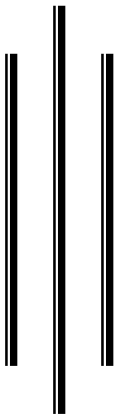
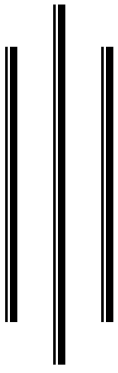
EPIDEMIOLOGY OF INTESTINAL PARASITES AMONG CHEPANG ADULTS AT TAKLUNG VDC OF GORKHA



A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE MASTER'S DEGREE IN ZOOLOGY WITH SPECIAL PAPER PARASITOLOGY

SUBMITTED BY

HARI NARAYAN MAJHI THARU



SUBMITTED TO

CENTRAL DEPARTMENT OF ZOOLOGY
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CENTRAL DEPARTMENT OF ZOOLOGY

KIRTIPUR, KATHMANDU

NEPAL

RECOMMENDATION

This is certified that **Mr. Hari Narayan Majhi Tharu** has completed his dissertation work entitled **Epidemiology of Intestinal Parasites Among Chepang Adults at Taklung VDC of Gorkha** for the partial fulfillment of the M.Sc. Degree in Zoology (parasitology) under my supervision. To the best of my knowledge, this is an original research study and has not been submitted for any other degree.

_____

Supervisor
Dr. Ranjana Gupta
Central Department of Zoology
Tribhuvan University, Kirtipur
Kathmandu, Nepal

Date:

TRIBHUVAN UNIVERSITY

INSTITUTE OF SCIENCE AND TECHNOLOGY

CENTRAL DEPARTMENT OF ZOOLOGY

KIRTIPUR, KATHMANDU

NEPAL

RECOMMENDATION

On the recommendation of supervisor **Associate Professor Dr. Ranjana Gupta** this dissertation of **Mr. Hari Narayan Majhi Tharu** is approved for examination and submitted to the Tribhuvan University in partial fulfillment of the requirements for M.Sc. Degree in Zoology with Parasitology as a special paper.

_____

Professor Dr. Tej Kumar Shrestha
Head of the Department,
Central Department of Zoology
Trubhuvan University, Kirtipur
Kathmandu, Nepal

Date :

TRIBHUVAN UNIVERSITY

INSTITUTE OF SCIENCE AND TECHNOLOGY

CENTRAL DEPARTMENT OF ZOOLOGY

KIRTIPUR, KATHMANDU

NEPAL

APPROVAL

We, the members of the expert committee, evaluated the dissertation work entitled **Epidemiology of Intestinal Parasites Among Chepang Adults at Taklung VDC of Gorkha** and approved that **Mr. Hari Narayan Majhi Tharu** is qualified for awarding M.Sc. in Zoology with Parasitology as a special paper.

Expert Committee

_____

Supervisor
Dr. Ranjana Gupta
Central Department of Zoology
Tribhuvan University, Kirtipur
Kathmandu, Nepal

_____

Professor Dr. Tej Kumar Shrestha
Head of the Department,
Central Department of Zoology
Trubhuvan University, Kirtipur
Kathmandu, Nepal

_____

External Examiner

Date:

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Hari Narayan Majhi Tharu
Exam Roll No: 1354
Regd No: 5-3-28-4-2002
Batch No: 059/060

ABSTRACT

In Nepal, Tribal (Chepang) population constitutes poverty community and they are illiterate, ignorant and can't afford education. Their houses have poor hygienic condition, lack of toilet and no safe drinking water facility. The present study was conducted with respect to different locality, feeding and drinking habit and personal and environmental sanitation in Chepang community of Taklung VDC at Gorkha district. A household survey was carried out to determined knowledge, altitude and practices regarding intestinal parasites by means of structural questionnaire. A total of 410 stool samples of different age groups and sexes were collected and examined by fecal smear preparation method in two phases. One before treatment and other after treatment. During first phase, stools of 225 persons were collected out of which 91.11% were infected by intestinal parasites. Among positive samples prevalence rate in male was 88.78% and in females 93.22%. There was no significant difference in prevalece in two sexes (χ^2=1.35, P>0.05 at 6 d.f.). The prevalence of *A. lumbricoides* was found to be 76.44% followed by hookworm (69.33%), *T. trichiura* (61.77%). *E. vermicularis* (6.22%) and *S. strecoralis* (2.66%) in helminthes while *E. histolytica* (24%), *G. lamblia* (11.11%), *Cryptosporidium* sp. (4%), *C. cayetanensis* (3.11%) in protozoan parasites. During second phases of study which was done six months after providing medicine to the infected persons out of 185 stool Samples 41.62% were positive for intestinal parasites (38.63% males and females 44.32%). The highest number of cases were found to be infected with *T. trichiura* (16.36%) where as least no. of cases (12.36%) were recorded to be suffered from hookworm. Similarly among protozoans, *E. histolyutica* recorded the highest infection while the least infection was that of *C. cayetanensis*.

The findings of survey study revealed that among the 225 respondents, 72% respondents use open field, 20% use pig shelter and 8% use pit toilet. Among them the highest prevalence (71.11%) of intestinal parasite was recorded from the people using open field for defecation. Maximum positive cases were reported from those who directly used water from Kholsa and Kuwa i.e. 94.44% and 94.44% respectively and those who used only water to clean hands (95.95%) before meal. The highest prevalence (95.55%) was recorded from those who randomly cut their nails. The survey recorded that 72% of the respondents follow traditional method of treatment, 20% take medicine without consulting medical persons and 8% consult doctors.

CONTENTS

I
INTRODUCTION

Health is an integral part of development. Healthy adults make the nation strong. But when they are unhealthy, a country has to face invalid manpower.

In ancient times, health and illness were interpreted in a cosmological and anthropological perspective. Health is a common theme in most cultures. In fact, all communities have their concepts of health, as part of their culture. The state of positive health implies the notion of "perfect functioning" of the body and mind. It conceptualizes health biologically, as a state in which every cell and every organ is functioning at optimum capacity and in perfect harmony with the rest of the body, psychologically, as a state in which the individual feels a sense of perfect well-being and of mastery over his environment, and socially, as a state in which the individual's capacities for participation in the social system are optimal (Park, 2002).

The health and economic status of tropical and subtropical countries are influenced by the prevalence of many essentially chronic diseases, particularly those due to parasites (Belding, 1956). Intestinal parasitic infections are major cause of childhood disease in rural regions (Limoncu *et al.,* 2005). Intestinal parasitosis remains to be of great health and socio-economic concern in Nepal (Rai *et al.*, 1995). Prevalence of intestinal parasitic infection in some areas in developing countries reportedly approaches one hundred percent with high level of polyparasitism (Rai, 2000).

The World Health Organization (WHO) estimated that more than one billion people are chronically infected with intestinal helminths (WHO, 1998).

In Nepal, major causes of death among adults, after acute respiratory tract infection, is diarrhoea, vomiting and malnutrition. Nepal like in most of the third

world countries is characterized by poverty, ignorance and diseases. Literacy, poverty, malnutrition, high infant mortality rate, inadequate health facilities, poor water supply and unsanitary conditions have led the country to a very poor socio-economic condition (Chhetri, 1993). The health status is also dominated and badly affected by parasitic diseases.

Intestinal parasitosis is highly prevalent in rural communities of Nepal (Sherchand *et al.,* 1997) and constitutes an important cause of morbidity and mortality among Nepalese. In certain rural areas, prevalence has been found to be over 90% (Rai *et al.*, 2000).

Its high prevalence in the country causes decreased work capacity and productivity of children and adults, increased maternal and foetal moribidity and mortality, premature delivery, low birth weight, slower cognitive development, poor school performance, increased absenteeism in school children, deeresed ability to grow or procure food and prone to many infection of the diseases by the citizen. Hence, the country suffers from poverty, malnutrition and infection (Chhetri, 1997).

Thus the public health importance of intestinal parasitoses continues because of its high prevalence, virtually global distribution and affects on both nutritional and immune status of individuals (WHO, 1987). Many intestinal parasites are also known to cause Vitamin A deficiency leading to the night blindness and Keratomalacia (WHO, 1981).

Williams–Blangero *et al.,* 1998 showed that intestinal worm infections including Roundworm *(Ascaris lumbricoides),* Hookworm *(Ancylostoma duodenale)* and Whipworm *(Trichuris trichiura*) affect a quarter of the world's total population and are major international health concern.

Millions of elderly people across the globe are not getting the oral health care they need because governments are not aware enough of the problem. By 2025, there will be about 1200 million people aged 65 years according to UN estimates. Failure to address oral health need today could develop into a costly problem tommorrow (WHO, 2005). Health determinants (socioeconomic, environmental, behavioural and genetic factors) and the contextual and legal environments within which the health system operates (WHO, 2005).

In Nepal, Tribal (Chepang) population constitutes an important fraction. The tribal population of Nepal is far away from the main stream population. Chepang are poverty stricken community and they are illiterate, ignorant and can't afford education. Their houses have poor hygienic condition and lack toilet and safe drinking water facility.

Death due to intestinal parasites in different groups of people is not confirmed in Nepal. There might be possibility of huge number illness, infection and loss of people and properties in Nepalese tribal people like Chepang. The NGOs/INGOs and other health authorities are not viewing towards the intestinal parasitic problems in these people. The information about the status of intestinal parasites in Chepang community is very limited and most of the people are illiterate and ignorant. The present study was conducted to get the prevalence rate of the gastro-intestinal parasites in Chepang people and to make them aware about importance of health, hygiene and sanitation.

This study was conducted to find out the relation of parasitic infection with respect to different locality, feeding and drinking habit and personal and enviromental sanitation in the Chepang community. The study also throws some light on this less known, minor, scheduled, nomadic tribe community. The present study includes stool

examination, free treatment, which is quite unique and different than other studies as well as awareness programme to bring awareness among Chepang community.

Thus this study has been focused on adult Chepang community, their behaviours and awareness regarding the intestinal parasitic infection.

II
OBJECTIVES

General Objective

The general objective of the study was to determine the **Epidemiology of intestinal parasites among Chepang adults at Taklung VDC of Gorkha.**

Specific Objectives

- To determine the prevalence of intestinal parasites among Chepang adults above 16 years and below 84 years of age.
- To find out the relationship between intestinal parasitic infection with socio-economic, cultural and behaviroural aspect of Chepang people.
- To find out the effectiveness of Albendazole and Metronidazole against worm and protozoan infection respectively.
- To assess the knowledge, attitude and practices in study population in relation to transmission of intestinal parasites.
- To bring awareness about different aspects of intestinal parasites among the Chepang people.

III

LITERATURE REVIEW

Some Recent Literature Review on Intestinal Parasites in the Context of World

Chakma *et al.* (2000) conducted a study among school going children (6-14 years) of Baiga, Abuithmedia and Bharia tribes of Madhya Pradesh to assess the prevalence of anemia and intestinal parasitic infection among themselves. A total of 776 school going children were included in the study. The results revealed that 30.3% of the children has severe anemia (Hb<7g/d1) and 50% children had intestinal parasites. The most common parasites were Hookworm (16.3%) and *Ascaris lubricoides* (18.5%).

Werneck-silva *et al.* (2001) assessed intestinal permeability in patients with infection caused by *Strongyloides stercoralis*. Twenty six patients (16 women) and 10 men), mean age 45.9, with a diagnosis of Strongyloidiasis were evaluated. For comparison, 25 healthy volunteers (18 women and 7 men), mean age 44.9, without digestive disorders or intestinal parasites served as normal controls.

Luca *et al.* (2001) conducted a research among 48 patients with acute diarrhoea with mixed etiology admitted in the hospital during 1995-1998. 12 cases (24%) were mixed bacterial infections with the following microorganisms association: *Salmonella* + *Shigella* (10 cazuri); *Salmonella* + *Yersinia enterocolitica* (1 cases); *Salmonella* + *Rotavirus* (1 cases). 16 cases (44%) had mixed digestive infections with parasites, in double or triple associations: *Giardia intestinalis* + *Ascaris lumbricoides* (10 cases); *Giardia intestinalis* + *Ascaris lumbricoides* + *Entamoeba coli* (1 cases) ; *Giardia intestinalis* + *Enterobius vermicularis* (3 cases); *Ascaris lumbricoides* + *Trichuris trichiura* (2 cases).

