CHAPTER I

INTRODUCTION

1.1 Background Information of Nepal

Nepal Situated in the central part of Asia in between 26^0 22" to 30^0 27" North Latitude and 80^0 4" t0 88^0 12" East Longitude. Nepal has a total area of 1, 47,181 sq. km. This area is about 0.03% of the world and 0.3% of Asia. The east west length of Nepal is 885 km but the width is not uniform. The average width is 193 km (with maximum of 241 km and minimum of 145 km)

Nepal a landlocked and hilly country where 77% land is covered by rocks, snow, barren mountains and sloppy hills etc. While only 23% land is of plain type. Nepal is a Himalayan kingdom where the highest mountain of the world, Mt. Sagarmatha or the Everest (8,848 m) is also situated. Likewise, it has the deepest gorge (the data of Kaligandaki) and the deepest valley (the Arun valley) in the world. This Himalayan kingdom is popularly known as the country of the third world of diversities

Nepal is surrounded by India in the east, west and south and by China in the north. There is a long Himalayan range that separates Nepalese territory from the Tibetan Autonomous Region of the People's Republic of China. In the east, the Mechi River separates the country from India's Sikkim and West Bengal. In the west, the Mahakali River separates the country from Uttar Pradesh of India. Likewise, in the south the boundary pillars and about 9 meters of no man's land on the either side demarcates the Nepalese territory and the Indian States of west Bengal, Bihar and Uttar Pradesh).

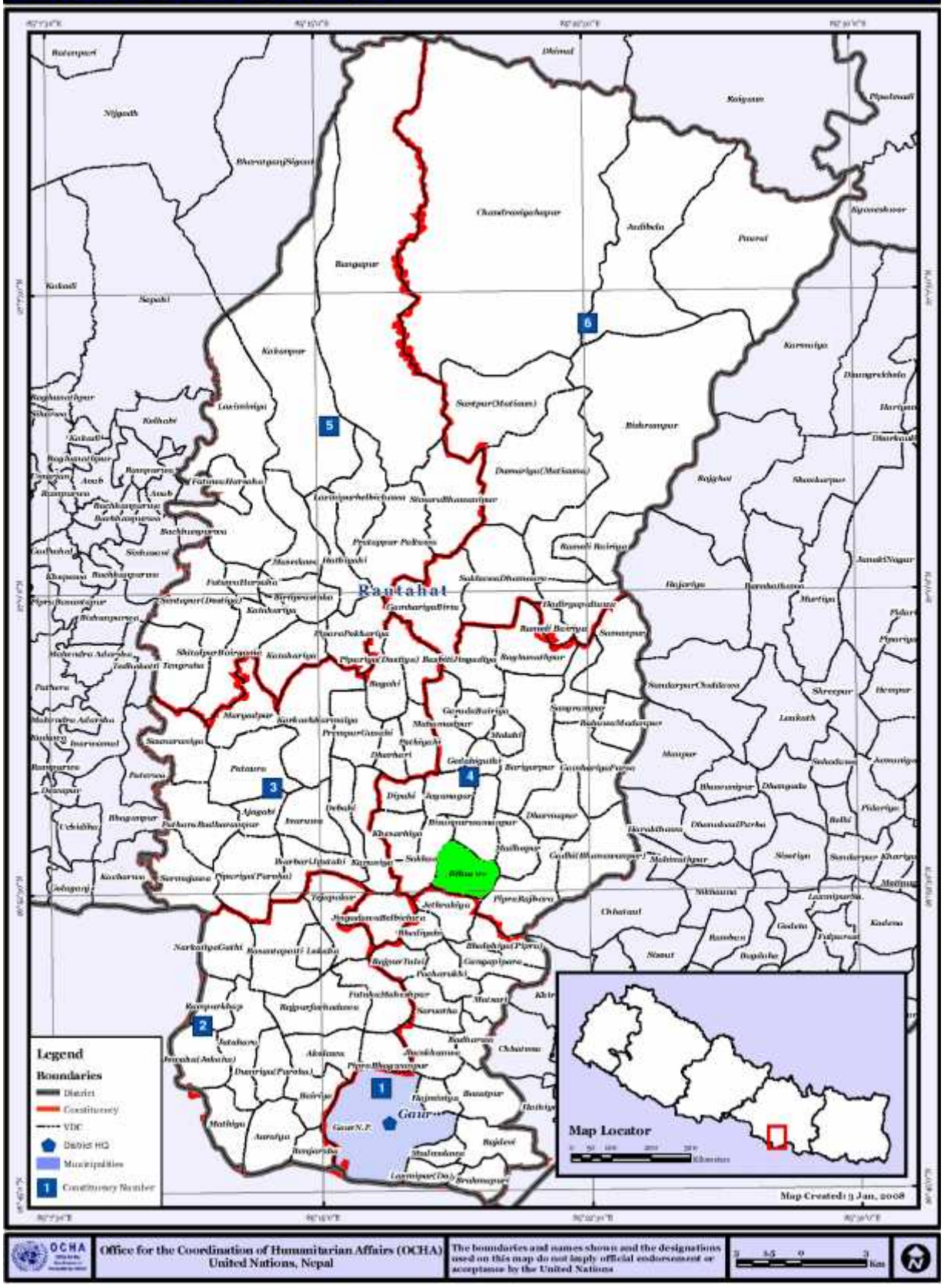

MAP OF NEPAL
ADMINISTRATIVE DIVISION
75 Districts, 14 Zones, 5 Regions
International Boundry
Regional Boundry
Zonal Boundry
District Boundry
KTM - Kathmandu
B - Bhaktapur
©ncthakur.itgo.com
CHINA
INDIA
MIDWESTERN REGION
WESTERN REGION
CENTRAL REGION
EASTERN REGION
FAR WESTERN REGION
HUMLA
DARCHULA
BAJHANG
BAITADI
BAJURA
DADELDHURA
DOTI
ACHHAM
KANCHANPUR
KAILALI
KALIKOT
JUMLA
MUGU
DOLPA
JAJARKOT
DAILEKH
SURKHET
BARDIA
BANKE
DANG
SALYAN
ROLPA
RUKUM
PYUTHAN
GULMI
ARGAKHACHI
KAPILBASTU
RUPANDEHI
NAWALPARASI
MUSTANG
MANANG
MYAGDI
BAGLUNG
KASKI
PARBAT
SYANGJA
LAMJUNG
TANAHU
GORKHA
RASUWA
NUWAKOT
DHADING
KTM
B
KAVRE
PALANCHOK
SINDHUPALCHOK
DOLKHA
RAMECHHAP
SINDHULI
CHITWAN
MAKWANPUR
PARSA
BARA
RAUTAHAT
SARLAHI
MAHOTTARI
DHANUSA
SOLUKHUMBU
SANKHUWASABHA
TAPLEJUNG
KHOTANG
OKHALDHUNGA
BHOJPUR
DHANKUTA
TERHATHUM
PANCHTHAR
ILAM
UDAYAPUR
SAPTARI
SIRAHA
SUNSARI
MORANG
JHAPA

1.2 Rautahat

Nepal is divided in 14 zones and 75 districts among them Narayani Zone is situated in the central development region. Narayani zone comprises five districts including Rautahat.

Rautahat District is situated in 26° 44’ to 27° 14’ latitude and 85° 14’ to 85° 30’ longitude. The total area of this district is about 1126 sq km. and altitude of this district is about 122 to 244 meters. It is surrounded by the Sarlahi district in the east, Bihar of India in the south, Bara district in the west and Makwanpur district in the north. The head quarter of this district is Gaur.

RAUTAHAT DISTRICT



Mithuawa

There is one municipality and 94 VDC in the Rautahat district among them Mithuawa is situated about middle of the district. Political boundary of Mithuawa is Madhopur VDC in east, Jetharahiya VDC in south, Sakhuawa VDC in west and Jayanagar VDC in north. There is Jhanjh River which divide this VDC in two parts east and west.

There are two Primary schools, one high school, one sub health post and one post office. The sanitation of the village is not so good. PLAN Nepal (An INGO) is working in this village for sanitation and eradication of water borne disease but yet not success. There is need of sanitation programme. The total population of this VDC is about 3401, among them 1733 male and 1628 female. The main casts are Teli (Baisya), Kanu (Baisya), Mallah (Majhi), Chamar (Sarki), Dushadh (like as sarki), Muslim and some Brahamin. Most of the peoples are illiterate in this VDC. Farming and agriculture labour are livelihood job of these people. During farming season, about four hundred peoples are migrated in India for agriculture labour. Because of the illiteracy, unhygienic living habit, poor socio economic condition and conservative thinking they are suffering from different kind of parasitic condition and deformities

1.3Back- ground Information of parasites

Parasites are those organisms which live at the expense of the individuals of another species. They remain closely associated with their hosts biologically and ecologically. During their life cycle, parasites derive nourishment, shelter and protection from the hosts. In its medical usage, it is an association in which one animal, the host, is injured in some

degree through the activities of others called parasite (or pathogens) and the condition that results from the damage constitutes diseases. The association may be temporary or a permanent one. Moreover, the study of the phenomenon of parasitism is called parasitology is now a multi disciplinary subjects.

Parasitic diseases play a very important role in the life of human beings, not to mention the animals leading to serious health hazards. Hence a pre-requisite to control and prevention of the parasite is a clear understanding of the epidemiology of each causative organism. It is essential to know in advance about its distinctive characteristics by which it can be recognized easily. The condition should be made clear under which it survives and propagates and man is exposed to the infections. With this information as well as with reliable other information about the disease in each area, prevention and control are to be under taken. The next steps to be considered are the most practical economic way by which the goal can be achieved.

Unfortunately, the more human beings are becoming aware of them, the more, especially in our country, unhygienic management practices and poor sanitation are seen. Nepal like most of other developing countries presents a very depressing health statistics which results due to a wide range of communicable diseases such as diarrhoea, dysentery etc. These are the major causes of death and sickness especially among children and infants in our country. Mostly the protozoa and helminth worms causes the diarrhoea and dysenteric attacks.

1.4 Introduction of Intestinal Helminth Parasites

The worm like parasites, the helminthes, belongs to three phyla: the platyhelminthes or flatworms, the nematodes or round worms and the acanthocephalan or spiny-headed worms. While some representative of the platyhelminthes and nematode are free living, acanthocephalan are exclusively parasitic. They are generally larger and some may grow up to relatively massive sizes, several meters long in the case of cestodes and nematodes. Since helminth parasites are the causative agents of a terrible list of debilitating, deforming and killing diseases of humans and their livestock's, the studies in these regard are very important from epidemiological point of view. Furthermore some helminth infections particularly due to intestinal parasites are one of the major causes of gross health problem. The mode of lifecycle for various helminth parasites is either direct or indirect. Direct life-cycle strategies basically include single host species like many gut dwelling nematodes and also by *H. nana* in one mode of its life cycle. In indirect life cycle, more than one host species are involved. The definitive host is almost always a vertebrate and the intermediate hosts maybe vertebrates or invertebrates. Indirect life cycles with 2 or 3 hosts are the rule among digenea and the vast majority of cestodes. In the hermaphroditic digenea and cestodes, self fertilization is sometimes possible but unidirectional or reciprocal cross- fertilization is nearly always favoured. Parthenogenesis is rare, but is used by both the nematodes like *S. stercoralis* and the lung inhabiting digena *Paragonimus westermani*.

Eggs or larvae achieve transmission of helminthes infections from host to host. An intermediate host usually directly ingests eggs. Larvae may be

similarly ingested, while attached to a plant or consumed while located in an intermediate host, which acts as a prey item for the next host in the life cycle i.e. definitive host.

