CHAPTER - I

INTRODUCTION

1.1. General Background

Goat (*Capra hircus*) is an important domestic animals, it is a herbivious animals and widely distributed in all over the worlds. It is a member of the bovine family and subfamily caprinae is one of the oldest domesticated species.

Female goats are reffered to as *does* as *nannies*, intact males as *bucks* or *billies*, their offspring are *kids*. Castrated males are *wethers* goat meat from younger animal is called *kid* or *cabrito* and from older animals is some time called *chevon* or in some areas "mutton" (www.wikipedia.org / goat)

It has life span of about 8-15 years and weight about 30-60 kg. Gestation length is approximately 145-155 days. Twins are the usual result with single and tripled births are also common. The mother often eats the placent. Which with its oxytocin, gives her much needed nutrients help staunch her bleeding. (www.bva.awf.org.uk)

Livestock population is Nepal for 2004/05 was estimated to be 6.99M cattle, 4.08M buffaloes 7.15M goats and 0.36 m sheep (www.maacwto.gov.np.statistics/ livestock/pdf) .Roughly 70% of households keep some type of livestocks, including cows, buffaloes, pigs and chick.

1.2 Goat products and use:

It is regarded as a very beneficial animal for thousand of years, they have been utilized for their milk, meat, hair and skins all over the world. In the last century they have also gained some popularity as pests. A goat is said to be truely useful both when alive and dead.

1.2 .a. Meat

The taste of goat meat is called *chevon*. It is healthier and contain low fat and cholesterol in comparable to chicken. It also has more mineral than chicken, and is lower in saturated fats than other meat. Other parts of the goat including organs are

also equally edible. Special delicacies include the brain and liver .For examples, in Patagonia and Argentina, the head and legs of the Brodie goat are smoked and use to prepare unique spicy dishes.

Rearing of goats is mainly done for obtaining meat. Meat consumption varies widely while compairing different countries as it depends on factor like socio-economic condition, religious beliefs, cultural practices, etc. In a resource poor and developing country like Nepal, natives have included meat as important part of their diet to supplement nutritional requirements. In Nepal buffaloes, contribute about 64% of meat consumed, followed by goat meat 20% ,pork 7% ,chicken 6% and sheep 3% (Joshi *et al*;2001)

1.2. b. Milk and cheese

Goat's milk is more easily digested than cow's milk and is recommended for infants and people who have difficulty with cow's milk. The curd is much smaller and more digestable. Goat milk is also used to make popular cheese such as Rocamadour and feta, although it can be used to make any type of cheese.

1.2. c. Skin

Goat skin is still used today to make gloves, boots, and other products that require a soft hide.

1.2 .d. Fiber

Cashmere goats produce a fiber, Cashmere wool, (sheep) which is one of the best in the world. Cashmere fiber is very fine and soft, and grows beneath the guard hairs. The fiber is made into products such as sweaters and a dolls hair with the mohair. In South Asia, Cashmere is called *pashmina* and these goats are called *pashmina* goats

1.2. e. In farming

Small ruminants mainly goats are essential components of the mixed farming system in the hills of Nepal and are found in all parts of country. They are mainly kept for meat, although wool (sheep), fiber (goat) and manure are also important products from these animals . In the present subsistence farming systems of the hills, farmers have little surplus agricultural produce to sell and so depend upon the sale of livestock

and their products as asource of income. However, because of their inherent ability of utilize mountain terrain, unstable for crop forming, a high proportion of sheep and goats are found in the hills. Resource- poor farmers of the hills, who can not invest large sums of money in cattle and buffalo, prefer sheep and goat husbandry which has no social, religious or cultural taboos, or caste restrictions. (ghimire, www.fao.org/docrep/004/TO706E/HTM)

Nepal is an agrarian country where 82% of the people depend on agricultural activities .in 2004, the Ministry of Agriculture and Cooperatives(MOAC) has estimated agricultural contribution to be 39% to the national (GDP), where as livestock sector contribution have been estimated to be 16%. Around 31% of the agricultural GDP is being rendered by the livestock sector only of which 53% is derived from the hills, 38% from the Tarai and 9% from the mountains. (CBS 2001/02)

Goat are ruminants and have four stomach the largest being the rumen. Stomach which plays a vital role in digesting regurgitating and redigesting their food. They will consume on average 4.5 pound of dry matter per 100 1bs of body weight per day. But there are several health problem in livestock. They face many problems by helminth parasites due to lack of nutrition and poor management due to these worms there is loss of lives of live- stock. They caused infection in intestine mostly and also in liver, lungs, circulatory system ,lymphatic system and skin and hence mainly called “gastro- intestined parasites”. Trematodes and cestods attack them to caused adverse harm. Fluke suck the blood and destroy the lives of the host.

Endoparasites are those organisms livings within their hosts, in the gut, body cavity, liver, lungs, gall bladder and blood or with in the internal cavities, tissue or cell of the host. Such forms nearly always live a completely parasitic existence. Since they totally depend upon there host, endo parasitism is also reffered to as infection. *Fasciola* sp, *Trichostronglus* sp, *Schistosoma* sp. For example are typical endo parasite.

Cestodes found in gut and acquired by eating contaminated food or water found to be largely affecting the ruminants. This group comprises the genera *Moniezia* which are cosmopolitan is distribution and *Taenia* which are commonly

found in the rumen of the domesticated and wild carnivores. They have reported from Asia and Africa (Karki, 2005).

Moniezia sp in ruminants of goats and cattle causes infections by ingesting herbage contaminated with the mites carrying the infective stage of the parasite. Heavy infections cause poor growth and diarrhoea in lambs.

Taenia saginata usually cow or buffalo tapeworm and has two hosts viz; Definitive host man and intermediate host cow or cattle. It is also called beef tapeworm. The worms (segments) passes out along with the faeces of human beings and when ingested by cattle, infects them on reaching alimentary canal of the host, the egg hatch out and liberated , they penetrate the gut wall and enter mesenteric lymphatics and finally reaches circulation. Then they invade the muscular tissue and undergo further development

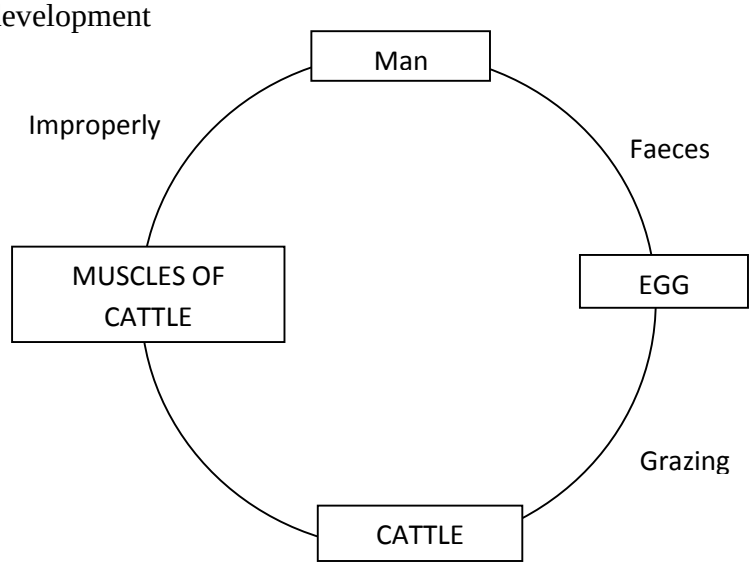

Fig. 1: Life-cycle of *Taenia* sp

Trematodes commonly known as flukes, often live in the bile duct or small intestine and may also affect the lungs. Their eggs are passed with the faeces of the host. Some are ingested but some burrow into the skin after hatching for access. Trematodes especially include *Fasciola* sp, *Dicrocoelium* sp, *Schistosoma* sp and *Paramphistomum* species. (Shah and Agrawal, 1990)

Fasciola hepatica and *Fasciola gigantic* inhabit similarly in the bile ducts of the final hosts. The eggs produced by parasite are expelled with the bile into the

intestine. These in turn are shed in the feaces as Eggs → Free swimming miracidium → Cercaria → Metacercaria → Adults.

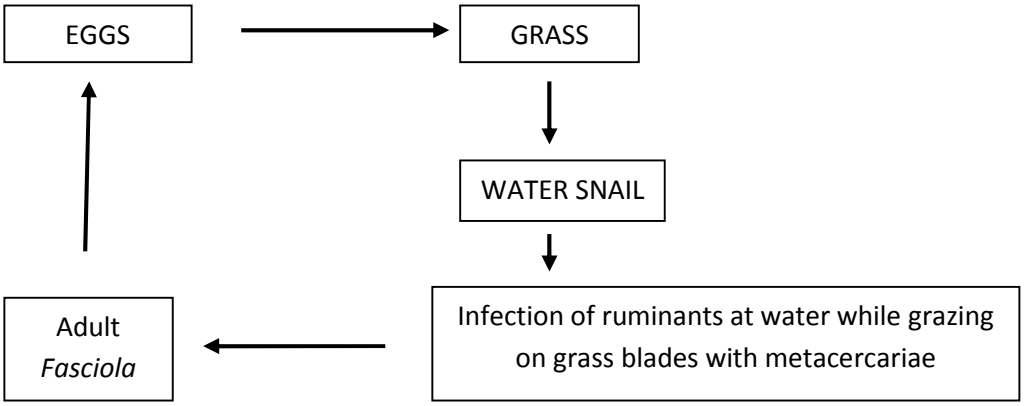

Fig. 2: Life- Cycle of *Fasciola* sp

Fascioliasis is a well known parasitic infection of herbivorous animals. It has worldwide distribution on the animal reservoir host. The different local names of this disease such as namle, mate, lew etc in different regions are the proof of its continued existance for many years in the animal population of the country. Infection of *Fasciola* sp. causes significant loss estimated at over US$ 2000 million per annum to the agriculture sector worldwide with over 600 million animals affected (Boray, 1985, Hillyer and Apt, 1997). The economic loss due to fascioliasis in Nepal was estimated to be Rs. 14.2 corer (Lohani and Rasaili, 1995). Infection of the human host was very sporadic until the last two decades when clinical cases and outbreaks were reported. It has now become an important emerging food borne trematode of increasing concern (Chen and Mott, 1990). The largest numbers of infected people have been reported in Bolivia, China, Ecuador, Egypt, France, Islamic republic of Iran, Peru and Portugal (WHO, 1995)

