I

INTRODUCTION

Nepal is a land of cultural diversity. It is recognized as multi-caste, multi-lingual, multi-cultural and multi-ethnic country in Asia. We can find syncretism of various cultures, languages, religions, castes and creeds. It is model of mosaic society in real sense. So, Nepal is a garden of all castes and ethnic groups. The racial, religious, cultural and social system is diversified according to the diversity of castes living with respect to geography.

Nepal is one of the poorest countries of the world. Poverty is deeply rooted in Nepalese society. The health status of the population is a reflection of the socio-economic development of the country and is shaped by a variety of factors, the level of income and standard of living, housing, water supply, education, sanitation, including work place environment, employment, consciousness, the coverage, accessibility and affordability of health care delivery service, social security, participation in the socio-political activities of the community, recreation and human rights. Low economic status is not the sole factor for parasitic infections, but also the increased water pollution is one of the major public health issues in Nepal. Parasitic infections, diarrhoea of gastro-intestinal diseases are the result of environmental, particularly the water pollution.

WHO estimated that nearly one forth of world's population harbors one or more intestinal parasites in their gastro-intestinal tract. Intestinal parasitic infection is a major cause of morbidity and mortality among school aged children and developing countries (WHO, 1987). A survey conducted in Bhaktapur showed 99% stools were positive for the soil-transmitted helminthes (Shrestha 1983).

Prevalence of parasites, *A. lumbricoides* infection for instance, has remained unchanged (Rodgers, 1987 and Rai *et al.* 1994). In some tropical areas, the prevalence reaches nearly 100%. Twenty-five percentage of world's population is estimated to be infected with one or more species of soil transmitted helminthes alone (Palmer, 1995). The reported prevalence of intestinal parasites in Nepal varies considerably from one study to another (Rai *et al.*1986 and 1995) with over 90% prevalence in some areas Rai and Gurung, 1986. High prevalence of the parasites has been due to the contamination of the soil and water (Rai *et al.* 2000 and 2001). Moreover, emerging new parasites also have been reported from Nepal (Sherchand *et al.* 1997).

The intestinal parasites of man are cosmopolitan in distribution, posing very serious health problems in the developing countries where disease, ignorance and poverty are interlocked. Basically, children of the rural are more infected than adult because of the lack of awareness about sanitation. They spend most of the time playing in soil and dirty places which helps to transmit the parasites. Generally farmers and lower castes (i. e. Dalit) are at high risk of infection with intestinal parasites as they are involved in pig farming, cattle farming, poultry farming and they spend their most of time in fields. They take food without washing hands and they even eat raw vegetables without washing. Due to poor hygienic and sanitary condition the transmission of many intestinal parasites occur easily.

Significance of the study:

Health is wealth. Most of people are suffering from different intestinal helminth parasites due to lack of knowledge. Heavy infection with these parasites effect on growth of host, weakness and also death leading to great socio-economic loss. Factors such as inadequate medical care, poor

nutrition, housing and education may account for higher rates of parasitic diseases. Race influences behavior, how people interact with another, where people live, what jobs they have, how much education they have etc. These all things have impact on life and also give opportunities to parasitic infections. Except these the Hanumante River flows near by school. Children swim in it during summer, which bring great opportunities to helminthic infection. The study about the prevalence of intestinal parasitic infections in students of different ethnic groups may be fruitful for demarcation of health status of ethnic groups with their low socio-economic status. This will help to bring awareness in different ethnic groups. They may improve their traditional activities such as eating sekuwa, preparing pork near dumping site that gives chance to intestinal helminthic infection.

Similar situation might be prevailing in other part of country, which is yet to be investigated. The findings of present study may help the public health division to make health strategy for those places. Moreover, the present study may help to the future investigators to advance their knowledge and may play great role to spread awareness to the people of study area.

II

OBJECTIVES

General objective:

To study the prevalence of intestinal helminth parasitic infections among the students of Dyola School, Bhaktapur.

Specific objectives:

- To study the age, class and sex-wise distribution of intestinal helminth parasites among students of Dyola school.
- To know the health and education status of students.
- To recommend the control plan for the intestinal helminth parasitic infection.
- To assess the awareness of the disease among the students.

III

LITERATURE REVIEW

Some recent literature review in context of world:

☺ Alo *et al.,* (1993) determined the prevalence of intestinal helminthiasis among students of Nigeria. Of the 200 students between ages 10-20 years old examined, 86 (43%) were found infected. The most commonly found worm were hookworm, *A. lumbricoides, and T. trichiura* with mean egg per gram of 4800, 2600 and 1250 respectively. Infection was independent of both sexes and parental occupations but decreased significantly with host age and a progressive increase in body weight.

☺ Alo *et al.,* (1993) determined the prevalence of intestinal helminthiasis among students of Government Secondary School, Gairei, Song Local Government Area of Adamawa State, Nigeria, between January and July 1991. Out of 200 students between ages 10-32 years old examined, 86 (43%) were infected.

☺ Hassan *et al*., (1994) surveyed 4 primary and secondary schools at Kafr Hakeem, El-Mansuria and Barkesh village in Imbaba district. Urine and stool specimens of 791 students were examined. Results revealed *amoebiasis* (22.5%), *H. nana* (6.2%), *A. duodenale* (5.7%), *ascariasis* (1.5%) and *enterobiasis* (1.1%). There was no statistical difference between primary and secondary school students as regards the rate of infection.

☺ Hadju *et al.*, (1995) studied the prevalence and intensity of helminth infections and nutritional status in urban slum school children (276 boys and 231 girls), in Ujung Pandang, Indonesia. Prevalence of *Ascaris, Trichuris* and hookworm was 92%, 98%, and 1.4% respectively. 91% children had both *Ascaris* and *Trichuris* infections. About half of the *Ascaris* and *Trichiris* infected children (46% & 58%) had moderate

infections. Stuning was seen in 55% of the children, while wasting was observed in 10%.

- ☺ Kightlinger *et al.,* (1995) condected an epidemiological study of intestinal nematodes with 1292 children up to11 years old, living in Ranimafana rain forest of southeast Madagascar. Fecal examination revealed prevalence of 78% for *A. lumbricoides*, 38% for *T. trichiura*, 16% for hookworm, and 0.4% for *S. mansoni*. The distributions were over dispersed for all 3 nematodes. The age profiles showed a rapid acquisition of *A. lumbricoides* during infancy, increasing to 100% prevalence by age 10 years.
- ☺ De Silva *et al.,* (1996) examined the relationship between the prevalence of geohelminth infections in preschool children living in an urban slum area in Sri Lanka and parental education, socio-economic status, the use of anthelmintics and beliefs regarding these helminthes. Stool samples were collected from preschool children (<60 months of age) in October 1992 to February 1993 in the Mahaiyyawa area, Kandy, Sri Lanka. Examination was done using direct smears and a concentration technique and positive samples were examined using modified Kato-Katz technique. Questionnaires were taken from the principle caretakers or mothers of the children from whom stool samples were collected to assess parental education, socio-economic status of the family and knowledge, attitudes and practices related to intestinal parasites particularly geohelminths. Stool samples from 307 children were examined where 81 (26.4%) were positive for geohelminth ova, roundworm infections were predominant and were seen in 73 (90.2%) of the 81, either alone or together with whipworm and hookworm infections. As the educational level of the mother a principal caretaker improved, the prevalence of geohelminth infections in the children declined. However, there was no significant correlation between prevalence of infection and parental educational level. Prevalence also tended to increase as the socio-economic class declined (X^2=4.899,

P=0.026). Another finding was the wide spread ignorance and misconceptions regarding geohelminth infections among carers.

Sorensen *et al.,* (1996) studied 1614 children of 3-12 years' age group and 246 women of 18-44 years age group in Sri Lanka. 89.7% of children and 86.2% of women had one type of nematode infection. 77% of children and 69.5% of women were infected by *Ascaris*, likewise 69.4% of children and 56.5%of women had *Trichiuris* and 23.2% of the children and 41.4% of women had hookworm.

☺ Pegelow *et al.,* (1997) examined stool specimens of children aged 8-10 years from ten schools located in the rural district Sukaraja, west Java. Indonesia in December 1995 by using modified Kato-Katz thick techniques. Four nematodes (hookworm taken as one species), two cestodes and nine protozoan species were detected, but no trematode infection was observed. Among helminthes, soil transmitted nematode infections were predominant. *T. trichiura* with a prevalence of 76% being the most common infection, followed by *A. lumbricoides* (44%). Hookworm and *E. vermicularis* were found as 9% and 3% respectively.

☺ Pandit *et a.,* (1997) studied 85 children of age 3-12 years 25 cases who needed surgical intervention due to *ascariasis*. The surgical conditions found at Lapartomy were intestinal obstruction (18) appendicitis (3), ideal perforation (2) and biliary *ascariasis* (2). The study highlighted the high incidence of surgical *ascariasis* among children with abdominal complains in an endemic area.

☺ Kabaterine (1997), served by cross-section in intestinal parasitic infection by stool sample taken from 5,313 pupils of ages between 10-15 years in 28 primary schools in Kampala. The aim was to identify the types and distribution of intestinal parasites and to estimate the prevalence in school children. *T. trichiura* (28%), *A. lumbricoides* (17%) and hookworms (12.9%) were common infections among the children. Other less commonly

found parasites were *S. mansoni, S. stercoralis, Taenia sp., E. vermicularis, G. lamblia, E. coli* and *E. histolytica*. Refused dumps were probably significant sources of transmission of intestinal helminthic infections in Kampala.

- ☺ Mafina *et al.,* (1998) condected and investigated to determine the prevalence of soil transmitted helminth parasites in children in Abeokuta, the capital city of Ogum State, Nigeria. Faecal examination of 1060 children revealed a prevalence of 64.0% for *A. lumbricoides,* 21.9% for *T. trichiura* and 14.5% for hookworm. The study also showed a preponderance of *A. lumbricoides* (94.4%) in the infected population over *T. trichiura* (34.2) despite their similar life cycles.
- ☺ Kightlinger *et al.,* (1998) served 663 children, 4-10 years old living in southeastern Madagascar and reveled prevalence of 93% for *A. lumbricoides,* 55% for *T. trichiura* and 27% for Hookworm. Worm expulsions were conducted in 428 of these children. The data revealed an over dispersed distribution of *A. lumbricoides,* with an arithmetic mean of 19.2 worms per child. Environmental, demographic, behavioral and socio-economic indicators assessed a concurrent to infection. *A. lumbricoides* aggregations were associated with genders housing styles ethnicity and agricultural factors.
- ☺ Paul *et al.,* (1999) carried out a study to determine the prevalence and intensity of intestinal helminth infections. The children were between 7-13 years of age and belong to lower socio-economic status. Stool samples collected were processed by modified formalin ethyl acetate sedimentation technique. 177 children were infected with one or more of the intestinal parasites viz., *A. lumbricoides, T. trichiura* and Hookworm. The overall prevalence of infection was 82%; *A. lumbricoides* was the most common infection with a prevalence of 75% followed by *T. trichiura* (66%) and hookworm (9%).

☺ Glickman *et al.,* (1999) performed a stool examination on 286 randomly selected children aged 1-18 years from three rural villages in Guinea, Africa. They collected information by using questionnaire to examine the relationship between geophagia and infection with intestinal nematodes acquired by ingestion versus skin penetration. They found that 53% of children were infected by at least one type of soil-transmitted nematode. Geophagia was reported by parents to occur in 57%, 53% and 43% of children aged 1-5, 6-10 and 11-18 years, respectively. The pattern for the two orally acquired and soil-transmitted nematodes (*Ascaris lumbricoides, Trichuris trichiura*) than it did the infection pattern for the two soil-transmitted that infect by skin penetration (hookworm, *strongyloides stercoralis*).

☺ Lee *et al.,* (2000) examined stool and cello-tape anal swab carried out in August 1997 on handicapped people at an institution located in Chorwongun, Kangwon-do, Korea. Out of 112 stool samples, 3 cases of *T. trichiura* and 1 case of *E. vermicularis* infections were found and *E. coli* (25%), *E. histolytica* (1.8%), *Endolimax nana* (21.4%), *I. butschii* (1.8%) and *G. lamblia* (0.9%). Out of 165 cello-tape anal swab samples, the prevalence rate of *E. vermicularis* was (20.6%).

☺ Toma *et al.,* (2001) studied on *Strongyloides* infection conducted by fecal examination and subsequent treatment of the population on a model island (Kume Island) in Okinawa, Japan for 5 years from 1997. More than 1200 persons, accounting for 17% to 20% of the person was subjected, received fecal examinations each year.

☺ Amin *et al*., (2002) conducted an investigation to determine the prevalence of intestinal parasites in the United Status. Prevalence of infection was lowest in winter gradually increased during the spring, reached peaks of (36-43%) between July and October and gradually to 32% in December. In single infections pathogenic protozoa caused asymptomatic sub clinical

infection in 0.31% of the case and nonpathogenic protozoa unexpectedly caused symptoms in 73-100% of the cases.

☺ Farook *et al.,* (2002) carried out a study to determine the intestinal helminthes infestations among tribal population of Kottar and Achankovil areas in Kerla (India). Out of 258 stool samples examined, 60 shows ova of one or more intestinal helminthes. Hookworm infestation was found to be predominant (58.82%) in Achankovil and remaining (41.1%) was due to only roundworm, whereas in Kottar area roundworm infestation predominated (74.41%) followed by hookworm (18.6%) and other type (6.97%).