The phylum platyhelminthes can be divided into four main classes and a number of minor ones. The monogenea, digenea and cestoda are exclusively parasitic while the turblelleria are mainly free living with a few ectoparasitic representatives. Moreover, intestinal helminthes associated with human hosts belong to the class cestoda. One small subclass of cestoda, the cestodaria, have cinoacg bib segmented bodies, but members of the principal subclass the eucestoda have a characteristically segmented adult body made up of a string of proglotids each of which contain a complete set of reproductive organs. Except for *H. nana* all eucestodes exhibit only an indirect mode of life cycle with larval metacestode development and or asexual multiplication occurring in one or two intermediate hosts. Conveniently, however, the species that causes human disease all fall within two well-recognized and reasonably homogeneous orders: the pseudophyllidea and the cyclophyllidea.

Tapeworm generated diseases or cestodiasis in human can be considered under two headings larval and adult cestodiasis. Larval cestodiasis in which larval cestodes in a variety of organisms are the origin of disease symptoms and adult cestodiasis where the pathology is due to adult worms in the human gut. In global terms four adult cestodiasis are all common namely those caused by *D. latum, T. solium, T. saginata and H. nana.*

1.5 Intestinal Helminths Parasites

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

The helminthes parasites are multicellular, bilaterally, symmetrical, triploblastic animals. The helminthes are broadly grouped in three phylum platyhelminthes, nemathelminthes and acanthocephalan. They are end parasites of intestine and blood of human body and cause different disease. Most helminth parasites come under the heading of intestinal infection.

Many parasitic helminthes require one or more intermediate hosts. *Hymenolepsis* spp., *Ascaris lumbricoides, Trichiuris trichiura*, *Ancylostoma duodenale, Strongylodies stercoralis* and *Taenia* are common helminthes recorded from humans.

1.5.1 Hymenolepsis nana

GeoFig.ical Distribution: Cosmopolitan in distribution.

Habitat: The abode of the adult worms in the small intestine (distal protion of the ileum) of human.

Morphology: It exists in three phases: adult worm, proglottides and eggs.

a) Adult worm: *H. nana* one of the smallest intestinal cestodes infecting man. It is small and thread like, measuring 1 to 4 cm in length with maximum diameter of 1mm. It is also known a s dwarf tapeworm.

b) Proglottides: The number of segment is about 200. A nature segment measures 0.3 mm in length by 0.9 mm in breadth.

c) Eggs: Eggs are oval or spherical in shape, measuring 30 to 45 « m in diameter. There are two distinct membrane: outer membrane is thin and clorless, and inner embryophore encloses an oncosphere with three pairs of lancet-shaped hook lets.

Mode of Infection: The first infection occurs through ingestion of food contaminated with egg of *H. nana*.

Pathogenicity: The disease caused by *H. nana* is called as Hymenolepsis. The clinical symptoms are restless, irritability, abdominal pain and diarrhea.

1.5.2 Ascaris lumbricoides

GeoFig.ical Distribution: *Ascaris lumbricodies* is cosmopolitan, having a world-wide distribution, being specially prevalent in the tropic region.

Habitat: The adult worm lives in the lumen of the small intestine (jejunum) of human and maintains its position by its muscle tone.

Morphology: It is elongated, cylindrical nematode, tapering bluntly at the anterior end and somewhat more attenuated at the posterior end. Lateral line can easily be seen. The head is provided with conspicuous lips. Sexes are separated. The size of male is 15-25 cm in length with a maximum diameter of 3-4 mm and female is 25-40 cm in length with diameter of 5 mm.

Mode of Infection: Fecal-oral route infection occurs by the ingestion of food or water contaminated with embryonated eggs of the parasite.

pathogenicity: Infection of *A. lumbricoides* in human is known as ascariasis. It is an important parasite of human, it often occurs in high levels in population living under conditions of poor hygiene (Smyth, 1996). In some surveys of children between the ages of 6 to 12 years, the infection rate was a high as 90%. The infection results in malnutrition and related of growth in children but other symptoms associated with both the larval and adult stages include pneumaonitis, asthma, diarrhea, nausea, abdominal pain and anorexia.

1.5.3 Trichuris trichiura

GeoFig.ical Distribution: Worldwide and cosmopolitan in distribution. But more common in the worm moist region of the world. The whipworm infection is more or less co-extensive with ascariasis.

Habitat: The adult worm live in the large intestine of man, particularly the caecum, also in the vermiform appendix. But it has also been reported in monkeys, lemurs, sheep, cattle etc.

Morphology: *Trichuris trichiura* is also called whipworm. In shape and general appearance the worm resembles a whip, the anterior three-fifth is very thin and hair like and the posterior two-fifth is thick and stout, resembling the handle of a whip. Male measure 3 to 4 cm in length and female measures 4 to 5 cm in length. Eggs are Barrel-shaped with mucous plug at each pole. Measuring about 50 « m in breath.

Mode of Infection: No intermediate host is required, worm passes its life cycle in one host. Man is infected when the embryonated eggs are swallowed with food or water. The digestive juices dissolve the eggshell and the larva emergent through one of the poles of eggs near caecum, which is the site of localization.

Pathogenicity: Infection with *T. trichiura* is known as trichiuriasis. There is now evidence that people are especially prone to intestinal disorder like loss of appetite, abdominal pain, nausea, vomiting emaciation and dysentery with blood tinged, mucous, acute appendicitis and prolepses of rectum.

1.5.4 Ancylostoma duodenale

GeoFig.ical Distribution: It is widely distributed in all tropical and sub-tropical countries. They occur in all countries where humidity and temperature are favorable for the development of the larva in the soil.

Habitat: The adult worm live in the small intestine of human, particularly in the jejunum, less often in the duodenum and rarely in the ileum.

Morphology: It is commonly known as hookworm. The adult worms are somewhat cylindrical in shape, are slightly constricted anteriorly. The large conspicuous buccal capsule is lined with a hard substance provided with six teeth, four hooks on ventral side and two knobs like on dorsal side. A male measure 8-11×0.4 mm while female 10-12×0.6 mm (Craig and Faust, 1943). Male bears copulatory bursa at posterior end. Freshly passed egg usually with 4-blastomeres.

Mode of infection: Filariform larva is infective stage always in search of host climbling on elevated protion of soil. Infection occurs when man walks bare foot on the faecally contaminated soild or works there with his bare hands the filariform larva, (the infective form) makes its passage by penetrating directly through the skin with which they come in contact. The common site of their entry are thin skin between the toes, dorsum of feet and inner side of the soles. The larva can penetrate from hair follicle at any part of the skin, which is sufficiently him.

Pathogenicity: Hookworm must be classified as one of the most destructive of human helminthes parasites with estimates of some 900 million cases worldwide. Hookworms were essentially blood suckers and can cause severe blood loss due to which causes anemia.

1.5.5 Strongyloides stercoralis

GeoFig.ical distribution: Worldwide in distribution. Maximum in tropical and sub-tropical. Also occurs in temperate climate (Craig and Faust, 1943)

Habitat: The parasitic female live in the wall (mucous membrane) of the small intestine of human, especially in the duodenum and jejunum.

Morphology: In the parasitic phase, the females are readily discovered 2.5mm in length and 40-50 « m in diameter. Male are shorter and broader than female. Eggs are thin-shelled, transparent and oval. The egg measures about 55 « m in length by 30 « m in breath.

Mode of infection: Infection occurs when a man walks bare-foot on the faecally contaminated soil. The filariform larvae penetrate directly

through the skin coming in contact with the soil. It can also undergoes 'autoinfection'; this infection has been reported to last more than 30 years in untreated human. Also, infection with these parasites can be transmitted via breast milk (Stephenson *et al.*, 2000).

Pathogenicity: Infection with *Strongyloides stercoralis* is called as strongyliodiasis. *S. stercoralis* is the fourth most important intestinal nematode infection. *Strongyloides stercoralis* have some common symptoms such as diarrhea, abdominal pain, nausea and vomiting being common gastrointestinal symptoms (Milder *et al.*, 1981, Nonaka *et al.*, 1998).

1.5.6 Enterobius vermiculars

GeoFig.ical Distribution: It is cosmopolitan in distribution, being found all over the world.

Habitat: It is especially common in children and women. Adult worm live in the caecum and vermiform appendix of human, where they remain until the eggs are developed. They generally remain on the surface of mucosa.

Morphology: Adult worm is small and white in colour. It is more or less spindle - shaped and resembles a short piece of thread. Male measure 2 to 4 mm in length and 0.1 to 0.2 mm across its girth. The posterior third of the body is curved and sharply truncated. Female measure 8 to 12 mm in length and 0.3 to 0.5 mm across its thickest part. The posterior extremity is straight and drawn out into a long, tapering and finely pointed tail.

Eggs are colourless, asymmetrical in shape, beng plano-convex i.e., flattened on side and convex on the other. Measuring about 50 to 60 « m in length by 30 « m in breadth and surrounded by a transparent shall. Contain a coiled tadpole-like larva.

Mode of Infection: Children are the usual victms and familiar infection is common. Transmission is effected from one person to another by the ingestion of eggs. The first infectionis either contagious form close association or due to contaminated food and drink. Person handling the night-clothes and bed lines of infected patients often contract the infection. There is also a possibility of the infectionbeing air-borne, especially in an infected place. Autoinfection may also occurred due to careless. Infection may occur direct form anus to mouth, a very common habit with children. Infection of less intensity may be produced by retro infection in which the larvae after hatching in the perianal region, enter the anus and migrate to caecum.

Pathogenicity: Irritation of perianal and perineal regions with exeoriation eczema and pyogenic infection from scratching occurs during hatching of eggs and migration of larvae. In females vaginitis may take place due to invasion of worm from perianal region. Internally parasites may cause mild acute or choric catarrhal inflammation of the multiple focal types from the attachment irritation of the worms. The early symptoms of this parasites are inflammation of colon mucosa with abdominal pain and irregular bowel habit, loss of appetite, appendicitis. Migration of gravid female cause intense irritation and itching towards perianal and perineal region. Insomnia, restlenssness, nervousness, even sexual disorders to hysteria, vaginitis and salphangitis is also evident.

The aim of present study is to record the prevalence of Hymenolepis *nana, Ascaris lumbricoides, Trichuris, Trichiura, hook worm, strongylodies stercoralis, Taenia solium, Taenia saginata* in the study.

1.6Parasitic Infection

WHO estimated that nearly one fourth of world's population harbor one or more intestinal parasites in their gastro-intestinal tract. Intestinal parasitic infection is a major cause of morbidity & mortality among school aged children & developing countries (WHO, 1987).

Nepal is one of the poorest countries of the world. Poverty is deeply rooted in Nepalese society, especially in rural area with percapita income of less than US $ 244 up to 2001 when 42% of the Nepal's population was below poverty line (CBS, 2001). 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 & standard of living, housing, water supply, education, sanitation, including work place environment, employment, consciousness, the coverage, accessibility & affordability of health care delivery services, social security, participation in the socio- political activities of the community, recreation & human rights (RECPHEC, 1997).

Low economic status is not the sole factor for parasitic infections, but also the increased water pollution and 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.

Twenty five percent of world's population is estimated to have infected with one or more species of soil-transmitted helminthes alone (Pawloski,

1984). The reported prevalence of intestinal parasites in Nepal varies considerably from one study to another (Rai *et al.*, 1980 & 1995) with over 90% prevalence in some areas (Rai & Gurung, 1986 & Reily, 1980). High prevalence of the parasites has been due to the contamination of the soil & water (Rai *et al.* 2000 & Ono *et al*. 2001). Moreover, emerging new parasites also have been reported from Nepal (Sherchand *et al.* 1996 & 1999).