Schistosoma sp are the only trematode living in the blood stream of warm blooded hosts. The blood stream rich in glucose and amino acids, so along with the plasma and blood cells, it represents an environment which is suitable for egg producing tremadoes. *Schistosoma* sp. causes diseases called Schistosomiasis or Bilharziasis and is the main helminth diseases. The infections are often manifest by acute intestinal signs, the mucosa of the intestine is severally damaged and the animal develops profuse bloody diarrhoea, dehydration and loss of appetite. Not only goats,

sheep or cattle over 200 million people are infected in at least 75 countries with 500 million or more people exposed to infection. Most of species like *Schistosoma spindalia, S.japonicum & S.bovis* has been reported among buffaloes from Surkhet district (Ghimire,1987). In Satungal, Kathmandu prevalence rate of *Schistosoma* sp.was found about 9% (Mukhia,2007) and 5.06% was found from Khasibazar of Kalanki, Kathnmandu (Bashir, 2009). During this study it has been reported from khiljee V.D.C of Arghankhachi, Lumbini

Among roundworms of goats the commonest are *Trichostrongylus* sp; Hookworm ,*Ascaris* sp *Strongyloid* sp. Female round worms lay microscopic eggs that pass in the manure of cattle. With in few days the larva hatch from the egg. The larva passes via second and third stage. They infects the pasture. Goats get infected when they graze on the contaminated pasture. The larva mature in the intestine, mate and begins laying eggs. Adult roundworms can cause anaemia, diarrhoea, poor growth and even death. Hookworm like *Nector* and *Ancylostoma* shows severe symptoms like anaemia laziness and lack of physical and mental ability. Their infection also leads to physical and mental retardation. The heavy infection of the worms numbering from 250-400may leads to loss of about 268ml blood per day from the host body.

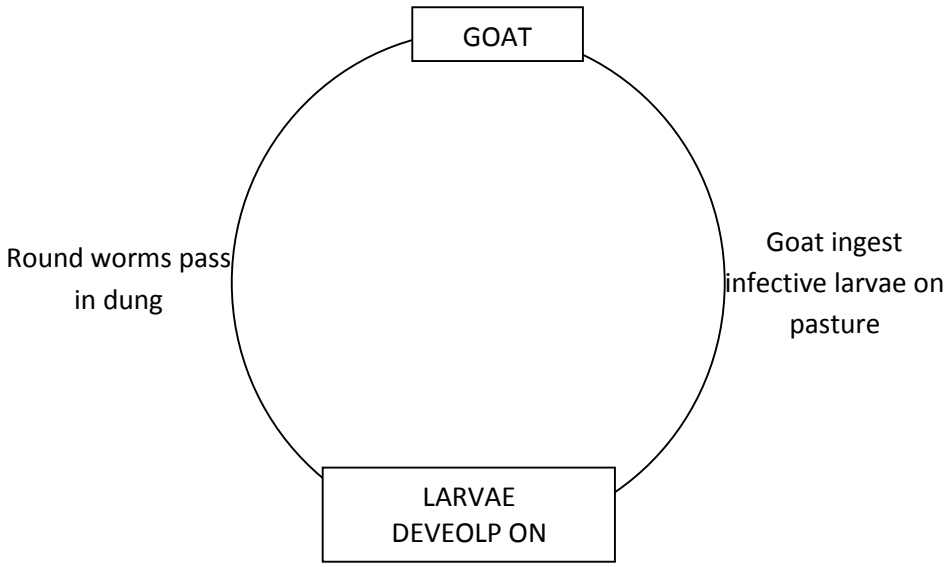

Fig. 3: Life - Cycle of gastrointestinal roundworms in general

The pathogenic effects of gastro-intestinal parasites may be sub-clinical or clinical. Young animals are most susceptible. The effect of these parasites is strongly dependent on the number of parasites and nutritional status of the animal they are

infecting. The clinical sign comprise of weight loss, reduced feed intake, diarrhoea and reduced yield. Severe blood and protein loss into abomasums and intestine due to damage caused by the parasite often results in oedema in the sub-mandibular region. Some nematode species especially *Haemonchus* is most pathogenic among blood suckers and infections with large number of this parasite often results in severe anaemia in the host. Blood loss from *Bunostomum* and *Oesophagostomum* infections may add to the severity of the anemia. Infections with gastrointestinal nematodes usually occur by the ingestion of eggs by the young kids. These nematodes damage the mucous membrane of the small intestine, migrating larvae may cause damage to the liver and lungs and cause severe anaemia and diarrhea to the host. Mixed infections with gastro-intestinal nematodes are very common.

Trichostrongyliasis is diseased stage of the gastro-intestinal tract of herbivorous animals and man is an accidental host only. This disease is caused by the members of the germs *Trichostrongylus* sp.The infection is acquired by the ingestion of contaminated vegetables or drinks with its third stage lrvae Strongyloidiasis is an intestinal infection of man caused by the penetration of the skin by the filariform larvae of *Strongyloides stercoralis.*

1.3 Zoonoses

These are disease that can be picked up by humans in close contact with animals such as goats. Goats with skin problems can transmit ringworm or mange, young kid with diarrhoea may have a parasites called *cryptosporidium* that can potentially cause diarrhoea in people, particularly in young children. There are many micro-organism in goat milk which also affect the human beings.

Some other disease like *Tuberculosis*, *Salmonella*, *Hydatiadosis*, f*ascioliasis Anthrax* and *Rabies* are also caused by the livestock in human beings.

1.4 Significance of the Study

Nepal ,being a developing country depends on agriculture and animal husbandry for its bulk of economy however, the farming technique is rather unscientific. The goat farming is also done in poor and unhygenic manner and hence

is heavily infected with different parasites including Helminth parasites. In these circumstances this type of study can play a vital role.

In Asian, European and American countries most people who live in village, goat is one of the financial resource of these villagers. The infection of helminth parasites in goats can cause significant economic loss leading to the poor health, reduced growth, mortality of kids, e.t.c. This study is an effort to determine the seasonal prevalence of helminth parasite in goat.

In addition the role and importance of goat for parasitic transmission and there significance in the continuty of some zoonotic disease can be investigated.

This study will also form a base for the future investigators, those working on livestocks.

1.5. Limitation of the study

Research studies face many problems, so obviously have limitation to the study. The present study no doubt bears the following limitation:

- This academic study has been carried out for the partial fulfillment of the requirement foe the master degree in Zoology at Tribhuvan University, Kathmandu, Nepal.
- This study was carried out to determine the prevalence of helminth parasites seasonally but the study doesn't reveal why some parasites were more predominant and other were not.
- This study is limited to certain parameters and some of the parts of the study were left untouched sue to time and cost factors so that future researchers can elaborate this study by approaching the untouched portion.
- Due to the lack of sophisticated instruments the identification of parasites were done up to genus level only.

CHAPTER II

OBJECTIVES

2.1 Objectives

2.1. a. General Objective

To determine the prevalence of intestinal parasites of goat (*Capra* sp.) brought to , Khiljee V.D. C. of Arghakhanchi, Lumbini, Nepal.

2.1. b. Specific Objectives

- To identify intestinal helminth parasites.
- To determine the general prevalence of intestinal helminth parasites.
- To determine the prevalence percentage of trematodes, cestodes and nematodes in goat.
- To develope the recommendation for the planning regarding the control of helminth parasites in goat.

2.2. Hypothesis

H_0 = There is no significant difference in prevalence of helminth parasites in summer, winter and rainy season.

H_1 = There is significant difference in prevalence of helminthes parasites in summer, winter and rainy.

CHAPTER III

LITERATURE REVIEW

An organism which obtains food or shelter from another organism (host) inhabiting in or on the body of host providing nothing in return but always harmed. Generally the parasite is smaller than the host eg. Louse, Round worm ,Hook worm ,Mosquito etc.

Origin of parasitism can be said as merely accidental. Parasitism probably began as harmless association of different organism i.e. with commensalism or mutalism. (Firstly ectocommensals followed by endocommensals), which during the course of evolution degenerated into parasitism. When the dependent partner (the parasite) failed to make its own living. The intestinal parasites were evolved from free living organism which were accidentally swallowed and adapted themselves in their new homes.

Rudolf Leuckart was considered the father of parasitology as well as one of the most famous Zoologist of the 19^{th} century .In the field of parasitology, his studies of the liver fluke, *Taenia* and of *Trichina spiralis* were highly significant. His work with parasitism infections proved that *Taenia saginata* occurs only in cattle and that *T. solium* occure only in pigs.

Goat (*Capra hircus*) is an important domestic animals, it is a herbivious animals and widely distributed in all over the worlds. It is a member of the bovine family and subfamily caprinae is one of the oldest domesticated species It is regarded as a very beneficial animal for thousand of years, they have been utilized for their milk, meat, hair and skins all over the world.

Goats are ruminants and have four stomach the largest being the rumen. Stomach which plays a vital role in digesting regurgitating and redigesting their food. They will consume on average 4.5 pound of dry matter per 100 1bs of body weight per day. But there are several health problem in livestock. They face many problems by helminth parasites due to lack of nutrition and poor management due to these worms there is loss of lives of live- stock. They caused infection in intestine

mostly and also in liver, lungs, circulatory system ,lymphatic system and skin and hence mainly called “gastro- intestined parasites”. Trematodes and cestodes attack them to caused adverse harm. Fluke suck the blood and destroy the lives of the host.

Parasitic zoonoses are distributed world wide and constitute an important group of diseases affecting both the human and animals. Many of the parasitic zoonoses produce significant mortality and morbidity in the human and are responsible for the major economic loss by affecting the animal health. Most of the papers have been presented and published largely after the outbreak of helminthic diseases among human and animals. Literatures exist in helminth parasites as the diseases continued to survive with new threats. Major research efforts that have been directed towards helminth parasites, the portions of the work and reports related to the epidemiology of helminth parasite have been mentioned here.