☺ Rim *et al.,* (2003) carried out the study to determine the prevalence of intestinal parasitic infections on national scale among primary school in Laos. From May 2000 to 2002 June, examined once the cellophane thick smear technique. The cumulative egg positive rate for intestinal helminthes was 61.9%. By species, the rate of *Ascaries lumbricoides* was 34.9%, hookworm 19.1%, *Trichuris truchiura* 25.8%, *Taenia* sp. 0.6% and *Hymenolepis* sp. 0.2%, *Opisthorchis viverrino* was 10.9%.

Saksirisampant *et al.*, (2003) put forward the study about intestinal parasitic infestations among children in an orphan age in Pathum Thani province. During investigation *Blastocystic hominis* was found at the high prevalence (45.2%). The infection caused by *Giardia lamblia* was (37.7%) and *E. histolytica* was (3.7%). Other non-pathogenic protozoa were found.

☺ Deepmala *et al.,* (2004) investigated on the prevalence of intestinal parasitic infections in human population of Darbhanga region of Bihar. IN the epidemiological survey of intestinal parasitic infection, out of 2553 stool samples examined 920 (36.03%) were found to be positive for protozoan parasites, 1162 (15.52%) for helminthes and 471 (18.45%) for mixed infection. In overall infection, males and even those of 21-30 years age group showed higher prevalence rate (55.55%) than females (44.45%).

☺ Singh *et al.,* (2004) studied on helminthic infection of the primary school going children in Manipur. Out of 1010 stool samples collected from the primary school going children between age group of 5-10 years showed 248 (24.5%) were positive for various helminthes. Among the positive cases 110 (26.3%) were form urban area and 138 (23.4%) from the rural areas of Manipur. Maximum number of parasitic infection were found in (5-6) years age group 27% *Ascaris lumbricoides*, 19.6% *T. trichiura*, 2.18% *H. nana*, 0.99% hookworm and 0.09% *S. stercoralis*.

☺ Cheng *et al.,* (2005) studied 464 psychiatric patients. During their examination 8.4% were found to be infected with one or more intestinal parasite species, 6.3% single infection, 1.5% double infections and 0.6% triple infections. Significantly higher prevalence were found among the male, unmarried patients, those with lower education, institutionalized for more than 3 years, sent by social workers to the hospitals.

☺ Gulay *et al.,* (2005) conducted an investigation on the distribution of intestinal parasites in students of the Mustafa Kemal University School of Health. In their study, the prevalence of intestinal parasites in female students (aged from 16-18 years) in the Mustafa Kemal University, out of 142 fecal samples and 136 cellophane tape preparations, 65 (45-77%) fecal samples were positive. *Blastocystis hominis* in 63 samples (96.92%) and *Giardia intestinalis* in 63 samples (3.08%). *Enterobius vermicularis* was found in 9 (6.61%), out of 136 cellophane tape preparations.

☺ Aydin *et al.,* (2005) conducted the study on distribution of intestinal parasites in children from the 23 Nisam primary school in Hakkari. In this study, out of 114 stool samples i.e. 60 males and 54 female students, 66 (57.8%) samples were found positive. *Giardia intestinalis* (28.9%),

Blastocystic hominis (23.6%), *Entamoeba coli* (12.2%) and *Ascaris lumbricoides* (6.14%) were most prevalent parasites.

Some recent literature review in the context of Nepal:

☺ Sherstha (1983) surveyed in Bhaktapur district which showed 99% stools were positive for the eggs of soil transmitted helminthes. 94% eggs were of *A. lumbricoides*, 42% eggs were of *Trichuris* and 11% eggs were of hookworm. Similarly, from the Panchkhal area 41% stools were positive for the eggs of helminthes. 75% were of *T. trichiura*, 37% were of hookworm, 19% were of *A. lumbricoides*. During stool test Kato-Katz method was followed.

☺ Rai *et al.*, (1986) collected 200 stool samples and examined by direct smear technique overall period of 16 days. The incidence of roundworm was the highest (i.e.35%) followed by hookworm (i.e.14%). The infection rate was 69% and the result showed that the infection was more common in girls than the boys.

☺ Gupta *et al.,* (1988) studied on the infection rate of human intestinal parasites of Kirtipur. They found the high rate of parasitic infection in the Kirtipur area and concluded that in developing countries, intestinal parasites are a common clinical entity, leading there by a high level of mortality and morbidity in Nepal. These are major causes of sickness in children of Nepal.

☺ Rai *et al.,* (1991) presented the paper to show the prevalence of various intestinal parasites in Kathmandu valley, Nepal. The overall prevalence of intestinal parasites was 30.9%. There were no significant differences in the

prevalence between to sexes. Intestinal parasitoses were more common among children (less than 15 years) than in adults (more than 15 years). *A. lumbricoides* was the common parasite followed by hookworm, *Taenia* sps., *E. vermicularis* and others. Among protozoan parasites, *G. lamblia* was the most common followed by *E. histolytica*.

☺ Rai *et al.,* (1994), studied the status of soil transmitted helminthic infections in Nepal during 1985-1992. Averages of 6537 fecal samples were examined each year. The annual rate of the positivity for soil-transmitted helminthiasis ranged from 18-36.6%. *A. lumbricoides* had the most common prevalence than hookworms.

☺ Huston *et al.,* (1994) studied for helminthic infections among Peace Corps volunteers in Nepal. The authors have estimated the prevalence of helminthic infection. Out of 994 samples 209 were of volunteers. Among them 41 specimens were positive for helminthes for volunteers. There were no mixed helminthic infections, although 8 (4%) samples for *Ascaris*, 6 (3%) for *Trichuris*, and 4 (2%) for hookworm during their tours. It concluded that helminthic infection seems to be low prevalence in volunteers who reside in Nepal.

☺ Blangero *et al.,* (1997) studied the helminthic infections for three ethnic groups (Jirels, Sherpas and high cast Hindus) resident in the Jiri region of eastern Nepal. There were significant differences between the groups for prevalence of hookworm, with Jirels having the overall highest infection rates. Significant age effects were observed for both whipworm and hookworm in all three ethnic groups. The results of this study suggest that helminhic infections are major causes of morbidity in the Jiri region, particularly for the Jirel ethnic group.

☺ Sherchand *et al*., (1997) studied the intestinal parasitic infection in rural areas of southern Nepal, Dhanusa district. Out of 604 children aged between 0-9 years examined 63.1% were found positive for one or more intestinal parasites.

☺ Serchand *et al.,* (1998) carried out a cross sectional survey in Primary school of Godar VDC between 9 October to 15 October. Out of 292 children examined 192 (87.7%) were found positive for one or more intestinal parasites. In their finding *Ascaris lumbricoides* suppressed all parasites by showing a positive of 14.6%. Other parasites found were hookworm, *Trichuris trichiura, Hymenolepis nana, Enterobious vermicularis,* tapeworm*, Giardia lamblia, Entamoiba histolytica, E. coli* and *Cryptosporidium*. The parasitic infection may be due to lack of awareness about personal cleanness and hygiene among school children. Majority of them had helminthic infection; hence mass treatment and health education is necessary for control and prevention from the parasitic infection.

☺ Nishimura (2000) interviewed 1000 mothers of the children with diarrhea in Kanti Children Hospital. Mothers younger than 20 years 20-30 years and more than 30 years were 4%, 75% & 21%, respectively. Among them 1% never gave breast milk, 11% gave only for few days 34% stopped breast before 5^{th} month and 13% of mothers still were only breast feeding up to 7 months.

☺ Rai *et al.,* (2000) investigated the contamination of soil with helminthes eggs in Kathmandu valley and outside of valley in Nepal by centrifugal floatation technique using sucrose solution (sp. gr. 1200). Out of 156 total samples, 122 were taken from Kathmandu valley and 34 samples from outside of valley. The overall soil contamination rate was 36.5%. The

prevalence was uniform in Kathmandu valley (36.3%) and outside of the valley (35.3%). In Kathmandu valley, soil contamination was higher (48.3%) during wet season compared with that observed in dry season (33.3%) but without significant difference ($p>0.005$) altogether 5 species of nematodes were recorded (i.e. *A. lumbricoides*, *Toxocara* sp., *T. trichiura*, *Capillaria* sp, and *Trichostrongylus* sp.) and 2 species of Cestoda (i.e. *H. nana* & *H. diminuta*). *A. lumbricoides* was prominent in Kathmandu valley while *Trichostrongylus* was the commonest one in outside of valley.

☺ Rai *et al.*, (2001) studied the intestinal parasitic infection in rural hilly area of Western Nepal, Achham district. The stool test revealed 76.4% prevalence of intestinal parasites in the children of the district.

☺ Shrestha (2003) examined 115 stool samples from different part of Bhakrapur. She showed 3.1% of the samples were infected by five different spp. of intestinal parasites. *Ascaris*, Hookworm and *Giardia* were the common parasites.

☺ Suwal (2005) examined 250stools samples in Dhulikhel hospital. 29% samples were positive for parasites. 29% had Hookworm, 21% had *Ascaris*, 9.9% had *Trichiura*, 8.5% had *Giardia* and 4% had *E. histolytica.*

IV
MATERIALS AND METHODS

Study area:

Kathmandu, capital city of Nepal, is located at 27°42”North and 88°36”east at an attitude of 450 ft above from sea level and is surrounded by high mountains on all sides, ranging from 5000 ft to 9000 ft. Kathmandu valley includes three main districts-Kathmandu, Lalitpur, and Bhaktapur. This valley has four well-defined seasons spring (March- May), summer (June-August), autumn (September-November) and winter (December-February).

Bhaktapur is the smallest district of Nepal and lies about 15 km east of Kathmandu district. It is surrounded towards east by Kavre, on south by Lalitpur, on west and north by Kathmandu. The total area of Bhaktapur is 199 sq. km. Bhaktapur is also known as the historical city of Nepal. It is known from its unique cultures and traditions. Bhaktapur is not only rich in its cultures and traditions but also it is full of natural beauty. Nagarkot and Suryabinayak are the examples of natural beauty of Bhaktapur. The Hanumante River is the famous river of Bhaktapur.

According to the District Development committee survey report (2001), the total population of the district is 225461. Out of this, 114798 (50.94%) are males and 110663 (49.08%) are females.

Economically more than 85% of the population depends on agriculture. Ethnically, the Newars form a majority with 125926 (55.85%) of the total population of the district. Second populated caste is Chhetries 41777 (18.53 %) followed by Brahman 10.14%, Tamang 6.53%. Besides Magar, Yadav, Rai, Gurung, Limbu, Sherpa, Kami and other castes live here in minority. Most of them (89.87%) are Hindus while a fraction of

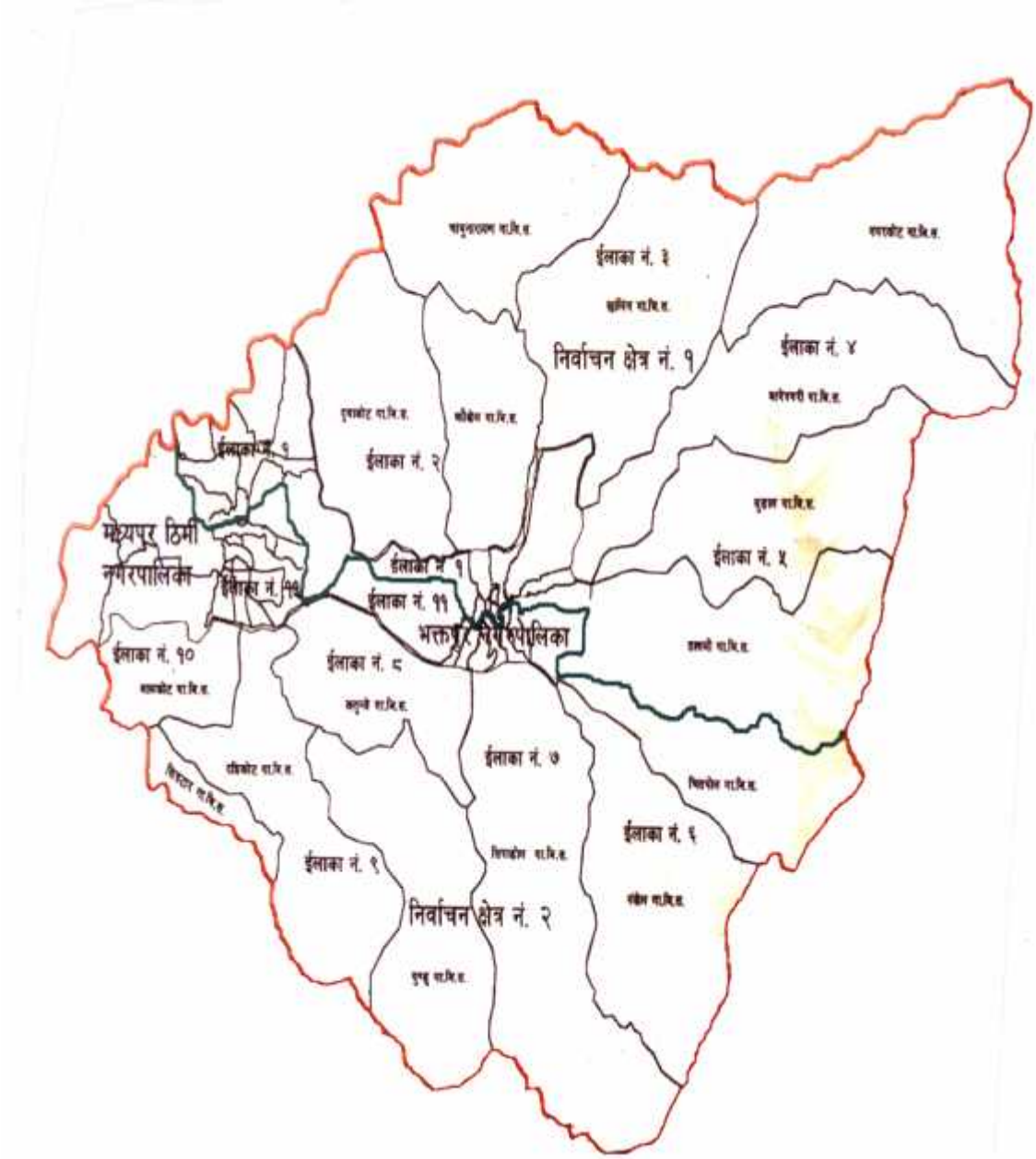


Figure 1: Map of study area

population is found to be follower of Buddhism (9.40%), Christian (0.35%) and other religions. Bhaktapur is divided into 16 VDCs and 2 municipalities.