People in the lowest socio- economies status have the highest rate of morbidity & mortality. Factors such as inadequate medical care, unemployment, low- income, race, poor nutrition, housing & education may account for higher rates of parasitic diseases. Race influences behavior, how people interact with one another, where people live, what jobs they have, how much education they have, have impact on life & opportunities in parasitic infections (Wallace & Doebbeling 1998).

Similarly, the soil contamination with helminthes eggs in Nepal is higher in wet season than in the dry season. Intestinal infections like giardiasis, amoebiasis, ascariasis, ancylostomiasis, fascioliasis & taeniasis are common in Nepal (Acharya, 1979). It is because of the dirty finger & nails which might play an important role in the transmission of intestinal parasites (Soulsa, 1975)

1.7Significance of the study

The high prevalence of intestinal parasite is an indication of human behavior walking bare foot, poor sanitary condition, illiteracy and lack of awareness and less immunity power due to illness.

1.8 Limitation of the Study

- This study is for partial fulfillment of the requirement for the master's degree of science in zoology at T.U. Katmandu of one year.
- The minimum people of ward no 4, 5 and 6 of Mithuawa VDC are taken due to financial and time constraints.
- The common stained and un stained microscopic examination method was used due to lack of resource.

CHAPTER II

OBJECTIVES

2.1 General Objectives

To study the prevalence of intestinal helminth among people in Mithuawa VDC of Rautahat.

2.2 Specific Objectives

- To determine the prevalence of different intestinal helminth parasites in the people.
- To analyze the susceptibility of intestinal helminth parasites with relation to various age and sex groups in the people.
- To determine the prevalence of intestinal helminth parasites regarding the ethnic and socio-economic condition of the people.
- To compare the health and educational status of people of different wards of Mithuawa VDC.
- To develop the recommendations for further planning regarding control of the intestinal parasites.

CHAPTER III

LITERATURE REVIEW

3.1 History of Parasitology

Up to the middle of the seventeenth century knowledge of parasitology was limited for recognition of the existence of a few common external parasites such as lice, fleas and few internal parasites like *Tapeworms*, *Ascaris, Pinworms* and guinea worms. However, they were considered as natural products of human bodies. Even Rudolphi and Bremser also supported this idea (Chandler and Read, 1961).

In Linnaeus time, people thought that internal parasites were originated from accidentally swallowed free living organisms (Chandler and Read, 1961).

During the later half of 17^{th} century Francesco Redi, Grand father of parasitology stated that maggots developed from eggs of flies. At the same time, Leeuewnhoek perfected microscopes and discovered *Giardia* in his own stool and other protozoan in rain water, saliva etc. (Chandler and Read, 1961).

In 1771, *Trichuris trichiura* was first described by Linnaeus, Grassi in 1887 and Fulleborn in 1923 carried out its complete life cycle.

Rudolphi (Linnaeus of parasitology) classified all the parasites known up to his time. In 1773 Muller discovered cercaria larvae but as protozoan.

Zeder, in 1800 recognized five classes of worms, which Rudolphi named as Acanthocephala, Nematoda, Cestoda and Cystica.

In 1876 Normand first reported *Strongyloides stercorlis*, Schoudinn, in 1903, differentitated pathogenic and non pathogenic types of amoebae.

In 1916 Stewart experimentally proved tissue migration of *Ascaris* where as Ranson 1920 1920, Stewart 1921 and Vokogawa 1923 conclusively demonstrated that only one host is required for *Ascaris*.

Human intestinal parasites have been studied by many workers. Some recent studies on human intestinal parasites are as follows.

3.2 Literature Review in National Context

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

Sharma *et al.*, (1971) carried out a study on intestinal parasites among auxiliary health workers student in Kathmandu. They examined 80 stool specimens of whom 10 did not show any infestation, the rest 70 were suffering from different types of infestations. The commonest infestation found was round worm (*Ascaris lumbricoides*). In some cases, mixed infestations were also seen.

Lynch, and Party, (1978) worked on prevalence of Hook worm and helminthes in British Gorkha recruits reported 89% of healthy appearing individuals were ifnested with hook worm, 49% with round worm and 36% with whipworm.

Nepal and Palfy (1980) reported about a study of prevalence of intestinal prarasites in the Mahanchal Panchyat. Out of 225 examined stool samplkes, 95.3% were positive. The most common parasites were round worm (63.5%) followed by hookworm (34.2%), *E. histolytica* (28.8%), *G. lamblia* (28.4%).

Khetan (1980) carried out the study of the incidence of parasitic infestation in Narayani zone. Stool examinations of 2073 patients were done between the years 1977-1980. Out of total samples 1522 stool samples had worm infestations, of which 458 samples had *Ascaris*, 591 had hook worm, 203 had *Trichuris*, 175 had *G. lamblia* and 83 had other infestations.

Integrated Family planning and parasite control project, IFPPCP (1980), examined 11,699 samples from June 1979 to 1980. Out of these 10,385 (89%) cases showed positive results in Bhaktapur and Panchkhaal area. The infection rate of the *Ascaris* (66.5%) was highest followed by hook worm (38%), *T. trichura* (20%). Infestations by other types of parasites was around 2%.

Integrated Family Planning and Parasite Control Project (1981), examined 5,532 stool samples in Panchkhal area in which 4148 (70%) were positive. The hook worm infection was highest followed by *T. trichura* and *Ascaris*. In Bhaktapur, 586 stools were examined in which 525 (92%) were found positive. Gurbacharya (1981) observed that the infections by soil transmitted helminthes in Bhaktapur and Panchakhal area were higher than any other sites of parasites.

Bol and Roder (1981) reported the soil transmitted nematodes in Lalitpur district. They observed *A. lumricoides, Nectar americanus, A. duodenale, T. trichura and S. stercorlais* are soil transmitted nematodes.

Integrated Family Planning and Parasite Control Project, IFPPCP (1982) examined 4,696 stool samples in Panchakhal area of which 3,475 (74%) stool were positive. The infection rate of *Ascaris* was 37%, hookworm was 47% and *T. trichura* was 7.3%.

James *et al.,* (1983) published a medical journal from isolated communities in Baitadi district. On which the intestinal parasites were also reported. According to field lab of study area out of 37 samples collection from the patients complained of diarrhoea or worms only 20 samples i.e. 54.05% were found to be infected with intestinal parasites. In the field, among the 20 respondent , 70% *A. lumbricoides*, 45% *E. hitolytica*, 5% *T. trichiura,* 5% with hook worm were found to be infective. Similarly 35 samples were collected from this study area and analyzed Duke University Medical Centre (DUMC) in Dhurum, North Carolina, USA. Study revealed 29 samples with 87.9% positive for *A. lumbricoides*, 15.2% for *E. histolytica*, 12.1 % for *G. lamblia*, 6.1% for *T. trichuira,* 6.1% for *S. stercoralis* and 3% for *E. vermicularis.*

Integrated Family Planning and Parasite Control Project (1983) examined 1,772 stool samples from school children in Panchakhal area of which 704 (75%) samples were positive with T. trichuira followed by 259(37%) of hook worm and 136(19%) of A.lumbricoides. During the same period a total of 310 stool samples from Bhaktapur were examined out of which 786(97%) had worm infections.

Shrestha, (1983) carried out a survey study in Bhaktapur district showed 99% stool were positive or the egg of soil-transmitted helminthes. Among them, 94% were *A.lumbricoides*, 42% were *T. trichuira* and 11% were hook worm. Similarly from Panchakhal area 41% of total stool examined were positive with the eggs of helminthes: 70% cases were *T. trichuira*, 37% of hookworm and 19% *Ascaris lumbircoides.*

IFPPP (1984) examined 416 stool samples of school children of Panchakhal. Out of which 112 (27%) cases were positive. The common intestinal helminthes were *A. lumbricoides 22(29%), hookworm 53 (47%), and T. trichuira 53 (47%).* In Bhaktapur the project examined 412 stool samples of which 295 (72%) were positive.

IFPPCP (1985) examined 25,260 stool samples of students from 46 schools of Kathmandu valley out of which 22,626 (86%) were found positive. The infection by *A. Lumbricoides* was 15,423 (68.16%) followed by *T. trichuira* 7.104 (35.8%), Giardia 2,491 (11%), hookworm (6.7%) and tapeworm 220 (0.97%).

Suguri *et al.*, (1985) conducted to find the helminthes 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 helminthes infection rate was found 36.8% including round worm (50.3%), hookworm (44.1%), whipworm (47.6%), pinworms (1.2%) and Taenia species (.1%).

Gupta and Gupta (1998) collected 285 stool samples in Kirtipur. Among them 192 (67.36%) was found to be positive for intestinal parasites. Out of 192 positive stool samples, 49 (25.52%) cases were infected with protozoan parasites, 9.12% by *G. lamblia* and 9.47% by *E. histolytica*. Out of 192 stool samples, 155 (80.72%) were positive for helminthes parasites: *A. lumbricoides (40%), T. trichuira (25.26%), A. duodenale (4.56%), H. nana (2.46%) and T. solium (0.55%).*

Gellman (1998) carried out an extensive disease survey in Patan Hospital General Outpatient clinic from December 1986 through November 1987. A total of 79,404 people were seen during the period and the incidences of the related infection disease were as follows: Amobic disease 1.7% Giardiasis 2.7%, Ascariasis 3.5%, hookworm infection 0.85% and other parasites 0.7%

Rai *et al.,* (1991) showed the prevalence of various intestinal parasites in Kathmanu valley, Nepal. The overall prevalence of parasites was 13.9%. There were no significant differences in the prevalence between two sexes. Intenstinal parasites were more common among the children below 15 years than in adults more than 15 years. *A. lumbricodes* was the common parasites followed by hookworms, Taenia species, *E. vermicularis* and others. Among protozoan parasites, G. Lamblia was the most common followed by *E. histolytica.*

Blangero *et al.,* (1993) studied helminthes infections in Jiri, concluded that round worm, whipworm and hook worm were endemic in Nepal and are the major health problems for the population.

Gianotti (1993) surveyed, in 1990, a total 137 cases from Kathmandu valley and 22 cases from Solukhumbu in children. He reported *Ascaris* 11.2%, *Trichuris 9.8%, G. lamblia 5.9%, E. histolytica 5.3%,* hook worm 3.3%, *H. nana 0.5%* and *T. solium* 0.5% in Kathmandu valley cases, but in Solukhumbu cases *Ascaris* 22%, *G. lamblia* 31.8% and *E. histolytica* 9.1%.

Sherchand *et al.,* (1996) carried out study on intestinal parasite from Kathmandu area of Nepal and reported 28.1% parasitic load among subjectively healthy children (HC) and 38.8% parasitic load among healthy adults where as 62.7% total parasitic load was record among children with abdominal discomfort. *H. 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 adults, while 13.3% prevalence was found in sick children and 11.5% in sick adults.

Shrestha *et al.,* (1997) carried out a study on, "prevalence of intestinal parasite among the primary school children of two schools in Dharan". A total of 293 stool samples were examined for different intestinal parasites out of 293 samples in which 27.30% of stool samples were positive for intestinal parasites. Highest prevalence was recorded from that of *G. lamblia* - 53.75% which was followed by 17.5% of *E. histolytica,* 15% of *A. lumbricoides,* and 5% of mixed infections.