3.1 In Global Context

Jithendran and Krishna (1990) conducted a study on prevalence of helminthiasis in small ruminants in Palampur (Himanchal Pradesh, India). Faecal examination of 325 goats was done and 93 percent goats were found to be infected with *Strongyloides* and species of *Fasciola.*

Ndao *et al*., (1991) conducted an epidemiological survey on gastrointestinal helminthiasis in 51 sheep and 51 goats on Senegal from October 1990 to September 1991. All the animals examined were infected with at least one helminth species. Three trematodes (*Fasciola gigantica, Schistosoma bovis, Amphistomum* spp), 2 cestodes (*Moniezia, expansa, Cysticercus tenuicollis)* and 9 nematodes were identified. The most important parasite in goat was *Trichostrongylus colubriformis,* while *Haemonchus contortus* in sheep.

Jithendran (1993-1997) examined the status of helminth parasites in goats and sheep in Palampur (Himanchal Pardesh) by using standard coprologic parasitological procedure and recorded the prevalence of predominant nematode species of *Strongyloides, Trichostrongylus, Haemonchus* and *Oesophagostomum, Fasciola, Dicrocoelium* and *Schistosoma* among the trematodes and *Moniezia* among the cestodes

Pathak *et al* ; (2000) collected 88 gastrointestinal tracts of goats from the slaughter house Supela, Bhilai and were also collected from the Veterinary College, of Durg district Chhattisgarh and were brought for the postmortem examination during November 1999 to October 2000.The percentage of overall parasitic infection *Paramphistomum* spp; *Cotylophoron* spp; *Moniezia* spp; *Avitellina* spp; *Haemonchus* spp; *Cooperia* spp; *Oesophagostomum* spp; *Bunostomum* spp; and *Trichuris* spp., were 80.68, 45, 45, 17.04, 3.40, 26.13, 5.68, 3.40, 30.68, 5.68 and27.27 respectively. In case of *Paramphistomum*, infection was highest in monsoon (91.8%) and lowest in winter (63.15%). In present investigations the seasonal prevalence of gastrointestinal parasitic infection in goat showed that prevalence was highest in monsoon (94.60%) moderate in summer (87.50%)and lowest in winter (63.15%).

Silvestre *et al.,* (2000) studied the relationship between helminth species diversity, intensity of infection and breeding management in dairy goat farms of South Western France. A total of 17 helminths, among which 14 nematodes, one cestode (*Moniezia* sp) and two trematodes (*Paramphistomum* and *Dicrocoelium)* were recorded in the 26 necropsied culled goats during the study.

Jithendran *et al* ., (2001) studied the prevalence of gastrointestinal parasites in sheep and goats of Himachal Pradesh, India and found the prevalence in sheep and goats respectively as follows: *Fasciola* 9.6%, 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%.

Sharkhuu (2001) performed the Post-mortem examination of 236 goats from all provinces in Mongolia for the study of helminthes in goats. Thirty-nine helminth species belonging to three classes, 14 families and 23 genera were found. The prevalence and intensity of helminth infection were reported for three age groups of goats in four seasons and three geographic zones in Mongolia. Common helminth infections of goats in all zones of Mongolia were infection of *Ostertagia*, *Marshallagia* and *Nematodirus*. The highest number of eggs per gram (EPG) of feaces was counted in March (average 1335.3+405.3) and the lowest count was in November (54+18.6).

Mondal *et al.,* (2002) conducted a study of gastrointestinal helminth in livestock grazing is grassland of Bangladesh. They released two cow calves and two goats in a grassland used for commonal grazing of livestock. After slaughtering of the tracer animals, their gastrointestinal examination revealed six species of nematode and one cestode. The nematode species were *Haemonchus contortus, Trichostrongylus axei, Mecistocirrus digitaus, Oesophagostomum* sp, *Trichuris* sp and *Bunostomum* sp. The cestode was one of the genus *Moniezia*. With this study, grasslands are thought to be one of the main sources of gastrointestinal parasitic diseases of livestock in Bangladesh.

Wanjala *et al.,* (2002) conducted a research on prevalence of parasitic infections in small ruminants in a post oral community in Narok district, Kenya. The investigation was done in 150 sheep and 150 goats during wet season (May - June) and dry season (August - September) and the findings showed that 52 percent of the animals were infected. The most prevalent genera of helminthes identified were Strongyle group.

Woldemariam (2002-2003) conducted a study on 57 lamb and 53 kid tracers during different seasons in the Mid-Rift valley of Ethiopia. In this study, the predominant worms recovered from 57 lambs were *Haemonchus contortus* (91-100 %) and *Trichostrongylus colubriformis* (90-100 %), followed by *Oesophgostomum columbianum* (33-83%) and *Trichuris ovis* (8-33%). Similarly, *Haemonchus contortus* (95-100%) and *Trichostrongylus colubriformis* (83-100%) were predominant in the 53 kid tracers, followed by *Oesophagostomum columbianum* (58-83%) and *Trichuris ovis* (41-74%). A significant different in eggs count was observed within seasons and sites.

Besier and Love (2003) conducted a study on intestinal parasites in sheep and goats in Australia. In this study, *Haemonchus* spp, *Trichostrongylus* spp and *ostertagia* spp. were predominant helminth parasites.

Regasa *et al*., (2003-2004) were conducted a study on epidemiology of gastro-intestinal parasites of ruminants in western Oromia, Ethiopia. This study showed that the overall prevalence of gastrointestinal parasites were 84.1 percent in goats.

Nematodes of group Strongyle and *Eimeria* were the most prevalent parasites encountered in this area.

Yadav *et al.*,(2005) reported the highest incidence of gastro-intestinal nematodiasis in goats followed by buffalo and cattle in India. *Haemonchus, Trichostrongylus, Bunostomum, Oesophagostomum* and *Strongyloides* species were the main parasites recovered from the intestine of sheep, goats and buffaloes.

Waruiru *et al*. (2005) conducted a study on gastrointestinal parasitic infections of sheep and goats in semi-arid area of Machakos district, Kenya. The overall prevalaence were *Strongyloides* (51.6%), *Fasciola* spp (31.5%), *Coccidia* (28.0%), *Moniezia* spp (2.5%) *Haemonchus* (58.0%) was the most prevalent nematode followed by *Trichostrongylus* (29.0%) and *Oesophagostomum* (13 %).

Opara *et al*. (2005) Conducted a study on occurrence of parasitic helminthes among small ruminants rared under traditional husbandry system in Owerri, South East Nigeria. In this study, out of 2,550 small ruminants examined 71.4 percent were goats which have helminth infection rates of 90.1 percent. Nematode infection was consistently high and gave infection rate of 78.4 percent, while trematodes and cestodes were recorded 13 percent and 8.7 percent respectively. Among trematodes, *Paramphistomum* inflection is 86.7 percent, among nematodes *Strongyloides* 62-2 percent and among cestodes *Moniezia* 50 percent were the highest.

Di Gebro *et al*., (2006) carried out a survey of parasites in goat farms in Bergamo province, north Italy from May 2005 to Jan, 2006. Fecal samples of 836 adult female goats from 31 dairy goat farms were examined. *Strongyloides* sp. showed higher value of prevalence in goats housed in summer while *Nematodirus* in winter in goats at pasture. *Strongyloides* occurred more frequently in autumn in stabled goats.

Lima *et al.,* (2006) studied the faecal samples collected from 20 goats in Paulista, PERNAMBUCO, Brazil, from August 1998 to July 1999. They were subjected to eggs per gram faeces (EPG) determination and nematode larvae culture. It was shown that 82% of the samples were positive for helminthes. *Strongyloides, Moniezia* and *Trichuris* spp. Ova were obtained in 72.8%, 8.4% and 2.0% of the samples, respectively, while third stage larvae of *Haemonchus*, *Trichostrongylus* and

Oesophagostomum spp. were obtained from 75.13, 24.32 and 0.54% of the samples, respectively. The medium number of *Haemonchus* and *Trichostrongylus* spp. larvae per gram faeces was higher in the rainy months. There was a significant correlation between EPG and temperature, EP and rainfall and EPG and the number of *Haemonchus* spp. larvae per gram faeces. *Haemonchus* spp. was present throughout the study period.

Mungube *et al.*, (2006) estimated the prevalence and economic losses caused by *F. gigantica* and *F. hepatica* in the ruminant production systems of Taveta division of Kenya in a retrospective appraisal of the slaughter records on the total number of animals slaughtered and livers condemned over the period 1989 to 2004. Liver condemnation rates differed significantly between bovines, caprines and ovines ($p \leq 0.05$) for *F.gigantica* (26%, 6.6% and 5.2% respectively)and for *F.hepatica* (0.4%, 22% and 28% respectively).The total loss through condemnation of both *F.gigantica* and *F. hepatica* infested livers was 4 408272 KES (Kenyan shillings) (US$ 72 272). The proportion of loss in bovines, caprines and ovines was 76%, 17% and 7% respectively.

Regassa *et al* ., (2006) conducted a study to determine the prevalence and risk factors associated with gastrointestinal parasitism in western Oromia, Ethiopia during 2003-2004. A total of 757 ruminants (257 cattle, 255 sheep, and 245 goats) were included in the study using standard coprological parasitological procedure. The study showed that the overall prevalence of gastrointestinal parasites was 69.6% with 50.2%, 75.3% and 84.1% in cattle, sheep and goats respectively. *Strongyles* and *Eimeria* were the most prevalent parasites encountered in the area. Season and age were shown to have association with prevalence but not EPG while no association was revealed between prevalence and EPG with sex and body condition of the animal.

Rehman *et al.*,(2006) assessed the month-wise prevalence of gastrointestinal trematodes, nematodes and cestodes in Damani sheep and goat in Pakistan. A total of 96 positive gastrointestinal tracts (48 each) of sheep and goats were examined. Trematode infection was 16.66% both in sheep and goats in May, whereas in June, July and August it increased to 25% in sheep. A similar increase was recorded in June and July in goats which dropped to 8.33% in August. Highest custodial infections in sheep and goats were recorded in June (33.33%) and August (41.16%) respectively.