Oyelese *et al*. (2002) studied to determine the prevalence of intestinal helminthic and protozon infections. During a three- years period in two succeeding decades (1998-90 and 1996-98). During the two periods, 4223 (65.1%) of 6504 and 2279 (63.1%) of 3641 clinical specimens were respectively, positive for intestine parasites.

Siddiqui *et al.* (2002) studied on the prevalence of human intestinal pathogenic parasites. Out of 263 residents, 185 tested for intestinal parasites and 88 (47.5%) had pathogenic parasites. The distributions of parasites were *Giardia lamblia* 50% and *Entamoeba histolytica* 48.86%.

Amin (2002) studied on seasonal prevalence of intestinal parasites in the United States during 2000. One-third of 5,792 fecal specimeus from 2,896 patients in 48 states and the district of Columbia tested positive for intestinal parasites during the year 2000. Multiple infections with 2-4 parasitic species constituted 10% of 916 infected cases. *Balstocystis hominis* infected 662 patients (23% or 72% of the 916 cases). Its prevalence appears to be increasing in recent years. Eighteen other species of intestinal parasites were identified, *Cryptosporidium parvum* and *Entamoeba histolytica/ Entamoeba dispar* ranked second and third in prevalence, respectively.

Nuchprayoons *et al.* (2002) studied a total of 6231 Thais. Evidence of parasitic infections was found in 557 (8.94%) cases. The parasites were most prevalent in males (57.3%), and in the age group > 15-30 years old people (11.1%). The parasite prevalence rates in the West, East, South and Central regions were 10.6%, 8.9%, 7.7%, and 4.92% respectively. The parasites most commonly identified were *Strongyloides stercoralis* (33.39%), while Giardiasis was the most common protozoan infection (14.36%).

Sirivichayakul *et al.* (2003) conducted a study on the prevalence of intestinal parasitic infection in institutionalized and non-institutionalized Thai people with mental handicaps. It was found that the prevalence of infection was much higher in institutionalized (57.6%) than in non-institutionalized people (7.5%). The common parasites found in institutionalized people were *Trichuris trichiura* (29.7%) *Entamoeba coli* (23.1%) *Giardia intestinalis* (8.0%) *Hymenolepis nana* (7.8%), and *Entamoeba histolytica/dispar* (7.1%) .

Romanenko (2003) performed a study of 301 stool samples subjected to the formalin-ether concentration method for the detection of helminth ova and protozoan cysts. The overall positive rate was 64.5%, and that of male and female were 56.6% and 72.5%, repectively. The highest infected helminth was *Ascris lumbricoides* (51.2%), followed by *Trichuris trichiura* (27.6%), Hookworm (8.0%) and *Enterobius vermicularis* (0.3%). The protozoa infection status revealed that *Entamoeba coli* was the most frequent (15.0%). *Iodoamoeba buetschlii and Entamoeba histolytica* were found but few. The multiple infection more than two parasites was 29.6% and double infection with *Ascaris lumbricoides* and *Trichuris trichiura* was most common.

Alves *et al*. (2003) studied on intestinal parasite infections in a semiarid area of Northeast Brazil. A total of 265 stool specimens were collected and examined by spontaneous sedimentation. Approximately 57% of specimens were infected with at least one parasite species. *Entamoeba coli* (35.8%). *Endolimax nana* (13.6%), *Hymenolepis nana* (9.4%) and Hookworm (9.4%) were the most frequently observed parasites.

Fontes *et al.* (2003) conducted study of 1020 students. Out of these 983 (92%) showed positive results for at least one species of parasite. Six months after treatment,

a sample of 383 students (37.5%) was reevaluated and 347 (90.6%) presented positive results.

Hamze *et al.* (2004) determined the prevalence of intestinal parasites in the North of Lebanon between 1997 and 2001. They analyzed the parasitology records of 17126 patients and evidence of parasitic infections was found in 5713 (33.35%) cases. There was no significant difference in prevalence for males or females for any of the parasites. The most prevalent parasites were *Entamoeba coli* (38.45%). *Ascaris lumbricoides* (37.14%), *Giardia intestinalis* (15.39%), *Entamoeba histolytica* (4.57%) and *Taenia sp.* (3.3%).

Minvielle *et al.* (2004) studied to relate personal data, socio- cultural and environmental characteristics, and the presence of symptoms/signs with the frequecies of *Giardia* sp. and *Blastocystis hominis* among a rural population in Buenos Aires provinee, Argentina. Of the surveyed population (350), 3.7% were infected with only *Giardia* sp. or 22.9% with *Blastocystis hominis*, and 2.3% were infected with both protozoa. The frequency of infection according to sex; 6.1% of males were infected and 1.6% of females by *Giardia* sp., 26.7% and 19.5% by *Blastocystis hominis*, and 2.4% & 2.2% by both parasites, respectively.

Adedayo *et al.* (2004) performed a retrospective study by of stool samples at the parasitology unit of the medical laboratory services of Princess Margaret Hospital, Dominica, in January-December 1999. Parasites were found in 393 out of 3,752 stool samples (10.47%). The main parasites were *Entamoeba coli*, 14% (51/3,752), Hookworm, 1.5% (56/3,752), *Giardia lamblia* 1.4% (51/3,752), *Strongyloides stercoralis* 1.0% (37/3,752), *Ascaris lumbricoides* 0.8% (28/3,752), and *Trichuris trichiura* 0.9%(3,752).

Wongjindanov *et al.* (2005) performed a survey for the current rate of *Giardia lamblia* infection in three different districts in two provinces of Thailand, Surin and Samut Sakhon, in March 2002, October 2003, and March 2004. Out of 3,358 healthy individuals from rural Surin province, 75 cases (2.2%) were found positive of *G. lamblia*. 30 of which were below 10 years of age. By comparision, 656 individuals from sub-urban Samut Sakhon prvince volunteered and 43 (6.5%) were positive of *G. lamblia.* other intestinal parasites, both helminth and protozoa, were also identified from these two groups, Hookworm, *Enterobius vermicularis, strongyloides stercoralis, Trichuris trichiura, Taenia* sp., *Entamoeba histolytica, Entamoeba coli, Endolimax nana, and Blastocystis hominis.*

. Garg *et al*. (2005) reported the prevalence of helminths and protozoa as well as demographic risk factors associated with these infections among 533 refugees seen at the Santa Clary country, California, refugee clinic between October 2001 and January 2004. Stool parasites were identified from 14% of refugees, including 9% found to have one or more protozoa and 6% found to have at least one helminth.Most common protozoan infections were *Giardia lamblia* (6%) and *Dientamoeba fragilis* (3%) and Hookworm (2%). Protozoa were more frequent in refugees < 18 years of age (OR: 2.2 [1.2-4.2]) whereas helminths were more common in refugees from South Central Asia (OR: 8.0 [2.3-27-7]) and Africa (OR: 5.9 [1.6-21.6]) when compared with refugees from Eastern Europe and the middle East.

Spinelli *et al.* (2006) evaluated the prevalence of intestinal parasites in 277 healthy subjects in the city of Mamuras Albania Sou. The overall prevalence of intestinal parasites was 183/277 (66.06%). In particular, pathogenic protozoan or helminths were found in 67 subjects (24.18%), including *Trichuris trichiura* in 34

(12.27%), *Giardia intestinalis* in 31 (11.19%), *Hymenolepis nana* in 5(1.8%) and *Ascaris lumbricoides in* 3 (1.08%).

Literature Review on the Intestinal Parasites in the Context of Nepal

Sharma (1965) reported that the Roundworm infection is very common in some parts of our country. He studied 976 stool samples and found 40% Roundworm infection in Bhaktapur area.

Sharma and Tuladhar (1971) carried out a study on intestinal parasites amongst auxiliary health worker's students in Kathmandu. They examined 80 stool specimens of which 70 were suffering from different types of infection. The commonest infection found was of Roundworm (*Ascaris lumbricoides*), Hookworm, *Entamoeba histolytica, Giardia lamblia, Trichuris trichiura* and *Enterobius vermicularis* .

Dongol (1972) studied a case of Roundworn infection in gall bladder.

Acharya (1979) reported that the intestinal infection like Giardiasis, Amoebiasis, Ascariaris, Ancylostomiasis, Fascioliasis and Taeniasis were common in Nepal.

Khetan (1980) examined 2073 stool samples in the pathology laboratory of Narayani Zonal Hospital between 1977 to 1980. Out of total samples 1522 stool samples had worm infection, of which 458 samples had *Ascaris*, 591 had Hookworm, 203 had *Trichuris*, 175 had *Giardia lamblia* and 83 had *Entamoeba histolytica* and 11 had other infection.

Nepal and Plafy (1980) reported about a study of prevalence of intestinal parasites in the Mahanchal Panchyat. Out of 225 stool samples, 95.3% were positive. The most common parasite was Roundworm (63.5%) followed by Hookworm (34.2%), *Entamoeba histolytica* (28.8%) and *Giardia lamblia* (28.4%).

IFPPCP (1981), examined 5,532 stool samples in Panchkhal area in which 4148 70% were positive. The Hookworm infection was highest followed by *Trichuris trichiura* and *Ascaris*. In Bhaktapur, 586 stools were examined in which 525 (89%) were found to be positive.

Guracharya (1981) observed that the infection by soil transmitted helminth in Bhaktapur and Phanchkhal area was higher than any other types of parasites.

Bol and Roder (1981) reported the soil transmitted nematodes in Lalitpur district. They observed *Ascaris lumbricoides,* Hookworm, *Trichuris trichiura* and *Strongyloides stercoralis* the soil transmitted nematodes.

IFPPCP (1982) examined 4696 stool samples in Panchkhal area, of which 3475 (74%) stools were positive. The infection rates were *Ascaris* 37%, Hookworm 47% and *Trichuris trichiura* 7.3%.

Estevez *et al.* (1983) collected and examined 40 stool samples in a remote area of western Nepal and found 36 (90%) to be positive. The infection rate of Hookworm was 83.3% followed by Roundworm (52.8%) and Whipworm (5.5%).

. IFPPCP (1984) examined 416 stool samples of school children of Panchkhal. Out of which 112 (27%) cases were positive. The common intestinal helminths were *Ascaris lumbricoides* 22((19%), Hookworm 53 (47%) and *Trichuris trichiura* 53(47%).

Suguri *et al*. (1985) surveyed to find the helminth infections, in 737 nepalese people living in the Gandaki, Dhaulagiri, Lumbini and Sagarmatha Zone of Nepal and in 26 Japanese living in Kathmandu from February to April in 1975, employing the so called thick smear method. The overall helminth infection rate was found 86.8% including Roundworm (50.3%) Hookworm (44.1%), Whipworms (47.6%), Pinworms (1.2%) and *Taenia* sp. (0.1%). The positive rate was the lowest in Bhairahawa

(53.8%) and the highest in Darbang (98.8%). In Namche Bazar, Roundworm infection rate was the highest (70.3%) and that of Hookworms was the lowest (0.2%).

Rai and Gurung (1986) collected 200 stool samples and examined by direct smear technique over a period of 16 days. The incidence of Roundworm was the highest (2. 35%) followed by Hookworm (i.e. 14%). The overall infection rate was 69% and the result showed that the infection as more common in girls than the boys.

Gupta and Gupta (1988) collected 285 stool smmples in Kirtipur. Among them 192 (67.36%) was found to be positive for intestinal parasite. Out of 192 postive stool samples, 49 (25.52%) cases were infected with protozoan pasasite, 9.12% by *Giardia lamblia* and 9.47% by *Entamoeba histolytica.* Out of 192 positive stool samples, 155 (80.72%) were positive for helminth parasite, *Ascaris lumbricoides* (40%), *Trichuris trichiura* (25.26%), *Ancylostoma duodenale* (4.56%), *Hymenolepis nan*a (2.46%) and *Taenia solium* (0.55%).

Houston and Schwarz (1990) studied about helminth infections among peace corps volunteers station in various rural regions of Nepal indicated 14% were positive for Hookworm, 3% for Whipworm and 82% for Roundworm infections.

Rai *et al.* (1991) showed the prevalence of various intestinal parasites in Kathmandu valley, Nepal. The overall prevalence of parasites was 30.9%. Intestinal parasites were more common among children below 15 years than in adult more than 15 years. *Ascaris lumbricoides* was the most common parasite followed by Hookworm, *Taenia* sp., *Enterobius vermicularis* and others. Among protozoan parasites, *Giardia lamblia* was the most common followed by *Entamoeba histolytica*.

