Eimeria* sp.	119	59.5%
2	Trematoda	*Fasciola* sp.	8	4%
3	Nematoda	*Strongyle* sp.	67	33.5%
		Trichuris sp.	46	23%
		Haemonchus sp.	29	14.5%
		Strongyloides sp.	27	13.5%
		Trichostrongylus sp.	18	9%

4.4 Age wise prevalence of gastrointestinal parasites

4.4.1 Age wise prevalence of protozoan infection

In this study 200 samples were collected, 91 from adults (>8 months), 69 from young (4-8 months) and 40 from kids (2-4 months). 52 adults (57.14%), 45 young (65.21%) and kids 22 (55%) were infected with one or more parasites. The prevalence of age wise prevalence protozoan infection is summarized in table3 which shows that ($\chi 2 = 1.481$, df = 2, p-value = 0.476, i.e. $p > 0.05$), there is no significant difference in age wise prevalence between kids, young and adults in protozoan infection.

Table 2: Age wise prevalence of protozoan infection

Age	Total sample	Total positive	Prevalence (%)
Kids	40	22	55%
Young	69	45	65.21%
Adults	91	52	57.14%
Total	200	119	59.5%

4.4.2 Age wise prevalence of helminths infection

From the table 4, the prevalence of helminths infection in this study did not show any statistical significance ($\chi 2 = 1.727$, df = 2, p-value = 0.42, i.e. $p > 0.05$), in relation to age of the goat's infection.

Table 3: Age wise prevalence of helminths infection

Age	Total sample	Total positive	Prevalence (%)
Kids	40	20	50%
Young	69	43	62.32%
Adults	91	50	54.94%
Total	200	113	56.5%

4.5 Sex wise prevalence of gastrointestinal parasite

4.5.1 Sex wise prevalence of protozoan

From the microscopic examination of 200 total samples, 49 males and 70 females were found to be positive for one or more parasites. The prevalence of protozoan infection in males and females has been summarized in table 5.

Table 4: Sex wise prevalence of protozoan

Sex	Total sample	Total positive	Prevalence (%)
Male	79	49	62.02%
Female	121	70	57.85%
Total	200	119	59.5%

There is no significant difference in sex wise ($\chi 2 = 0.194$, df = 1, p-value = 0.659, i.e. $p > 0.05$), prevalence in protozoan infection.

4.5.2 Sex wise prevalence of helminths

As per the result of total samples examined, 43 males and 70 females were found infected with one or more parasites. The prevalence of helminths infection in males and females is summarized in table 6 and there is no significant difference in males and females ($\chi 2 = 0.109$, df = 1, p-value = 0.74, i.e. $p > 0.05$), prevalence in helminths infection.

Table 5: Sex wise prevalence of helminths

Sex	Total Sample	Total positive	Prevalence (%)
Male	79	43	54.43%
Female	121	70	57.85%
Total	200	113	56.5%

4.6 Concurrent parasitic infection in goats

The results revealed that, single infection was found to be higher (n = 52) than double infection, (n = 48), triple infection, (n = 26) and multiple infection (n = 6). Single infection was found highest in *Eimeria* sp., Double infection was found highest in *Eimeria* sp. and *Strongyle* sp.

Table 6: Concurrent parasitic infection in goats

S. N.	Type of infection	Total 132(100%)
1.	Single	52 (39.39%)
2.	Double	48 (36.36%)
3.	Triple	26 (19.69%)
4.	Multiple	6 (4.54%)

4.7 Intensity of infection

Most of the parasites of goats revealed that light infection with 94.5% while almost six species of parasites revealed mild rate of intensity i.e. 87%, Only four species of parasites were found to be positive for moderate infection i.e. 23% and two species revealed heavy infection 1.5%.

Table 7: Intensity of infection during study period

Class	**Parasites**	**Light (+)**	**Mild (++)**	**Moderate (+++)**	**Heavy (++++)**
Sporozoa	*Eimeria* sp.	60 (30%)	50 (25%)	7 (3.5%)	2 (1%)
Trematode	*Fasciola* sp.	8 (4%)	_	_	_
Nematode	*Strongyle*	20 (10%)	36 (18%)	10 (5%)	1 (0.5%)
	Trichuris sp.	10 (5%)	20 (10%)	16 (8%)	_
	Haemonchus Sp.	17 (8.5%)	7 (3.5%)	5 (2.5%)	_
	Strongyloides	8 (4%)	19 (9.5%)	_	_
	Trichostrongylus	11 (5.5%)	7 (3.5%)	_	_