The lowest recorded nematodal infections in sheep were observed in June (41.66%), which increased in July (50%), May (58.33%) and August (58.33%). In goats, the lowest records were observed in June (41.66%), with an equal increase in May and August (i.e.50%)

Menkir (2007) carried out a two year epidemiology study of helminthes of small ruminants. The study involved the collection of viscera from 655 sheep and 632 goats from 4 abattoirs in eastern Ethiopia. A further more detailed epidemiology study of gastrointestinal nematode infections used the Haramaya University (HU) flock of 60 Black Head Ogaden sheep. The parasitological data included numbers of nematode eggs per gram of faeces (EPG), faecal culture L3 larvae, packed red cell volume (PCV), adult worm and early L4 counts, and FAMACHA eye- colour score estimates, along with animal performance (body weight change). There were 13 species of nematodes and 4 species of flukes present in the sheep and goat, with *Haemonchus contortus* being the most prevalent (65-80%), followed by *Trichostrongylus* spp. The nematode infection levels of both sheep and goat followed the bi-modal annual rainfall pattern, with the highest worm burdens occurring during the two rain seasons (peaks in May and September).

Odoi *et al*., (2007) investigated the burden and risk factors of gastrointestinal nematode parasite infection in sheep and goats kept in small holder mixed farms in the Kenyan Central Highlands. 370 small ruminants were sampled from 66 smallholder mixed farms in agro-ecological zones 1 (humid) and 3 (semi-humid) in the Kenyan Central highlands. Fecal eggs counts (FEC) were performed using the modified McMaster technique. Study investigated the burden and risk factors of gastrointestinal nematode parasite infections in sheep and goats kept in smallholder mixed farms in the Kenyan Central Highlands.

Ijaz *et al*., (2008) carried out a study to find out the infection rate of gastrointestinal tract (GIT) helminthes and its association with diarrhoea in goats in Lahore, Pakistan. For this purpose, 300 faecal samples from goats suffering from diarrhoea presented at the Outdoor Hospital, Department of Clinical Medicine and Surgery, UVAS Lahore and various private as well as government hospitals located in Lahore were examined coprologically for the presence of helminthes. The result revealed that an overall infection rate of GIT helminthes was 63.33% in goats. When

compared the class wise infection rate, highest infection rate of nematodes (42.67%) was observed, followed by trematodes (16.67%) and cestodes (4%).

Rajapakse *et al*., (2008) collected and examined the gastrointestinal tracts of 218 crossbred goats representing the dry zone of Sri Lanka during a year study period 217 (more than 99%) of the animals examined ere infected with one or more species of nematodes. Five species of nematodes were found in the abomasums and intestine. They were *Oesophogostomum columbiamum* (88%), *Haemonchus contortus* (81%), *Trichostrongylus columbriformis* (76%), *Trichostrongylus axei* (59%) and *Trichuris ovis* (59%).

Sueleyman *et al*., (2009) studied the concentration of haptoglobin, serum amyloid A and ceruloplasma were measured in goats with mixed gastrointestinal infection of nematodes and liver trematodes. Twelve patients who were diagnosed as having mixed helminth infection after detection of *Trichuris* spp, *Trichostrongyloides* spp and*Fasciola* spp and six healthy controls participated in the study. The concentration of the acute phase protein were significantly higher in goat with mixed gastrointestinal infection with nematode and liver trematode. As a result of this study, we determine that the concentration of haptoglobin and serum amyloid A increased in goat with mixed helminth infection.

Pavel vejl and Andriy Lytvynets (2009) investigated the epidemiology of gastrointestinal nematodes of sheep with special focus on the survival of infective larvae in winter condition. Tracer tests conducted over a 3 years period were aimed at measuring the level and species nematode composition of survival on pasture with a special focus on winter month. The survival of infective larvae in chilly condition is not significantly affected by *Trichostrongylus axei, T colubriformis,* and *Chabertia ovina*.On the contrary the number of *Teladorsagia circumcincta* and *Nematodirus filicollis* significantly increase in middle winter condition. The result confirmed and epidemiology strategy of over wintering in the arrested stage for *Teladorsagia circumcincta* and *Nematodirus filicollis.* The epidemiology strategy of genus *Trichostrongylus* used both strategy in particular the tolerance of free living stage to cold condition.

3.2. Literature review in context to Nepal

The preliminary work on parasitic diseases of farm livestock in Nepal initiated during 1970-72 under a Swiss associated project. Surveys on common parasitic diseases were undertaken in the Kathmandu Valley and in few other districts representing hills, Terai and high mountains (Singh *et al*., 1973). This study determined the prevalence of parasitic diseases (Liverfluke) and carried out the identification of nematode parasites, snail species and some ectoparasites. Following this study, prevalence of parasitic diseases were carried out by other workers in different parts of the country but most of these studies were limited to the examination of dung samples for Liver fluke in buffaloes and cattle (commonly) and very rarely studied the gastro-intestinal parasites of sheep and goats.

Thakur and Thakuri (1992) reported that the prevalence of the parasitic infection was 100 % in goats during the month of July in western Nepal.

Jha *et al.*, (1993) analyzed the autopsy record of 266 goats carried out at Pakhribas Agricultutre Centre, Dhankuta and attributed 6.4 percent mortality in goats due to GI nematodes and 3.7 percent and 1.2 percent mortality due to fascioliasis and paramphistomiasis respectively.

Joshi (1994) recorded 28 percent mortality in goats due to gastro-intestinal nematodes in a sedentary flock at low hill village of western Nepal in which *Haemonchus contortus* was the main worm species involved.

Thakuri (1994) found that the major clinical problem in goat was parasitic diseases which accounted for about 74 percent of the total treated cases of the 20,499. Helminth parasites recorded in the hill district were 34 percent trematodes, 65 percent nematodes and 1 percent cestodes.

Joshi (1995) carried out a detailed study on sheep and goats in western hills of Nepal. In this study during 12 months period, a total of 4090 faecal samples were analyzed from both migratory and sedentary systems. Prevalence of worm infection ranged between 60-100 percent in ewes, 7-97 percent in lambs, 15-100 percent in adult goats and 6-100 percent in goat kids.

Dhakal, Jha and Basnet (1996) reported the prevalence of GI nematodes in sheep and goats in Pathivara VDC of Sankhuwasawa district to be 100 percent and 85 percent respectively.

Acharya (1999) carried out a study on GI parasites of goat and sheep of IAAS livestock farm and recorded *Haemonchus*, *Ostertagia*, *Chabertia*, *Strongyloides*, *Trichostrongylus*, *Oesophogostomum* and *Cooperia*.

Joshi (2000) conducted a study for a period of one year on the epidemiology and clinical significance of gastro-intestinal nematodes on the health and production of goats raised under the sedentary and migratory managements in the hills and mountains in Nepal. The findings showed that the worm burden in the migratory goats was considerably higher than that in the sedentary (management) goats throughout the year. *Ostertagia* was the predominant nematode genus present in migratory system followed by *Trichostrongylus* species with a low proportion of *Haemonchus.* In sedentary system, however, the predominant genus was *Trichostrogylus* followed by *Haemonchus.*

Nirmal (2000) conducted a study of major diseases of goats in far western region Nepal. In the study, 71 percent cases were found as parasitic diseases, among which 54.6 percent due to *Strongyloides* and 61 percent due to coccidians.

Kushwaha (2000) conducted an investigation of goat diseases under commercial rearing system from May 1999 to April 2000 in Surkhet. In this study, the prevalence percent age of parasitic disease was 44 percent of which 88 percent due to *Strongyloid* species, 2 percent due to *Ostertagia* species, 7 percent due to *Haemonchus* species and 1 percent due to *Coccidia* species.

Devekota (2005/06) conducted a study on outbreak of parasitic gastroenteritis in goats under sedentary management in a low hill village of western Nepal. In this study, *Haemonchus contortus* was the most prevalent species.

Jaiswal (2006) carried a study on fascioliasis in ruminants at Dhanusa district based on the examination of faecal sample brought to DLSO Janakpur from June 15th to November 15th 2005. Total of 2655 faecal samples were examined out of which 70.70 percent were positive for overall parasitic infestation. Among these, prevalence

of fascioliasis was found to be 43.43 percent followed by paramphistomiasis 38.09 percent and round worms 13.43 percent. The prevalence of *Fasciola* infection was found in goat is 31.25 percent in cattle 49.36 percent and in buffalo is 56.02 percent.

Dhital (2006) conducted a study to determine the prevalence of gastro-intestinal parasites in goats at the IAAS livestock farm and Maglapur VDC-2, Chitwan. A total number of seven gastro-intestinal parasites were found from goats. Among them, strongyles types (*Haemonchus, Trichostrongylus, Bunostomum, Cooperia* and *Ostertagia*) and *Nematodirus* were the commonest parasites, where as *Trichuris, Moniezia* and *Oesophagostomum* spp were less common. The faecal sample examination showed that out of 20 samples collected from goats of IAAS farm, 90 percent were positive for eggs of one or more types of GI parasites, where as out of 30 samples collected form Manglapur VDC-2, 76.66 percent were positive for eggs of these parasites.

Parajuli (2007) studied intestinal helminth parasite of goat (*Capra hircus*) and found 181 (81.53%) positive samples among 222 total samples from Khasibazar of Kalanki, Kathmandu.

Bashire (2009) studied seasonal prevalence of intestinal helminth parasite of goat (*Capra hircus*) and found 46, (46%) positive sample in winter out of 100 samples and 112, (90.3%) samples were found positive in summer out of 124 samples.

CHAPTER IV

MATERIALS AND METHODS

4.1. Study Area

Nepal is one of the richest countries in the world in terms of biodiversity due to unique geographical position and latitudinal variation. Geographically, it is 80^0 4" to 88^0 12" East longitude and 26^0 22" to 30^0 27" North latitude. It is an independent, sovereign and landlocked country bordered by China to the North and India to the East, West and South. It is approximately 885 km in length and it's mean width is 193 km with a total land area of 147,181 sq. km. It has devided into 5 development regions, 14 zones and 75 districts.