The Dyola School is situated at ward no.11 of Bhaktapur municipality. Ward no. 11 consists of about 6260 populations in which 27% are children. But Dyola tole consosts only about 450 school aged children. About 236 students study in this school and most of them are from lower castes (i.e. Dalit). Vegetable farming, open pig farming and poultry farming is alternative sources of their parent's income. Their parents spend most of time in field and take food without washing hands and they even eat raw vegetables without washing.

The Hanumante river, which is famous in Bhaktapur and is very polluted nowadays, flows nearby the school and the dumping site of Bhaktapur city lies about at 200m east from the school. Due to poor hygienic and sanitary condition the transmission of many intestinal parasites occur easily.

Equipments:

Microscope

Materials:

Cotton, coverslip, forcep, gloves, needle, sticks and slide tray.

Chemicals:

Saturate salt solution, 2.5% potassium dichromate, detol or soap.

Sample collection:

The stool samples of the students of age 4 to 15 years were collected from Dyola School. A small clean plastic container was distributed among the students from 10-15 years and the container were given to parents of

students of age up to 9 years, which were noted with name, age, sex and serial number as in the note book. They were told to collect about 10ml of morning stool sample. The students brought the containers next day with lids. These were collected and about 20ml of 2.5% K_2CrO_3 (potassium dichromate) solution were put in it for preservation. To ensure good condition of sample collection following precautions were taken:

i. Sufficient quantity of stool (at least 10ml) sample was collected to prevent rapid drying of stools.
ii. Morning samples were collected and labeled with serial number that were noted with name, age, sex and serial number in notebook.

Fecal sample examination:

All the collected samples were brought to the Central Department of Zoology, Tribhuvan University and examined macroscopically (naked eyes) and microscopically.

i. Macroscopic examination:

For macroscopic examination consistency, colour, blood and mucus were tested. Adult worms or segments of adult worms were examined with naked eyes. This examination gives some clue of parasitic infections but it is not specific except for the finding of adult worms or segments of adult worms. Therefore macroscopic examination of fecal sample is mandatory.

ii. Microscopic examination:

Microscopic examination was done by smear and levitation method.

All the prepared slides were examined under the low power of microscope starting from one end of the cover slip. Any suspicious object was centered and focused under the high power objective for a detailed diagnosis. While examining such preparation, precaution was taken in that the films did not get dry up. For this purpose the coverslip was ringed with Vaseline.

The characters of the individual helminth eggs were sufficiently given attention specially to shape, size, colour and making on the surface of the egg shell, the presence of yolk granules, ovum or a differentiated embryo, the existence of an operculum and in specific case, as in cestodes, the 3 pairs of embryonic hook lets.

Data collection:

The obtained data from fecal examination of all 256 stool samples from study area were collected with age, sex, ethnic group, occupational background of family, their food habit such as vegetarian or non-vegetarian and prevalence rate of the intestinal helminthic parasites. Besides this information, the relationship of occupational background of their family and intestinal parasite of the children as well as drinking water source were also collected with the help of questionnaire. Tentative data of socio-economic conditions were also collected which have great relationship with the prevalence rate of intestinal helminth parasites.

Data analysis:

After data collection, they were edited, coded, classified, tabulated and analyzed. Analysis was done by representing with table, bar diagram, pie chart and drawing graphs of suitable data. On the basis of findings age,

sex, class, economic condition and others, were stratified. The significant difference was calculated by χ^2-test.

Validity and Reliability of the study:

- Validity was maintained on specimen collection.
- All the laboratory works were performed in standard way.
- The study was completed under the supervision of the expertise.

Limitation of the study:

- Due to time constraint the samples were collected only for one time, hence seasonal impact cannot be studied.
- Drinking water samples were not examined for the confirmation of the presence of parasitic eggs, cysts, oocysts and trophozoites.
- Financial support was not available.

V

RESULTS

The study was conducted among the students of Dyola School of Bhaktapur. It was conducted in two ways.

i. Questionnaire survey: Data regarding sanitary, behaviour, hygienic condition, sources of water, awareness about parasites were collected.

ii. Stool samples collection and examination.

During the process of study, out of 216 students 186 students of Dyola School were interviewed with the help of a set of questionnaire. Among the total interviewed students, 97 (52.15%) were boys and 89 (47.85%) were girls. The parents were interviewed of those students who could not answer the questions themselves.

Photo 1: Dyola School and students

Photo 2: Dissemination of knowledge about parasites

Photo 3: Researcher in awareness programme with the students

Photo 4: Researcher interviewing the students

Photo 5: Open pig farming near the school

Photo 6: Open dumping site near the school

Photo 7: Polluted Hanumante river near the school

Photo 8: Preparing pork next to dumping site

Prevalence of helminthes regarding to awareness

Yes\No answer based question i.e. Are you aware of intestinal helminthic worm. Table 1, reveals that 52.78% of the Lama students (51.72%) were aware of intestinal parasitic worms and 63.98% of Dalit students were not aware of parasitic worms.

From the Table 1, it is also clear that though 52.78% of Lama students were aware, 46.67% of aware Lama students were infected. Prevalence of helminthes regarding to awareness found insignificant statistically (χ^2 =8.27, p>0.05,d.f. =9).

Table 1: Prevalence of helminthes regarding to awareness

S.N.	Castes	Intervie wee	Aware		Positive		Not aware		Positive	
			No.	%	No.	%	No.	%	No.	%
1.	Dalit	97	35	36.08	15	30.61	62	63.98	34	69.39
2.	Newar	29	15	51.72	02	16.67	14	48.28	10	183.33
3.	Chhetri	16	07	43.75	02	28.57	09	56.25	05	71.43
4.	Lama	36	19	52.78	07	46.67	17	47.22	08	53.33
5.	Magar	08	03	37.50	00	00.00	05	62.50	04	100.00
6.	Total	186	79	42.47	26	29.89	107	57.53	61	71.11

Different aspects of treatment of parasitic infections

With the help of questionnaire, it was found that out of total 186 students, 79 (79.47%) used allopathic medicines with consulting doctors, 48(25.81%) used allopathic medicines without consulting doctors, 6(3.23%) used to call dhami and jhankri at home, whereas 53(28.49%) used mixed types of treatment for parasitic infections.

Table 2: Different aspects of treatment of parasitic infections

S.N.	Types of treatment	Total population	
		Number	Percentage
1.	Allopathic treatment with consulting doctors	79	42.47
2.	Allopathic treatment without consulting doctors	48	25.81
3.	Dhami & jhankri	06	03.23
4.	Mixed	53	28.49

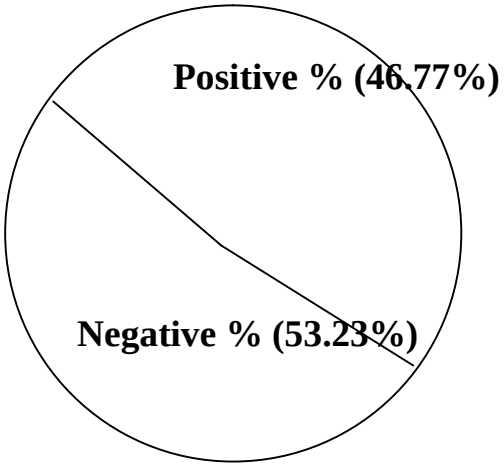
Laboratory examination of stool samples

To study the prevalence of intestinal helminth parasites in students of Dyola School, Bhaktapur, a total of 186 stool samples were collected. They were categorized into different groups: age-wise, sex-wise, class-wise and ethnic-wise. The samples were examined in the laboratory of Central Department of T.U., Zoology for identification of the eggs of intestinal helminth parasites. Out of total students of the school belonging to grade nursery to eight, 186 stool samples were collected. Out of 186 stool samples examined, 87 samples were positive for one or more specific intestinal helminth parasites, showing 46.77% prevalence of infection (Table 3).

Table 3: General prevalence of intestinal helminthes

Total sample examined	Positive cases		Negative cases	
	No.	%	No.	%
186	87	46.77	99	53.23

Chart 1: General prevalence of intestinal helminthes

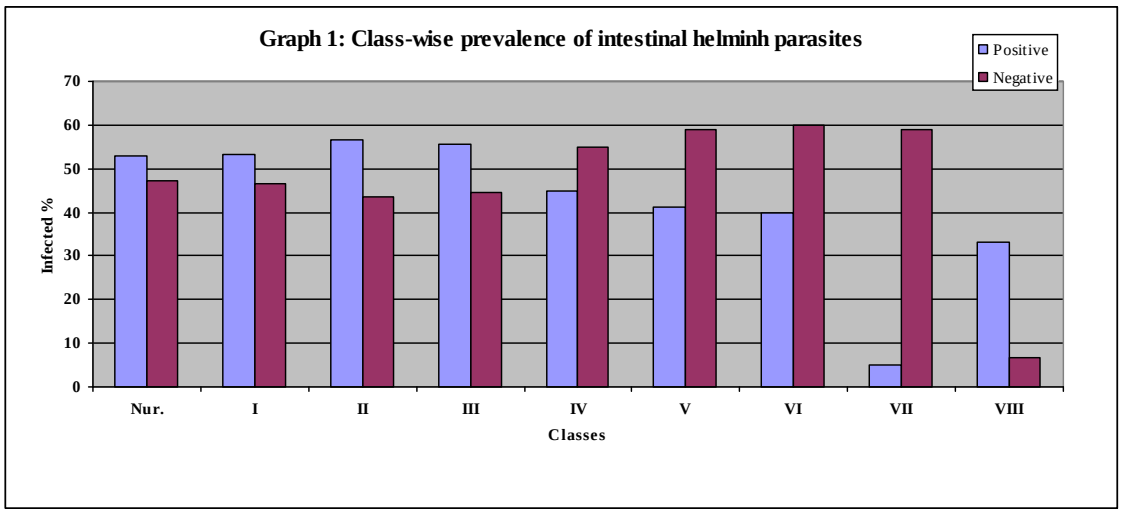


♣ Class-wise prevalence of intestinal helminth parasites

Table 4 and graph 1 show prevalence of intestinal helminth parasites were the highest among the students of class II. Out of 23 students of that class II (56.52%) were infected whereas only 33.33% of class 8 were infected, which was the least infected percentage. But statistically, the class wise prevalence was found insignificant (χ^2 =4.62, p>0.05, df=17)

Table 4: Class-wise prevalence of intestinal parasites

S.N.	Class	Total samples examined	Positive		Negative	
			No.	%	No.	%
1.	Nursery	17	09	52.94	08	47.06
2.	I	15	08	53.33	07	46.67
3.	II	23	13	56.52	10	43.48
4.	III	27	15	55.56	12	44.44
5.	IV	20	09	45.00	11	55.00
6.	V	17	07	41.18	10	58.82
7.	VI	30	12	40.00	18	60.00
8.	VII	22	09	40.91	13	59.09
9	VIII	15	05	33.33	10	06.67
10.	Total	186	87	46.77	99	53.23



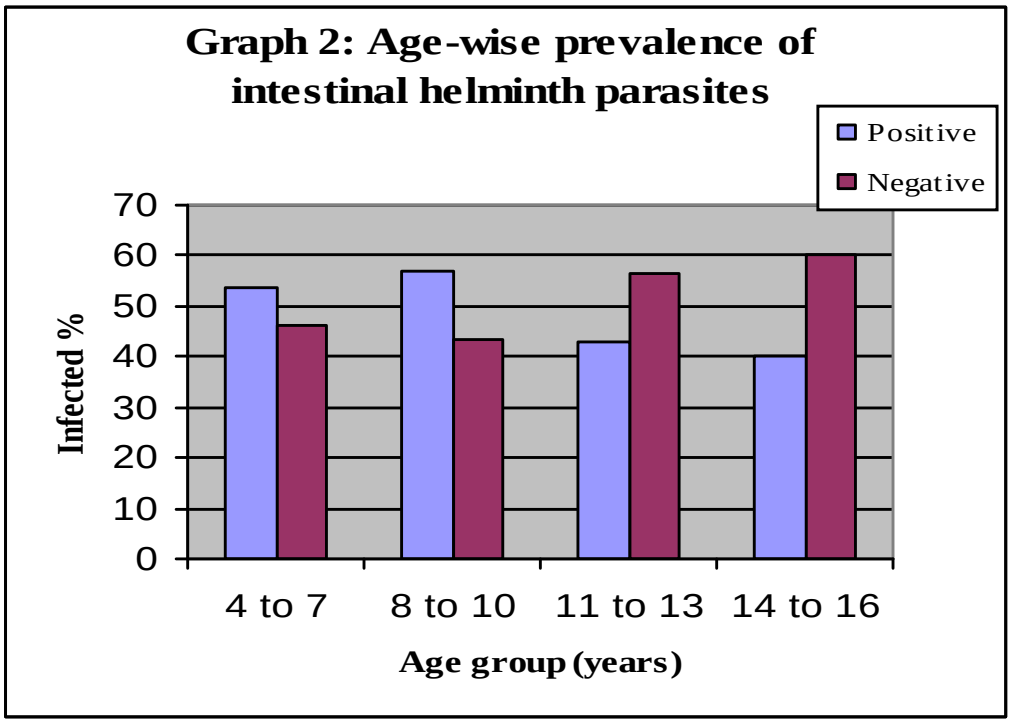
♣ Age wise prevalence of intestinal helminth parasites

The Table 5 and graph 2 show the prevalence of intestinal helminth parasites were maximum in 8-10 years age group (56.76%), and minimum in 14-16 years age group (40.00%). But statistically, the age-wise prevalence of intestinal helminth parasites was found insignificant (χ^2=3.23,p>0.05, df=7)

This result also coincides with the class-wise prevalence i.e. 8-10 years old students study in class II and 14-16 years old students study in class 8.