Note:

Light infection = <2 eggs/oocysts/larvae per gram

Mild infection = 2-4 eggs/oocysts/larvae per gram

Moderate infection = 4-6 eggs/oocysts/larvae per gram

Heavy infection = > 6 eggs/oocysts/larvae per gram

4.8 Photos of eggs/oocysts /larva of parasites

Photo 1: *Eimeria* with micropyle (30X x 16µm) at (10X x 40X)

Photo 2: *Eimeria* without micropyle (28X x 17.5µm) at (10X x 40X)

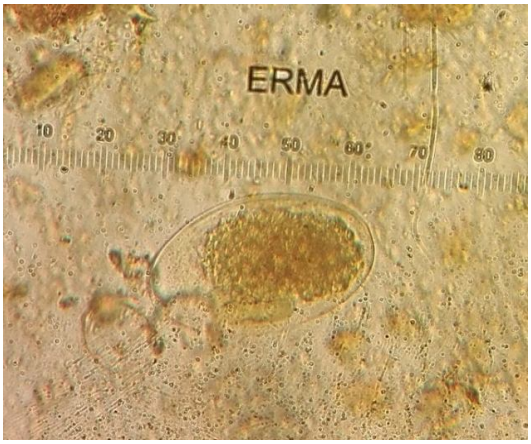

Photo 3: *Haemonchus* sp. (90 x 40µm) at (10X x 40X)

Photo 4: *Trichostrongylus* sp. (95 x 35µm) at (10X x 40X)

Photo 5: *Strongyloid* sp. (80 x 22.5 µm) at (10X x 40X)

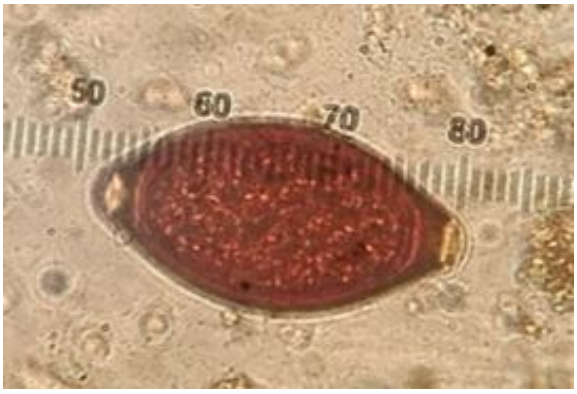

Photo 6: *Trichuris* sp. (77 x 40 µm) at (10X x 40X)

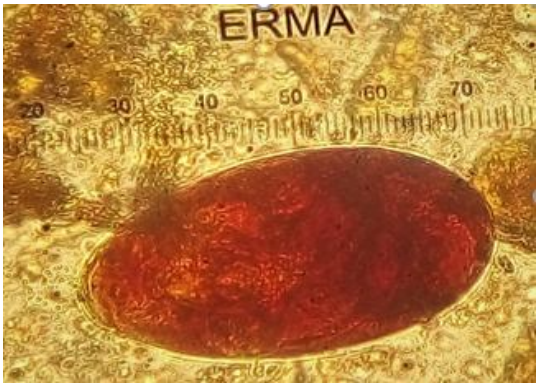

Photo 7*: Fasciola* sp. (130 x 92 µm) at (10X x 40X)

Photo 8: *Strongyle* larva (10X x 40X)

Photo 9: *Strongyle* larva (10X x 40X)

4.9 Assessment of Knowledge, Attitude and practices (KAP) among goat farmers, regarding parasitic infection in goats

Among 50 goat farmers (25% male and 75% female) involved in business purpose were randomly selected for questionnaire survey. All respondents were farm owner; 60% were either illiterate or had a primary level education while 40% had SLC or intermediate level education. Forest grazing was most practiced (25/50) followed by riverside (15/50) and field grazing (10/50). Field grazing was practiced sometimes but forest grazing was the most common practice. Hundred percent farmers provide supplementary feed to goats, 30% of farmers practiced of giving clean water and 50% of them provide with clean water. 30% of the farmers knew about the internal parasite of goat, 38% treat their goat against worms, 80% were found using allopathic drugs from veterinary pharmacy when their goats get sick but 10% go to traditional healer and 10% practiced selfmedication by traditional method, 40% knew the harmful effect of anthelminthic drugs but 60% didn't know about that. 60% pointed out summer season being the favorable time for goat showing signs related to parasitic infestation like diarrhea and anemia while other respondent pointed it happened even or winter season. Only 20% farm had good management system, 30% medium and 50% has poor management.