Williams- Blangero *et al.* (1993) studied helminthic infection in Jiri, concluded that Roundworm, Whipowrm *and* Hookworm were endemic in Nepal and represent the major health problem for the population.

Rai *et al.* (1994) studied the status of soil transmitted helminthic infection in Nepal during 1985-1992. Averages of 6537 faecal samples were examined each year. The annual rate of the positivity for soil transmitted helminthiases ranged from 18-36.6%, *Ascaris lumbricoides* had the most common prevalence than the Hookworms and others

Sherchand *et al.* (1996) carried out study on intestinal parasites from Kathmandu area of Nepal and reported 28.1% parasitic load among subjectively healthy children (HC) and 38.8% parasitic load among healthy adults, whereas 62.7% parasitic load was recorded among children with abdominal discomfort. *Hymenolepis nana* was recorded as most common Tapeworms associated with patient having abdominal discomfort. Among protozoan parasites prevalence of *Giardia* was highest among the sick children. In healthy children the prevalence of mixed parasite infection was 2.1% and 7% in healthy adullts, while 13.3% prevalence was found in sick children and 11.5% in sick adults.

Rai *et al.* (1999) had suggested *Ascaris* as leading human parasite and also reported as major cause of public health problem. The study reported that over 75% people were infected by *Ascaris lumbricoides* in rural areas, where as hospital based study in Kathamndu over a period of one decade also had shown a static annual prevalence with mean of approximately 35%.

Rai *et al.* (2000) investigated the contamination of soil with helminth eggs in Kathamndu Valley and outside Valley in Nepal. Out of 156 total samples, 122 were taken from Kathmandu Valley and 34 samples from outside 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 rate was higher (48.3%) during wet season compared with that observed in dry season (33.3%) but without significant difference ($P<0.05$. Altogether 5 species of

nematodes were recorded *Ascaris lumbricoides*, *Toxocara* sp., *Trichuris trichiura*, *capillaria* sp. & *Trichostrongylus* and 2 species of cestoda *Hymenolepis nana & Hymenolepis diminuta. Ascaris lumbricoides* were prominent in Kathmandu Valley while *Trichostrongylus* was the commenst one outside of Valley.

Yong *et al*. (2001) investigated the status of intestinal infection in two rural Villages in Chitwan district, Nepal in 1999. Stool examination was performed with a total 300 specimens from school children by formalin-ether sedimentation technique. The prevalence rate of intestinal parasite infections in the surveyed areas was 44.0% .The prevalence rate in Jerona was slightly higher than that of Chitrasar. The prevalence rate of intestinal parasite infections in female was slightly higher than male without statisfically significant difference. The rare of *Entamoeba coli, Gidrdia* and other parasite (21.0%) *Giardia lamblia* (13.7%) and other (5.3%) respectively was the most prevalent intestinal helminth (13%) followed by *Trichuris trichiura* (3%) and others (5%), 43 specimens (14.3%) showed mixed infections.

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

Goto *et al.* (2002) studied the poor intestinal permeability in mildly stunted Nepali children: associations with weaning practices and *Giardia lamblia* infection. In this cross-sectional study, 210 poor urban Nepali children, less then 1 month to 60 months old, were recruited and measured for high or length and weight, 167 were examined for intestinal permeability and 173 for parasitic infection.

Rai *et al.* (2002) studied intestinal parasites among school children in a rural hilly area of Dhading district, Nepal. A total of 423 school children were included and 254 (60%) of them were found to be positive for intestinal parasite. *Ascaris lumbricoides* was the most common (69.6%) parasite detected followed by Hookworm (19.2%), Whipworm (5.9%). *Giardia lamblia* was only protozoan parasite

detected in this study (5.2%) where as Dalit had significantly higher prevalence (74.1%).

Uga *et al.* (2004) studied on intestinal parasites were investigated in 396 diarrhoeal stool samples collected from individuals aged 1 to 68 years (males: 239 and females: 157) in Nepal. Samples were collected at different medical centres located in Kathmandu and from two public schools in a Village setting in Kathmandu Valley and outside, during October 1999 to January 2001. Of a total of 396 fecal samples investigated, 193 (49%) were positive for some kind of parasite. Altogether, 15 species of parasites were detected. *Giardia intestinalis* topped the list of protozoa, where as *Trichuris trichiura* was the most frequently detected among helminth parasites.

Sharma *et al.* (2005) studied on the prevalence of intestinal parasite infection in school children in the northeastern part of Kathmandu valley, Nepal. A total of 533 school children (269 girls and 264 boys, aged 4 to 19 years) were included in this study. The overall prevalence of parasitosis was 66.6% (395/533) with no significant difference between boys and girls (P> 0.05). Tibeto-Burma children had a non significant higher prevalence, compared with Indo-Aryan and Dalit children (P>0.05). Half (53.8%, 1991/355) of the children had multiple parasitic infections. Altogether, nine types of parasites were recovered. The prevalence rate of helminths was higher (76.9%) than protozoan (23.1%). *Trichuris trichiura* was the most common helminth detected, followed by Hookworm, *Ascaris lumbricoides* and others. *Entamoeba coli* was the most common protozoan parasite, followed by *Entamoeba histolytica*, *Giardia lamblia* and others.

IV

MATERIALS AND METHODS

- **Study Site**

The study was carried out in the adult Chepang of Taklung VDC at Gorkha district. Gorkha district is located between 488 to 7162 meter altitude and $27^0$15' to $28^0$45' latitude North and $84^0$71' to 84^0 98' longitude east. It's boarder are Chitwan district in the South, Lamjung and Tanahun in South West, Dhading in East, and Manang in the North. Gorkha district is surrounded by Budigandaki in East, West and South while by Marsyangdi river (CBS, 2001).

Gorkha district is divided into sixty eight VDCs and one municipality. Among sixty eight VDCs, Chepang communities are present in only four VDCs. This district is one of the Hilly and some what rectangular extending from North to South with an area of 3,610 square kilometers. The average temperature of the district is 25^0C (Red Cross Profile, 2061).

In Nepal, more than 75 ethnic groups are present, speaking over 35 languages (Bista, 1985). In Nepal the total population of Chepang is 52,237. In Gorkha district, the population of Chepang is only 2742 in which males are 1341 (48.91%) and females are 1401 (51.09%).

Taklung VDC has 14 ethnic groups. Chepangs are one of them. There are people of seven different religions in this VDC. The famous hill lake Danda is at about 2200 meter height. Danda is located at about 1800 meter height while Dhodeni is at about 488 meter height. This VDC is attached to the Kuringhat in the Southern side of Chitwan district and about 10 Km. from Mugling (CBS, 2001).

Out of 68 Village Development Committee (VDC) in Gorkha district, Taklung VDC is one which was selected for the research site. The selected area was ward

no. 1 and 3 in the Taklung VDC. Taklung VDC is attached to famous Manakamana. The present research was carried out in adults of Chepang community of Taklung VDC. The total population of Taklung VDC is 5413 in which males are 2545 (47.02%) and females are 2868 (52.98%), sheltering in 964 houses. Among total population 360 are Chepang community sheltering in 63 houses (CBS, 2001). But the present study conducted revealed approximately 410 population of Chepang in this year 2004.

- **Study Population of Chepang Community**

In past time, Chepang community used to migrate from jungle to jungle and had shelter in caves. They still utilize tubers, insect, roots, fruits wild shoots as good source of food. Hence, Chepang are previously caucasoid people of lean frame. They were nomadic tribes but nowadays they have settled community near jungle.

Settlements

Chepang inhabits near the jungle and their houses are small and low in height. They are visitors from place to place and still utilize cave for hunting and storage purposes. Houses are at 5 to 10 m distance in a single place. They have bad sanitary condition. They live with clustered dwelling, poultry, muddle dwelling with cracks and pig shelter. Open air defecation practice serves as a means of transmission of zoonotic diseases. Every household keeps pigs, hen, goats for personal use and also to sacrifice for God and Goddess in Baishak Purnima and other cultural activities. So, these animals are sources of transmission of parasites.

Food and water

Chepang used to feed on grains such as Kodo, corn etc. as food. They are omnivorous in habit with meat of different animals such as buffalo, pig, chicken, fish,

goat, ox, cow etc. in their food. They lack proper knowledge of transmission of diseases. They eat inadequate cooked meat with drinks and Raksi (locally prepared alcohol). They also take tarul, sakharkhanda, vacure, gittha and also wild fruits, such as daicamblo, katuse, chiuri, wild mango, valayo etc. They also feed on various types of insects, and larvae of wasp, aringle, bee, bachhim etc. as well as aquatic animals such as crabs, prawn, fish, molluscs etc.

The major source of water is Kholsa for drinking, washing and bathing etc. Some Chepang community utilize tap and well water. Kholsa is a kind of small but very deep land, usually in the hilly region, where people get many small sources of water. It is very wet and humid, usually made by a small stream flowing down.

- **Equipments and Materials**

I. Sticks	VI. Hot Air Oven	XI. Gloves
II. Sampling Vails	VII. Forceps	XII. Tray
III. Slides	VIII. Marker	XIII. Dustbin
IV. Cover Slips	IX. Stiger (Tape)	XIV. Cotton
V. Electric Microscope	X. Refrigerator	

- **Chemicals**

I. Normal Saline Solution

II. 2.5% $K_2Cr_2O_7$ Solution

III. Lugol's iodine Solution (1%wt by Volume)

IV. Soap

- **Methods**

The entire study was divided into three parts:

I. Questinnaire survey for socio-economic and health condition

II. Stool sample collection, examination and identification of intestinal parasites

III. Awareness programme about intestinal parasites and medicine distribution programme (25 to 30 September, 2004)

Questionnaire

A questionnaire was prepared and translated into nepali language so that the respondent could understand the questions very clearly. The questionnaire contained the respondents question regarding home, age, sex, food habits, socio-economic conditions.

Sample size

A total of 410 stool samples were collected during the study period and were examined. Out of 410 samples, 225 stool samples were collected and examined before the treatment. Another 185 stool samples were also collected from the positive and a few new persons, six months after the antiparasite medicine administration.

V

RESULTS

A total of 410 stool samples from Chepang Community people of age 16-84 years of both sexes were collected and preserved in 2.5% pottassium dichromate solution. Stool samples collection and examination were done in two phases. One before treatment and another after treatment. During first phase, stool samples of 225 persons were collected and examined. Among them, 174 adults (80 males and 94 females) (77.34%) were from ward no.1 whereas 51 people (25 males and 26 females) (22.66%) belonged to ward no. 3 of Taklung VDC, Gorkha, which constitutes 4.15% of total population of Chepang (CBS,2001). Collection and examination of 225 stool samples were completed from June 2004 to September 2004.Treatment was provided to the infected persons from 25th to 30th September.

Second phase of stool samples collection was done six months later. This included stool samples of 185 (3.41% of total population of Chepang) from previous infected persons who were given treatment from 2 to 12 April, 2005. Hence, altogether 410 samples (7.57% of total population of Chepang) were examined.