Karki and Parija (1997) worked on hospital based on study of intestinal parasitic infection in Dharan. Total of 6,230 stool specimen from patients attending B.P. Koirala Institute of Health Sciences, Dharan, Nepal during a period of 36 months (1994 July to 1997 June) were examined for intestinal parasites. Among 6230 stool specimens only 943 positive stool samples 876 i.e.92.9% had single infection, rest 67 (71%) had multiple infection. The *E. histolytica* was recorded as most frequently infected parasite i.e. 30.54% followed by 24.5% of hook worm. Majority of parasites, except hook worm were recorded as more prevalent in children upto 9 years i.e. 5.4% of *E. hsitolytica,* 5.4% of *G. intestinalis* and 4.2% of *A lumbricoides* where as hook a worm infection was found to be higher among adults of 22-29 years. Taenia was demonstrated only in 1.6% of positive stool.

Chettri *et al.,* (1997) analyzed the parasite infection scenario of Nepal and concluded that 50% of people were infested by helminthes. *A. lumbricoides* was found to be top on the list of Helminthes and Giardia in protozoa from 400,000 stool samples reports studied by different organizations at different places and periods (from 1979 to 1995 i.e. 16 years).

Bhattarai *et al.,* (1998) studied disease pattern of the patient attending medicine unit of three mobile specialists health camp in Taplejung and

reported 6% of worm passing with stool and 1% of tapeworm segment out of total 19,315 study population.

Navisky *et al.,* (1998) exmined faecal specimens from 292 pregnant women (age 15 to 40 years) and 129 infants (age 70 to 140 days) for helminthes eggs by the Kato-Katz method. These stool speciemens were collected from Sarlahi district in Southern Nepal among pregnant women was found to be 78.8% hookworm, 52% *A. lumbricoides* and 7.9% *Trichuira.*

Rai, *et al.,* (1999) Ascaris, Ascariasis, and its recent scenario in Nepal and suggested Ascaris as leading human parasites also reported as major causes of public health problem. The study reported that over 75% of people were infestated by *A. lumbricoides* in rular areas, where as hospital based studies in Kathmandu over a period of one decade also shows a static annual prevalence with mean of approximately 35%.

Rai *et al., (2000),* investigated the contamination of soil with helminthes eggs in Kathmandu valley and outside valley in Nepal. Out of 156 total samples 122 were taken from Kathmandu valleyand 34 samples from out side valley. The overall soil contamination rate was 36.5%. The prevalence was uniform in Kathmandu valley (36.3%) 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 recrded. A. lumbricoides,Toxocara species, T. trichura , capilliaria species and trichostrongylus and 2 spices of cestoda *H. nana* and *H. diminuta*. *Ascaris lumbricoides* was prominent in Kathmandu valley while *trichostrongylus* was commonest outside of the valley.

Rai *et al.,* (2001) studied on intestinal parasite infections in healthy school children of Lalitpur district. Stool samples of 595 healthy urban and rural school children of 7–12 years age group were collected. Among them 81.94% of children were found to be infected with parasites. Among them prevalence of *A. lumbricoides* was found to be highest (73.45%) in rural and (71.66%) in urban children. But *T*

trichuira was found to be higher among children of urban area 37.91% where as that of rural was 27.27%.

Rai *et at.,* (2002) studied intestinal parasites among school children in 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 parasites. *A. lumbricoides* was the most common (69.6%) parasites detected followed by hookworm (19.2%), whipworm (5.9%), *G. lamblia* was only protozoan parasite detected in this study (5.2%) where as dalit had significantly higher prevalence (74.1%).

Karki *et al.,* (2004) conducted study among Magars in Barangdi VDC of Palpa from July 2002 to June 2003. A total of 157 samples were examined and the total prevalence was 66.88%. The highest prevalence was found to be due to *A. lumbricoides* (50.32%) followed by hookworm (24.2%), *T. trichuira* (72.2%), *Taenia species* (8.28%), *H. nana (6.37%)* and *S. stercoralis* (1.91%).

Parajuli (2004) studied on the prevalence rate of intestinal parasites in Musahar community in Chitwan district. A total of 183 stool samples were examined of which 77.05% were positive. Female had higher prevalence (79.2%) than male (74.4%), *A. lumbricoides* had higher prevalence (48.08%) followed by *A. duodenale* (34.94%), *T. trichuira* (22.4%), *E. histolytica (15.3%), S. stercoralis (8.19%), G. lamblia (7.65%), H. diminuta (4.37%), H. nana (2.73%)* and Taenia species (1.63%).

Chandrasekhar and Shivananda *et al.,* (2005) conducted a study to estimate the prevalence of intestinal parasitic infestations among school children in Kaski District of Western Nepal. A total of 2091 stool samples were collected from school children selected from 11 rural and eight urban schools. the stool samples were examined for evidence of parasitic infections by direct microscopic examination. Prevalence of intestinal parasites was 21.3%. There as a significant difference in prevalence between urban (18.7%) and rural (24.1%) school samples. *Giardia lamblia* (13.2%), *Ascaris lumbricoides* (2.1%) and *Entamoeba*

histolytica (14.7%) were the commonest parasites isolated. The results indicate that intestinal parasitic infestation among school children in the study area in mainly water-borne. The burden of parasitic infestations among the school children, coupled with the poor sanitary conditions in the schools, should be regarded as an issue of public health priority. This strongly supports the need for school health programmes that will involve periodic deworming, health education and improvement of school sanitation.

Sharma *et al.,* (2005) studied the prevalence of intestinal parasitic infestation in school children in the northern part of Kathmandu valley, Nepal. This paper presents the status of intestinal parasites in public school children (269 girls and boys, aged 4 to 19 years) were included in this study. The overall prevalence of parasite was (6.6%) (95/533) with no significant difference between boys and girls ($p>0.05$). Half (53.8%; 191/355) of children has multiple parasitic infections. Altogether, nine type of parasite were recovered. The recovery rate of helminthes was higher (76.9%) than protoza (23.1%). *T. trichiura* was the most common helminthes detected, followed by hookworm, *A. lucmricodies* and others E. coli was the most common protozoan parasite followed *E. histolytica, G. lamblia* and others.

Ghimire and mishra (2006) conducted a study to highlight the intestinal parasites in the role of diarrhea in Human Immunodeficiency Virus infected patients who attended in Sukra Raj Tropical and Infectious Desease Hospital of Kathmandu, Nepal from May 2003 to April 2004. The total of 86 stool samples were collected from 86 HIV patients once and they were examined by direct semear methods modified kinyoun acid-fast stain. Here, 18 females (78.3% out of 23 HIV paitents and 40 males (63.4%) out of 63 patients were found to be infected with intestinal parasites with the prevalence of 67.4%. Though in August and October 2003, 100% samples were positive, there was statistically nop significant difference with months ($x^2=18.83$, $P>0.05$). In this study, *Cyclospora* (19.8%) *Cyptosporidum* (14.0%), *Isospora (3.5%), Strongyloides (10.5%), Ascaris (4.7%), Giradia* (2.3%) were reported with statistically significant ($x^2=8.3$, $p<0.05$). The total prevalence of coocidian and non-

coccidian prasites was 37.0% and 30.2% respectively with statistically significant (x^2=15.51, P<0.05). The prevalence was found 100% in drivers, 80% in farmers, 100% in housewives and 48.9% in sex workers. Among 48 diarrheic patients, 36 (75.0%) showed infection. 17 (35.4%) was actue diarrheic among which 11 (64.7%) was positive. Among 31 (64.6) chronic diarrheic, 25 (80.6) was positive. They conclude that the control of intestinal parasite involves adequate treatment and proper health education, provision of adequate toilet facilities and pipe borne water.

3.3 Literature Review in Global Context

Virk *et al.,* (1994) worked on prevalence of intestinal parasites in rural area of District and Shahjahanpur Uttar Pradesh. Out of 381 individuals examined 111 i.e.29.2% were found positive for one or the other intestinal parasite *A. lumbricoides* superseded all the parasite by showing positivity of 17.85% followed by hook worm 7.87%, Tapeworm 3.41%, *H. nana* 3.15%, *E. vermicularis 0.52%, T. trichiura 1.05%, E. istorlyitca 2.36%* and *G. lamblia 0.26%*.

Navarrete *et al.,* (1994) worked in prevalence of infection by intestinal helminthes and protoza in school children from a coastal locality in the province of Valdivia Chile. During July-August (1989), 219 carpological samples from primary school children were obtained and examined. The most predominant intestinal parasites were *E. histolytica* 18%, *Giardia lamblia27.9% A. lumbricoides12.7%, T.trichiura32%,E.vermicularis* 1.6%, *H. nana 0.4%.* The high prevalence of intestinal parasites in those studies was related to sanitary condition of houses and fecal contamination of the estuary of the Valdivia river.

Saha *et al.,* (1995) worked on intestinal parasitism. A childhood problem in Rural Bengal, a total of 221 feacal samples were obtained from rural community during November 1992 to April 1994. *G. lamblia* 17.2, *E. histolytica* 8.1%, *E. vermicularis* 12.2%, *A. lumbricoides* 8.1% was found to be common amongst intestinal parasites.

A significantly lower infection rate was observed in children below one year 24.4% as compared to older age group 66.4%.

All Maldani *et al.,* (1995) worked on prevalence of intestinal parasitic infectins. Among female housekeepers in Abha district of Saudi Arabia, a group of 5518 female Asian housekeepers working in Abha district of Saudi Arabia were examined during 1990 to 1992. The study revealed on overall prevalence of 45.6%. The common parasites was found to be *T. trichuira* 28.8%, *A. lumbricoides* 22.2%, hook worm 14.9%, *E. vermicularis* 0.8%, *S. stercoralis* 0.6%, *E. histolytica* 1.2% *H. nana* 0.2% and *G. lamblia* 0.1%.

Kobayash *et al.,* (1995) worked on prevalence of intestinal parasitic infection in five farms in Holambra, Sao Paulo, Brazil. An October (1992), 222 stools samples were collected from people of 5 farms in Holambra and examined. The result of study revealed 70% overall prevalence rate. The prevalence of common intestinal parasites recovered was 5.4% of *A. lumbricoides,* 8.6% of *T. Trichiura,* 19.8% of *N. Americans,* 10.4% of *S. stercoralis,* 1.4% *E. vermicularis,* 0.9% *H. nana* and 10.4% of *G. lamblia.*

Suguna *et al.,* (1996) worked on intestinal parasitic infection among different population groups of Andaman and Nicobar Islands. A total of 1384 stool samples collected from preschool aged children and adult of rural as well as urban settlements of two tribal groups (viz, Nicobarese and Onges) were examined. The microscopic examination resut revalence rate was 40% of *A. lumbricoides,* 10.8% of *T. trichuira,* 0.4% of hook worm, 2.5%of *G. lamblia* and 0.8% of *E. histolytica* in urban settings. While out of 490 stools samples from rural setting 24.3% of *A. lumbricoides,* 5.9% of *T. trichuira,* 1.25 of hookworm, 12.4% of *G. lamblia* and 2.7% of *E. histolytica.* In Nicobar, out of 41 stool samples *A. lumbricoides* had highest prevalence followed by 24.4% of *T. trichiura* and 2.4% of hook worm and *E. histolytica.*

Dorea *et al.*, (1996) carried out a program for control of parasitic infection among school children in the peri-urban area of Botecatu, Sao and Paulo, Brazil. A total of 219 (School children) stool samples of 7-18 years age group were collected. The study of result revealed that 123 I.e. 5.61% was found to be infected with one or more parasitic to various antiphrastic treatment schedules, 89% student were revaluated next time after 4-6 months as post chemotherapy. The result indicated that the combination of treatment with prophylactic measures has been successful in the control of parasitic infection. Since're infection rates were generally low (<0=5.3%) except for G. lamblia infection 18.6% and a marked reduction on the prevalence rates was observed with a significant percentage of cure (I.e. > or = 73.1%) in children infection with most parasitic species.