Table 8: Assessment of practices and knowledge of farmers on the management of goat

S.N	**Questionnaires**	**N=50**	Percentage (%)
1.	Grazing site	Zero grazing Forest grazing Riverside grazing Field grazing	_ 50% 30% 20%
2.	Provision of clean water	Yes Sometimes No	30% 50% 20%
3.	Drug availability	Vet. pharmacy Open market Others	90% 10% _
4.	Taking care of side goats	Self Vet. Hospital Traditional healer	10% 80% 20%
5.	Types of drug used	Allopathic Ayurvedic	80% 20%
6.	Knowledge about internal parasites in goats	Yes No	30% 70%
7.	Knowledge on harmful effect of Anthelminthic drug	Yes No	40% 60%
8.	Drug availability	Vet Pharmacy Open market From others	90% 10% _
9.	Season of infection	Summer Winter All year around	70% 20% 10%
10.	Farm management	Good Medium Poor	20% 30% 50%

5. DISCUSSION

The present study was carried out to determine the prevalence of gastrointestinal parasites of goats. This study was carried out in the month of February/march. The sample was collected from Malarani Rural Municipality-1, Arghakhanchi district. From the present study out of 200 samples 132 (66%) were found positive. It is well known that the intestinal parasites are cosmopolitan in distribution and all animals whether humans, domestic animals or wild animals bear different kinds of parasites. It can be said that the prevalence of any gastrointestinal parasites is influenced by the climatic conditions and geographic factors. Generally, the warm and humid conditions, continuous rainfall throughout the year which prevail in much of South-East Asia, provide good conditions for many gastrointestinal parasites to flourish that means there is no season during which the parasites are not problem (Tiya *et al.,* 2008).

In the present study 66% of the goats from study area were found to be infected with one or more gastrointestinal parasites. One genera of Protozoa, one genera of trematode and five genera of nematode was found. Among protozoa *Eimeria* sp. was found and in trematode *Fasciola* sp. was found. Among nematodes *Strongyle, Trichuris, Haemonchus, Strongyloides* and *Trichostrongylus* were found. The prevalence of protozoan *Eimeria* sp. (59.5%), trematode genera found in goat was *Fasciola* sp. (4%). In the nematode *Strongyle* sp. (33.5%), *Trichuris* sp. (23%), *Haemonchus* sp. (14.5%), *Strongyloides* (13.5%), and *Trichostrongylus* (9%) were found. The overall prevalence of helminths parasites among goats under traditional husbandry system in South East Nigeria (Opera *et al*., 2005) of which nematode infection revealed 78.4%, trematode13%. The present study was little bit similar to this study i.e. nematode infection 52.5% and trematode 4%.

The presence of oocyst of *Eimeria* sp. was observed in goats of different countries (Radavelli *et al*.,2011, Jimenez *et al*., 2007, Idris *et al*.,2011), nine species (Heidari *et al*.,2014) from Iran. In present study since oocyst were not cultured, so species couldn't be identified hence *Eimeria* sp. has been broadly differentiated into two types (*Eimeria* with micropyle and *Eimeria* without micropyle) on the basis of morphological structure. Goats of Malarani were found to be infected with 59.5% out of 132 positive samples which is higher in higher in comparison to 27.1%, 50%, 57.5% and 22.4% revealed by Gupta and Chabra (1990) and Kaur and Kaur (2008), but lower than the 89.54% and 94.7% (Jimenez,2007) and Purja (2015) respectively. The result of present study sample infected with *Eimeria* sp. is 59.5% which is almost similar to 60.83% revealed by(

Husain, 2017).The high prevalence rate of *Eimeria* in the present study may be due to the contamination of drinking water and food by manner of infected goats and more grazing open field grasses which may be infected with fecal particles.

Nematodes are free living or parasitic unsegmented worms, usually cylindrical and elongate in shape (Soulsby, 1982). Parasitic nematodes infect animals cause serious diseases that are deleterious to human health and agricultural productivity. In present study out of 200 fecal samples 105(52.5%) were found to be positive with five different types of nematode parasites.