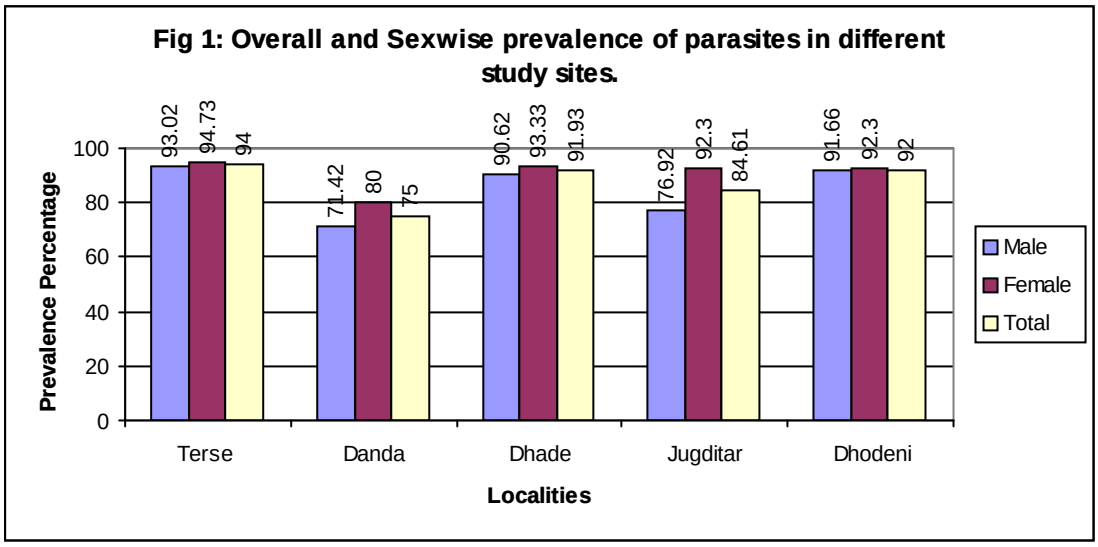
I. Results of Stool Examination of First Phase (before treatment)

- **General Prevalence:** Out of 225 stool samples of adults examined before treatment, 205 (91.11%) were found to be positive for intestinal parasites (Table 1).
- **Sexwise Prevalence:** Among the positive cases, prevalence of intestinal parasites was found to be little higher in females 110 (93.22%) than that in males 95 (88.75%) (Table 1).
- **Overall and Sexwise prevalence of parasites in different localities.**

Parasitic prevalence is associated with localities (χ^2=8.72, P>0.05 at 4 d.f.). Out of five study sites, maximum positive cases were recorded from Terse i.e. 94% while least positive cases were recorded from Danda gaun i.e. 75%. Regarding sex and areawise prevalence of parasites in the five study sites both males and females separately showed the highest prevalence in Terse and the lowest in Danda (Table 1).

Table 1: Overall and Sexwise prevalence of parasites in different study sites.

S.N	Locality	Male				Female				GrandTotal		
		Total no.	%	+ve no.	+ve %	Total no.	%	+ve no.	+ve %	Total no.	+ve no.	+ve %
1	Terse	43	43.00	40	93.02	57	57.00	54	94.73	100	94	94.00
2	Danda	07	58.33	05	71.42	05	41.67	04	80.00	12	09	75.00
3	Dhade	32	51.61	29	90.62	30	48.38	28	93.33	62	57	91.93
4	Jugditar	13	50.00	10	76.92	13	50.00	12	92.30	26	22	84.61
5	Dhodeni	12	48.00	11	91.66	13	52.00	12	92.30	25	23	92.00
6	Total	107	47.55	95	88.78	118	52.45	110	93.22	225	205	91.11

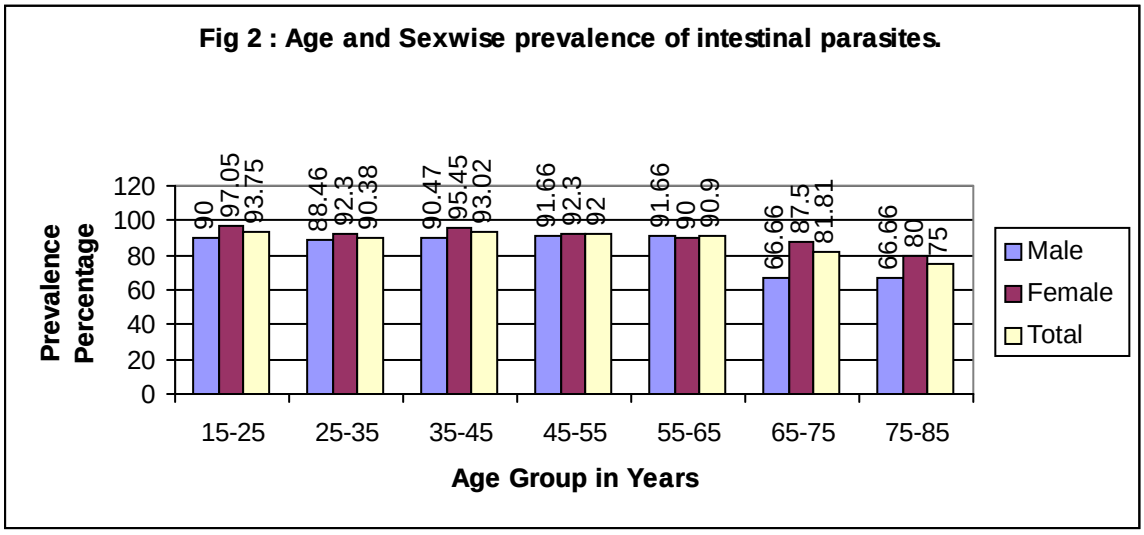


- **Age and Sexwise prevalence of intestinal parasites.**

There is significant relation in age of respondents and intestinal parasite infection (χ^2=8.61, P>0.05 at 6 d.f.). The highest prevalence (91.66%) of intestinal parasites was found to be in the age group 45-55 years and 55-65 years in males. In females highest prevalence (97.05%) was found in the 15-25 years age group (Table 2 and Fig 2). Distribution of intestinal parasites is independent of sex (χ^2=1.35, P>0.05 at 6 d.f.). However, regarding sex-wise prevalence of intestinal parasites, female adults were found to be more infective i.e. 110 (93.22%) than the male adults 95 (88.78%). Out of 107 stool samples of male, 95 samples were found to be positive whereas out of 118 stool samples of female, 110 samples were found to be positive.

Table 2: Age and Sexwise prevalence of intestinal parasites.

S.N	Age group	Male			Female			Total		
		Total no. of samples examined	No. of positive samples	+ve %	Total no. of samples examined	No. of positive samples	+ve %	Total no. of samples examined	No. of positive samples	+ve %
1	15-25	30	27	90.00	34	33	97.05	64	60	93.75
2	25-35	26	23	88.46	26	24	92.30	52	47	90.38
3	35-45	21	19	90.47	22	21	95.45	43	40	93.02
4	45-55	12	11	91.66	13	12	92.30	25	23	92.00
5	55-65	12	11	91.66	10	09	90.00	22	20	90.90
6	65-75	03	02	66.66	08	07	87.50	11	09	81.81
7	75-85	03	02	66.66	05	04	80.00	08	06	75.00
Total		107	95	88.78	118	110	93.22	225	205	91.11

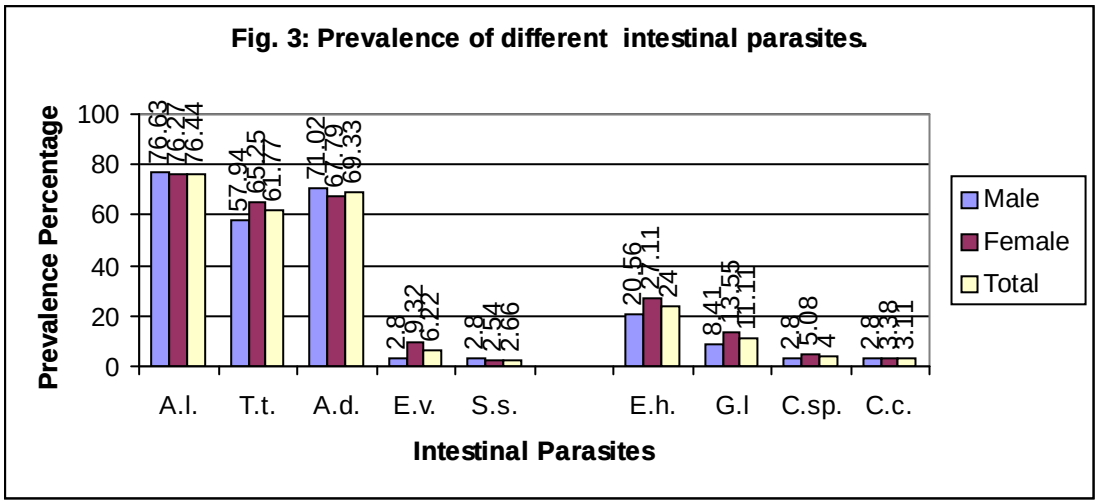


- **Prevalence of different intestinal parasites.**

Out of 225 samples before treatment, 205 samples were found to be positive in which 95 (88.78%) were males and 110 (93.22%) were females. Examination revealed that *A. lumbricoides* was found to be the most prevalent with 76.44% (i.e, 172 cases) followed by hookworm (69.33%), *T. trichiura* (61.77%), *E. vermicularis* (6.22%) and *S. stercoralis* (2.66%). Likewise, among the protozoan parasites, the highest prevalence was of *E. histolytica* with 24% (i.e., 54 cases) followed by *G. lamblia* (11.11%), *Cryptosporidium* sp. (4%) and *C. cayetanensis* (3.11%) (Table 3 and Fig 3)

Table 3: Prevalence of different intestinal parasites.

Name of Parasites	Male (N=107)		Female (N=118)		Total (N=225)	
	No. of +ve cases	%	No. of +ve cases	%	No. of +ve cases	%
HelminthParasites						
Ascaris lumbricoides	82	76.63	90	76.27	172	76.44
Trichuris trichiura	62	57.94	77	65.25	139	61.77
Hookworm	76	71.02	80	67.79	156	69.33
Enterobius vermicularis	03	02.80	11	09.32	14	06.22
Strongyloides stercoralis	03	02.80	03	02.54	06	02.66
Protozoan Parasites						
Entamoeba histolytica	22	20.56	32	27.11	54	24.00
Giardia .lamblia	09	08.41	16	13.55	25	11.11
Cryptosporidium sp	03	02.80	06	05.08	09	04.00
Cyclospora cayetanensis	03	02.80	04	03.38	07	03.11

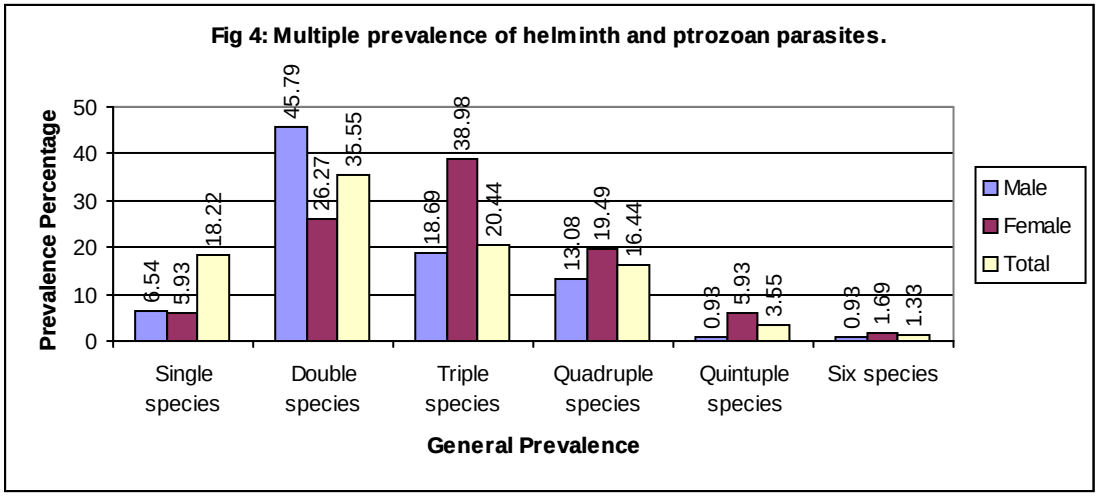


- **Concurrent prevalence of helminth and protozoan parasites.**

Analytical findings of multiple prevalence of both the helminth and protozoan parasites revealed that the highest number of cases (i.e. 80 cases- 49 males and 31 females/ 35.55%) were found to be suffering from two species of parasites (double infection) while only 3 cases (1 male and 2 females) were found to be infected with six different parasites (Table 4). Mostly multiple infection was of *Ascaris lumbricoides* followed by *Trichuris trichiura* and hookworm

Table 4: Multiple prevalence of helminth and ptrozoan parasites.

S.N	Types of Infection	Male (N=107)		Female (N=118)		Total (N=225)	
		No.	%	No.	%	No.	%
1	Single species	07	06.54	07	05.93	14	18.22
2	Double species	49	45.79	31	26.27	80	35.55
3	Triple species	20	18.69	46	38.98	46	20.44
4	Quadruple species	14	13.08	23	19.49	37	16.44
5	Quintuple species	01	00.93	07	05.93	08	03.55
6	Six species	01	00.93	02	01.69	03	01.33



- **Prevalence of parasites in relation to altitude.**

Table 5 depicts that comparatively high number of infected cases (91.95% or 160 cases) were recorded at the altitude of 1800 m than that of low altitute of 448m(88.23% or 45 cases). But the difference was not very much.However, the positivity of intestinal parasites is independent to altitude (χ^2=0.672, P>0.05 at 1 d.f.). Among five localities, Danda, Terse and Dhade are located at high altitude i.e. at 1800 m height, while Jugditar and Dhodeni are located at low altitude i.e. at about 448 m height.