Table 5: Age-wise prevalence of intestinal helminth parasites

S.N.	Age group (yrs)	Total samples examined	Positive cases		Negative cases	
			No.	%	No.	%
1.	04-07	28	15	53.57	13	46.43
2.	0 8-10	37	21	56.76	16	43.24
3.	11-13	76	33	43.12	43	56.58
4.	14-16	45	18	40.00	27	60.00
5.	Total	186	87		99	



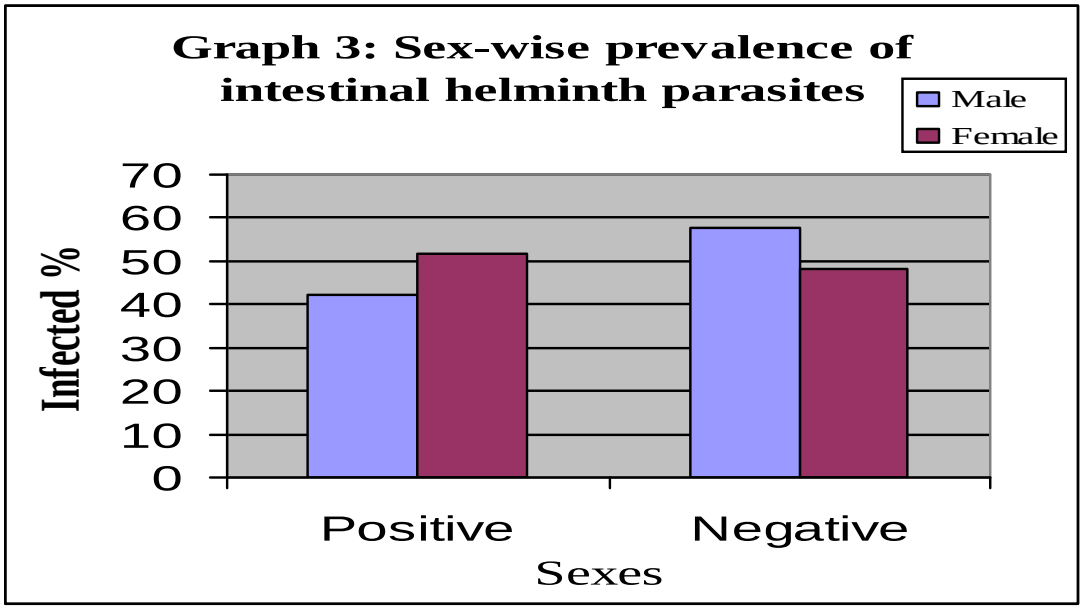
♣ Sex-wise prevalence of intestinal helminth parasites

Out of 186 examined stool samples, 97 (52.15%) were of boy and 89 (47.85%) were of girl students.

Out of 97 boys stool samples examined, 41 (42.27%) were found to be positive for intestinal helminth parasites. Likewise out of 89 girls stool samples examined, 46 (51.17%) were found to be positive for intestinal helminth parasites (Table 6 and graph). But statistically, no significant difference in the prevalence of helminth parasites was found between the two sexes (χ^2=1.67, p>0.05, df=3).

Table 6: Sex-wise prevalence of intestinal helminthes

S.N.	Sexes	Total samples examined	Positive cases		Negative cases	
			No.	%	No.	%
1.	Male	97	41	42.27	56	57.73
2.	Female	89	46	51.69	43	48.31
3.	Total	186	87	46.77	99	53.23

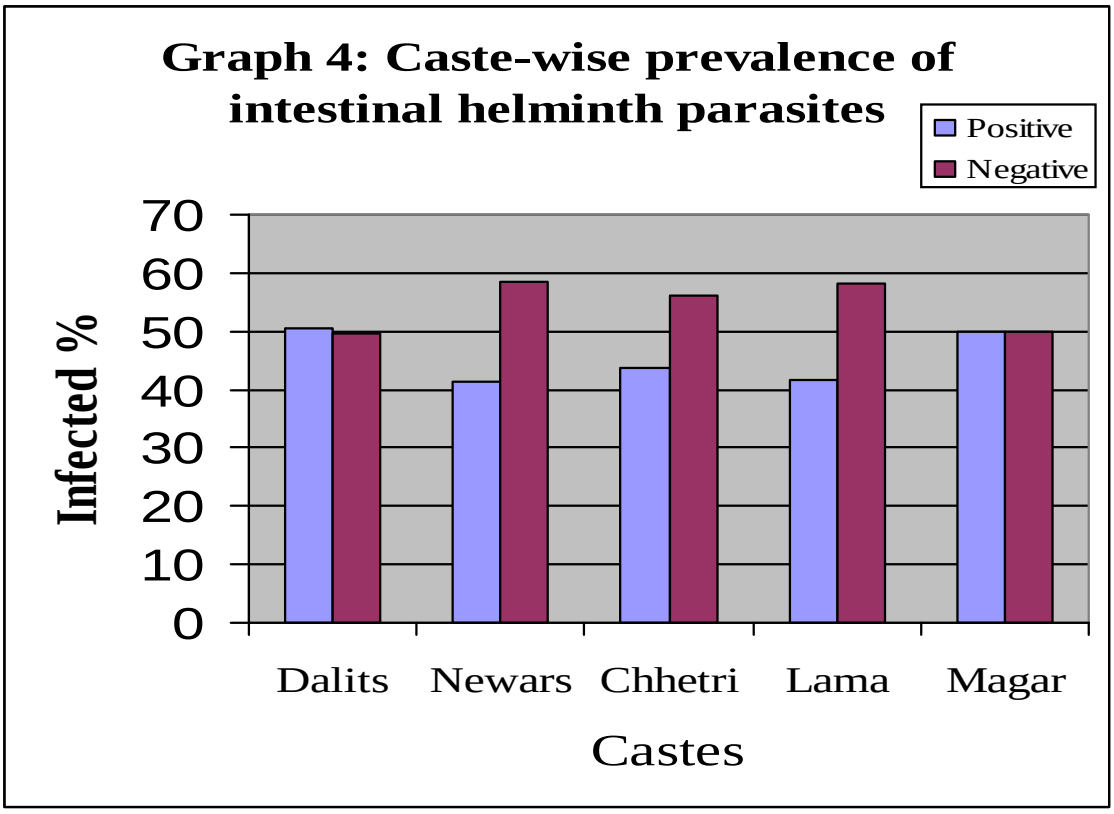


♣ Caste-wise prevalence of intestinal helminth parasites

It is clear from the Table 7, that Dalits had the highest prevalence of intestinal helminth parasites i.e. 50.52% followed by Magar (50.00%) and Newars had the lowest prevalence of intestinal helminth parasites i.e. 41.38%. But statistically, cast wise prevalence was found to be insignificant (χ^2=1.37, p>0.05, df=3)

Table 7: Caste-wise prevalence of intestinal helminthes

S.N.	Castes	Total samples examined	Positiveve cases		Negative cases	
			No.	%	No.	%
1.	Dalits	97	49	50.52	48	49.48
2.	Newar	29	12	41.38	17	58.62
3.	Chetri	16	07	43.75	09	56.25
4.	Lama	36	15	41.67	21	58.33
5.	Magar	08	04	50.00	04	50.00
6.	Total	186	87	46.77	99	53.23

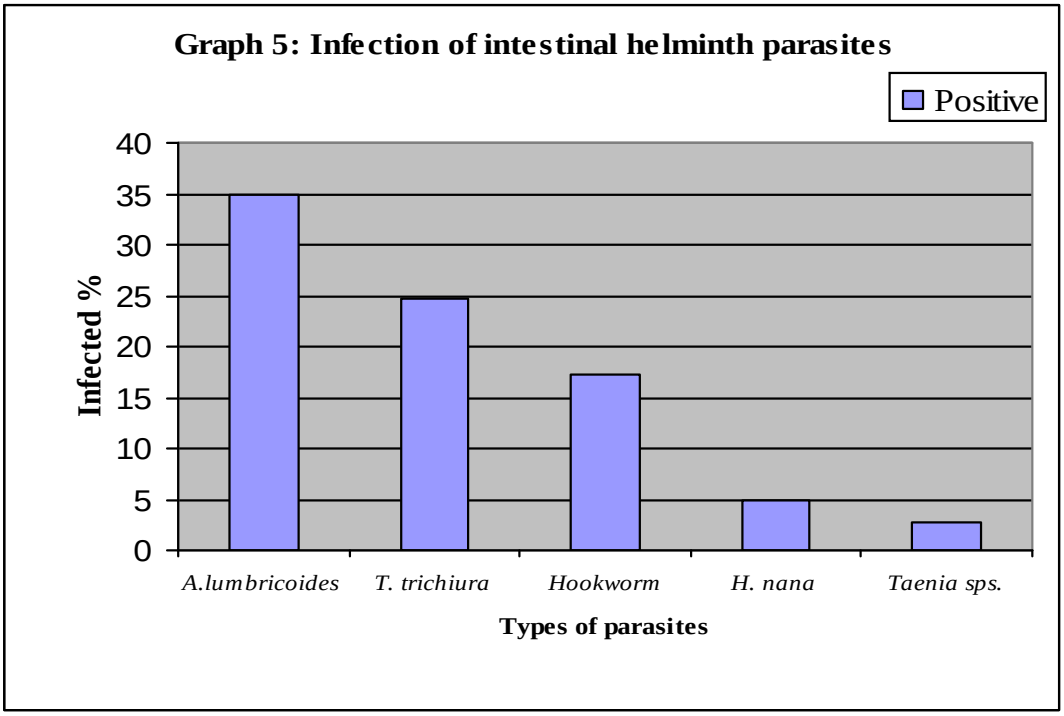


♣ Infection of specific intestinal helminthes

All together 5 types of helminth parasites were found. The Table 8 clearly shows the fact that the infection of *A. lumbricoides* was found maximum i.e. 34.95% followed by *T. trichiura* (24.73%), *Hookworm* (17.20%), *H. nana* (4.84%) and infection of *Taenia* spp. was found minimum i.e. 2.69%.

Table 8: Infection of intestinal helminthes in study area

S.N.	Parasites	Total sample examined	+ve cases	+ve %
1.	*A. lumbricoides*	186	65	34.95
2.	*T. trichiura*		46	24.73
3.	Hookworm		32	17.20
4.	*H. nana*		09	04.84
5.	*Taenia* spp.		05	02.69

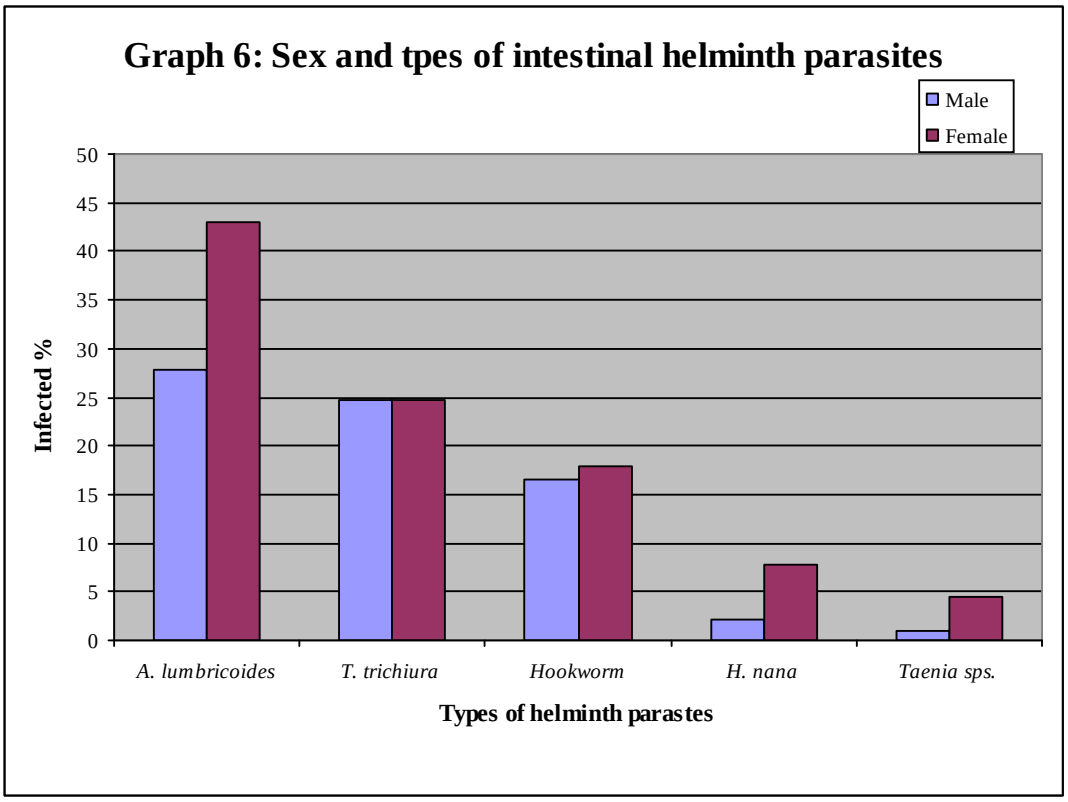


♣ Sex-wise prevalence of specific helminth parasites

The study shows that infection rate of *A. lumbricoides*, *H. nana* and *Taenia* spp. was found more in females than males whereas prevalence of *T. trichiura* and Hookworm was found almost equal in both the sex groups (Table 9 and graph).