Menon *et al.*, (1997) studied on profile of intestinal helminthes is in school aged children in the city of Abidjan. A total of 1001 fecal samples from school children aged from 4-15 years were collected and examined. The overall prevalence for intestinal parasites was 36.5%. The more prevalent species were *T. trichuira* 23.4% *A. lumbricioides* 15.5% hook worm 6.3% *S. stercoralis* 1.4% *H. nana* 1.1% and *E. vermicular* is 0.2%. The males were found to be more infected than females. Most infected group was 12-13 years while least infected group was 4-5 years age group.

Nicole *et al.*, (1998) carried out a study on intestinal parasitic infection in servia. A total of 5981 stool samples were collected from school children of 7-11 years age group during 1984-1993. The more prevalent intestinal parasites recovered were *E. histolytica* 0.02% *G. lamblia* 6.8%, *H. nana* 0.06%, *E. vermicular* is 14.7%, *A. lumbricoides* 33% and *T. tricguira* 1.8% with overall prevalence of 24.6%.

Toma *et al.*, (1999) carried out questionnaire survey and studied prevalence of intestinal helminthes infections in Barru, Sulawesi Indonesia. A total of 654 fecal samples were collected and examined. The most common enteroparasite were *A. lumbricoides*, *T. trichiura*,

hookworm and *S. stercoralis, H. nana* infection was also cofirmed T. *tirchiura* was most common followed by hookworm and *A. lumbricoides* hookworm infection was significantly higher in males than in females of older age. The inhabitant with higher education background had significantly lower infection rates of *A. lumbricoides* and *T. trichiura.* The prevalence of Hookworm infection was not significantly different between in inhabitant owning latrine and without it, but prevalence of *Ascaris* and *Trichuris* differed significantly.

Paul *et al.,* (1991) carried out a study to determine the prevalence of intensity of intestinal helminthes infections. The children were between 7 to 13 years of age and belonged to lower socio-economic status. Stool sample 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. tirchiura* and hook worm. The overall prevalence of infection was 82%. *A. lumbricoides* was the most common infection with a prevalence of 7.5% followed by *T. trichuira* of 66% and hookworm of 9%.

Lee *et al.,* (2009) carried out a survey on the intestinal parasites of the school children in Kaohsiung country. This study was conducted among school children form September to December 1999. The overall infection rate in i305 children was 17%. The most common intestinal parasite detected was *A. lumbricoides,* hookworm, *T. trichiura, H. nana* and *G. lumblia.* the male had highest infection rate (24%) than females (11%). The infection rate of aboriginal and non-aboriginal children was 17% and 14% respectively. Grade 1 and grade 6 had the infection rate (21%) out of 302 tape perianal examination revealed 25% prevalence.

Sofia *et al.,* (2001) worked on intestinal parasitic infections in the University campus of Aligarh. Faecal samples of 3695 persons complaining for diarrhea, dysentery, abdominal pain another bowl disturbances were examined. Out of total samples, 2152 samples (58.24%) were found to be positive for *E. histolyitca, A. lumbricoides, G. lamblia.* Among them, *E. histolytica* showed highest prevalence rate

(37.55%) followed by *G. lamblia* (14.95%) while *A. lumbricoides* showed the least infections rate (5.71%).

Smith *et al.,* (2001) conducted a cross sectional survey between January and March 1998 in four rural community in Honduras, Central America. He examined the prevalence and intensity of *A. lumbricoides* and *Trichuris trichiura* infection among 240 faecal specimens of 62 households. The overall prevalence of *A. lumbricoides* and *T. trichiura* was 45% and 38% respectively. The most intense infection of *A. lumbricodes* and *T. trichiura* was 45% and 38% respectively. The most intense infection of *A. lumbricodes* and *T. trichiura* were found in children aged 2–12 old.

Olsen *et al.,* (2001) conducted a study in Kisumu district, Kenya to identify important risk factors for infection with intestinal helminth using traditional epidemiological methods. This study was focused on sanitation practices and local illness perceptions. The multiple logistic regression analysis revealed that the absence of latrines was a significant predictor for hookworm infection. The analysis also revealed that households without soap had a 2.6 times higher risk of being infected with *A. lumbricoides.* The presence of children of 5 years and under in the household was a predictor for infection with *A. lumbricoides,* while the absence of the age group was predictor for hookworm infection.

Fernandez *et al.,* (2002) carried out a comparative study of the intestinal parasites prevalent among children living in rural and urban setting in and around Chennai. A total of 324 stool samples were collected and examined. Out of 125 specimens tested from the rural location, the overall prevalence of intestinal parasite was 91%. *A. lumbricoides* was the most common helminthes parasite detected 52.8% followed by *T. trichiura* 45.6%, *A. duodenale 37.6%* where as *G. lamblia* (16%) was the most common protozoan parasite detected followed by *E. histolytica* 4% in contrast under urban setting out of the 199 stool sample tested the positivity rate was 33%. *G. lamblia* was the most common parasite detected 22.6% followed by *E. histolytica* 10.6%. Other intestinal parasite such as *T. trichiura* 2.01%, *H. nana* 1.01%, *E. vaermicularis*

0.5% and *A. lumbricoides* 0.5 were found to have much lower prevalence in comparison to the rural area.

Rao *et al.,* (2002) studies worm infestation and anaemia, a public health problem among Tribal pre-school to Madhya Pradesh. Total samples of 985 from pre-school children wre collected from Jabalpur District. The result revealed that 48% of them had intestinal parasite infection. Common parasites observed among them were *H. nana* 16%, hookworm 28.26%, *A. lumbricoides* 34% and *E. histolytica 7%.* High prevalence of anaemia could be due to indiseriminate defecation, low socio-economic status, ignorance and low standard of personal hygiene.

Hiroshi *et al.,* (2002) studies on the prevalence and intensity of *A. lumbricoides* in 492 children from five rural villages in the Northern area of Pakistan. The overall prevalence of *A. lumbricoides* was 91%. The most intense of *A. lumbricoides* infections were found in children aged 5 –8 years.

Waikagul *et al.,* (2002) conducted a cross sectional study of the prevalence of intestinal parasitic infections at eight schools in Boklav district and four schools in Chelerm Parkiet district, Nan providence, in January and February, 2001. A total of 10% faecal samples were examined using the formalin ether sedimentation technique. Results revealed that the rate of helminthes infection was 60.6% while protozoa accounted for 36.2% of infections. Mixed infections were common, resulting in a total prevalence of both parasites of 68.1%. Helminth parasites, listed by frequency of infections were *A. lumbricoides* (21.7%), hookworm (18.5%), *T. trichiura* (16.3%), *Opisthorchis viverrini (1.7%), S. stercoralis (0.9%),* and *E. vermicularis* (0.9%). THe protozoan infections were *E. coli (25.8%), G. lamblia (5.3%), Endolimax nana (2.5%), E. histolytica (1.4%), B. hominis (0.8%), Chilomastix msenili (0.3%)* and *lodamoeba butschlii* (0.1%).

Kaur *et al.,* (2002) determined the parasitic causes of diarrhea in children in Delhi by the direct smear technique; stool specimens of 127 children were examined for intestinal parasites. In 59 cases (46.5%) intestinal

helmintes and protozoa were demonstrated. *A. lumbricioides* was observed in 1 (0.8%) cases while *T. trichiura* was found in 3(2.4%) protozoan parasites included *G. intstinalis* and *E. histolytica* in 14(11%) cases each *Blandtidium coli* in 3(2.4%) cases and cryptosporidium sp. In 24 (18.9%) patients. Mixed infection was not seen in any of the cases.

Bong-gin *et al.,* (2003) carried out small state survey to investigate the status of intestinal protozoa and helminthes infection of inhabitants in Roxus city, Mindoro, the Philippine. A total of 301 stool samples were collected. The overall positive rate was 64.5% and that of male and female were 56.6% and 72.5% respectively. The highest infected helminthes was *A. lumbricoides* (51.2%) followed by *T. trichiura* (27.6%), hookworm (8%) and *E. vermicularis* (0.3%). The protozoan infection status revealed that *E. coli* was the most frequent (15%). *lodoameoba bulerschlii* and *E. histolytica* were found but few. The multiple infection more than two parasites was 29.6% and double infection with *A. lumbricoides* and *T. Trichiura* was common. The intestinal helminthes infection was highly prevalent in this area.

Miller *et al.,* (2003) examined the presence of intestinal protozoan and helminthes infections and their association with clinical signs and symptoms in children in Trujillo, Venezuela. The point prevalence of protozoan infection was 21% for *G. lamblia,* 1% for *E. histolytica/disper, 4%* for *E. coli,* 16% for *Blastocystic hominis* and 89% for cryptosporidium. Prevalence of helminthes infections wsa 11% for *Ascaris,* 11% for *T. trichiura,* 0% for *S. stercoralis* and 2% for *H. nana.*

Amare *et al.,* (2004) conducted a community-based, cross-sectional study in Jimma town from October 2004-January 2005. Of the total, 754 (83%) had one or more intestinal parasitic infections. *T. trichiura, A, lumbricoides* and *S. mansoni* were detected in single infection in 124 (16.4%), 44(5.8%) and 11 (1.5%) of the infected study subjects, respectively. Polyparasitism was found in 515 (56.7%) of the total examined. Up to 5 parasites were detected in some individuals. *T. trichiura* with *A. lumbricoides,* hookworm and *S. monsoni* constituted 102 (13.5%), 33 (4.3%) and 17 (2.2%) of the double infections,

respectively. *H. nana* and *S. mansoni* predominantly affected males than females (P<0.05). The prevalence of *Giardia* trophozites and *H. nana* were significantly higher in pre-school children than other age groups (P<0.05). Higher proportions of teenagers were infected by *A. lumbricoides* and *S. mansoni*. Taeniasis was also dominant in teenagers.

Zakai, Haytham and Ahmed (2005) studied the intestinal parasitic infections among primary school children in Jeddah, Saudi Arabia the prevalence of intestinal parasitic infections among primary school children, were studied by selection of seven male and seven female schools to cover different parts of Jeddah city. A total of 1000 questionnaire were distributed to primary school children, filled by the child's guardian and stool samples were collected from those who agreed to participate in the study. 231 stool sample only 22 (9.5%) samples had parasites. *G. lamblia* was the most reported parasite. Double infection was seen in only 3 samples. The ow prevalence of intestinal parasites among the study group reflects the outstanding health and hygienic care in primary care in primary schools visited.

Park *et al.,* (2006) determined the status of *Enbterobius vermicularis* infection among children (3-10 years) in 39 kindergartens and primary school et were examined using the cello-tape and swab method during July and August 2000. O 1, 661 children examined. 307 (18.5%) were found to be positive for *E. cermicularis eggs.* The highest infection rate (59.3%) was found to be garten and a branch school of Shinyang primary school on Chujadp, jeju-do. Remarkable differences in egg positive rate were observed in different localities. The egg positive rate for boys (21.3%) was significantly higher than that the girls (15.4%). However, positive rates were not significantly dependent on age.

AKK us et al., (2006) worked out the effect of social-demo Fig.ie characteristics and liygienic habits on the prevalence of *Enterobious vermicularis* in primary school children. In our country, parasitic disease in children and in particular, those caused by *Enterobious vermicularis* are wide-spread and are an important health problem. The level of education, nutrition, customs and social-economic medical-social and

living standards as well as the climate and sanitary facilities play an important role in the incidence and prevalence of intestinal paradite.