Table 5: Prevalence of parasites in relation to altitude.

S.N	Altitude	Total Sample	Result obtained from Stool Examination	
			+ve cases	+ve %
1	1800 m	174	160	91.95
2	448 m	51	45	88.23
3	Total	225	205	91.11

- **Locality wise prevalence of helminth and protozoan parasites.**

The study revealed that helminth infection was higher i.e. 91.11% than protozon parasite infection i.e. 42.22% (χ^2=3.457, P>0.05 at 4 d.f.). Among the five localities, helminth infection was recorded as the highest 94% from Terse gaun while the least prevalence of helminth was recorded from Danda 75%. Both Danda and Terse gaun are situated at high altitude (1800m). Similarly, maximum prevalence of protozoan parasites was recorded from Jugditar i.e. 57.69% where as least prevalence was recorded from Dhodeni 28%. Both Jugditar and Dhodeni are from low altitude (4@48m). Hence prevalence of neither helminth nor protozoan parasites are related to altitude.

Table 6: Locality wise prevalence of helminth and protozoan parasites

S.N	Locality	Altitude	Helminth parasites		Protozoan Parasites		Total no of examined samples
			+ve no.	+ve %	+ve no.	+ve%	
1	Terse	High	94	94.00	42	42.00	100
2	Danda	High	09	75.00	06	50.00	12
3	Dhade	High	57	91.93	25	40.32	62
4	Jugditar	Low	22	84.61	15	57.69	26
5	Dhodeni	Low	23	92.00	07	28.00	25
6	Total		205	91.11	95	42.22	225

II Result of Stool Examination of Second Phase (after treatment)

- **General Prevalence:** A total of 185 stool samples of old cases who had taken medicine six months before were examined for intestinal parasites. 77 (41.62%) were found to be positive for intestinal parasites.
- **Sexwise Prevalence:** Among the positive cases, prevalence of intestinal parasites was found to be little higher in females 43 (44.32%) than that in males 34 (38.63%) (Table 7).
- **Overall and Sexwise prevalence of parasites in different localities.**

Parasitic prevalence is associated with localities (χ^2=10.631, p<0.05 at 4 d.f.). The maximum positive cases were recorded from Jugditar i.e. 55.55% while the least positive cases were recorded from Dhodeni i.e. 28.0%.

Table 7: Overall and Sexwise prevalence of parasites.

Locality	Male				Female				Grand Total		
	Total No.	%	+ve No.	+ve %	Total No.	%	+ve No.	+ve %	Total No.	+ve No.	+ve %
Terse	37	43.52	18	48.64	48	56.47	22	54.83	85	40	47.05
Danda	06	60.00	03	50.00	04	40.00	02	50.00	10	05	50.00
Dhade	26	50.98	06	23.07	25	49.01	10	40.00	51	16	31.37
Jugditar	10	55.55	05	50.00	08	44.44	05	62.5	18	10	55.55
Dhodeni	09	42.85	02	22.22	12	57.14	04	33.33	21	06	28.57
Total	88	47.56	34	38.63	97	52.44	43	44.32	185	77	41.62

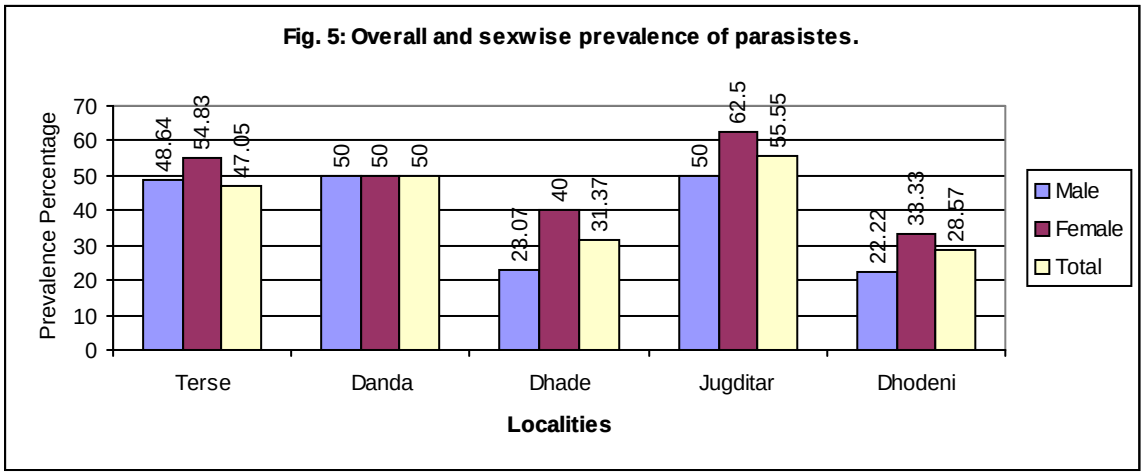


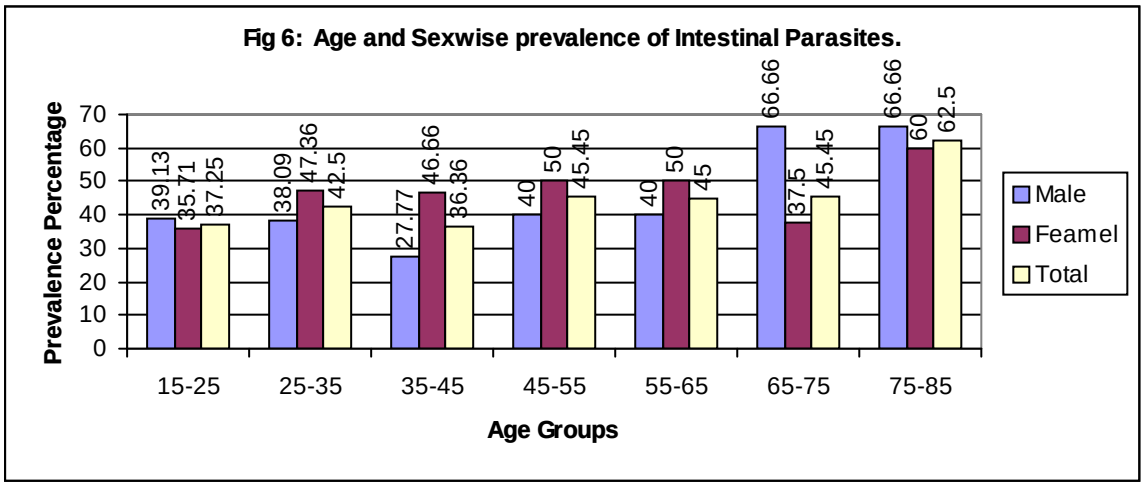
Fig. 5: Overall and sexwise prevalence of parasistes.

- **Age and Sexwise prevalence of intestinal parasites.**

There is significant relation in age of respondents and intestinal parasites infection (χ^2 =32.021,p<0.05 at 6 d.f.). The highest prevalence (66.66%) of intestinal parasites was found to be in the age group 65-75 years and 75-85 years in males. In females highest prevalence (60.00%) was found in the 75-85 years age group (Table 8 and Fig 6) . Regarding sex wise prevalence of intestinal parasites, female adults were found to be more infective i.e. 43 (44.32 %) than the male adults 34 (38.63 %). Statistically distribution of intestinal parasites is independent of sex (χ^2=0.61, P> 0.06 at d.f.). Out of 88 stool samples of male, 34 samples were found be positive whereas out f 97 stool samples of female, 43 samples were found to be positive.

Table 8 : Age and Sexwise prevalence of intestinal parasites.

S.N	Age group	Male			Female			Total		
		Total no of samples examined	No of positive samples	+ve %	Totle no of samples examined	No of positive samples	+ve %	Totle no of samples examined	No of positive samples	+ve %
1	15-25	23	09	39.13	28	10	35.71	51	19	37.25
2	25-35	21	08	38.09	19	09	47.36	40	17	42.5
3	35-45	18	05	27.77	15	07	46.66	33	12	36.36
4	45-55	10	04	40.00	12	06	50.00	22	10	45.45
5	55-65	10	04	40.00	10	05	50.00	20	09	45.00
6	65-75	03	02	66.66	08	03	37.50	11	05	45.45
7	75-85	03	02	66.66	15	03	60.00	08	05	62.50
Total		88	34	38.63	97	43	44.32	185	77	41.62



III Comparative Study on Prevalence of Intestinal Parasites Before and After Treatment

- **Comparative General Prevalence**

Before treatment : The general prevalence of the intestinal parasites was 91.11% (205 out of 225).

After treatment : The prevalence of the intestinal parasites was 41.62%(77 out of185).

Hence the general prevalence of intestinal parasites from 91.11% before treatment came down to 41.62% after treatment. Localtywise prevalence percentage of intestinal parasites was also found to be low after treatment at each site (Table 9).

Table 9: Comparative study on prevalence of intestinal parasites before and after treatment.

Before Treatment					After Treatment		
S.N.	Localities	Total No.	+ve No.	+ve%	Total No.	+ve No.	+ve%
1	Terse	100	94	94.00	85	40	47.05
2	Danda	12	09	75.00	10	05	50.00
3	Dhade	62	57	91.00	51	16	31.37
4	Jugditar	26	22	84.61	18	10	55.55
5	Dhodeni	25	23	92.0091	21	06	28.57
6	Total	225	205	91.11	185	77	41.62

- **Comparative prevalence of parasites in relation to occupation**

Prevalence of intestinal parasites based on the profession of the cases showed that centpercent cases from students and labours were found to be infected with at least one kind of parasite. Whereas other groups also had high prevalence of parasites. Six month after treatment all the occupational group still showed prevalence of intestinal parasites but comparatively much less.

After treatment labourer grouped showed highest prevalence also after Albendazole and Metronidazole treatment.

Table 10: Comparative prevalence of parasites in relation to occupation

S.N.	Category occupation	No of Respondents		Before treatment		No of Respondents		After treatment	
		No.	%	No.	%	No.	%	No.	%
1	Student	09	04	09	100	09	04.87	02	22.22
2	Agriculture	171	76	158	92.39	139	75.14	62	44.60
3	Student + Agriculture	18	08	14	77.77	15	08.10	04	26.66
4	Agriculture + Livestock	18	08	15	83.33	15	08.10	05	33.33
5	Labourer	09	04	09	100	07	03.79	04	57.14
6	Total	225	100	205	91.11	185	100	77	41.62

- **Comparative prevalence of specific intestinal parasites among treatment group.**

After a complete stool examination, 185 patients received treatment in which 110 patients were treated with Albendazole (single dose) whereas 75 patients were treated with Metronidazole. All the positive cases were treated with appropriate antiparasitic medicine under the supervision of medical doctor (Table 11). The highest prevalence, before treatment, was recorded that of hookworm (75.45%) while no case was found to be infected from *Taenia* sp. But after treatment, the highest number of cases were found to be infected with *T. trichiura* (16.36%), whereas least no. of cases were recorded to be suffered from hookworm. It is to be noted that only one case was found to be infected with *Taenia* sp. after treatment phase. Similarly, among protozoans, *E. histolytica* recorded the highest infection while the least infection was that of *C. cayetanensis* before and after treatment.

Table 11: Comparative prevalence of specific intestinal parasites among treatment group.