Strongyles are nematode worms of the family Strongylidae. They are often parasitic in the gastrointestinal tract of animals, specially grazers such as Antelope, Sheep, Goat and other Ungulates. It is not often possible to identify *strongyle* eggs to genus level as the eggs of most *strongylid* and *Trichostrongyloid* species are similar in appearance and overlapping in size. If identification is necessary, the fecal samples must be cultured to provide L3 larva for further examination. Prevalence of *Strongyle* (20.7%) reported from Korean goats by (Gebeyehu *et al*.,2013), which is lower than the present study (33.5%). Prevalence of *Strongyle* (69.27%) reported from Madhya Pradesh, India (Singh *et al*., 2014), from Northern-NIgeria 69.07% (Jatau *et al.*,2011), which is higher than present study. The variable distribution of these parasite may be attributed to difference in climatic condition prevailed in the area at the time of fecal samples collection, farm management practices such as grazing and source of drinking water.

Trichuris sp. has been observed frequently in animals worldwide such as (Khajuria *et al*., 2013) from India. Devi (2012) from Nepal 46.67% by (Yeasmil *et al*., 2014) from Bangladesh ,59% by Rajpakse (2008) from Srilanka.74% by Umur and Yakuri (2005)from Turkey is greatly higher than that in the present study (23%).It may be due to the difference in the techniques of the sample collection, climatic conditions and farm management practices.

Haemonchus was observed in domestic ruminants by different researcher 81% from Srilanka (Rajpakse *et al.,* 2008),58% from Kenya (Waruiru *et al*., 2005), 20.97% from Nepal (Neupane, 2012) etc. and infection with *Haemonchus* (72%)revealed among goats from dry zones of Srilanka (Faizal, Rajapaksha,1999-2000) are greatly higher than the present study i.e. *Haemonchus* 14.5%.This is due to the climatic condition, such as grazing and Source of drinking water. Among nematodes, *Strongyloides* sp. was most

prevalent nematode parasite. This genus contains several species which are parasitic in domestic and wild ruminants. The parasitic forms are parthenogenetic and their eggs may give rise outside of the host, directly to infective larvae of another parasitic generation or to a free-living generation of males and females (Soulsby, 1982). The present study showed lower prevalence of *Strongyloides* (13.5%) which was lower than 88% reported from Surkhet (Kushwaha, 2000) and 62.2% reported from South East Nigeria (Opara *et al*., 2005). It may be due to the climatic conditions and temperature during the study period. Prevalence of *Trichostrongylus* was found in the present study was 9% which is higher than 2% and 4.83% revealed in winter and summer season respectively by (Karki *et al*., 2011). This is due to the climatic condition and such as grazing site and sources of water.

Prevalence by age in contrast with the findings of Boomker *et al*., (1994) the prevalence was inversely related to age, however agree with Bashir (2009) found age do not play a major part which was similar to present study all age groups were infected. Prevalence by sex contradict the finding of Urquhart *et al*., (1988) who reported the existence of some evidence that entire male animals were most susceptible than females to the helminthes infection. This was different among the parasitic species were common. In present study females (57.85%) were higher than the male (54.43%), Since pregnant females were more susceptible to the helminths infection this may be the cause of higher prevalence in female animals.

During the study out of 200 samples taken 132 were found positive and out of 132 samples (54.54%) were found to have single infection which is higher than double infection i.e. (34.09%)which is followed by 7.57% followed by multiple infection 3.78%.The intensity of infection measured by fecal egg/oocyst count varied from light to heavy infection. In a high percentage of animals, light parasitic infections were found while heavy infections were less common and single infection was higher than the multiple infection, which is similar with the study carried out by Gebeyehu *et al*., (2013).

Trematode parasites causes watery diarrhea, weakness, weight loss, mortality and other secondary infections (Soulsby, 1982). Fasciolopsis and Paramphistomosis are two important parasitic diseases in farmed livestock all over the world where they causes huge losses of production (Wamae *et al*., 1928 and Mage *et al*., 2002).In the present study all over prevalence of trematode was 4%.The trematode observed in the goats of study area was *Fasciola* sp. *Fasciola* sp.is widely distributed trematode parasite and has been

reported from various countries such as Cambodia (Dorny *et al*., 2011),Bangladesh (Sangma *et al*.,2012),India (Chaubisa and Jaroli, 2013) and Nepal (Karki *et al*., 2012)etc. High prevalence of *Fasciola* has been observed from livestock from Surkhet, Nepal by Ghimire (1987)with the prevalence 83% Similarly Fasciolopsis has been reported from Kenya with 31.5%(Waruiru, Otienoad, Mutune 2005).In the present study *Fasciola* sp. was found 4% which was much more lower than those reported from Surkhet among goats 83% (Ghimire, 1987), followed by 58% from Chitwan district (Dhakal and Kharel 1988) and 31.25% from Dhanusa district (Jaisawal, 2006). 10.83% from Rupandehi district (Husain,2017) which is little bit similar to present study. This variation in the prevalence of *Fasciola* sp.in goats may be due to agro-ecological conditions, animal husbandry practices, breeds of animal, Prevalence of Snail host.