Table 9: Sex-wise distribution of specific helminth parasites

S. N.	Sex	Total samples	Positive cases									
			A. lumbricoides		*T. trichiura*		Hookworm		*H. nana*		*Taenia* spp.	
			No	%	No	%	No	%	No	%	No	%
1.	Male	97	27	27.84	24	24.74	16	16.49	02	2.06	01	1.03
2.	Female	38	38	42.97	22	24.72	16	17.98	07	7.87	04	4.49
3.	Total	186	65	34.95	46	24.73	32	17.20	9	4.84	05	2.69



♣ Distribution of intestinal helminth in different castes

The analytical study of the table 10 shows that the distribution of *A. lumbricoides* was highest (50.00%) but other helminthes are absent in Magar and lowest in Lama (27.78%). *T. trichiura* (29.90%) and *Taenia* sps. (5.15%) was highest in Dalit. *Taenia* sps. was only found in Dalits. Hookworm was highest in Lama (22.22%) and it was absent in Magar. *H. nana* was highest in Newar (6.90%) and absent in Lama.

Table 10: Distribution of intestinal helminth in different castes

S. N.	Castes	Total sample examined	Positive cases									
			A. lumbricoide		*T. trichiura*		Hookworm		*H. nana*		*Taenia* spp.	
			No	%	No	%	No	%	No	%	No	%
1.	Dalit	97	37	38.14	29	29.90	17	17.53	04	3.88	05	5.15
2.	Newar	29	09	31.03	05	17.24	04	13.79	02	6.90	00	0.00
3.	Chhetri	16	05	31.25	03	18.75	03	18.75	01	6.25	00	0.00
4.	Lama	36	10	27.78	09	25.00	08	22.22	02	5.56	00	0.00
5.	Magar	08	04	50.00	00	00.00	00	00.00	00	0	00	0.00
6.	Total	186	65	34.95	46	24.73	32	17.20	09	4.84	05	2.69

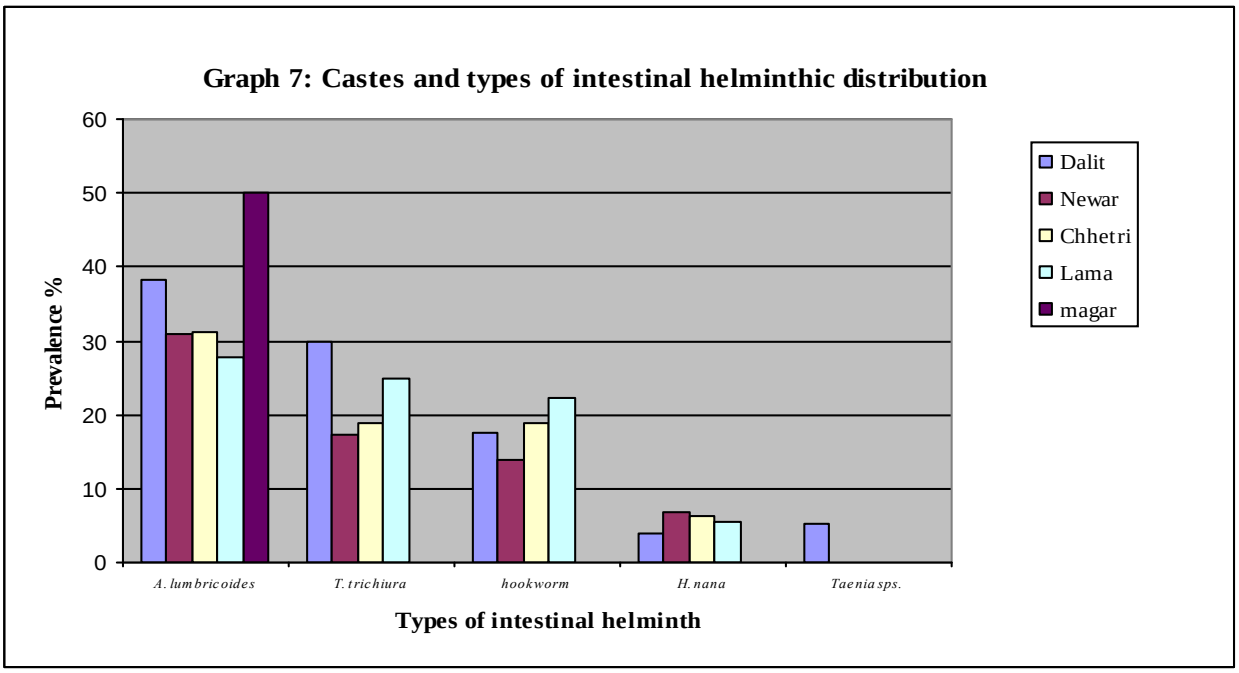


Photo 9: Preparing slides

Photo 10: Observing slides

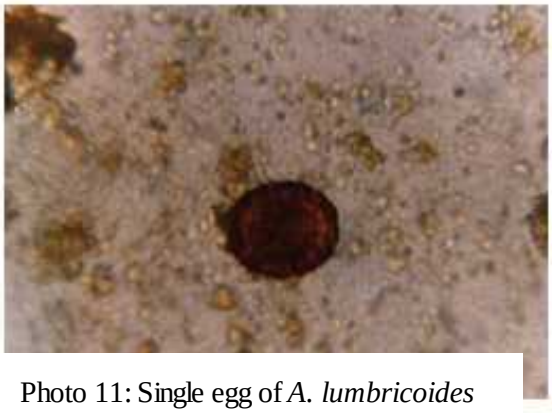


Photo 11: Single egg of *A. lumbricoides*

Photo 12: Double eggs of *T. trichiura*

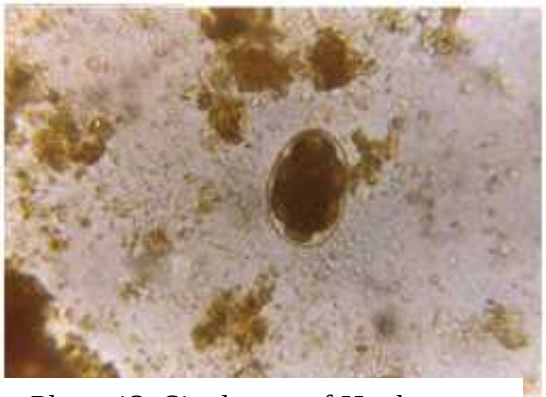


Photo 13: Single egg of Hookworm

Photo 14: Single egg of *H.nana*

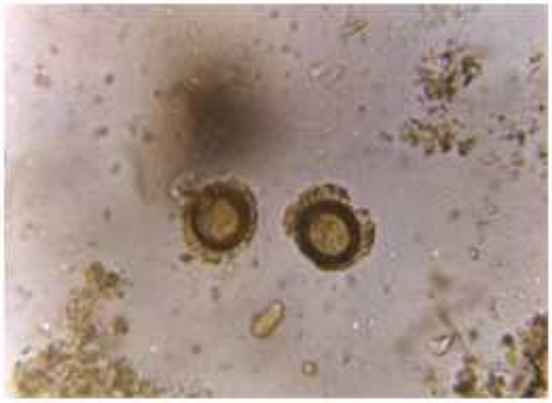


Photo 15: Double eggs of *Taenia* spp.

Photo 16: Eggs of *Taenia* spp.

♣ Prevalence of parasites in relation to food habit

The prevalence of helminthes was comparatively higher in non-vegetarian (47.31%) than in vegetarian (42.11%). However, there is not significant difference (χ^2=0.19, p>0.05, df=3).

Table 11: Prevalence of parasites in relation to food habit:

S.N.	Food habit	Total sample examined	Positive		Negative	
			No.	%	No.	%
1.	Non-veg.	167	079	47.31	088	52.69
2.	Vegetarian	019	008	42.11	011	57.89
3.	Total	186	087	46.77	099	53.23

♣ Prevalence of parasites in relation to housing condition

From the questionnaires it was found that out of 186 students, 149 had toilet in their houses and 158 had domesticated animals. It is found that higher prevalence of parasites was found in students who had no toilet at their homes (64.86%) and who had kept domestic animals at their houses (50.00%).

Statistically, there is no significant difference between students having toilet and not having toilet (χ^2=6.53, p>0.05, df=3). Same result was obtained between students having domestic animals and not having domestic animals (χ^2=5.21, p>0.05, df=3).

Table 12: Prevalence of parasites in relation to housing condition:

S. N.	Conditions	Total samples examined	Positive cases	
			No.	%
1.	House with toilet	149	063	42.28
2.	House without toilet	037	024	64.86
3.	House with domestic animals	158	079	50.00
4.	House without domestic animals	028	008	28.57

♣ Prevalence of parasites with respect to having anthelminthic drugs within last 6 months

The prevalence of parasites between two population groups, having and not having antihelminthic drugs within last 6 months, were found to be significantly different (χ^2=10.25, p<0.05, df=3). But 26.83% were still recorded as positive for helminthes although having medicines.

Table 13: Prevalence of helminth parasites with respect to having anthelminthic within last 6 months

S.N.	Conditions	Total pop^n	Positive cases	
			No.	%
1.	Having drugs	41	11	26.83
2.	Not having drugs	145	76	52.41
3.	Total	186	87	46.77

♣ Prevalence of parasites in relation to personal hygiene

The prevalence of parasites in the individuals washing hands before meal was less infected than those individuals who did not wash hands before meal (χ^2=4.48, p>0.05, df=3). Similarly the prevalence of helminthes was found higher in those who walk without shoes than those who walk with shoes (χ^2=1.29, p>0.05, df=3). Statistically, there was no significant difference between above two pairs of conditions. However, there was significantly difference in prevalence of intestinal helminth between people who used boiled water and direct (not boiled) water for drinking (χ^2=8.31, p<0.05, df=3).

Table 14: Prevalence of parasites in relation to personal hygiene:

S. N	Conditions	Total samples	Positive cases	
			No.	%
1.	a. Persons washing hands before meal	169	83	49.11
	b. Persons with no care in washing hands before meal	017	04	23.53
2.	a. Walk with shoes	069	36	61.62
	b. Walk without shoes	117	51	43.59
3.	a. Drink boiled water	047	14	29.78
	b. Drink water without boiling	139	73	52.52

♣ Intensity of helminth infections among different castes

Table 15, shows that among infected students the highest multiple infections (33.33%) was found among Newar students whereas no multiple infection was found among Magar students. The highest double infection (46.94%) was found among Dalit students followed by Lama students (46.76%) and the lowest (08.33%) double infection was found among Newar students. Highest single infection (75.00%) was found among Magar students and lowest (33.33%) among Lama students.

Table 15: Intensity of helminth infections among different castes:

S. N.	Castes	Total samples examined	Total +ve cases	Single infection		Double infection		Multiple infection	
				No.	%	No.	%	No.	%
1.	Dalit	97	49	17	34.69	23	46.94	09	18.37
2.	Newar	29	12	07	58.33	01	08.33	04	33.33
3.	Chhetri	16	07	04	57.14	02	28.57	01	14.29
4.	Lama	36	15	05	33.33	07	46.67	03	20.00
5.	Magar	08	04	03	75.00	01	25.00	00	00.00
6.	Total	186	87	36		34		17	

VI
DISCUSSION & CONCLUSION

The literatures on intestinal helminth parasites of Nepal revealed that a few investigations have so far been done in the country for the last few decades, the earliest being begun by Baczynsk in 1914. However, the earliest information on human intestinal parasites was produced by Sharma in 1965, who reported that the round worm infection is very common in some parts of our country. He studied 976 stool samples and found 40% round worm infection in Bhaktapur area. Thereafter the study in parasitology gradually expanded in Nepal. Some native and foreign workers contributed in this field.

Analysis of surveillance data shows that out of 186 students, 79 (42.47%) were aware of the parasitic worms. But only about 5% students were aware about mode of infection of parasitic worms. While analyzing the awareness about intestinal worms among Magar of Tindobate, Pradhan (2001) reported 26.22% awareness but only 3% children were aware about the mode of infection of worms.

The present study revealed 46.77% of the total populations examined were harboring different kinds of intestinal helminth parasites. Sharma (1965) conducted a similar type of survey among patients in Bhaktapur. He had taken a total 976 samples over a 5 years period. Of those 220 were children of less than 12 years age. He found 49% of children were infected.

A study carried out by Nepal and Palfy in Kathmandu valley, in 1980, has been published with the report of 51.1% individuals infected by intestinal helminth parasites. Shrestha (2000) conducted similar type of survey among children up to 10 years old and found 53% were positive for helminthes. Which is nearly equal to the present result (46.47%).