S.N	Name of Parasites	Name of the drugs	Treatment group				
			No. of treatead persons	Initial result before treatment		Six month after treatment	
				+veno.	+ve %	+ve no.	+ve %
1	*Ascaris lumbricoides*	Albendazole	110	84	76.36	17	15.45
2	*Ancylostoma duodenales*	Albendazole	110	85	75.45	14	12.72
3	*Trichuris Trichiura*	Albendazole	110	68	61.81	18	16.36
4	*Strongyloides stercoralis*	Albendazole	110	06	05.45	00	00.00
5	*Enterobius vermicularis*	Albendazole	110	14	12.72	00	00.00
6	*Taenia* sp.	00	00	00	00.00	01	00.90
7	*Entamoeba .histolytica*	Metronidazole	75	54	72.00	35	46.66
8	*Grardia lamblia*	Metronidazole	75	25	33.33	06	08.00
9	*Cryptosporidium* sp.	Metronidazole	75	09	12.00	07	09.33
10	*Cyclospora cayetanensis*	Metronidazole	75	07	09.33	05	06.66

Foot note:

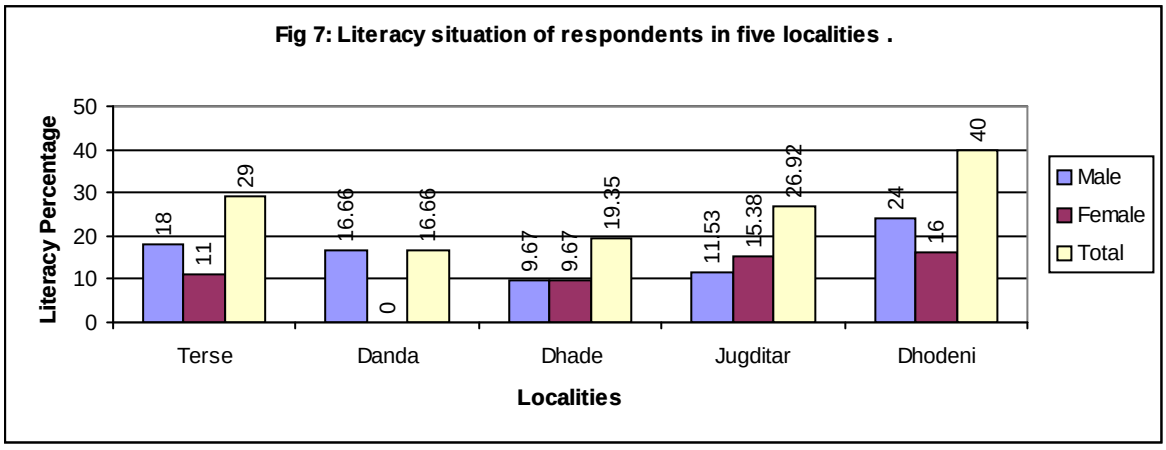
Treatment group: It indicates that who received treatment antihelminthes and antiprotozoal according to infection of helminthes and protozoans.

- **Literacy situation of respondents in five localities**

Literate indicates those person who are able to read and write. Regarding literacy situation among the respondents, the questionnaire survey reveals that 26.66% were literate while 73.34% illiterate. Maximum literacy 40% was recorded from Dhodeni gaun. While highest illiteracy 83.33% from Danda gaun.

Table 12: Literacy situation of respondents in five localities

Localities	Illiterate						Literate						Grand total	
	Male		Female		Total		Male		Female		Total			
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Terse	31	31.00	40	40.00	71	71.00	18	18.00	11	11.00	29	29.00	100	44.44
Danda	5	41.66	05	41.66	10	83.33	02	16.66	00	00.00	02	16.66	12	05.33
Dhade	22	35.48	28	45.16	50	80.64	06	09.67	06	09.67	12	19.35	62	27.56
Jugditar	8	30.76	11	42.30	19	73.07	03	11.53	04	15.38	07	26.92	26	11.56
Dhodeni	6	24.00	09	36.00	15	60.00	06	24.00	04	16.00	10	40.00	25	11.11
Total	72	32.00	93	41.33	165	73.34	35	15.55	25	11.11	60	26.66	225	100



- **Prevalence of parasites in relation to respondent's behaviour, attitude and practices**

Defecation:

From questionnaire survey, it has been recorded that 72% respondents use open field for defecation, while 20% use pig shelter and 8% use pit toilet. The highest prevalence (71.11%) of intestinal parasites was recorded from the people using open field for defecation (Table 13A).

Drinking water:

Maximum positive cases of intestinal parasites were reported from those respondents who directly used water from Kholsa and Kuwa, i.e. 94.44% (51), and 94.44% (17) respectively. Majority of respondents 68% were found to be using tap water for drinking (Table 13 B)

Cleaning hands:

The maximum prevalence of intestinal parasites 95.95% (95) was recorded from those respondent who used only water to clean hands after various conditions such as before meal, while cooking, after meal, after defecation, after working in the fields, etc. Similarly, least prevalence i.e. 77.77% (21) was recorded from those respondent who used water and soap to clean hands after various situation (Table 13 C).

Nail cutting:

The highest prevalence 95.55% (86) was recorded from those respondents who randomly (not very often) cut their nails (Table13 D)

Treatment:

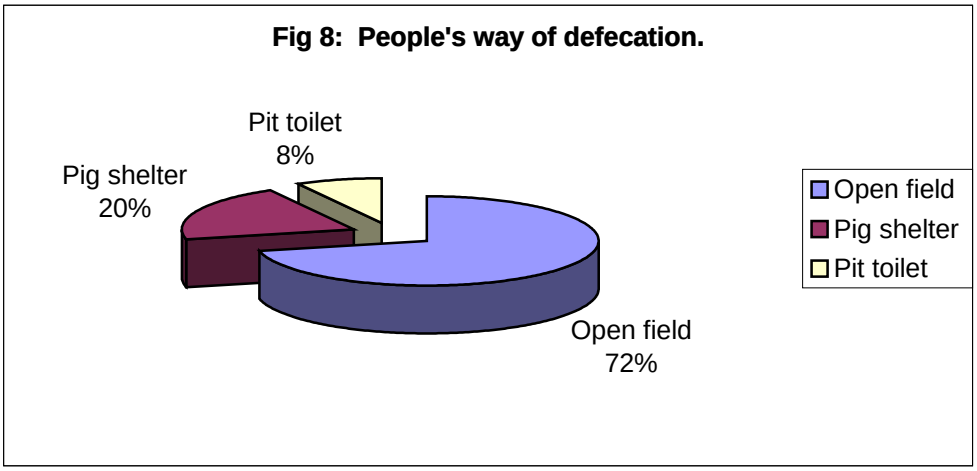
Questionnaire survey revealed that 72% of the respondents follow traditional method of treatment, 20% take medicine without consulting medical persons and 8% consult doctors for any complications(Table13 E).

Use of deworming tablets:

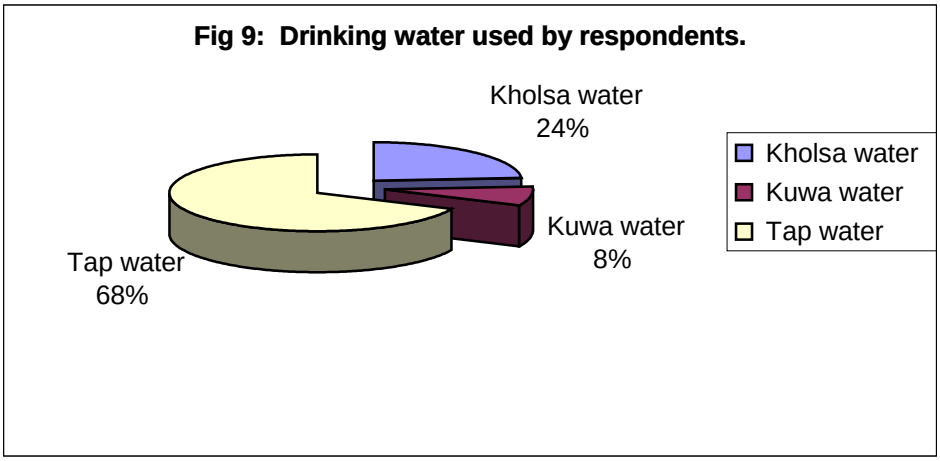
Analytical finding following stool examination revealed that 99.30% cases were detected from the people who did not take deworming tablets while the least cases i.e. 44.44% were found positive for intestinal parasites among the people who had deworming tablets three months before(Table13 F).

Table 13: Prevalence of parasites in relation to respondent's behaviour, attitude and practices

Respondents behaviour		No. of respondent		Result obtained from stool examination	
		No.	%	+ve no.	+ve %
A. Defecation					
1	Open field	162	72	160	71.11
2	Pig Shelter	45	20	36	16.00
3	Pit toilet	18	08	09	04.00
Total		225	100	205	91.11
B. Drinking water					
1	Kholsa water	54	24	51	94.44
2	Kuwa water	18	08	17	94.44
3	Tap water	153	68	137	89.54
Total		225	100	205	91.11
C. Cleaning hands					
1	Water only	99	44	95	95.95
2	Water and Ashes	45	20	42	93.33
3	Water and Soap	27	12	21	77.77
4	All of above	54	24	47	87.03
Total		225	100	205	91.11
D. Nail cutting					
1	Once a week	63	28	52	82.53
2	Once a month	72	32	67	93.05
3	Randomly	90	40	86	95.55
4	Total	225	100	205	91.11
E. Treatment					
1	Traditional method	162	72	159	98.14
2	Direct taking medicine	45	20	35	77.77
3	Doctor consulting	18	08	11	61.11
4	Total	225	100	205	91.11
F. Use of deworming tablets					
1	Don't Know	144	64	143	99.30
2 Every	Three months	18	08	08	44.44
3 Every	Six months	27	12	19	70.37
4 Every	Year	36	16	35	97.22
5	Total	225	100	205	91.11

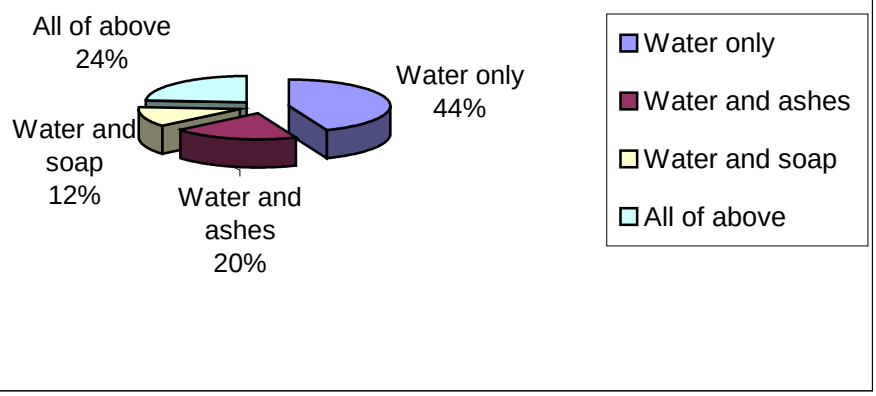


In the present study, among the 225 respondents, 162 (72.0%) use to defecate in open field, 45 (20.0%) use to defecation in pig shelter, whereas 18(8.0%) used to defecate in pit toilet.Maximum no of prevalence (71.11%) was found in open field people defecating in followed by pig shelter (16%) and (4%) in pit toilet.



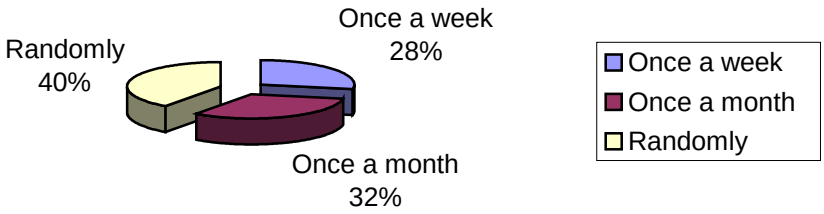
In the present study, among the 225 respondents, 54(24%) used to drink Kholsa water, 18(8.0%) Kuwa water, whereas, 153(68%) used to drink tap water. The positive cases for intestinal parasites were found similar (94.44%) in Kholsa water and Kuwa water.

Fig 10: Method of cleaning hands by respondents.