The study area, Arghankhachi is one of these 75 districts. The district is situated between 27'45"N to 28'6" N and 80'45" E to 83'23"E. The district covers a total of 1,193 km² area. It is bound by Palpa in the east, Gulmi in the north, Kapilbastu and Rupandehi districts in the south and Dang and Pyuthan in the west. 68% of its landscape is located in Mahabharat range and 32 % is located in Siwalik region. (www.google.com/Arghankhachi)

The study area 'Khiljee' is the one of the village of among 52 villages of Arghakhanchi district. It is situated at the mountain region of Nepal. Its about 200 KM west from the capital city Kathmandu. Khiljee is the V.D.C of same district where people kept many domestics animals for farming. Buffalos, cows, oxen and goats are such domestics animals. The main purpose of farming the goat by the people is meat which is their main source of earning. Goats are supplied from this places to the slaughterhouses of district headquarter.

Goats are most demanded common livestock species because of their wide acceptance as a source of animal protein (meat) for all religious and ethnic groups. The population of goat and meat production is estimated to be 6.6 million and 0.4 metric tons respectively which contributed 19.4 percent to the total meat production of the country (MOAC, 2002).

jkThis study is to determine the seasonal prevalence of helminthe infection in goats. The stool samples were collected from the study area and brought at Central Veterinary Laboratory, Tripureshwor for laboratory diagnosis.

Map of Arghankhachi

4.2. Study Design

The study is based under laboratory examination.

4.3. Study Period

Dec / Jan 2008/2009 ,May / June 2009, August / September 2009

4.4. Sample Size

The total no of samples taken during winter, summer and rainy seasons were 100,100 and 50 respectively. Altogether 250 samples were for examination. The sample were collected from Khiljee V.D .C ,Arghakhachi, Lumbini.

4.5. Precautions and Preservation

To ensure better condition during sample collection, the following precautions were taken.

a) The fresh stool samples were taken.

b) The samples were collected in airtight container to prevent desiccation.

c) 3-4 drops of 10 percent formalin were used to preserve stool samples.

4.6. Laboratory Equipments and Materials

- Cotton
- Refrigerator
- Slides
- Glass rod
- Cover slip
- Centrifuge machine
- Centrifuge tube
- Gloves
- Tea strainer
- Microscope
- Pasteur pipette
- Test tube
- Rack
- Dropper
- Motor & Pistle

4.7. Chemicals

i. Distilled water
ii. Zinc sulphate solution (33%)
iii. Methylene blue
iv. Formalin (10%)

4.8. Stool Examination

The stool samples were collected and brought to laboratory in preservatives and refrigerated. The stool samples were examined by differential floatation technique, sedimentation technique and stoll's counting method.

4.8. a. Floatation Technique

The floatation technique is widely used for the detection of nematode and cestode eggs. Eggs of cestodes and nematodes are relatively small and light. This technique ensures the eggs to float in the floatation liquid.

Three gram of stool sample was taken in a beaker and 42 ml of 33% zinc sulphate solution was added. With the help of motor and pistle, the sample was grinded lightly and filtered with a tea strainer. The filtered solution was poured into a plastic tube of 15 ml and centrifuged at 1000 rpm for 5 minutes. More zinc sulphate solution was added so that convex surface is formed at the top of the tube. A cover slip was placed over the top of the tube so that zinc sulphate touches the cover slip for a few minutes and then cover slip was placed on a slide and examined at 10X.

4.8. b. Sedimentation Technique

The technique is used for the detection of trematode eggs. It provides good results as the eggs of the trematode are bit heavier than the other eggs and deposited at the bottom of the test tube after the centrifugation with zinc sulphate solution.

A drop of deposited materials was taken out from the test tube with the help of pipette and placed on the slide, added a drop of methylene blue into it and examined under the microscope at 4X and 10X.

4.8. c. Stoll's Counting Method

It is the easiest quantitative method to count the number of eggs present in the microscopic field without the help of Mcmaster (According to Dr. Tom Nola, University of Pennsyivania, 2004)

Three gram of faeces was taken in a beaker and 42 ml of water was added. Using a tongue depressor, 3 gm of faeces was pushed through a sieve into the water. Then the sive was lifted and hold over the dish. Then the remaining water was pushed out from the faeces. After stirring the water-faeces mixture, 0.15 ml of the suspension was taken and spread over two slides. Each slide was covered with a long cover slip. Then both slips were examined for eggs. The total amount of eggs counted multiplies with 100 represents the number of eggs per gram of faeces.

4.9. Key for trematodes, cestodes and nematodes

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CHAPTER V

RESULT

Helminth parasitic infection is the common problem of goats and other domestic animals all over the world. This work has been done in order to identify the eggs of various type of helminth parasites. It also includes which parasite is found more in which season. Beside this, the study also includes the degree of infection. This particularly deal with the rate of infection i.e. what number of parasites are able to cause infection or to what extent the particular helminth parasite is pathogenic. All this will serve as a medium for solving the problem of helminth parasites. Thus the study has been devided into the following major parts are:

- General prevalence of helminth parasites.
- Seasonal prevalence of trematodes, cestodes and nematodes in Nepal.
- Class wise seasonal Prevalence.
- Identification of egg of helminth.
- Intensity of infection.

5.1. General prevalence of helminth parasites

During examinations of samples of summer, winter and rainy 170 hosts were found to be infected out of 250 hosts. Over all outcome of the study was 68% prevalence. This study showed 48.82% trematode infection, 26.47% cestode infection and 74.70% nematode infection. The total numbers of genera observed during examination were 20 in number.3 genera of trematodes, 2 genera of cestodes and 15 genera of nematodes were observed (Table 1).The general and overall prevalence percentage of each species is given in the following table.

Table 1 Observed genera of different classes with prevalence percentage

S.N.	Class	Genera of Helminth	Percentage(%)
1	Trematoda	*Dicrocoelium*	7.05%
2		*Fasciola*	18.82%
3		*Schistosoma*	25.88%
4	Cestoda	*Moniezia*	0.58%
5		*Taenia*	22.94%
6	Nematoda	*Ancylostoma*	3.52%
7		*Ascaris*	20%
8		*Bunostomum*	2.94%
9		*Capillaria*	8.23%
10		*Chabertia*	5.88%
11		*Cooperia*	4.70%
12		*Dictyocalus*	5.29%
13		*Heamonchus*	2.94%
14		*Nematodirus*	2.94%
15		*Oxyrius*	0.58%
16		*Strongyl*	1.76%
17		*Strongyloides*	5.29%
18		*Toxocara*	2.35%
19		*Trichuris*	7.05%
20		*Tricostrongyloid*	5.88%

Highest prevalence was shown by *Schistosoma (25.88%*) and lowest prevalence was shown by *Moniezia* and *Oxyuris* (0.58%).

5.2. Seasonal prevalence of helminth parasite in goats

After collection of 100 sample in each winter, summer and 50 samples in rainy season from the study area ,the examination of the sample were carried out. The examination of samples were done by using the floatation and sedimentation technique. Out of 100 samples in each winter and summer respectively 54 samples were positive (54%) in winter and 84 samples were found positive (84%) in summer. In rainy season 32 samples were positive (64%) out of 50 samples. The rate of prevalence of helminth was found more during summer i.e. 84% than in winter and rainy i.e. 54% and 64%.

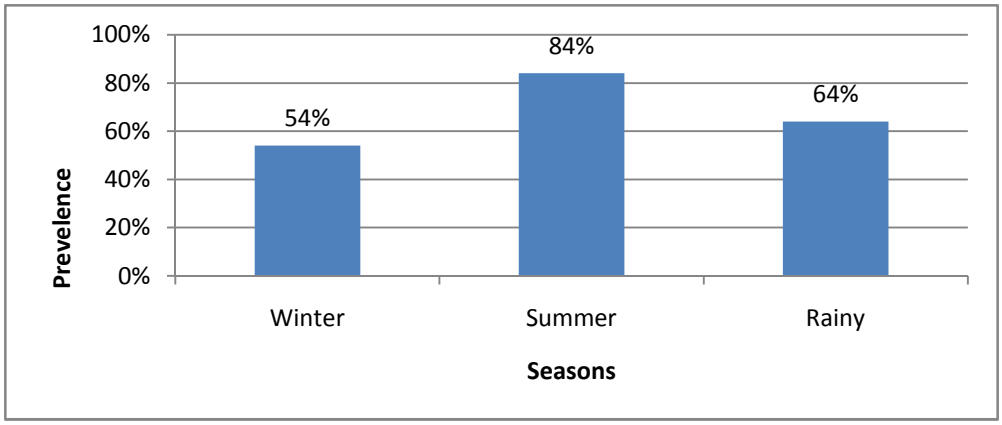


Fig:4 General seasonal prevalence of helminthes parasite in goats

5.3. Class wise seasonal Prevalence

During examination of the samples overall 20 genera were observed .But on seasonal basis 14 (73.68%) genera were recorded during winter ,18 (94.73%) genera were recorded in summer and 15 (78.94%) genera were observed in rainy season.