Shrestha (1983) in Bhaktapur showed 99% stools positive for the soil-transmitted helminthes. Chhetri (1997) reported 98% stools were positive for helminthes parasites, but present study shows only 46.77% of students were positive for helminthes parasites.

Present findings indicate that girls were more infected than boys i.e. 42.27% and 51.17% respectively. But significantly, there was no difference in prevalence of parasites inbetween two sexes (χ^2=1.67, p<0.05, df=3). It is because of the equal possibilities among them due to over dispersed of parasites in all communities. This finding is supported also by Rai *et al.* (2002). Shrestha (2001) found 51% of boys and 62.16% of girls infected.

Rai *et al.,* (2000) presented the paper to show the prevalence of various intestinal parasites in Kathmandu valley, Nepal. The over all prevalence of intestinal parasites was 30.9%. There was no significant different in the prevalence between two sexes. This result is in agreement with the present study.

Sherchand *et al.,* (1998) showed that the parasitic load was found slight higher in female children (58.1%) compared to male children (41.9%), however, no significant difference was found between these two sexes in parasitic infection. This is also in agreement with the present study. Sharma (1965) examined stool samples of patients from Bhaktapur. The result showed 32% of male and 44% of female to be infected. This also supports present study. Karim *et al.,* (1995) also examined the people of aboriginal community at Tamang of Hulu perale. He found females had a higher prevalence of intestinal helminthes than males. This result is different from the present study.

The total 186 samples collected from the age group 4-16 years were categorized into four groups 4-7 years, 8-10 years, 11-13 years and 14-16 years age. The present prevalence of parasites was found highest (56.76%) as a whole in the age group 8-10 years followed by age 4-7 years with

53.57%. Virk (1994) also reported the highest prevalence of parasites from the age group 6-14 years.

Ferreira *et al.*,(1995) Junior published result of their study from September to November 1995. During that time they examined 103 children. The over all prevalence rate was 22.3% and the highest incidence (34.8%) of infection was observed in 8-9 years age group. Sherchand *et al.*, (1997) showed that the parasitic infection was the highest (30.8%) in the age group 6-9 years. These results also support the present study. Prevalence of intestinal parasites increased with the increase of age up to 6-15 years, then decreased slightly in adulthood. The higher prevalence among younger children appeared to be associated with their less hygienic habit, less aware about personal cleanliness and being the most active age. Shrestha (2001) found slightly different result. Among age groups of 0-4, 5-7 and 8-10 the highest prevalence (49%) was found in the age group 5-7 years old followed by age group 8-10 years (45%).

In the present study students from class nursery to 8 were included. Among them the highest prevalence (56.52%) was found among the students of class 3 followed by the students of class 4 (55.56%).

In the present study, 5 different species of helminth parasites were found belonging to 2 groups of helminthes. Three species were of nematodes and two species were of cestodes. No trematode infection was found. These species are also reported by previous workers in Nepal viz, Sharma (1965), Gupta (1988), Serchand *et al*. (1992), Rai *et al.* (1994), Rai *et al*. (2001) and Pradhan (2001). While studying the different types of intestinal helminth parasites it was found that distribution of *A. lumbricoides* was highest (34.95%) followed by *T. trichiura* (24.73%), Hookworm (17.20%) *H. nana* (4.84%) and *Taenia* sps. was lowest (2.69%).

Out of five helminth parasitic species *A. lumbricoides* was the commonest (18.33%) followed by *T. trichiura* (5.00%), Hookworm

(5.00%) and *H. nana* (2.91%). The least infection was of *Taenia* spp. (0.83%). *A. lumbricoides* topping the parasites was in agreement with several previous reports from Nepal. Shrestha (1983) in Bhaktapur found 99% stools to be positive for the soil-transmitted helminthes. 94% were positive for *A. lumbricoides*, 42% were positive for *T. trichiura* and 11% were positive for hookworm.

Khetan *et al*., (1980) investigated the incidence of parasitic infections in Central Nepal, Narayani zone. They observed 29% hookworm, 21.9% round worm, 9.95 *T. trichiura*. In this result hookworm infection was found to be more common.

Kightlinger *et al.*, (1998) surveyed 663 children of 4-10 years old living in southern Madagascar and revealed prevalence of 93% for hookworm. In this result *A. lumbricoides* was found to be more common. Pegelow *et al*., (1997) examined stool specimens of children from ten schools of Sukuraja, West Java, Indonesia. His findings were quite different having *T. trichiura* 76%, *A. lumbricoides* 44%, hookworm 9% and *E. vermicularis* 3%.

Analysis of associations between parasites within host revealed strong correlation between *A. lumbricoides* and *T. trichiura*.

The analytical study showed that the distribution of *A. lumbricoides* (50.00%) is highest in Magar, *T. trichiura* (29.90%) is highest in Dalit, Hookworm (22.22%) is highest in Lama, *H. nana* (6.90%) is highest in Newar and *Tainea* sps. (5.15%) is highest in Dalit.

In the present study out of 87 positive cases, 36 (41.38%) harbored a single infection, 34 (39.08%) double and 17 (19.54%) harbored multiple infections in studied area. It can be compared to Osamn *et al.*, (1996) who found 57.4% single infection, 28.1% double and 14.1% multiple infections, while surveying the parasitic infection in 395 children aged less than 12 years of age in 5 rural communities in Paraguay.

Among different ethnic castes, Dalit had the highest prevalence (50.52%). However, there was not significant difference in prevalence of parasites among different castes (χ^2=1.37, p<0.05, df=9).

No similar such study regard intestinal helminth parasites in Dyola School, Bhaktapur has been conducted previously.

In the present study the high prevalence of intestinal parasites may be because in study area where human faeces are used as fertilizer for field crops or for vegetable garden, the open pig farming, open dumping site, washing vegetables and swimming in polluted Hanumante river. Under these favorable circumstances helminthes may develop in epidemic proportions or may provide a serious chronic public health for native populations. In community with high incidence of multiple infections the clinical as well as public health aspects are complex, such as malnutrition, retardation of growth in children associated with both the larval (tissue) and adult (intestinal) stages include pneumonitis, asthma, diarrhea, nausea, anemia, abdominal pain and anorexia. Moreover, from the questionnaire it was found that 3.23% people still believe in Dhami and Jhankri. This traditional faith of almost all ethnic castes for treatment of parasitic infections was found.

From the findings of the present research work, it may be assumed that similar situation might be prevailing in other part of the country which is yet to be investigated. The public health division should look after the control of intestinal helminth parasites. If timely measures are not taken, the situation may be aggravated to such an extent that both men and animals may become vulnerable to a number of zoonotic diseases as well as other transmissible diseases which will go beyond our reach to control in future. Thus, extensive study is needed for the determination and control of epidemiological and etiological factors that cause the high prevalence of parasites in the valley and even in the country.

VII

RECOMMNDATIONS

- Awareness and control programme for intestinal helminth parasites should be lunched by different organizations.
- Open dumping site and open pig farming should be stopped.
- Habit of defecating on open field, on the bank of river etc should be prevented and human night soil should be managed properly.
- Soil-pollution should be prevented by proper control of sewage disposed and disinfection of contaminated soil.
- Well-established sanitary toilet should be build up in each and every home.
- The people should be made aware to use neat and germ free toilets.
- Consumption of raw or undercooked meat, unwashed fruits, vegetables and washing with contaminated water should be prevented.
- A system of making of approved meat should be developed and unmarked meat should be rejected.
- Regular active surveillance to know the prevalence and incidence of intestinal parasites in human beings should be carried out.
- Treatment of individuals must perfectly be done. Suggestion should be made for national and even regional antihelminthic programme for the mass treatment of pre and primary school age children.
- The research work on the prevalence of intestinal parasites and prevention should be managed.

VIII
REFERENCES

Alo, E.B.; Anosike, J.C. and Danburan, J. B. (1933). A survey of intestninal heiminths among students of post-primary institution in Adamawa state, Nigeria. *Applied Parasitology*. **34**(3): 161-167.

Amin, C. M. (2000). Prevalence of intestinal parasites in the United States. *American Journal of Tropical Medicine and Hygine.* **66** (8) 799-803.

Aydin, A. and Oguz (2005). Distribution of intestinal parasites in children from the 23 Nisan primary school in Hakkari. *Turkiye Parazitoloji* **24** (4); 268-270.

Atchley, F.O.(1959). Significance of human intestinal helminthes in eastern Kentucky. *J.Parasitol***. 45**:518.

Blangero, S.W.; Blangero, J.; Robinson, E.S.; Adhakari, B.N.; Upreti, R.P. and Pyakurel, S. (1997). Helminthic infectin in Jiri, Nepal: Analysis of age and Ethnic group effects. *J.Inst. Med.* **15**: 210-216.

Bol, J.P.M. and Roder, E.C. (1981). Soil transmitted Nematodes in Lalitpur district in Nepal. *J. Inst. Med.* **3: 167** -178.

Chai, J.Y. and Bouasy H. (1998). A small-scale survey of intestinal helminthic infections among the residents near pakse, Laos. *Korean Journal of Parasitology.* **36** (1) March: 55-58.

Chadiwana, S.K.; Bradly, M. & Chombo, F. (1989). Hookworm & roundworm infections in farm worker communities in the large-scale agricultural sector in Zimbabwe. *J. Trop. Med. Hyg*. **92**:338-344.

Cheng, H.S. and Wang (2005). Intestinal parasites may not cause nosocomial infections in psychiatric hospitals. *Parasitology Research* . **95** 358-362.

Chhetri, M.K. (1997). Parasitic infection in Nepal. *J. Nep. Med. Asso.* **35**:62-65.

Deepmala, K. and Sinha, K.P. (2004). Prevalence of intestinal parasites infections in human population of Darbhnga region of Bihar. *Journal of Parasitology and Applied Animal Biology.* **13** (1-2) Jan.- July: 77-80.

District Development Committee (2002). Aawadhik jilla bikash yojana, Bhaktapur (2002-2007). *District Profile Analysis.* **1**:10-25.

Ejezie, G.C. (1981). The parasitic diseases of school children in Lagos State, Nigeria. *Acta Trop.* **38:79**-84.

Estevenz, E.G.; Levine, J.A. and Warren, J. (1983). Intestinal parasites in a remote village in Nepal. *Journal of Clin. Microbiol.* **17**(1): 160-161.

Farook, M.U.; Sudharmini, S. and Ramadevi, S.(2002). Intestinal helminthic infection among tribal populations of kattar and Achankovil areas in kerela (India). *Journal of Commusicable Disease*. **34**(3) Sept: 171-178.

Frreira, C.S.; Ferreira, M. U. and Nogueira, M.R. (1995). The prevalence of infection by intestinal parasites in urban slum in Sao Paulo, Brazil. *Journal of Tropical Medicine and Hygiene.* **97**(2): 121-127.

Gaihre, Y.K. (2000). Prevalece of intestinal parasites in general, *Ascariasis* in details in Sarkies and Magars community of Tindobate VCD, Syangja, Nepal. *M.Sc. Dissertation, T.U., Kritipur, Kathmandu Nepal.* (Unpublished).

Glickman, L.T.; Camara, A.O.; Glickman, N.W. and Mcabe, G.P.(1999). Nematode intestinal parasites of children in rural Guinea, Africa prevalence and relationship to geophagia. *J.Int. J. Epidemiol.* **28** (1): 169-174.

Gulay, G.D.; Duran, N. and Canpolot P. (2005). The distribution of intestinal parasite in students of the Mustafa Kemal University School of Health. *1 TURKIYA PARAZITOLOJI DERGISI* **29**(4):258-260.

Gupta, W. and Gupta, H.N. (1988). The infestation rate of human intestinal parasites of Kritipur. *J. Nep. Med. Assdc*. **26** (4): 23-28.

Gupta, R. (1988). Studies on infection rate of human intestinal parasites of Kritipur. *Journal of Nep. Med. Asso* 26, no.4.

Gurbacharya, D.L. (1988). Problem of soil transmitted helminthiasis in Nepal. *J. Nep. Assoc.* 19.

Hadju, V. K. A.; Lani, S. S.; Nur N. N.; Hussni, O.; M. and Dwight, D. D. (1995). Intestinal Helminthiasis, nutritional status, and their relationship; A cross - section study in urban slum School children in Indonesia. *Southeast Asian Journal of Tropical Medicine and Public Health.* **26**(4): 719-729.

Hassan, S. I. (1994). Parasitic infections in primary and secondary schools in Giza Governorate, Egypt. *Journal of Egyptian Society of Paraitology*. **24**(3): 597-601.

Huston, W. and Schwavtz, E. (1994). Helminthic infection Peace crops volunteers in Nepal. *JAMA ISSN* **009-74,84,190,263** : 373-374.

Jemanash, L. (1998). Comparative prevalence of some intestinal helminth infections in different altitudinal regions in Ethiopia. *Department of Microbiology and Parasitology, Faculty of Medicine Addis University*. **36** (1): 1-8.

Kabatereine, N.B.; Kemijumbi, J.; Kozibwe, F. and Onapa, A.W. (1997). Human intestinal parasites in primary school children in Kampala Uganda. *East African Medical Journal*. **74**(5) May, 311-3114.

Karim, R.; Rahman, N.; Khairnul, A.; Mehdi, R. and Abdullah, B. (1995). Parasitic infection in the aboriginal community at Temengor, Huluperak , Malaysia. *Malayan Nature Journal* **48**(3-4): 425-432.

Khetan, R.P. (1980). Incidence of parasitic infestation in Narayani Zone. *Journal of Nep. Med. Assoc.***18** (4): 29-31.