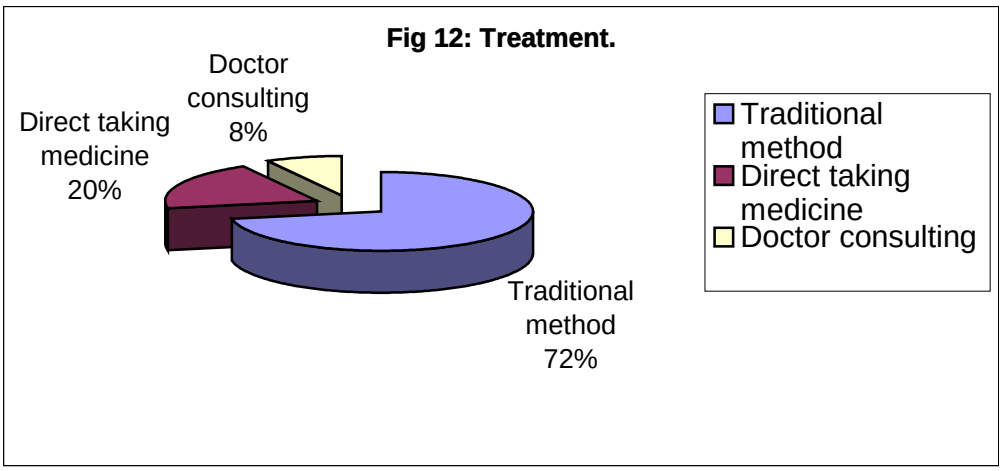


In the present study, among the 225 respondents, 44% used water only, 20% used water and ashes, 12% used water and soap, whereas, 24% used all of the above means the hands. The maximum prevalence of intestinal parasites (95.55%) was recorded from those who used only water (Fig 10).

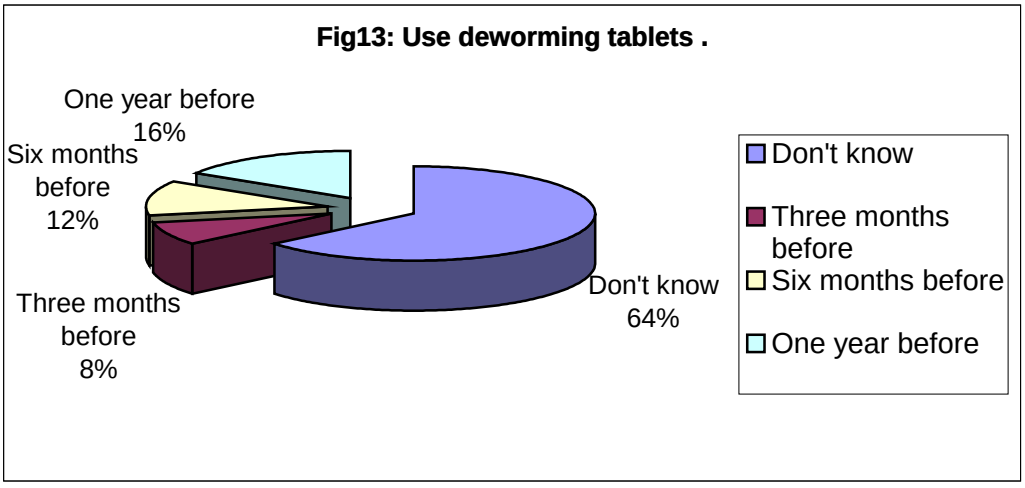
Fig 11: People's view about cutting nails.



In the present study, among the 225 respondents, 28% were used to nail cutting in once a week, 32% used to nail cutting in once a month, whereas 40% used to nail cutting in randomly. Highest prevalence (95.55%) was recorded from those who cut the nails randomly.



In the present study, among the 225 respondents 72% used to experience previous infection in traditional method, 20% used to experience previous infection in direct taking medicine, whereas 8% used to experience previous infection in doctor consulting. Maximum prevalence (98.14%) was obtained from the people who followed only traditional method of treatment.



In the present study, among the 225 respondents, 64% never used deworming tablets 8% took deworming tablets in every three months 12% took deworming tablets in every six months whereas, 16% took deworming tablets one in a year. The prevalence of intestinal parasites was found highest in never user (99.30%), followed by who took deworming tablets once in a year (97.22%) every six months (70.37%) and every three months (44.44%).

VI

DISCUSSION

Parasitic infections of the gastrointestinal tract occur world wide and have substantial morbidity and mortality. Prevalence is higher in the economically deprived regions of the world, especially in the developing countries (Gupta *et al.*, 2004). Among intestinal protozoal parasites respective prevalence of *Entamoeba histolytica* and *Giardia lamblia* have been estimated to be of 400 million (Walsh, 1986) and 200 million (Warren and Mahmoud, 1984). The Global Burden of disease caused by the 3 major intestinal nematodes is as estimated 22.1 million disability- adjusted life-years (DALYS) lost for Hookworm, 10.5 million for *Ascaris lumbricoides*, 6.4 million for *Trichuris trichiura*, and 39.0 million for the three infections combined (as compared with malaria at 35.7 million) (World Bank, 1993; Chan *et al.*, 1994).

In Nepal, about 4.8% of people died of cholera/diarrhoea (CBS, 2002). Morbidity due to intestinal parasites has always been an important public health problem in the tropics (Sherchand *et al.*, 1996).

The present study revealed that 91.11% of the adults were infected by different kinds of intestinal parasites. Rai *et al.* (1991) also showed the prevalence of various intestinal parasites in Kathmandu valley which was 30.9%. In the present study, 9 different types of intestinal parasites were found. These parasites were *A. lumbricoides* (76.44%), *A. duodenales* (69.33%), *T. trichiura* (61.77%), *E. vermicularis* (6.22%), *S. stercoralis* (2.66%), *E. histolytica* (24%), *G. lamblia* (11.11%) C*ryptosporidium* sp. (4%) and *C. cayetanensis* (3.11%). These parasites were also reported by Sherchand *et al.*, (1997) in rural areas of Dhanusha district of Southern Nepal.

Parasitic prevalence was found to be associated with localities in the present study. Rai and Gurung (1986); Rai *et al.* (1991) also reported similar findings . The present study showed females were more infected (52.45%) than males (47.55%). This might be due to immunity system, illiteracy, kitchen activities and usual contact with infected soil, water, food and feaces .

Regarding the helminth parasites, several previous studies have shown that hookworm was the most common helminth infection in Nepal (Esteven *et al.,* 1983; Navitsky *et al.,* 1998). But the present study provided result that *A. lumbricoides* (76.44%) was the most prevalent helminth parasites, followed by *A. duodenales* (69.33%), *T. trichiura* (61.77%), *E. vermicularis* (6.22%) and *S. stercoralis* (2.66%). A few other studies also reported *A. lumbricoides* to be the most common intestinal helminth parasite in Nepal (Suguri *et al.*, 1985; Rai *et al.*, 1997; Chhetri, 1997).

In case of protozoan parasites, the prevalence of *E. histolytica* was the highest (24%), followed by *C. cayetanensis* (3.11%), *G. lamblia* (11.11%) and *Cryptosponidium* sp. (4%) which resembles with the finding of Sharma and Tuladhar (1971), Nepal and Palfly (1980), Sherchand, *et al;* (1997). A few other studies obtained that *G. lamblia* is the most common protozoan parasite in Nepal (Khetan, 1977-1980). This study reported that among the protozoan parasites, *C. cayetanensis* and *Cryptosporidium* sp. were found to be 3.11% and 4% respectively, which resemble with the finding of Sherchand *et al.,* (2005).

Fujita *et al.* (1993) carried out an epidemiological survey for parasitic infection. Parasites were detected in 270 faecal specimens. 57.4% of these specimens showed single infection, 28.1% showed double, 9.6% triple, 4.1% quadruple and 0.4% quintaple infection. In present study also, there were 18.22% single infection, 35.55%

double infection, 20.44% triple infection, 16.44% quadruple infection 3.55% quintuple infection and 1.33% six species infection.

Jha (2004) showed that there was a great variation in the prevalence of helminth parasitic infection in ethnic groups. She found highest prevalence in pode (66.1%) . Like other ethnic groups, Chepang is also one of the most backward ethnic groups which showed high prevalence of intestinal parasites. In the present study *A. lumbricoides* (76.44%) occupied the top most position among the helminth parasites and *E. histolytica* (24%) occupied top most position among the protozoan parasites. The high infection rate of parasite in this community is due to lack of antihelminthic drugs and vitamin capsules, nomadic life style, cultural and behavioural variations and low economic factors.

Regarding the age groups, the highest prevalence (93.75%) was found in 15-25 years age group of adult Chepang. Chepang of this age group mostly spent their time in field works and out door games and are regularly in contact with soil as well as water. The minimum prevalence was observed in elderly people of age group 75-85 years (75%), this might be due to their awareness towards the personal hygiene and intestinal parasites. This result is supported by the result of Rai *et al.,* (1991).

The world health organization noted that human behaviour may influence the prevalence and intensity of intestinal infections (WHO, 1981). So the human behaviour such as open air defecation and cultural practices such as growing in faecally polluted gardens were all found to be contributing factors in transmission of parasites. Polluted water, eating raw meat and barefooted are also conductive to the transmission (Sherchand *et al.,* 1997).

Chepang are tribal population which constitutes an important fraction of Nepal's population. Their overall status directly or indirectly contributes to country's state of

economy, health, manpower resources and productivity. Majority of people are still in nomadic life style, depending upon in kandamul and wild fruits of jungles. These kandamuls are githa, vacure, tarul and other roots of plant. The common wild fruits associated with this community are bhakamblo, daikambo, chiuri, wild mango, bhalayo etc. They eat these fruits and tubers without properly washing and cooking. Majority of Chepangs use these fruits by rubbing and cleaning with leaves. They also utilize meat of the dead carcass of cow, buffalo, goat, pigs etc. Because of this omnivorous feeding habits, 91.11% Chepang adult suffered from intestinal parasites.

Chepang have very poor economic condition.They prefer eating insects and their larvae. Not only the insects but crab, fishes , prawn, molluscs, and other aquatic crustaceans are also regular part of their diet. Hence, proximity with livestocks, poultry, lack of proper sanitation, mud dwelling houses with cracks and cervices, clustered dwelling, open defecation around backyard and cropfield help to promote the condition very much favourable for contamination as well as transmission of parasitic diseases.

Regarding literacy condition, surveillance study revealed that among 225 interviewed people, 73.34% were found to be illiterate and only 26.66% were found to be literate. Among five localities, Terse and Dhodeni gaun had maximum literacy rate i.e.40 %, minimum in Danda gaun i.e. 83.33% was from Danda gaun .This literacy has very important role to play in the awareness of population regarding health and hygiene. Chepang concern towards sanitation is very low due to high illiteracy. From questionaire survey, it has been recorded that 72% respondents use open field for defecation,while 20% use pigshelter and 8% use pittoilet. The highest prevalence 71.11% was recorded from the people using open field for defecation.This open field and pig shelter defecation is responsible for contamination of soil, vegetable as well

as nearby water stream.This contamination of soil, vegetable and water contribute greatly for the parasite infection.

During surveillance study, it was found that 24%, 8% and 68% respondents used direct water from khola, well and tap water respectively for drinking even in endemic season. Defecation near the water streams, well, and kholsa also serve to contaminate the water source responsible for parasitic infection. Drinking direct water during endemic season accelerates the infection due to maximum chance of contamination and transmission (Sherchand *et al.,* 1997-2001). Chepang people do not use boiled water, filtered water and chemically treated water . Thus due to behaviour of using direct water, maximum prevalence of different parasites were found in Chepang community.

According to Olsen *et al.,* (2001) household who do not use soap had a 2.6 times higher risk of being infected with parasites. From the survey and stool examination, it is revealed that maximum prevalence i.e. 95.95% was recorded from those respondents who used only water to clean hands at different situation, whereas the least prevalence i.e. 77.77% was recorded from those respondents who used water and soap to clean hands. Similarly 93.33% prevalence was found from those respondents who used water and ashes to clean hands at different situation. From the interview, it was found that 40% respondents cut nail randomly whereas 32% and 28% respondents cut their nails at intervals of once a month and once a week respectively. Since maximum prevalence rate 95.55% recorded from the respondent that cut nail randomly whereas least prevalence 82.53% was recorded from those respondent who cut their nails once a week.

During the surveillance study, it was found that 20% used medicine without consulting doctors, 8% liked to visit clinics and hospitals to consult doctors while

72% believed in traditional and superstitional methods of treatment by dhami, jhakari and bajdhya. The high parasitic prevalence recorded (98.14%) in the present study gives the view that traditional methods used by them is not so satisfactory in prevention and control of intestinal parasites. Hence, modern treatment practice should be applied to control and prevent intestinal parasites.