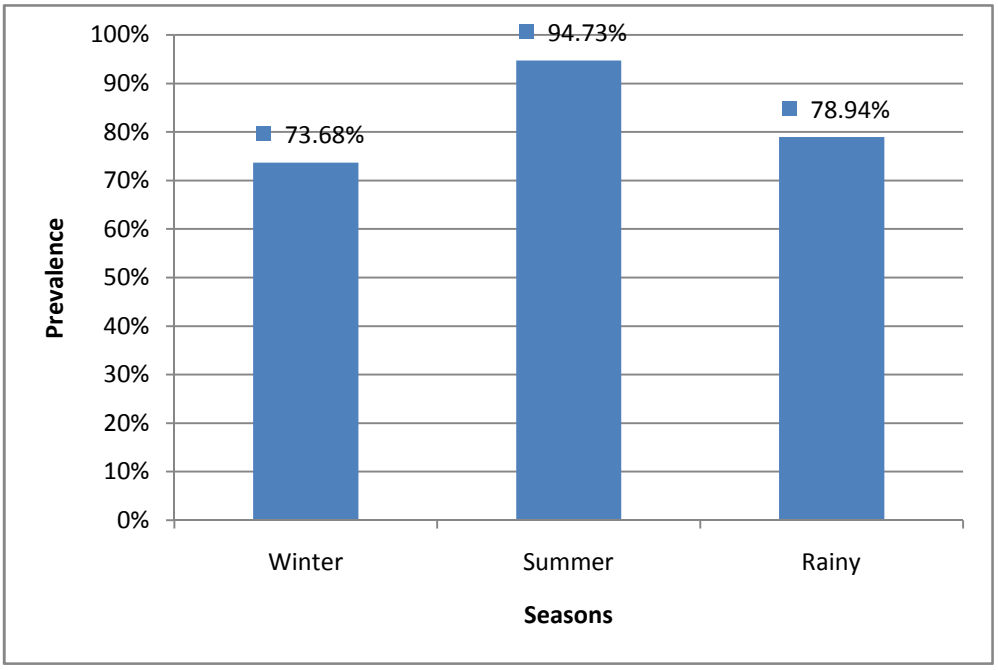


Fig:5 Genera wise seasonal prevalence

5.3. a. Seasonal Prevalence of Trematode of goat

Out of 100 samples in each winter and summer 26 (48.18%) samples were found positive in winter and 45 (53.57%) samples were found positive for in summer. Similarly out of 50 samples from rainy season 17 (53.12%) samples were found to be positive for trematodes. **A**ltoghter 88 (51.76%) sample were found positive for Trematodes. Trematodes samples of winter 14 (25.9%)samples were positive for *Schistosoma* and 11(20.3%) samples were positive for *Fasciola.* Trematode samples of summer 21 (25%) samples were positive for *Schistosoma* ,15 (17.85%) were positive for *Fasiola* and 9 (10.7%) were positive for *Dicrocoelium.* Trematode samples of rainy 9 (28.1%) samples were positive for *Schistosoma* 6(18.7%) samples were positive for *Fasciola* and 2 (6.25%) sample were positive for *Dicrocoelium.*

The difference in the prevalence of different genera of trematodes during winter, summer and rainy was found statistically insignificant (¡ ^{2} = 3.65, P < 0.05, d. f. = 1)

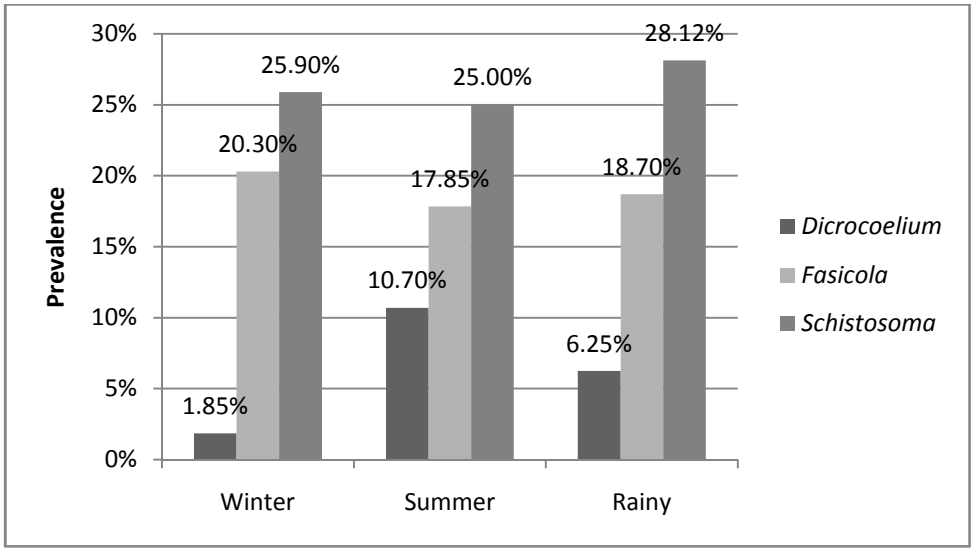


Fig: 6 Seasonal Prevalence of Trematode of goat

5. 3. b. Seasonal Prevalence of Cestode genera

Out of 100 samples in each winter and summer ,12(22.2%) were positive in winter and 17(20.23%) were positive in summer and 1 (1.19%) samples were positive for *Moniezia* only in summer season. Similarly out of 50 samples from rainy season 10 (31.25%) samples were found positive for cestode. Altogether 40 (23.52%) samples were found positive for cestodes The difference in the prevalence of different genera of cestodes during winter, summer and rainy was found statistically insignificant (¡ ^{2} = 0.05, P < 0.05, d. f. = 1)

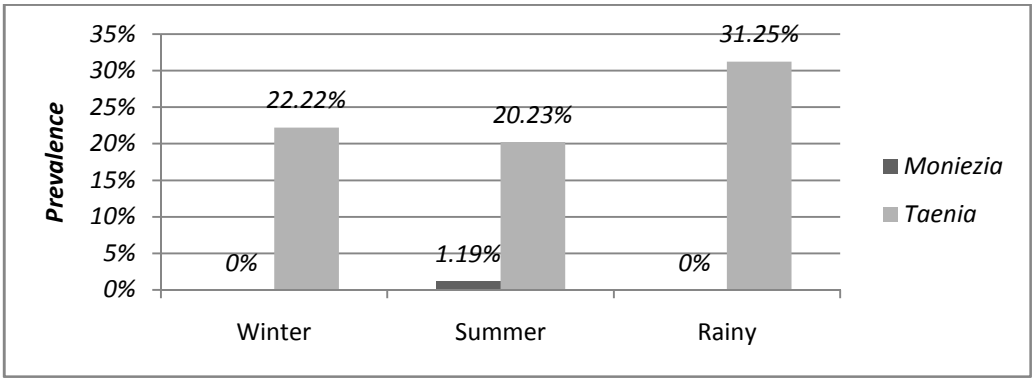


Fig:7 Seasonal Prevalence of cestode of goat

5. 3. c. Seasonal Prevalence of Nematode genera

Out of 100 sample in each winterand summer 40 (74.07%) were positive in winter, 67 (79.76%) were positive in summer. Similarly out of 50 samples from rainy season 29(90%) samples were found to be positive Altogether 136 (80%) samples were found positive for nematodes. The difference in the prevalence of different genera of nematodes during winter, summer and rainy was found statistically insignificant (¡ ^{2} = 70.26, P < 0.05, d. f. = 1)

Table 2: Prevalence of Nematodes during winter

S.N.	Nematode	During winter	Prevalence
1	*Ascaris*	12	22.22%
2	*Capillaria*	6	11.1%
3	*Chabertia*	3	5.5%
4	*Cooperia*	1	1.85%
5	*Dictyocalus*	4	7.40%
6	*Haemonchus*	2	3.70%
7	*Oxyrius*	1	1.85%
8	*Toxocara*	2	3.70%
9	*Trichuris*	4	7.40%
10	*Tricostrongyloid*	5	9.25%

Table 3: Prevalence of nematodes during Summer

S.N.	Nematode	During Summer	Prevalence
1	*Ancylostoma*	3	3.57%
2	*Ascaris*	16	19.05%
3	*Bunostomum*	4	4.76%
4	*Capillaria*	8	9.52%
5	*Chabertia*	4	4.76%
6	*Cooperia*	7	8.33%
7	*Dictyocalus*	3	3.57%
8	*Haemonchus*	2	2.38%
9	*Nematodirus*	3	3.57%
10	*Strongyloid*	8	9.52%
11	*Toxocara*	2	2.38%
12	*Trichuris*	4	4.76%
13	*Tricostrongyloid*	3	3.57%

Table 4: Prevalence of nematodes during Rainy Season

S.N.	Nematode	During rainy	Prevalence
1	*Ancylostoma*	3	9.37%
2	*Ascaris*	7	21.87%
3	*Bunostomum*	1	3.12%
4	*Chabertia*	3	9.37%
5	*Strongyl*	3	9.37%
6	*Dictyocalus*	2	6.25%
7	*Haemonchus*	1	3.12%
8	*Nematodirus*	2	6.25%
9	*Trichuris*	4	12.15%
10	*Strongyloid*	1	3.12%
11	*Tricostrongyloid*	2	6.25%

5.4. Identification of egg of Helminth

While examining the 100 samples of winter and summer respectively 54% samples were found positive in winter and 84% samples were found positive for summer season. In 50 samples of rainy season 64% samples were found positive .The total number of egg identified were listed below in the table:

Table 5: Observed genera of different classes

S.N.	Class	Genera of Helminth
1	Trematode	*Dicrocoelium*
2		*Fasciola*
3		*Schistosoma*
4	Cestoda	*Moniezia*
5		*Taenia*
6	Nematoda	*Ancylostoma*
7		*Ascaris*
8		*Bunostomum*
9		*Capillaria*
10		*Cooperia*
11		*Chabertia*
12		*Dictyocalus*
13		*Haemonchus*
14		*Nematodirus*
15		*Oxyuris*
16		*Strongyl*
17		*Strongyloides*
18		*Trichostrongylus*
19		*Trichuris*
20		*Toxocara*

Identification of eggs of helminthes were done on the basis of their morphology and characters Identification of eggs of helminthes in brief were done as follows:

TREMATODES

Fasciola sp

Family - Fasciolidae

Genus - *Fasciola* sp

Description of the egg

Eggs are 130-197 by 63-104 ⇑m in size, oval shaped, yellowish in colour, consists of embryonic mass and shell, operculum usually indistinct.

Schistoma sp

Family - Schistosomitidae

Genus - *Schistosoma* sp

Description of the egg

Eggs are 200um by 70-90⇑m in size, spindle shaped, flattened at one side, greatly elongated with straight slender terminal spine.

Dicrocoelium sp

Family - Dicrocoelidae

Genus - *Dicrocoelium* sp

Description of the egg

Eggs are 36-45 by 23-30 ⇑m in size, dark brown in colour, operculated, usually with a flattened side, contains miracidium when passed in the faeces.