Kightlinger, L.K.; Seed J.R. and Kightlinger M.B., (1995). The epidemiology of *Ascaries lumbricodies,Trichuris trichira* & hookworm in children in Ranomafana rainforest, Madagascar. *J.Parasitol.* **81**: 159-169.

Kightlinger, L. K.; John, R. S. and Kightlinger, M.B. (1998). The epidemiology of Ascaris *lumbricoides, Trichus trichiura* and hookworm in children in the

Ranomafana rainforest, Madagascar. *Journal of Parasitology.* **81** (2): 159-169.

Lee, J. W.; Park, G.M.; Lee, D.H.; Park, S.J. and Yong, T.S. (2000). Intestinal parasite infections at an institution for the handicapped in Korea. *Korean J. of Parasitol.* **32**:119-181.

Mafiana, C.F.; Sodipe, M.B. and Koleoso, B.I. (1998). Soil transmitted helminth parasites of human in city in southwestern Nigeria. *Helminthologia* (Bratislava). **35**(4) Dec. 203-208.

Navitsky, R.C.; Dreyfuss, M. L.; Shrestha, J.; Khatry, S.K.; Stoltzfus, R.J. and Albonico, M. (1998). *Ancylostoma duodenale* is responsible for hookworm infections among pregnant woman in the rural plains of Nepal. *Journal of Parasitology.* **84** (3) June: 647-651.

Nepal, M. and Plafy, B. (1980). A study of prevalence of intestinal Parasites in the mahnakal panchyat and their relation with hemoglobin levels. *Journal of Inst. med*.**2** (2): 175-182.

Nishimura, M. (2000). Study on living circumstances of children suffering from diarrheal diseases. *Jour.Inst. Med.* **19:**11-21.

Osamn, R.; Ohnishi, M.; Gimener, H.; Susumo, K. T. and Sendo, F.(1996). Epidemiological survey for intestinal parasitic as a part of primary care project in Caazopa Dept., Paraguay. *Yamagata Medical Journal.* **14**(2): 25-31.

Palmer, D.R. and Bundy, D.A.P. (1995). Epidemiology of human Hookworm and *Ascaris lumbricodies* infestations in rural Gambia. *East African Journal.* **72**(8): 527-530.

Pandit, S.K. and Habib, U. Z. (1997). Surgical *ascariasis* in children in Kashmir. *Tropical Doctor*. **27**(1): 13 -14.

Paul, I.; Gnanamani, G. and Nallam, N.R. (1999). Intestinal parasitic infections among school children in Visakhapatnam. *Indian journal of Pediatrics.* **66**(5) Sep-Oct, 669-673.

Pegelow, K.R.; Gross, K.; Pretrzik, W.; Lukito, A.L.; Richards, P. and Fryuff, D.J. (1997). Parasitological and Nutritional Situation of school children in Sukaraja distirict, west Jave, Indonesia. *Southeast Asian Journal of Tropical Medicine and Public Health.* **28**(1): 173-190.

Pradhan, Y.K. (2001) Prevalence of Intestinal Parasites is Sharkies and Magar community of Tindobate VDC.Syangja. *M. Sc. Dissertation, T. U., Kritipur, Kathmandu, Nepal* (Unpublished).

Rai, S.K. and Gurung, C.K. (1986). Intestinal parasitic infections in high school students of Birgunj city. *Jour. Inst. Med.* **8** (1a): 33-38.

Rai, S.K.; Nakanishi, M.; Khadka, J.B.; Sharma, C.M.; Shrestha, M.K. and Shrestha, H.G. (1991). Intestinal parasites in kathmandu, Nepal. *Asian Conferences in Med. Labora, Techno. 4th Bangkok, Thialand.*

Rai, S.K.; Kubo, T.; Nakamishi, M.; Sumi, K.; Shibata, H.; Matsuoka, A. and Shrestha, H.G. (1994). Status of soil-transmitted helminthic infection in

Nepal. *The Journal of Japanese Association of Infectious Disease*. **68**(5): 625-630.

Rai, S.K; Nakanishi, M. and Upadhaya, M.P. (1998). Effect of intestinal helminth infection on some nutritional parameters among rural villagers in Nepal. *Kobe Jour. Med. Sci. (Jpn)* **44**: 91-98.

Rai, S.K.; Nakanishi, M. and Upadhaya, M.P. (2000). Effect of intestinal helminth infection on rational and B-contene status among rural Nepalese, *Nutr Res* **02**:15-23.

Rai, S.K.; Takeo, M.; Ono, K.; Yoko, O.; Shoji, U.; Rai, N. and Shrestha, H.G. (2001) Intestinal parasites in an unknown disease out break rural hilly area in Western Nepal. *Nepal Medical Council Journal.* **2**(2): 61-64.

Rai, S. K.; Uga, S.; Ono, K.; Rai, G. and Takeo, M. (2000). Contamination of soil with helminth parasite eggs in Nepal. *Asian J. of Trop. Med. Pub. Health.* **31**:388-395.

Rim, H.J.; Chai, J.Y.; Min, D.Y.; Cho, S.Y.; Fom, K.S.; Hong, S.J.; Sohn, W.M.; Yong, J.S. and Yun, C.H. (2003). Prevalence of intestinal parasite infections a national scale among primary school children in Laos. *Biological Abstract T.U.,Kritipur.*

Rodger, F.C. (1987). Nutritional factors and helminthiasis. *An Esc. Nac. Saude. Pub Med. Trop.* **1**:163-169.

Saksirisampant, W.; Surang, N.; Viroj, W. and Sutin, Y. (2003). Intestinal parasitic infections among children in an orphan age in Pathum Thani Province. *Journal of the Medical Association of Thailand.* **86**(2) June: 263-270.

Sharma, B.P.(1965). Roundworms and their infection. *Journal of Nepal Medicine Association Vol.**3**, No.2.*

Sherchand, J.B.; Larsson, K. and Sherstha, M.P. (1992). On the incidence of Rotavirus and Enteric Adenovirus diarrhea, Kanti-Children Hospital and Journal Practitioners in the Kathmandu Area. *J. Nep.Med.Assoc*.**30**: 149-159.

Sherchand, J.B. (1997). Intestinal parasitic infections in rural area of Southern Nepal. *Journal of Institute of Medicine.* **19**(3and 4): 115-121.

Sherchand, S.; Ohara, H.; Matsuda, H. and Sherchand, J.B. (1998). A cross sectional study on intestinal parasitic infections in primary school children of Godar VDC, Nepal. *Journal of the Nepal Association for Medical Laboratory Sciences.* **1**: 61-61.

Shrestha, I.L. (1983). Soil-transmitted helminthiasis. *Journal of Inst. Med.* **5**(2): 193- 196.

Shrestha, R. (2000). Prevalence of Intestinal parasite of to 10 years old children in Kathmandu and Bhaktapur. *M. Sc. Dissertation, T.U., Kritipur, Kathmandu, Nepal.* (Unpublished).

Shrestha, P. (2003). A study of prevalence of intestinal parasites in Bhaktapur district. *The dawn bulletin.* **50:** 60-66.

Singh, H. L.; Singh, B. and Singh, Y.I. (2004). Helminthic infestation of the primary school going children in Manipur. *Journal of Communicable Disease.* **36**(2) June: 111-116.

Sorensen, E.; Mahroof, I.; Amarasinghe, I. and Dassenaieke, H. (1996). The prevalence and control of soil transmitted nematode infections among children and women in the plantations in Sri-Lanka. *Ceylon Medical Journal.* **41**(2): 253-259.

Suwal, R.P. (2005). A study of prevalence of intestinal parasites in the Dhulikhel district and relationship of intestinal parasites with hemoglobin levels. *Nursing Report Khwopa Nursing College, Bhaktapur.* (Unpublished).

Toma, H.; Shimabukuro, I.; Kobayashi, J.; Tasaki, T.; Takara, M. and Sato, Y. (2001). Community control studies on *Strongyloides* infection in a model Island of Okinawa, Japan. *Southeast Asian J. of Trop. Med & Pub Health.* **31**:383-387.

Virk, K.; Prasad, R.N. and Prasad, H. (1994). Prevalence of intestinal Parasites in rural areas of District Shahjahanpur, Utterpradesh.. *Journal of Communicable Diseases.* **26**(2): 103-108.

World Health Organization (1997). Intestinal Protozoan and Helminthic infections: *Report of WHO Experts Committee. Ecep. Ser.* 666.

IX

ANNEX-1

Questionnaire:

S.N.: ……. Date: ……

Name: …… Sex: ……..

Class: …… Age: …….

1. Do you know about intestinal helminthes? a. Yes b. No
2. Do you know about mode of infection of intestinal helminth parasites?
   a. Yes b. No
3. What do you do to treat intestinal helminthic parasitic infection?
   a. Consult Doctor b. Take medicine without consulting Doctors.
   c. Call Dhami & Jhankri d. Mixed
4. What type of food habit do you have?
   a. Vegetarian b. Non vegetarian
5. If non-vegetarian how frequently you take meat?
   a. Daily b. twice a week
   c. Once a week d. Once a month
6. Which meat frequently do you take?
   a. Pork b. Chicken c. Buff
   d. Mutton e. Fish f. All
7. How you prepare your meat to eat?
   a. Raw meat preparation b. Bardique (Sekuwa Masu)
   c. Well cooked d. Half cooked (boiled)

8. Do you have toilet at home? a. Yes b. No

9. Do you have any domesticated animals? a. Yes b. No

10. If yes what do you have kept?

……,…

11. Did you take anthelmintics before? a. Yes b. No

12. If yes how long ago?

a. Before a week b. Before 2 weeks c. Before a month

d. Before 3 months e. In last 6 months

13. How you clean your hand?

a. by soap b. by ash c. by soil water

14. When did you wash your hands?

a. Before meal b. After meal c. After toilet

d. After field work e. All above

15. Do you cut your nail? a. Yes b. No

16. If yes when did you cut it?

a. Once a week b. Twice in week

c. Once in two week d. Once a month

17. Do you have habit of walking bare foot? a. Yes b. No

18. From where do you get drinking water?

a. Spring b. Well

c. Piped water supply d. Tap water

19. What type of water do you use for drinking?

a. Boiled b. Not boiled

Thank you.

ANNEX-2

S. N.	Sam. no.	Name	Sex	Age	Class	*A. lumbricoides*	*T. trichiura*	Hookworm	*H. nana*	*Taenia* spp.	Types of parasite found
1.	2	Bikash Shrestha	M	6	Nurser.						
2.	5	Anjana Dyola	F	6	Nurser.	*C		*A			2
3.	6	Bijesh Dyola	M	5	Nurser.						
4.	11	Bikash Dyola	M	5	Nurser.						
5.	12	Pbitra Shrestha	F	4	Nurser.						
6.	15	Sujita Dyola	F	12	1	*C	*A		*A		3
7.	16	Rasna Dyola	F	7	1						
8.	18	Kusum Dyola	F	9	1						
9	19	Utterman Thing	M	8	1						
10.	20	Krishna Lama	M	5	1	*A	*A	*B			3
11.	21	Samita Dyola	F	6	1	*A				*A	2
12.	22	Manisha Dyola	F	6	1						
13.	23	Bimala B.C.	F	6	1	*C		*B			2
14.	25	Sagar Lama	M	6	1						
15.	26	Rupesh Kayapa	M	6	1						
16.	27	Anil Shrestha	M	8	2						
17.	28	Ramesh Kapaya	M	10	2	*A					1
18.	29	Anju Kayapa	F	10	2	*C		*A			2
19.	30	Dibya Dyola	F	8	2	*A	*B				2
20.	31	Tasmita Magar	F	9	2	*A					1
21.	32	Sunita Lama	F	11	2						
22.	33	Rina Lama	F	11	2						
23.	34	Bishwas Shrestha	M	8	2	*B	*A				2
24.	35	Bishal Lama	M	8	2		*A				1
25.	36	Kalpana Pariyar	F	12	2	*A		*B			2
26.	37	Rabin K. C.	M	8	2						
27.	38	Anita Dyola	F	11	2						
28.	40	Rupesh B. C.	M	8	2		*A	*A			2
29.	41	Anish Dyola	M	9	2						
30.	42	Rohita Dyola	F	8	2	*A					1
31.	43	Manju Magar	F	11	2						
32.	44	Saru Dyola	F	8	2	*B	*A				2
33.	45	Nisha Lama	F	8	2		*A				1
34.	46	Kamalmaya Tamang	F	11	2						
35.	47	Puspa Lama	F	11	2	*A	*B		*A		3
36.	48	Anu Shrestha	F	11	3						
37.	49	Sila Tamang	F	10	3			*A			1
38.	50	Raju Lama	M	10	3						
39.	52	Dipesh Dyola	M	9	3	*B					1
40.	53	Srijana Majhi	F	9	3						
41.	54	Lalita Shahi	F	10	3	*A	*B				2
42.	55	Aakash Lama	M	7	3						
43.	56	Rabindra Dyola	M	10	3	*A	*B				2
44.	58	Rajesh Lama	M	11	3			*B			1
45.	59	Sabin Magalathi	M	10	3						
46.	60	Prakash B. C.	M	12	3		*A				1
47.	61	Aakash Dyola	M	15	3	*C					1
48.	62	Muni Dyola	F	12	3						
49.	64	Anika Dyola	F	11	3		*A				1
50.	65	Manju Thapa	F	11	3						
51.	66	Rabina Sunar	F	11	3	***C**			*C		2
52.	68	Bebi Kumari Sokami	F	10	3	*B					1
53.	69	Madhusudhan sokami	M	8	3						
54.	70	Bikram Shrestha	M	10	3		*A				1
55.	71	Priya Dyola	F	12	4						
56.	72	Saroj Pariyar	M	12	4	*A		*B	*A		3
57.	73	Ajaya Thapa	M	13	4						
58.	74	Bishal Dyola	M	13	4						2
59.	75	Krishna Shahi	M	11	4	*C		*A			1
60.	76	Janada Lama	M	13	4	*B					1