In the present study, it was found that 99.30% prevalence were from those respondents who had never taken deworming tablets but 44.44% prevalence was recorded from those respondents who used deworming tablets at 3 months before the studies. The majority of people 46%, did not take anti-helminthes drugs and also did not know about antihelminthe drugs. This study indicate that the antiparasitic medication help to reduce and control the parasitic infection. Similalry to the present study, Luca *et al.* (2001) conducted a study in which treatment of the patients with acute diarrhoea caused by different etiologic agents was followed by antiparasitic program.

Regarding the prevalence of intestinal parasites based on the occupation it was found that centpercent respondents students and labour were found to be infected with at least one kind of parasite. Whereas other groups also had high prevalence of parasites. Sixmonths after treatment all the occupational groups still showed prevalence of intestinal parasites but comparatively much less. After treatment labourer grouped showed highest prevalence also after Albendazole and Metronidazole treatment. This might to be due to everyday contact with infected soil, water, foods and feaces and livestocks.

After stool examination, 185 infected people received treatment in which 110 people were treated with Albendazole (single dose) whereas 75 patients with Metronidazole as mass treatment. All the positive cases were treated with appropriate antiparasitic

medicine under the supervision of medical doctor (Table 11). The highest prevalence, before treatment, was of *A. duodenales* (75.45%) while no case was found to be infected from *Taenia* sp. But after treatment, the highest number of cases were found to be infected with *T. trichiura* (16.36%), whereas least no. of cases were recorded to be of *A. duodenale.* Altogether only one case infected with *Taenia* sp was recorded after treatment phase. Similarly, among protozoans, *E. histolytica* was recorded to be the highest infection while the least infection was that of *C. cayetaenensis*..

The high prevalence of parasites among female patients before treatment(93.22%,110 out of 118) and after treatment (44.32%, 43 out of 97) might be due to low socioeconomic status, low education, frequent contact with infected faece, water, food, soil by Chepang female. Sherchand *et al. (*1996,1998,2001) also reported these factors to be cause of high prevalence of intestinal parasites in Nepalese females.

The Prevalence of intestinal parasites decreased after the treatment of parasite positive patients by antiparasitic medicines. It deereased from 91.11% (205 out of 225) to 41. 62% (77 out of 185). Similar results of decreased prevalence of parasites due to antiprotozoan and antihelminthic medicines were recorded by (Sherchand *et al.,* 1996, 1998, 1999, 2001).

But after treatment the prevalence of intestinal parasites was not very low . This indicates that's their activities regarding health and hygiene should be imjproved. This can be done by making them more aware about the transmission of the parasites and their personal prophylaxis.

Hence, during survey and treatment programme, information regarding cause and prevention measure of intestinal parasites were provided to all people of the community with the help of local person who distributed the message, school teachers

and Mukhia. They were also suggested to examine the stool in the interval of every six months. Chepang community is simple, people having tribal nomadic and jungali life style. They lack technical skill which was found to be responsible for poverty. Social and poverty discrimination result as high illiteracy, which is responsible for lack of awareness of health and hygiene, poor sanitary condition and unhygienic food. These are found to be contributing factors for intestinal parasites to be endemic with high prevalence.

VII

CONCLUSION

The lack of awareness, unhygiene management practices and poor sanitation had lead Taklung VDC of Gorkha district to present a very depressing health statistics. High prevalence rate of intestinal parasitic infections, associated with intake of contaminated water, poor hygiene, poor sanitary condition, open air defecation effect the tribal population of Gorkha district. The present study is the first study on prevalence and control strategy of intestinal parasites among Chepang adults (16>84 years) of ward no.1 and 3 of Taklung VDC of Gorkha . The study found that

1. The feeding behaviour of Chepang showed their nomadic nature.
2. They eat larvae of wasp, bee, aringale, vachhim and other various types of insects in cooked or uncooked condition.
3. Chepang people drink chhang and raksi (local alcohol) along with inadequately cooked meat.
4. They eat flesh of buffalo, pigs,chicken , goat, ox, cow etc. They also take meat of dead carcass of cows, buffaloes, goats, pigs etc. due to lack of proper knowledge about transmission of disease.
5. People are mostly illiterate, due to lack of knowledge conservative type of treatment is done by dhami, jhankri and baidhya, which make them vicitimized to different fatal diseases.
6. The personal hygiene and sanitary condition of the people is not satisfactory. This enhance the high rate of infection with intestinal protozoan and helminth which reduces their health.

7. Low socio- economic conditions, unhygiene conditions, poor sanitation, unsystematised latrine type are most important factors which play an important role for contamination with intestinal parasites among Chepang communities of Taklung VDC, Gorkha.
8. Regarding the age and sex, the highest prevalence rate was observed in 15-25 years age-group. This might be due to their more open field work and out door activities.
9. The present study revealed that 91.11% of the adults were infected by different kinds of intestinal parasites.
10. In the present study, 9 different types of intestinal parasites were found. These parasites were *A. lumbricoides* (76.44%), *A. duodenales* (69.33%), *T. trichiura* (61.77%), *E. vermicularis* (6.22%), *S. stercoralis* (2.66%), *E. histolytica* (24%), *G. lamblia* (11.11%) C*ryptosporidium* sp. (4%) and *C. cayetanensis* (3.11%).
11. But the present study provided result that *A. lumbricoides* (76.44%) was the most prevalent helminth parasites, followed by *A. duodenales* (69.33%), *T. trichiura* (61.77%), *E. vermicularis* (6.22%) and *S. stercoralis* (2.66%).
12. In case of protozoan parasites, the prevalence of *E. histolytica* was the highest (24%), followed by *C. cayetanensis* (3.11%), *G. lamblia* (11.11%) and *Cryptosponidium* sp. (4%).
13. In the present study *A. lumbricoides* (76.44%) occupied the top most position among the helminth parasites and *E. histolytica* (24%) occupied top most position among the protozoan parasites.

VIII

RECOMMENDATION

From the present research work, following recommendations are extracted for efficient prevention and control of intestinal parasite:

1. Basic health education programmes should be conducted time to time in communities for raising awareness towards the parasitic infections and prevention and control.
2. People should be made aware about their feeding behaviour, like use of boiled water for drinking purpose and avoid consuming raw meat preparation.
3. Chapang should be encouraged to use latrine.
4. People should use gloves on hands during working on farm and avoid walking barefoot.
5. Public health education in the school curriculum must be made compulsory.
6. Intervention strategy including health education program should be designed and implemented to control parasitic infections.
7. Living standard of Chepang should be improved by organizing different programmes at the local level.
8. Parasitological researchers should be focused with special emphasis on these tribes so as to control further outbreak of intestinal parasitic diseases.

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ANNEX- 1

Questionnaire for baseline health survey in Chepang people of Taklung VDC of Gorkha District.

1. i) S.N./Household No …….. Date ……

2. ii) Name of the respondent …….

i) Age …… iii) Sex …….. iv) Locality …….. v) Occupation …….

vi) No. of family members …….

3. Are you literate ? Yes ☐ No ☐

If literate, primary level ☐, Lower secondary level ☐, Secondary level ☐, HSL ☐, General read and write ☐

4. Where do you go for defecation ?

i) Open field ii) Pig-shelter ii) Pit-toilet iv) Organized toilet

5. Where do you get drinking water for family ?

i) Tap ii) Kholsa iii) Well iv) Others

6. How do you use water for family ?

I) Direct water ii) Boiled iii) Using germicides iv) Others

7. What do you use to clean hands ?

i) Water only ii) Water soap iii) Water and Ashes iv) All of above

8. When do you wash hands ?

i) Before meal ii) After meal iii) After defection iv) After working in field v) All of above

9. Do you cut nail regularly ? Yes ☐ No ☐

If yes when ? i) Once a week ii) Once a month iii) Randomly

10. Which type of domestic animals do you keep ?

i) Hens ii) Ducks iii) Dogs iv) Goats v) Cows vi) Buffalo vii) Pigs viii) Cats

11. What type of food habit you have ?

i) Vegetarian ii) Non- vegetarian

12. If non- vegetarian, which meat frequently you take ?

i) Pork ii) Chicken iii) Buffalo iv) Mutton v) Fish vi) Beef

13. How do you prepare your meat to eat ?

i) Raw meat preparation ii) Sekuwa masu iii) Half cooked vi) Boiled v) Well cooked

14. How do you clean the vegetables and fruits ?

i) Rubbing on clothes ii) Tap/Kholsa/Well water iii) Without washing

15. Have you taken deworming tablet before ? Yes ☐ No ☐

If yes, when ? i) Don't know ii) Three months before iii) Six months before

iv) One year before

16. Have you suffered by diarrhoea/dysentery worms ? Yes ☐ No ☐

If yes, when ? i) One week before ii) One months before iii) Six months before

iv) Now v) Don't know

17. When do you treat in case of infection ?

i) Traditional methods ii) Direct taking medicine iii) Consult doctors

18. Do you know the causes of worm infection ?

If yes, what are they ? ……

19. Do you know the symptoms of worm infection ?

    If yes, what are they ? ……..

20. Do you know the cause of diarrhoea ?

    If yes, what are they ? ……..

21. Do you know the methods of prevention of worm infection ?

    If yes, what are they ? ……..

ANNEX- 2

Sex and Area wise prevalence of different helmihthes parasites.

Locality	Total Samples	*A. lumbricoides* Positive case						*A. duodenale* Positive cases						*T. trichiura* Positive cases						*E. vermicularis* Positive cases						*S. stercoralis* Positive case					
		Male		Female		Total		Male		Female		Total		Male		Female		Total		Male		Female		Total		Male		Female		Total	
		No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%
Terse	100	34 42	79.06	45 57	78.94	79 100	79.00	28 42	65.11	42 57	73.68	70 100	70.00	28 43	65.11	40 57	70.17	68 100	68.00	2 43	4.65	7 57	12.28	9 100	9.00	2 43	4.65	3 57	5.26	5 100	5.00
Deanda	12	05 07	17.42	03 05	60.00	08 12	66.66	05 07	71.42	04 05	80.00	09 12	75.00	04 07	57.14	04 05	80.00	08 12	66.66	0 07	0.00	0 5	00.00	0 12	0.00	*0* 7	0.00	0 5	0.00	0 12	0.00
Dhade	62	24 32	75.00	22 30	73.33	46 62	74.19	23 32	71.87	15 30	50.00	38 62	61.29	13 32	40.62	16 30	53.33	29 62	46.77	1 32	3.12	4 30	13.33	5 62	8.06	*0* 32	0.00	0 30	0.00	0 32	0.00
Jugditar	26	09 13	69.23	09 13	69.23	18 26	69.23	12 13	92.30	10 13	76.92	22 26	84.61	07 13	53.84	11 13	81.61	18 26	69.23	0 13	0.00	0 13	00.00	0 26	0.00	1 13	7.69	0 13	0.00	1 26	3.84
Dhodeni	25	09 12	75.00	10 13	76.92	19 25	76.00	08 12	66.66	10 13	76.92	18 25	72.00	06 12	50.00	08 13	61.53	14 25	56.00	0 12	0.00	0 13	00.00	0 25	0.00	0 12	0.00	0 13	0.00	0 25	0.00

ANNEX-3

Sex and Area wise prevalence of different protozoan parasites.

Locality	Total Sample	*Entamoeba histolytica* Positive cases						*Giardia lamblia* Positive cases						*Cryptosporidium parvum* Positive cases						*C* P
		Male		Female		Total		Male		Female		Total		Male		Female		Total		M
		No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%	N
Terse	100	3 43	06.97	21 57	36.84	24 100	24.00	2 43	04.65	5 57	08.77	7 100	07.00	1 43	2.32	2 57	03.50	3 100	03.00	1 43
Deanda	12	0 07	00.00	02 05	40.00	02 12	01.66	2 07	28.57	1 05	20.00	3 12	25.00	0 07	0.00	0 5	00.00	0 12	00.00	0 7
Dhade	62	7 32	21.87	09 30	30.00	16 62	25.80	1 32	03.12	5 30	16.66	6 62	09.67	2 32	6.25	1 30	03.33	3 62	04.83	0 32
Jugditar	26	4 13	30.76	05 13	38.46	09 26	34.61	3 13	23.07	3 13	23.07	6 26	23.07	1 13	7.69	2 13	15.38	3 26	11.53	1 13
Dhodeni	25	0 12	00.00	03 13	23.07	03 25	12.00	1 12	08.33	2 13	15.38	3 25	12.00	0 12	0.00	0 13	00.00	0 25	00.00	0 12