Gundz et al., (2006) studied the precalence of intestinal parasites in children with gastrointestinal symptoms associate with socio-economic conditions in Mains a region. Stool samples of 3,216 children were examined by the saline-economic and environmental factors. Stool samples of cellophane tape method was also performed on 2,160 children. 'According to the educational level and the economic status of families the patients were classified as coining from underdeveloped, developing and developed area. The most common parasite was *G. intestinalis (40.1%)*, followed by *E. coli* (10.2%). *E. vermicularis* eggs were directed by the cellophane tape method in 221 (10.3%) out of 2, 160 patients. The positive cases were evaluated from underdeveloped and developing areas.

Soldan *et al.,* (2006) carried out the intestinal parasitism in children of Trujillo (peru) to create a prevention and control program. Feacal samples of 489 children were examined. The general prevalence of intestinal parasites was found to be 65%. The most frequent pathogenic enteroparasites were *G. lamblia* (26.4%). *Cyclospora cataensis* (12%), *H. nana (2%), H. diminuta (1.6%) and Crypposporidium spp (1%)*

Chandrasena *et al.,* (2007) carried out the growth status and intestinal parasitic infections among a group of children displaced by was in Sir Lanka was investigated. There was a high prevalence of growth retardation and intestinal parasitic infections (40.2%) among the study population. provision of adequate food, purified drinking water sanitation and broad- spectrum anthelminties eas recommended.

Koltas *et al.,* (2007) studied the importance of the detection of amoebic antigens in stool samples for the diagnosis of *Entamoeba histolytica* infections, among children in southern Turkey. *E histolytica* is the predominant causative agent of human amoebiasis, a significant and common diarrhoeal disease among children of developing countries. The sample investigated came from 131 children (aged <15 years) with

diarrhea, who lived in the previneces of Adana and Mersin, in sourthern Turkey. Microscopy had a specificity of 98.2% a positive predictive value of 87.5% and a negative predictive value of 93.1% but a sensitivity of only 63.6%.

Agbolade *et al.,* (2007) worked on the intestinal helminthes and Schistosomiasis among school children were investigated in an urban and some rural communities of Ogun State South West Nigeria. Fecal samples of 1,059 subjects (524 males, 525 females) ageds 3–18 years were examined between June 2005 and November 2006. The pooled prevalence of infection was 66.2%. *A lumbricoides* showed the highest prevalence (55.4%) followed by hookworms (17.5%), *T. trichiuris* (10.4%) *Taenia spp* (9.6%) and *E. vermicularis* (0.3%). The prevalence of *A. lumbricoides,* hookworm, *Taenia* spp *S. mansoni* and *S. steroralis* in the urban center were similar to those in the rural communities. The study demonstrates the need for urgent intervention programs against intestinal helminthiasis and Schistosomiasis in the study area.

Kassem *et al.,* (2007) studies the intestinal parasitic infection among children an dneonates admitted t Jbn-sina hospital sirt, Libya. A total of 350 stool samples from 196, males and 154 female children and neonates admitted I Ibn-sina hospital sirt, were examined from June 2001 to may 2002, to determine the prevalence of intestinal parasites. Intenstinal parasitic infections were identified in 196 (56%) of children and neonates. No Intestinal helminthich parasites were detected but 13 intestinal protozoan parasites were detected. the most prevalent protozoan was *E. hostolytica/Edipar* (36.57%) *B. hominis (12.57%), G. lambilia (10.29%), I. belli (3.43%),* and *B. coli (0.86%)* to the latter was exist between the prevalence of pathogenic and non-pathogenic protozoan parasite ($P<0.05$). High prevalence of *E. histolyica* and *G. lamblia* in both sexes.

Wani and Ahmad (April-October 2007) conduced a study to determine the prevalence of intestinal helminth infestation in school children of Pulwama district, Kashmir, India, Stool samples were collected from 199

students enrolled in eight middle level schools, which were processed by using both simple smear and zinc sulphate concentration method and surveyed, 73.36% had one or more intestinal helminthes. prevalence of *Ascaris lumbricoides* was highest (69.84%), followed by *Trichuris trichiura* (31.65%), *Enterobius vermicularis* (16.80) and *Taenia saginata* (3.01%).

Sirima Kitavatanachai, Siriphan Boonsilp and Suphatra Watanasatitarpa (April 2007–September 2008) conducted a study in suburban area at Simum subdistrict, Mueang district Nakhon Ratehasima Province. A total of 214 stool samples, from 85 males and 129 females were examined using simple direct smear. The results showed that the prevalence rate of protozoa infections by simple direct smear method was 17.3% (37 infected samples) in 11 males and 26 females and were from all age groups. The prevalence rate of helminthic infections was 7% total by Kato's thick smear and Modified Harada-Mori Filter Paper Strip culture technique. Kato's Thick smear Technique showed the highest rate of *Strongyloides stercolaris* (2.8%), followed by hookworm infection (1.4%) *Taenia* sp. (0.9%), and *Enterobius vermicularis* (0.5%), respectively. All infections showed a light intensity, (<200 epg), using Kato-Katz thick smear. Modified Harada-Mori's culture Technique showed higher *S. stercolaris* (3.3%) and hookworm infection (2.3%) than Kato's thick smear.

Ben Musa (2008) studied the long term formalin preserved stool samples for detection of intestinal parasites from school aged children in Tripoli, Libya. A total of 943 single stool samples were collected from school aged children (5–14 years old) in the city of Tripoli. The samples were preserved in 105 formalin and examined by routine microscopy using normal saline and Lugol's iodine preparation as well as the formal ethyl concerntration method after as storage period of 12 months at room temperature of 949 sample examined 4.5% were positive. *G. lamblia* and *E. coli* were the only protozoan parasites identified with an infection rate of 3.2% and 1.3% respectively. No helminthes were detected in any of the samples. About 14% of the children had intestinal yeast infection,

Candia. albicans in their stools of which 6.3% was infected with intestinal parasites.

Wani *et al.,* (2008) worked on the prevalence of intestinal parasites an associated risk factors among school children in Sri-nagar city, Kashmir, India. Stool, Samples were collected from 514 students enrolled in 4 middle schools. Of the 514 students surveyed 46.7% had one or more parasites. Prevalence of *Ascaris lumbricoides* was highest (28.4%) followed by *Giardia lamblia (7.2%), T. trichiura (4.9%)* and *T. saginata* (3.7%). Conditions most frequently associated with infection included the water source, defecation site. Personal hygiene and the extent of maternal education.

Almeric *et al.,* (2008) carried out the prevalence and risk factors for giardiasis among primary school children in Damascus, Syrua. A cross-sectional study was carried out on school children from 23 primary school in Damascus, between march and June 2006. Data were collected from 1469 children of both genders from urban and rural regions. Results showed that 206 (14%) of 1463 children were infected with other sorts of intestinal parasites. No correlation was found between giardiasis and age, gender, residence in urban and rural areas, availability of piped water or sewage system. In contrast, both mother (p=0.003) and father (p=0.0018) levels of education and the number of sibling in home (p=0.014)were found significant predicators of giardiasis.

Areeshi *et al.,* (2004) studied the *Cryptosporidium* species causing acute diarrhea in children in Antananariov, Madagasear-A13month Study of Children presenting with acute darrhoeal disease at hospitals and rehydration clinics in Antananarivo, Madagascar, was under taken between May 2004 and May 2005.

Nematian *et al.,* (2008) worked on the giardiasis and other intestinal parasite infections in relation to anthropometric indicators of malnutrition. In the present, cross-sectinoal study, the association between previously undiagnosed intestinal parasitic infections and growth was assessed in 1929 children attending elementary schools in

Tehran. The physical growth of these children was investigated by recording by weights, heights and weight - for - age Z scores. Faecal samples were collected and each checked for intestinal parasities using four methods. The prevalence of infection with any intestinal parasite was 18.4%. Although at least nine species of parasite were detected, only two, *G. lamblia* and *E. vermicularis,* were each significantly associated with low height for age and low weight for height.

Oninal *et al.,* (2008) carried out the prevalence and intestinal helminthic infection among primary school children were determined in rural and urban communities of the central local government area in south-western Nigeria. Oveall, 366 rural and 383 urban school children were investigated and 30.0% of them were found to be harbouring at least one species of intestinal helminth. The mean intensitives of infection in terms of excreted eggs/ faeces of those infected, were 2371.4 for *Ascaris*, 1070.6 for hookworm and 500 for *Trichuris*. Intestinal helminthiases still clearly represent a common child hood health problem in the study area, particularly in the rural communities.

Ayalev *et al.,* (2008) studied the *Crypotosoporidium* and *Giardia* infection and drinking water sources among children in Lege Dini, Ethiopia, in November 2005 and May 2006. Of 655 children examined, 80 (12.2%) were infected with *Cryptosporidium* and 231 (35.3%) with *Giardia*. No difference was observed in the prevalence of Cryptosporidiosis and gardiasis (P>0.05) between children drinking water from protected and unprotected sources.

Almerie *et al.,* (2008) carried out the prevalence and risk factors for giardiasis among primary school children in Damascus, Syrua. A cross-sectional study was carried out on school children from 23 primary school in Damascus, between March and June 2006. Data were collected from 1469 children of both genders from urban and rural regions. Results showed that 206 (14%) of 1463 children were infected with other sorts of intestinal parasities. No correlation was found between giardiasis and

age, gender, residence in urban and rural areas,availability of piped water or sewage system. In contrast, both mothers(p =0.003) and fathers (p=0.0018) levels of education and the number of siblings in home(p= 0.014) were found significant predicators of giardiasis.

Areeshi *et al.,* (2008) studied the *Cryptosporidium* species causing acute diarrhea in children in Antananarivo, Madagascar - A13-month study of children presenting with acute diarrhoeal disease at hospitals and rehydration clinics in Antananarivo, Madagascar, was undertaken between May 2004 and May 2005.

Nematian *et al.,* (2008) worked on the giardiasis and other intestinal parasitic infections in relation to anthropometric indicators of malnutrition. In the present, cross-sectional study, the association between previously undiagnosed intestinal parasitic infections and growth was assessed in 19, 2.9 children attending elementary schools in Tehran. The physical growth of these children was investigated by recording by weights, heights and weight - for - age Z scores. Faecal samples were collected and each checked for intestinal parasities using four methods. The prevalence of infection with any intestinal parasite was 18.4%. Although at least nine species of parasite were detected, only two, *G. lamblia* and *E. vermicularis,* were each significantly associated with low height for age and low weight for height.

Oninal *et al.,* (2008) carried out the prevalence and intestinal helminthic infection among primary school children were determined in rural and urban communities of the central local government area in south-western Nigeria. Oveall, 366 rural and 383 urban school children were

investigated and 30.0% of them were found to be harbouring at least one species of intestinal helminth. The mean intensitives of infection in terms of excreted eggs/ faeces of those infected, were 2371.4 for *Ascaris*, 1070.6 for hookworm and 500 for *Trichuris*. Intestinal helminthiases still clearly represent a common child hood health problem in the study area, particularly in the rural communities.

Ayalev *et al.*, (2008) studied the *Crypotosoporidium* and *Giardia* infection and drinking water sources among children in Lege Dini, Ethiopia, in November 2005 and May 2006. Of 655 children examined, 80 (12.2%) were infected with *Cryptosporidium* and 231 (35.3%) with *Giardia*. No difference was observed in the prevalence of Cryptosporidiosis and gardiasis (P>0.05) between children drinking water from protected and unprotected sources.