61.	77	Anup Dyola	M	12	4	*A					1
62.	79	Nisan Dyola	M	13	5						
63.	80	Kisan Dyola	M	15	5		*AQ	*A			2
64.	81	Shanti Shrestha	F	11	5						
65.	82	Sarmila Shahi	F	13	5						
66.	83	Bishal Lama	M	12	5						
67.	84	Lalchang Tamang	M	11	5	*A	*A				2
68.	85	Narendra Dyola	M	11	5		*A	*B			2
69.	86	Sadhana Dyola	F	14	5	*B	*A			*A	3
70.	87	Sanjip Dyola	M	11	5						
71.	88	Karan Dyola	M	11	5						
72.	89	Susmita Dyola	F	11	5						
73.	90	Liphan Lama	M	12	5						
74.	91	Kanchan Dhoju	F	11	5	*B	*A	*B			3
75.	91	Binita Khaitu	F	12	5						
76.	93	Indira Khaitu	F	8	3	*C					1
77.	1	Aaryaman K.C.	M	5	Nurser.	*A					1
78.	3	Sangita Lama	F	6	Nurser.						
79.	4	Swasthani B. C.	F	8	Nurser.		*A	*B	*B		3
80.	7	Sumita Dyola	F	5	Nurser.	*A					1
81.	8	Sustika B.C.	F	5	Nurser.						
82.	9	Binod B.C.	M	5	Nurser.	*B					1
83.	10	Srijana B.C.	F	5	Nurser.						
84.	13	Sonu Dyola	F	5	Nurser.	*C	*B	*A			3
85.	14	Dipen Dyola	M	4	Nurser.						
86.	17	Sujan Majhi	M	6	1						
87.	24	Sushil K.C.	M	6	1	*B	*C				2
88.	39	Dipak Rai	M	8	2						
89.	51	Dipesh Rai	M	9	3						
90.	57	Raj Dyola	M	10	3						
91.	63	Anjana Dyola	F	10	3	*C	*A				2
92.	78	Manisha Dyola	F	9	3						
93.	109	Roshan Ranabhat	M	13	4						
94.	108	Kamal Bdr Thapa	M	12	4	*A					1
95.	94	Ratna bdr Lama	M	13	4						
96.	95	Sujina Dyola	F	5	Nurser.	*C		*B			2
97.	96	Shanti maya Shrestha	F	5	Nurser.	*B	*B	*C			3
98.	112	Renu Dyola	F	4	Nurser.	*C					1
99.	97	Bikash Dyola	M	8	2						
100.	98	Lalita B.C.	F	6	1	*B	*C				2
101.	99	Shanta B.C.	F	6	1	*A	*C				2
102.	100	Yubraj B.C.	M	8	1						
103.	107	Indira Dyola	F	9	2				*C		1
104.	112	Rakesh Dyola	M	12	4	*B	*A	*C			3
105.	110	Kamal Shrestha	M	11	4	*C					1
106.	111	Renu Dyola	F	13	4						
107.	113	Dinesh Dyola	M	11	4						
108.	115	Sujata Dyola	F	12	4	*C	*A			*B	3
109.	114	Rasmita Dyola	F	12	4	*A		*C			2
110.	106	Rajan Majhi	M	12	4						
111	101	Kusum Dyola	F	13	4						
112.	103	Man Bdr Thing	M	8	3						
113.	102	Deepak Lama	M	10	3	*A		*C			2
114.	104	Sunita Dyola	F	11	3	*C		*C			2
115.	105	Anish Dyola	F	14	4						
116.	116	Pabitra B.C.	F	13	4						
117.	117	Yadab K.C.	M	14	5			*B			1
118.	115	Puran Lama	M	15	5	*A	*A				2
119.	141	Raj Shrestha	M	12	5						
120.	142	Sunil Shrestha	M	14	6						
121.	143	Roshan Kayapa	M	12	6						
122.	144	Manju Dyola	F	13	6	*C	*B	*A		*C	4
123.	145	Dibyaswori Dyola	F	14	6	*A	*A				2
124.	146	Rasmita Dyola	F	14	6	*B					1
125.	147	Susila Lama	F	15	6						
126.	148	Tina Lama	F	14	6						

127.	149	Bishal Shrestha	M	12	6						
128.	120	Binod Lama	M	12	6		*A	*A			2
129.	121	Karina Pariyar	F	16	6	*A					1
130.	122	Rabindra K.C.	M	12	6						
131.	123	Atindra Dyola	M	13	6						
132.	124	Dinesh Rai	M	13	6	*A					1
133.	125	Rupak B.C.	M	14	6	*A					1
134.	126	Aman Dyola	M	14	6						
135.	127	Rabin Dyola	M	15	6						
136.	130	Manita Magar	F	14	6						
137.	128	Siru Dyola	F	13	6	*B	*A				2
138.	129	Nirmala Lama	F	12	6						
139.	132	Manamaya Tamang	F	14	6	*A		*B	*A		3
140.	133	Anjali Lama	F	13	6						
141.	135	Anjana Shrestha	F	12	6	*A	*C	*C			3
142.	134	Madhumaya Tamang	F	13	6						
143.	136	Amar Rai	M	12	6	*C	*A				2
144.	137	Amrit Dyola	M	12	6		*B				1
145.	138	Sabina Majhi	F	13	6						
146.	140	Bina Shahi	F	14	6						
147.	139	Jeevan Lama	M	15	6						
148.	131	Kabindra Dyola	M	16	6						
149.	171	Raju Dyola	M	15	6						
150.	170	Sanjib Lama	M	16	7						
151.	169	Rajan Magalathi	M	15	7						
152.	168	Krishna B.C.	M	16	7		*A	*B			2
153.	162	Tulasi Dyola	F	14	7	*C					1
154.	163	Padak Dyola	M	15	7						
155.	164	Manisha Dyola	F	16	7	*C					1
156.	166	Kumari Dyola	F	14	7		*A				1
157.	165	Pramila Thapa	F	15	7						
158.	167	Kiran Sunar	M	15	7	*C	*C			*B	3
159.	150	Shanti Ranabhat	F	15	7						
160.	152	Dilsara Shrestha	F	15	7						
161.	151	Prem Shrestha	M	12	7						
162.	153	Resham Bdr Shrestha	M	12	7	*A	*A		*C		3
163.	154	Fulmaya Dyola	F	13	7						
164.	155	Ssuroj Pariyar	M	12	7						
165.	156	Ravi Dyola	M	12	7						
166.	157	Amar Shahi	M	12	7						
167.	158	Sudar Lama	M	13	7	*B	*C				2
168.	159	Mohan Thapa	M	13	7						
169.	161	Rupak Dyola	M	14	7						
170.	160	Uttam Dyola	M	13	7						
171.	186	Kishan Dyola	M	12	7	*A	*A				2
172.	181	Tikaram Dyola	M	14	8						
173.	180	Khimkala Shrestha	F	14	8						
174.	185	Laxmi Shahi	F	15	8						
175.	184	Jayaram Lama	M	16	8		*A	*A			2
176.	181	Indra Bdr Tamang	M	16	8						
177.	182	Birendra Dyola	M	15	8						
178.	183	Kamana Dyola	F	14	8						
179.	172	Deepak Dyola	M	13	8		*A	*B			2
180.	173	Suman Dyola	M	13	8		*C	*A			2
181.	177	Rasmita Dyola	F	13	8	*A	*B	*A			3
182.	176	Kiran Lama	M	14	8						
183.	178	Sunita Dyola	F	16	8						
184.	175	Kumari Suwal	F	15	8						
185.	179	Pramila Suwal	F	16	8						
186.	174	Sunmaya Lama	F	14	8						
187.		**Total**				**65**	**46**	**32**	**9**	**5**	**87**

Note: *A=1-2eggs, *B=3-5eggs, *C=more than 5 eggs.

ANNEX-3

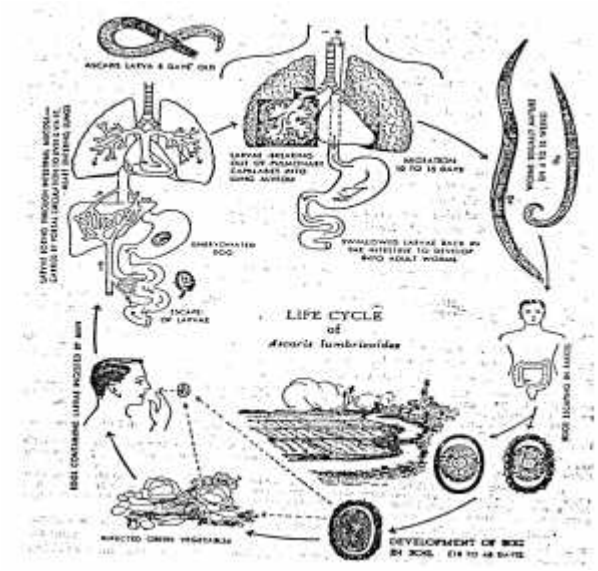


Figure 2: Life cycle of *A. lumbricoides*

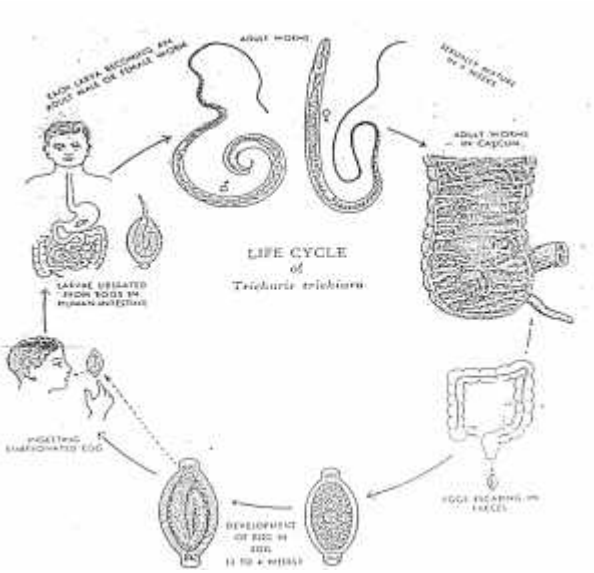


Figure 3: Life cycle of *T. trichiura*

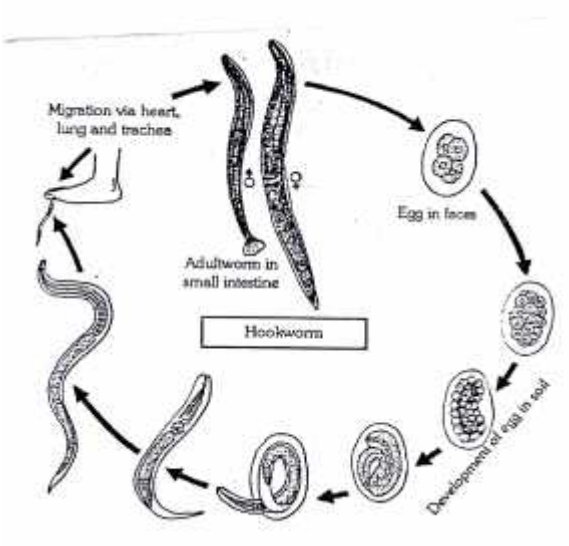


Figure 3: Life cycle of Hookworm

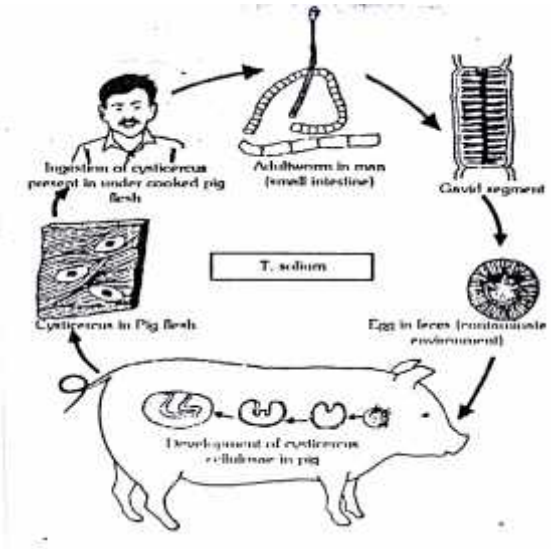


Figure 4: Life cycle of *T. solium*

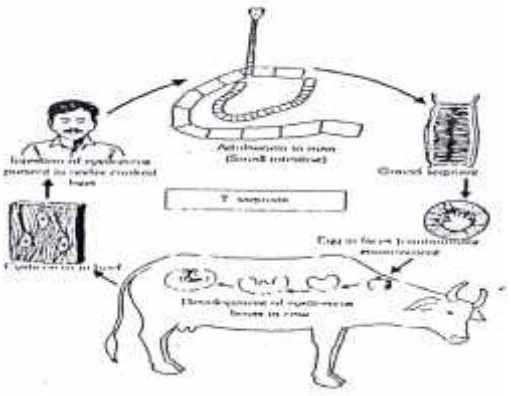


Figure 5: Life cycle of *T. saginata*