CESTODES

Moniezia sp

Family - Anoplocephalidae

Genus - *Moniezia* sp

Description of the egg

Eggs are 56-75 ⇑m in size; triangular, globular or quadrangular in shape and contain a well developed pyriform apparatus.

Taenia sp

Family - Taenidae

Genus - *Taenia* sp

Desctiption of the egg

Eggs are 24-41 ⇑m in diameter, spherical in shape, brown to dark-yellow in colour, thick shelled and contain an onchosphere.

NEMATODES

Haemonchus sp

Family - Trichostrongylidae

Genus - *Haemonchus* sp

Description of the egg

Eggs are 70-85 by 41-48 ⇑m in size, oval in shape and embryo 16-32 celled when laid.

Strongyloides sp

Family - Strongylidae

Genus - *Strongyloides* sp

Description of the eggs

Eggs are 40-64 by 20-40 ⇑m in size, ellipsoidal, thin shelled, embryonated when laid.

***Trichostrongylus* sp**

Family - Trichostrongylidae

Genus - *Trichostrongylus* sp

Description of the egg

Eggs are 79-118 by 39-52 ⇑m in size, oval in shape and bilaterally symmetrical, shell has a thin and transparent outer chitinous layer and a thin inner lipodial layer, embryonic mass multisegmented and varies from 16-32 in number.

***Chabertia* sp**

Family - Trichonematidae

Genus - *Chabertia* sp

Description of the egg

Eggs are 90-105 by 52-55 ⇑m in size, oval shaped, laid in morula stage.

***Cooperia* sp**

Family - Trichostrongylidae

Genus - *Cooperia* sp

Description of the egg

Eggs are 68-82 by 34-42 ⇑m in size, elliptical, consist of segmented ovum and a double layered covering.

Trichuris sp

Family - Trichuridae

Genus - *Trichuris* sp

Description of the egg

Eggs are 70-80 by 30-42 ⇑m in size, brown in colour, contain unsegmented embryo, barrel shaped with transparent plug at either pole.

Capillaria sp

Family - Capillaridae

Genus - *Capillaria* sp

Description of the egg

Eggs are 30-63 ⇑m in size, barrel shaped, contain unsgmented embryo, colourless shell.

Dictyocaulus sp

Family - Dictyocaulidae

Genus - *Dictyocaulus* sp

Description of the egg

Eggs are 82-88 by 30-33 ⇑m in size, ellipsoidal, contain fully developed larva when laid or first stage larva may pass. .

Ascaris sp

Family - Ascarididae

Genus - *Ascaris* sp

Description of eggs

Eggs are 40-90 ⇑m in diameter, sub-globular, laid in morulla stage.

***Toxocara* sp**

Family - Ascarididae

Genus - *Toxocara* sp

Description of the eggs

Eggs are 75-95 by 60-75 ⇑m in size, slightly oval with smooth shell often single celled, occasionally two celled. .

***Bunostomum* sp**

Family - Necatorinae

Genus - *Bunostomum* sp

Description of the eggs

Eggs are 79-106 by 47-50 ⇑m in size, elliptical, have blunt ends and darkly pigmented embryonic cells.

***Oxyuris* sp**

Family - Oxyuridae

Genus - *Oxyuris* sp

Description of the eggs

Eggs are 90 by 42 ⇑m in size, elongate, slightly flattened on one side, provided with a plug at one pole.

Hookworm

Family -Ancylostomatidae

Genus -*Ancylostoma* sp

Description of Eggs:

Eggs are 125-195 by 60-92 um in size. They are eight celled when laid.

***Strongyl* sp**

Family -Strongylidae

Genus - *Strongyl* sp

Description of Eggs:

Eggs are 80 ⇑m long, thin shelled. Broad ellipse, barrel shaped, blastomere present.

***Nematodirus* sp**

Family - Trichostrongylidae

Genus - *Nematodirus* sp

Description of Eggs:

Eggs are 152-230 by 67-121 ⇑m in size, elliptical, contain an embryo of about eight cells when passed by the host

5.5. Intensity of infection

Note: The figure in the column is the no. of samples.

+	=	less than 2 ova per field} Light infection
+ +	=	2 - 4 ova per field} Mild infection
+ + +	=	4 - 6 ova per field} Moderate infection
+ + + +	=	6 or more ova per field} Heavy infection

Table 6: Intensity of Infection in Winter

S.N.	Class	Name of the genera	Light Infection +	Mild Infection + +	Moderate Infection + + +	Heavy Infection + + + +
1.	Trematoda	*Dicrocoelium*	1	-	-	-
2.		*Fasciola*	4	3	2	2
3.		*Schistosoma*	5	3	2	4
4.	Cestoda	*Taenia*	4	2	3	3
5	Nematoda	*Ascaris*	4	6	3	3
6		*Capillaria*	3	2	1	--
7		*Chabertia*	1	2	-	-
8		*Cooperia*	1	-	-	-
9		*Dictyocalus*	2	2	-	-
10		*Haemonchus*	1	1	-	-
11		*Oxyrius*	1	-	-	-
12		*Toxocara*	2	-	-	-
13		*Trichuris*	2	1	1	-
14		*Tricostrongyloid*	2	-	1	1

Seasonally in winter 25 (46.29%) samples were observed mixed infection out of 54 positive samples. Light infection shown by *Schistosome* i.e.5 (+) positive samples (20%). Mild infection shown by *Ascaris* with 6 (++) positive samples(24%) Moderate infection was shown by *Ascaris* i.e 3 (+++) positive samples (12%) and Heavy infection was shown by *Taenia* with 3 (++++)positive sample (12%).

Table 7: Intensity of Infection in Summer

S.N.	Class	Name of the genera	Light Infection +	Mild Infection + +	Moderate Infection + + +	Heavy Infection + + + +
1.	Trematoda	*Dicrocoelium*	4	2	2	1
2.		*Fasciola*	5	3	4	3
3.		*Schistosoma*	10	5	3	3
4.	Cestoda	*Moniezia*	1	-	-	-
5.		*Taenia*	6	4	-	7
6.	Nematoda	*Ancylostoma*	2	1	-	-
7.		*Ascaris*	4	6	3	3
8.		*Bunostomum*	2	1	1	-
9.		*Capillaria*	4	2	-	2
10.		*Chabertia*	2	2	-	-
11.		*Cooperia*	2	4	1	-
12.		*Dictyocalus*	2	1	-	-
13.		*Haemonchus*	1	1	-	-
14.		*Nematodirus*	2	1	-	-
15.		*Strongyloid*	3	2	2	1
16.		*Toxocara*	2	-	-	-
17.		*Trichuris*	2	2	-	-
18.		*Tricostrongyloid*	2	1	-	-

In summer 60 (71.42%) samples were observed mixed infection out of 84 positive samples.

Light infection shown by *Schistosome* 10(+) positive samples (16.66%) Mild infection shown by *Ascaris* 6 (++) positive samples (10%). Moderate infection was shown *Fasciola* with 4 (+++)positive samples (6.66%) and Heavy infection was shown by *Taenia* i.e 7 (++++) positive samples (11.66%).

Table 8: Intensity of Infection in rainy

S.N.	Class	Name of the genera	+	+ +	+ + +	+ + + +
1	Trematoda	*Dicrocoelium*	1	1	-	-
2		*Fasciola*	1	2	2	1
3		*Schistosoma*	5	2	2	-
4	Cestoda	*Taenia*	4	3	2	1
5	Nematoda	*Ancylostoma*	1	2	-	-
6		*Ascaris*	3	2	1	1
7		*Bunostomum*	-	1	-	-
8		*Chabertia*	1	1	1	-
9		*Strongyl*	2	1	-	-
10		*Dictyocalus*	2	-	-	-
11		*Haemonchus*	-	1	-	-
12		*Nematodirus*	1	-	1	-
13		*Oxyrius*				
14		*Strongyloid*	1	-	-	-
15		*Tricostrongyloid*	1	1	-	-

In rainy season 25 (78.12%)samples were observed mixed infection out of 32 positive samples.

Light infection shown by *Schistosome* i.e 4 (+)positive samples (16%). Mild infection was shown by *Taenia* with 3 (++) positive (12%) Moderate infection was shown by *Fasciola* with 2 (+++)positive samples (8%) and Heavy infection was shown by *Taenia* i.e 2 (++++) positive samples (8%)

5.6 Multiple Infections

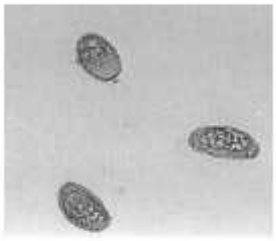
In the present study, the rate of mixed infection was also observed. Among 170 (68%) positive samples, 110 (64.70%) samples were found to have mixed infection with 2 to 5 species in each sample.