CHAPTER IV

MATERIALS AND METHODS

Study Area

The study was conducted among 450 randomly selected people of Mithuawa VDC with different occupations including 240 males and 210 females. The study was divided into two parts:

4.1 Stool samples collection

Out of 450 randomly collected stool samples 150 were from people of ward no. 4, 150 were from ward no. 5 and 150 were from ward 6. The pathological work was conducted at district hospital Gaur from April 2008 to March 2009.

To insure better condition during samples collection the following precautions were taken:

i. The sampling vials were properly washed, dried and filled with 2 - 5 ml of 5% formalin solution.
ii. Each stool container was distributed after interviewing individually and the stool samples were collected later for examinations.
iii. The samples were collected in airtight container to prevent dessication.

iv. Immediately after collecting the vials, they were brought to the nearest laboratory for further processing such as slide preparation and identification of ova and cysts of the parasites.

4.2 Questionnaire study

Surveillance study with prepared questionnaire by means of interview was also conducted.

4.3 Materials and Method

The whole study was divided into two parts. First part was surveillance study and second part was stool sample collection and examination. In first part people of different wards of Mithuawa VDC. The patient were interviewed with the help of prepared questionnaire.

4.3.1 Materials

4.3.1.1 Equipments

1. Compound Microscope
2. Refrigerator
3. Hot air oven
4. Sample vials
5. Gloves
6. Trays
7. Needle and sticks
8. Glass slides
9 Cover slip
10. Dust bin

1.2 Chemicals

1.Normal saline(0.85% Nacl)

2.Potassium dichcromate (2.5%wt.By volume)

3. Iodine solution(10% wt By volume)

4. Glycerine

5. Soap

Normal Saline

It is easy to observe characteristics movement of the parasites. It is used in unstained preparation. This solution was prepared by dissolving 8.5 gram of sodium chloride in 1000 ml. of distilled water.

2.5 % Potassium Dichromate

This solution is helpful for preservation of parasite, which is found in the stool. 2.4 gram of Potassium dichromate was weighted accurately by the help of electric balance and dissolved in 1000 ml. distilled water.

Iodine Solution

It is used to study the internal characters for identification of the species of protozoan parasites. It also helps to identify the egg of helminthes. Dissolving 10 gm of Potassium iodide in 100 ml of distilled water and slowly adding 5 gm of iodide crystals in it prepared the solution used in the present study. The solution id filtered and kept in a stoppered bottle of amber colour

4.3.2 Methods

4.3.2.1 Macroscopic examination

Immediately after collection before adding preservatives, the macroscopic examinations of stool samples were done. Macroscopic

Examination were performed to observe the colour of stool, odour of the stool, solidity or consistency of stool, presence of mucus and blood and presence of gravid segments or adult worm in the stool.

4.3.2.2 Microscopic examination

The smear prepared slides were first examined under the low power of microscope starting from one end of the cover slip to another end and vice- versa after changing field. If any suspicious object was seen it was centered and focused under the high power objective for a detailed diagnosing. During the examination of such preparation precaution was taken in that the films did not get dry up for this propose.

The collected stool samples were examined under microscope under 10x and 40x objectives. Specific attention was given to the characters of the helminth eggs such as shape, size, colour and marking on the surface of 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 6 embryonic hook-lets.

4.3.2.2.1 Unstained preparation

A small portion of stool sample was picked up with a wooden applicator and diluted with freshly prepared normal saline on a clean glass slide. A clear cover slip was placed over it. For prevention of desiccation glycerin was applied on cover slip and excess of fluid was removed with the help of filter paper. The resulting mixture was so transparent that it was possible to read newspaper though it.

4.3.2.2.2 Stained preparation

Stained preparation was required for identification and the study of internal nuclear characters for identification of the species. The iodine stained preparation was used for this purpose. It was prepared by adding a drop of Iodine on saline emulsion and then covered by cover slip. Glycerin was kept there to prevent desiccation before the cover slip was kept there. The excess of fluid was removed with the help of filter paper. Both stained and unstained preparation was kept on the same glass slide one on each half (Chattarjee, 1967).

4.3.3 Method of Observation

Stained and unstained preparations were first examined under the low power (10x) objective and (4x) ocular. It was started from one corner of the cover slip, the whole slide was examined very carefully. It was carefully watched on shape, size and color, marking on the surface of the egg shell during the identification of egg of helminthes and cyst of protozoa. With the of books and references, the presences or absence of ylok granules, ovum or differentiated embryos, the existence of operculum, polar filament of knob in specific case of cestodes and in case of protozoa, cyst remain of flagella, nucleus characters and position of nucleolus were considered.

CHAPTER - V

RESULTS

Questionnaire Survey

The study was conducted among 450 randomly selected people of Mithuawa VDC with different occupation including 240 males and 210 females. It was studied by two ways:

Data collection on questionnaire basis:

Stool sample collection and examination

Data regarding sanitation, behaviour, literacy, profession, hygienic condition, source of water, food habit, walking bare foot and awareness about parasites were used to the people.

5.1 Result based on Questionnaire

During the process of study, 450 people were interviewed individually with the help of questionnaire. Out of 450 people, 150 (80 males and 70 females) were taken from ward no. 4, 150 (80 males and70 females) were from ward no 5, and 150 (80 males and 70 females) were from ward no 6.

1. Area-wise literacy response among people (of studied population)

Out of 450 people interviewed 138 (30.67%) were literate whereas 312 (69.33%) were illiterate. Out of 150 people of ward no 4 interviewed 41 (27.33%) were literate, out of 150 people of ward no 5 interviewd 65 (43.33%) were literate. Similarly, out of 150 people of ward no. 6

interviewed only 32(21.34%) literate.The result (Fig.-1)shows that the people ward no 5 were more literate than the ward no 4 and 6 respectively.

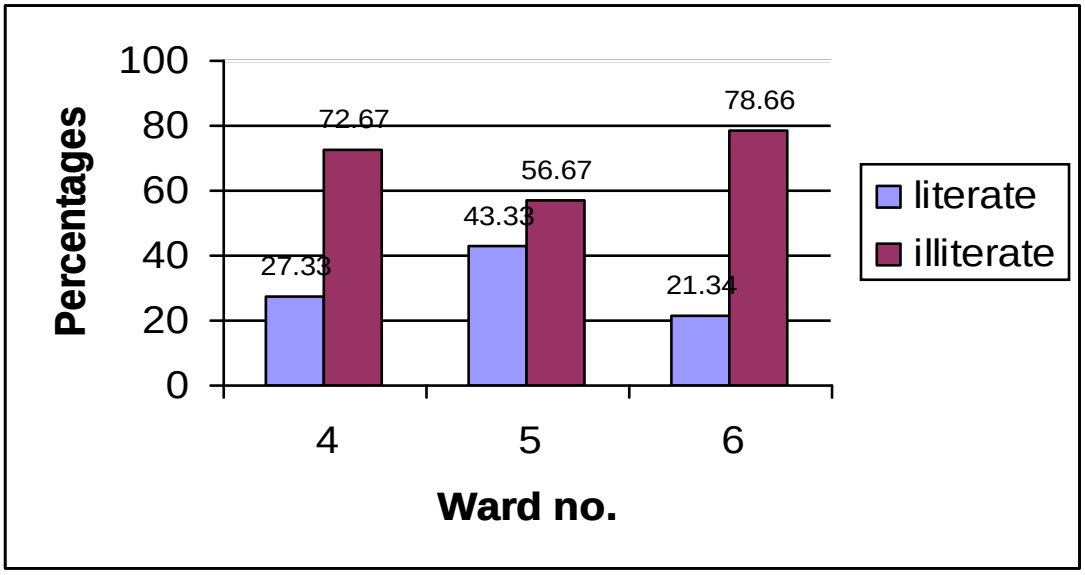


Fig. 1: Representation of area wise literate/ illiterate response among people

2. Area wise sanitary condition among people

The analysis of questionnaire showed that out of 150 people of ward no. 5 47 (31.33%) were using toilet for safe disposal of stool. Similarly, 53 (35.33%) of ward no. 5 and only 36 (24.00%) people of ward no. 6 were using toilet. Rest of people of ward no 4 i.e. 103 (68.67%), of ward no 5 i.e. 97 (64.67%) and of ward no. 6 i.e. 114 (76.00%) preferred open field for night soil disposal respectively (Fig.-2). Hence most of the interviewed people preferred open field for night soil disposal.

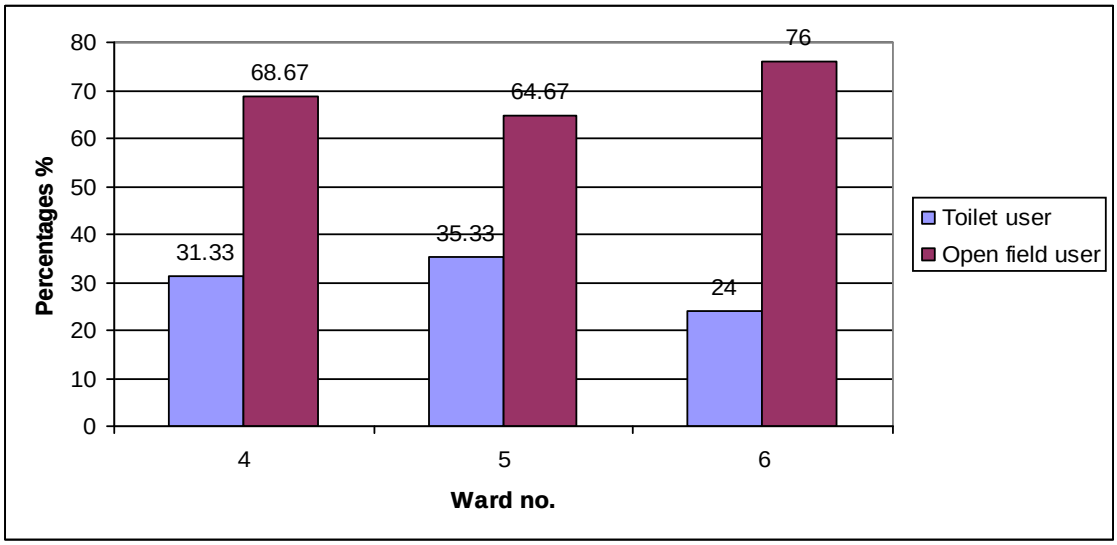


Fig. 2: Representation of area wise sanitary condition

3. Area wise knowledge of helminth parasites

Yes/No answer based question i.e. are you aware of intestinal helminth parasites (Annex - I) revealed that a larger percentage of people of ward no. 5 i.e. 33 (22.00%) and of ward no. 4 i.e. 29 (19.33%) and of ward no. 6 i.e. 21 (14.00%) were aware of helminth parasites respectively. Hence, from the total of 450 interviewed people, only 83 (18.44%) were aware of intestinal parasites and the rest 367 (81.56%) were not aware of intestinal parasites (table 3, Fig.-3)

Fig. 3: Representation of knowledge of helminthiasis among people

4. Area wise knowledge of mode of transmission of helminthiasis (Helminth Parasites)

Yes/ No questions among 33 people of ward no. 5 which were aware about the intestinal helminth parasites only 14 (42.42%) out of 29 people of ward no. 4 i.e. 10 (34.48%) were aware and out of 21 people of ward no. 6 i.e. only (23.80%) had a little bit knowledge about the mode of transmission of helminthesis. Hence from the total of 83 people, 29 were aware and 54 were not aware.