Questionnaire survey of that study shows that forest grazing was more practiced than the riverside and field grazing.80%were used allopathic drugs. Goat is suited for the poorest of the poor because of the short gestation period, low risk capital investment and low cost of maintenance. Goat rearing being a traditional practice among the rural poor, is widely considered as a "poor man's cow"(Gopala et al., 2010). This result shows that there was no significant difference between the age wise and sex wise prevalence. This is due to the climatic condition in the study area is favorable for gastrointestinal parasite.

All the farmers included in their questionnaire were the owners of the farm and graze their goats in forest, riverside and field. Most of the goats in the study area were grazed in forest followed by riverside and then field during the day time therefore there was low prevalence of trematode genera (*Fasciola* sp.) in this study because they require intermediate host to complete their life cycle. Transmission is dependent on the availability of intermediate host of trematode parasites in different countries. In Nepal *Lymnae* sp.is found most widely and these snails are found in permanent and temporary watercourse, irrigation channel, pond dam, edges, river etc. they are attached normally to vegetation in these habitats and are dependent on season for survival (Soulsby, 2006).

Goat intestinal status of a host can positively influence the pathogenesis of a disease depends upon various factors including breed, age, nutritional status and management systems as well as environmental condition (Houdijks *et al*., 2000). Some farmers didn't treat their pregnant goats because of the fear of abortion. *Strongyle* sp. was the most abundant nematode genus throughout the study period this is probably due to the fact that the climatic condition was favorable during the season of February to survive those

parasites. In general, this study showed the gastrointestinal infection in the Malarani Rural Municipality is not controlled. This could be due to the weak goat farming practices and open grazing in forest, riverside and field. *Eimeria* Sp. was most prevalent species that have been the potential to become problematic. It is important that appropriate control and management of these gastrointestinal parasites in study area should be practiced that helps to increase the productivity of goats. Emphasis should be placed on education of goat breeders on the importance of goat farming practices, environmental sanitation hygiene, proper disposal of manure, communication network among farmers, the government and expert are essential. Results of the present study revealed that coccidian, nematodes and trematodes as single or mixed infections are prevalent in goats This study also suggests a need for well-coordinated, permanent, sanitary monitoring of goat farmers helps to reduce the prevalence and intensity of gastrointestinal parasites. There is no significance difference between age wise and sex wise prevalence due to similar type of foods, water and from same habitat. In Present study Prevalence of gastrointestinal parasites also related with the farm management system. Farm management system may be one of the causes of gastrointestinal parasites. Only 20% farm has good management system, 30% medium and 50% has poor management which is similar with the study done by (Houdijks *et al*., 2000).

6. CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

The general prevalence rate of gastrointestinal parasites was found to be 66%. Altogether one genera of protozoan, one genera of trematode and five genera of nematodes were found in this study. The most common encountered gastrointestinal parasite was *Eimeria* sp. with micropyle (59.5%) and the least common parasite found was *Fasciola* sp. i.e. 4%.Seven different genera of parasites were observed in the present study which are as follows protozoans; *Eimeria* sp.(59.5%and among trematodes *Fasciola* sp. (4%) and among nematodes *Strongyle* sp. (33.5%), *Trichuris* sp. (23%), *Haemonchus* sp. (14.5%), *Strongyloides* sp. (13.5%), *Trichostrongylus* sp. (9%).There was no significance difference between age wise and sex wise prevalence(i.e. $p>0.05$)in both protozoan and helminths parasites.

The presence of infection in the goats was found and studied in season of February in this period temperature was moderate which was suitable for the development and survival of parasites. Some common risk factors observed during the study period were contaminated food and water, ingestion of contaminated grasses, ingestion of moist aquatic plant, contaminated vegetables, ingestion of green grasses near the river, grazing on contaminated field, contaminated soil feeding.

6.2 Recommendations

- Examination of soil and water sample from the grazing site should be carried out so as to confirm the possible risk factors of parasite transmission.
- Coccidiosis is a major problem in these goats hence mass treatment program is needed against it and must be initiated regularly.
- Knowledge on intestinal parasite of goat seems poor among farmers hence regular training of goat farming focused on disease aspect should be provided to goat farmers.