PHOTOGRAPHS

EGG OF TREMATODES

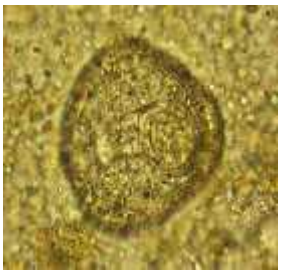
1. Egg of *Fasciola* sp
(10X×4X)

2. Egg of *Schistosoma* sp
(10X×4X)



3. Egg of *Dicrocoelium* sp
(10X×4X)

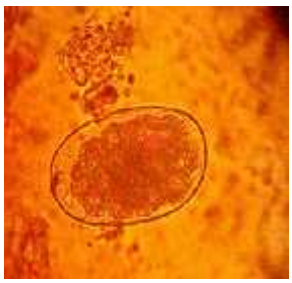
EGG OF CESTODES



4. Egg of *Moniezia* sp
(10X×10X)

5. Egg of *Taenia* sp
(10X×10X)

EGG OF NAMATODES



6. Egg of *Heamonchus* sp
(10X×10X)

7. Egg of *Strongyloides* sp
(10X×10X)

8. Egg of *Strongyl* sp
(10X×10X)

9. Egg of *Chabertia* sp
(10X×10X)

10. Egg of *Cooperia* sp
(10X×10X)

11. Egg of *Ancylostoma* sp
(10X×10X)

12. Egg of *Trichuris* sp
(10X×10X)

13. Egg of *Capillariea* sp
(10X×10X)

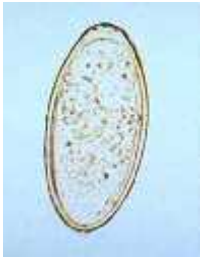
14. Egg of *Dictyocaulus* sp
(10X×10X)

15. Egg of *Ascaris* sp
(10X×10X)

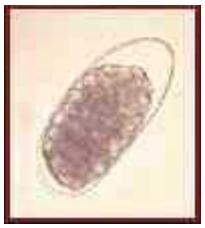
16. Egg of *Toxocara* sp
(10X×10X)

17. Egg of *Nematodirus* sp
(10X×10X)

18. Egg of *Bunostomum* sp
(10X×10X)



19. Egg of *Oxyuris* sp
(10X×10X)



20. Egg of *Trichostrongylus* sp
(10X×10X)

Microscopic observation of Feacal samples

Laboratory sample

CHAPTER VI

DISCUSSION AND CONCLUSION

6.1. Discussion

The aim of the study was to determine the seasonal prevalence of intestinal helminth parasite of goat. It is thought that the prevalence of gastro intestinal parasites is considerably influenced by the climatic conditions and as far as possible the evidence for the distribution and prevalence of the diseases is presented by geographical area' roughly corresponding to climatic conditions. Generally the warm and humid conditions, which prevail in much of South-East Asia, provide good conditions for many gastro intestinal parasites to flourish. Continuous high rainfall throughout the year in pars of the region means that there is no season during which the parasites are not a problem. (Tiyo et al 2008). The present study was carried out in the month of December/January, May/June and August/September. The site of collection of samples was Khiljee V.D. C. of Arghakhanchi, Lumbini. From the present study, 54% and 84% samples were found positive in winter & summer out of 100 samples. In 50 samples of rainy season 64% were found positive.

In the present study 3 genera of Trematodes,1 genera of Cestodes and 10 genera of Nematodes were observed during winter.Similarly from summer and rainy season 3,3 genera of Trematoda, 2,1 genera of Cestoda and 13,11 genera of Nematoda were identified respectively. In Trematoda *Fasciola*, *Schistosomaand Dicrocoelium* were common in three season. In Cestoda *Moniezia* was found only in summer season while *Taenia* were found all three seasons. In Nematodes, 10 genera were observed in winter samples , namely- *Ascaris, Capillaria, Chabertia, Cooperia, Dictyocalus, Haemonchus, Oxyrius, Toxocara, Trichu*ris and *Trichostrongyloid*. In summer 13 genera of Nematodes were observed as *Ancylostoma, Ascaris, Bunostomum, Capillaria, Chabertia, Cooperia, Dictyocalus, Haemonchus, Nector, Strongloid, Toxocara, Trichuris and Trichostrongyloid*.Similarly in *rainy* season 11 genera of Nematodes were observed namely as *Ancylostoma, Ascaris, Bunostomum Chabertia Dictyocalus, Haemonchus, Nematodirus, Strongyl, Strongloid, Trichuris* and *Trichostrongyloid.* Similarly *Ancylostoma, Bunostomum* and *Nector*, were found only in summer and rainy season ,they were not observed in winter.

Nematode genus *Strongyle* has been reported in goats from other part of the world but not in goat of Nepal. So it has been reported for the first time in goat of Nepal. This species has been reported only in rainy season it may be due to the presence of suitable temperature and moisture.

The seasonal prevalence of trematode genera found in goat was *Dicrocoelium* 1%\9%\4%, *Fasciola* 11%\15%\12% and *Schistosoma* 14%\21%\18% during winter, summer and rainy respectively. Similarly for cestodes and nematodes during winter, summer and rainy were recorded as follows- *Moniezia* 0.0%/1%/0.0%, *Taenia* 12%\17%\20%, *Ancylostoma* 0.0%\3%\6%, *Ascaris* 12%\16%\14%, *Bunostomum* 0.0%\4%\2%, *Capillaria* 6%\8%\0.0%, *Chabertia* 3%\4%\6%, *Cooperia* 1%\7% \0.0% *Dictyocalus* 4%\3%\4%, *Haemonchus* 2%\2%\2% *Nematodirus* 0.0%\3%\4%, *Oxyrius* 1%\0.0%\0.0%, *Strongyloid* 0.0%\8%\2%, *Strongyl* 0.0%\0.0%\6% *Trichostrongyloid* 5%\3%\4%, *Toxocara* 2%\0.0%\0.0%, *Trichuris 4*%\4%\8%.

The present study exhibited 11%,15% and 12% prevalence rate of fascioliasis during winter, summer and rainy season respectively. The increase in their prevalence during summer may be due to increase in humidity and availability of favorable temperature. High prevalence of *Fasciola* was reported from Surkhet among goats (Ghimire, 1987), followed by 58% from Chitwan district (Dhakal nand Kharel , 1988), 31.25% infection from Dhanusa district(Jaiswal, 2006), 31.5 % from Kenya (Waruiru, Otieno and Mutune, 2005) and 8.8 % from Himanchal Pradesh, India (Jithendran and Bhat, 2001)

Cestode *Moniezia* has been reported from Kathmandu and Surkhet district (ADPCD, 1982/ Ghimire, 1987/Gupta, 1989) among buffaloes, sheep, goat and cattle. In the present study, *Moniezia* has been reported only in summer. It has been not found in winter and rainy seasons. Presence of suitable temperature and moisture serve best for the breeding and development of the helminthes parasites. So this could be the reason behind excessive prevalence of certain helminthes parasites.

The overall prevalence of helminth parasites among goats raised under traditional husbandry system in South East Nigeria (Opara, Nwaobasi and Okoli, 2005) were 90.1 percent of which nematode infection was 78.4 percent, trematode

and cestode infection were 13 percent and 8.7 percent respectively. In the present study 74.70% of nematodes infection 48.82%. 26.47% of trematode and cestode infection were found. Nematodes infection were found a bit similar in both studies, but trematodes and cestodes infection is higher during this study .

A research by Wanjala *et al.,* in the month of May/June and August/September showed 52% infection. While this study had shown overall 68% infection, the main genera prevalent in the study were *Schistosoma, Fasciola, Taenia, Ascaris, Dictyocalus, Chabertia* and *Strongyloides*. Whereas Yadav et al., (2005) reported the highest incidence of *Haemonchus, Trichostrongylus, Bunostomum, Oesophagostomum* and *Strongyloides.*

The prevalence of helminth parasites among sheep and goats in semi-arid area of North- Eastern , Nigeria (Nwosu *et al .,* 2007) were *Strongyl, Trichuris* and *Strongyloids* .

During this study *Trichuris* and *Strongyloids* were found all three seasons , while *Strongyl* was found only in rainy season . This type of egg increased with the rains and reached peak level at about the peak of rainy season in September.

During winter and summer 25(46.29%), and 60(71.42) mixed infection had been shown out of 100 samples. In rainy season 25 (78.12%)mixed infection had been found out of 50 samples. The abundance of multiple infection mainly during rainy season , it might be due to availability of suitable temperature and moisture.

Infection with *Haemonchus* (72%) among goats have been found from dry zones of Srilanka (Faizal, and Rajapaksha , 1999-2000)is greatly higher than the present study i.e. *Haemonchus* (3.70%,2.38%, 3.12%) in the month of winter, summer, and rainy season.

Ascariasis (43.69%) reported from Panchthar district (Sharma, 1998-99) is found to be higher than the present study 22.2%, 19.0% and 21.8% in winter, summer, and rainy season.

According to Islam *et al .,* (2008) the most commonly occurring gastrointestinal parasite goats and sheep were *Emeria, Trichostrongylus, Haemonchus, Moniezia* and *Fasciola.* Similarly presented study depicted *Dictyocalus, Chabertia, Cooperia* and *Strongyloids* as the most prevalent helminth parasites of goats.

6.2. Conclusion

The current study was carried out in order to observe the seasonal prevalence of intestinal helminthes parasites in goat. During this study the sample were collected from Khiljii V.D.C, Arghakhachi, Lumbini. The samples were collected in the month of December/January, May/June and August/September. The total number of samples collected and examined for the study were 100, 100 and 50 respectively for these study period.

The overall prevalence of helminthes parasite during December/January were 54%, in the month of May/June were 84% and in the month of August/September were 32%. A huge difference in the prevalence of helminthes parasites in the three different study period was observed. During December and January (winter) 48.18% of infection were caused by Trematodes, 22.22% by Cestodes and 74.07% by Nematodes. In May/June (summer) 53.57%, 20.23% and 79.76% of infection were caused by Trematodes, Cestodes and Nematodes. Likewise 53.12%, 31.25% and 90% of infection were caused by Trematodes, Cestodes and Nematodes in the month August/September (rainy season).

Nematode genus *Strongyle* has been reported in goats from other part of the world but not in goat of Nepal. So it has been reported for the first time in goat of Nepal. Mixed infection was observed in 46.29%, 71.42% and 78.12% in the samples of winter, summer and rainy respectively

Some species like *Moniezia* and *Strongyl* has been reported only in summer and rainy season respectively. It is due to the presence of suitable temperature and moisture serve best for the breeding and development of the helminthes parasites. So this could be the reason behind excessive prevalence of certain helminthes parasites.

CHAPTER VII
RECOMMENDATIONS

On the basis of out come of the study, following measures are recommended:

- For the prevention of spread of gastro-intestinal parasites, the contamination of pastures should be prevented by treating the hosts with anthemintics.
- The pastures can be made free of helminth parasites by breaking their life cycle by eradicating inter mediate host, snail through biological control method.
- Immigration of goats and other animals should be done after fulfilling the quarantine terms and condition.
- The sheds should not be kept wet, moist or humid. These all prove as heaven to helminth parasites for their growth and development.
- Treatment of infected hosts with anthelmintics and diagnosis could be done by taking help of nearby veterinary personnel.
- Awareness among the livestock farmers, public butchers and goat dealers regarding the ill effect of infection and zoonotic diseases by helminth parasites should be created.
- Impure water should not be supplied.
- Further research work should be carried out.

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