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PHOTOGRAPHS

Photo 10: Grazing of goats around their habitat

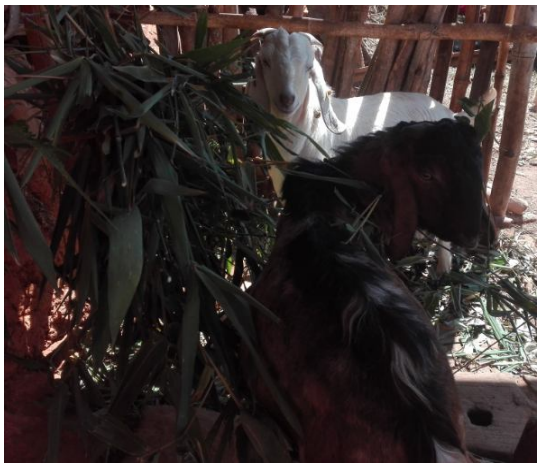

Photo11: Goats in their habitat

Photo12: Questionnaire survey

Photo 13: Microscopic observation

Photo 14: Centrifuging the sample

ANNEX-1

Morphological characters of egg, oocyst and larva of gastro-intestinal parasites of Goats

Name of parasite	Reference Size	Size in present study	Remark	References
Eimeria sp.	23-38µm ± 16-24µm.	30x16 µm.	Ovoid or ellipsoidal shaped.	(Soulsby,1982)
Haemonchus sp.	70-85 ± 40-45 µm.	90x40 µm.	Oval, passed in the feces of host contain an embryo divided 16-32 cells.	(Soulsby,1982)
Strongyloides sp.	40-75 ± 20-25 µm.	80x22.5µm.	Oval, clear thin shelled similar to hookworm but are smaller and contain fully developed embryo when passed in the feces of the host.	(Soulsby,1982)
Trichostrongylus sp.	(79-92) ± (32-49) µm.	95x35 µm.	0val, bilaterally symmetrical, embryo mass multisegmented, thin transparent outer layer.	(Soulsby,1982)
Trichuris sp.	(70-80) ± (30-42) µm.	77x40 µm.	Brown in color, contain unsegmented embryo, barrel shaped with transparent plug at either pole.	Parasitic infection of domestic animals. A diagnostic manual (by Johannes Kaufmann)
Strongyle sp.			Strongyles have a short cylindrical or annular buccal capsule. The dorsal gutters are short and do not reach the anterior border of the capsule.	(Soulsby,1982)
Fasciola sp.	125-130µm±40-65µm.	130x92 µm.	Oval, non-embryonated, thin egg shell, operculated and immature.	(Soulsby,1982)

ANNEX-2

Questionnaire for survey of gastrointestinal parasite infection in goats of Malarani Rural Municipality-1, Arghakhanchi.

A. Respondent and farming practice information. Date:

1. Name of respondent …….

2. Is respondent……owner/employer/relative.

3. Gender…….... Male/Female.

4. Level of education……Illiterate/literate/primary/SLC/Intermediate/Over.

5. How many goats do you have?

- 2 – 4 month Male…… Female…….
- 4 -8 month Male……. Female…….
- >8 month Male……. Female…….

6. Where do your goats graze?

	Always	Sometimes	Never
Zero grazing			
Field			
Forest			
River side			

7. Do you have practice of giving clean water to your goats?

- Yes….
- Sometimes….
- No…...

B. Worm control information

8. Do you know about the internal parasites of goat?

- Yes…
- No…

9. Do you give any medicines to your goat against worms?

- Yes…...
- No……

10. Which type of drug do you use?
    - Allopathic…
    - Ayurvedic…
11. Do you know about the harmful effect of internal parasites?
    - Yes…
    - No…
12. Do you know about the harmful effect of antihelminthic drug?
    - Yes…
    - No…
13. where do you get your drugs?
    - Open market…
    - Vet pharmacy
    - Others…
14. When do you think your goats are more suffering from diseases?
    - Summer…….
    - Winter……...
    - All year around……
15. Who takes care of your goats when they fall sick?
    - Veterinary hospital….
    - Self……
    - Traditional healer…
16. Farm Management System
    - Good
    - Medium
    - Poor

ANNEX-3

Goat information Sheet

Date….

Address….

1. Goat identify……
2. Sample number…...
3. Sex……
4. Age

2-4 months	4-8 months	>8 months