Table 1: Area wise knowledge of mode of transmission of helminthiasis

S.N.	Area	Interviewed no.	Knowledge about MOT	
			No.	%
1.	Ward No. 4	29	10	34.48
2.	Ward No. 5	33	14	42.42
3.	Ward No. 6	21	5	23.80
	Total	83	29	34.94

MOT = Mode of Transmission

5. Area wise food habit among people

Out of 450 persons interviewed 35 (7.78%) were vegetarian where as 415 (92.22%) were non-vegetarian. Out of 150 interviewed people of ward no. 4 i.e. 12 (8.00%), ward no. 5 i.e. 15 (10.00%) and of ward no. 6 i.e. 8 (5.33%) were vegetarian. Hence, most of the interviewed people were non-vegetarian (Fig.-4)

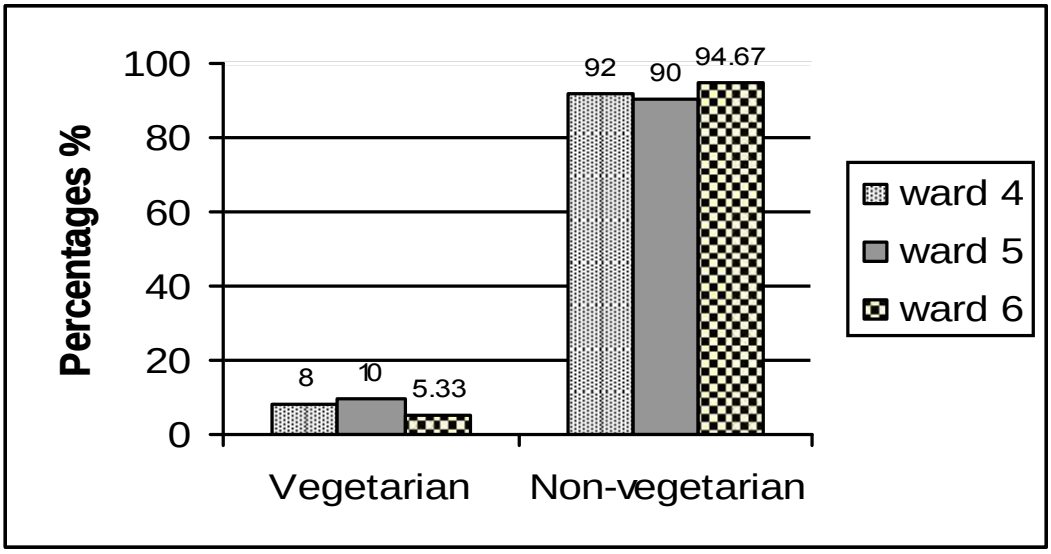


Fig- 4: Representation of area wise food habit among people

6. Areas wise occupation of interviewed people

Out of 450 persons interviewed (people of ward no. 4, 5 and 6) 275 (61.11%) were dependent on agriculture, 93 (20.67%) were service holders and 82 (18.22%) were businessman respectively. It was found that maximum people of ward no. 6 i.e. 112 (74.67%) were dependent on agriculture where as maximum people of ward no. 5 i.e. 42 (28.00%) were service holders. (fig- 5).

Hence, most of the interviewed people depended on agriculture.

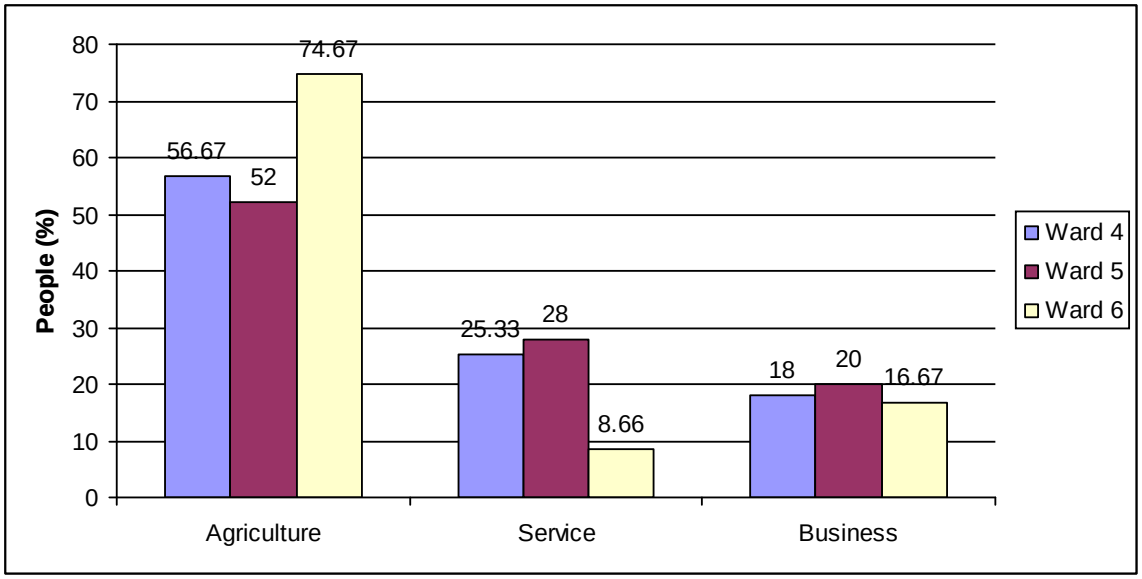


Fig. 5: Representation of area wise occupation of people

7. Area wise water supply among people

The analysis of questionnaire showed that out of 150 people of ward no. 4 i.e. 93 (62 %) were using tube-well water, 51 (34 %) using well water and 6 (4 %) were using river water. 104 people (69.33%) of ward no. 5 were using tube well water, 44 (29.34%) were using well water and 2 (1.33%) were using river water. Likewise out of 150 people of ward no. 6 i.e. 76 (50.67%) were using tube well water, 56 (37.33%) using well water and 18 (12.00%) using river water respectively.

Hence from the total of 450 interviewed people, 273 (60.67%) used tube well, 151 (33.55%) used well-water and only 26 (7.78%) used river water for bathing, washing clothes and even for drinking and cooking purposes. Thus, most of the people were using tube-will water. River water was used more by people of ward no. 6 than ward no. 4 and 5 (Fig. 6).

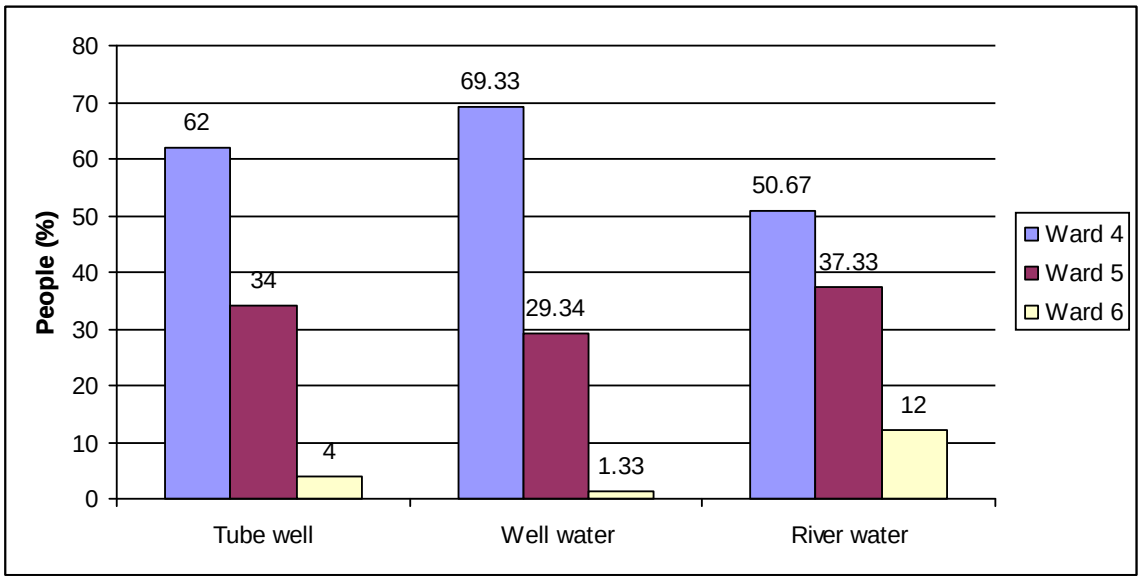


Fig. 6: Representation of area wise water supply to people

8. Area wise treatment method of intestinal helminth

Out of 450 persons (of ward no. 4, 5 and 6) interviewed, 136 (30.20%) people visited hospital for the treatment of helminthic infection. Likewise 263 (58.44%) people visited health post and 51 (11.34%) were under the treatment of traditional healer for the disease. Similarly, 40 (26.67%) people out of 150 of ward no. 4 had gone for the treatment of parasitic infection to hospitals, 98 visited health post and 12 (8.00%) people followed the traditional type of treatment by Dhami and Jhakri.

Hence, the data shown that the people of ward no. 6 followed more i.e. 35 (23.33%) traditional type of treatment when compared to people of ward no. 4 and 5 respectively (Fig. 7).

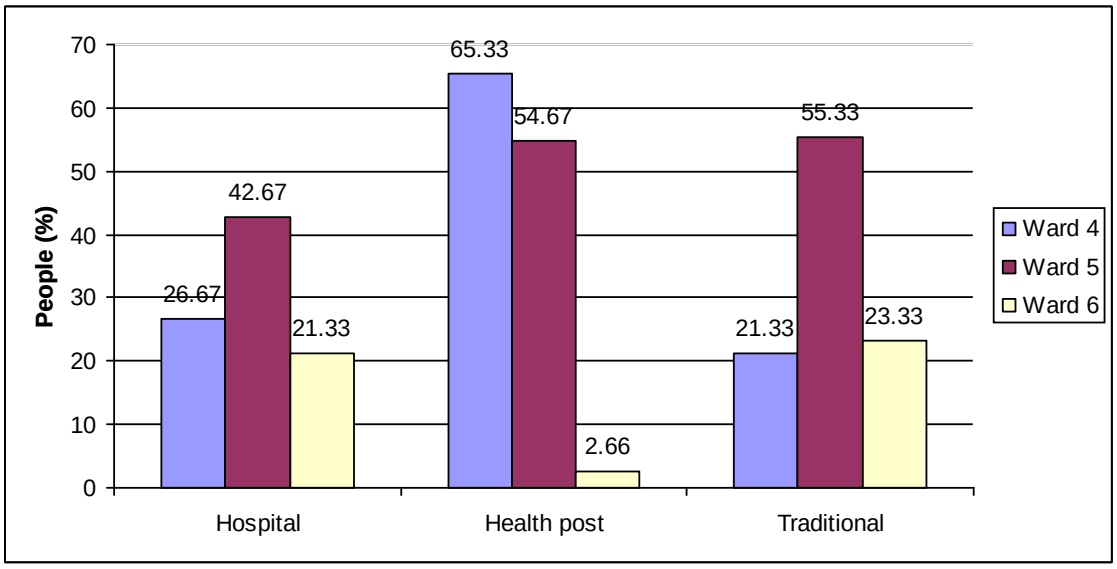


Fig. 7: Representation of area wise treatment method of helminthiasis among people

5.2 Result Based on Stool Examination

General prevalence of helminth parasites:

A Study was conducted to determine the prevalence of intestinal helminth parasitic infection in people of ward no. 4, 5 and 6 in VDC Mithuawa, Rautahat.

(1) Area wise prevalence of Helminth parasites

Out of 450 stool samples examined, 203 stool samples were positive for one or more specific intestinal parasites, showing 45.11% prevalence of parasitic infection. A total of 450 stool samples comprised of 150 people of ward no. 4 followed by 150 of ward no. 5 and 150 stool samples of people of ward no. 6 of Mithuawa VDC. The stool samples were collected from 3 different ward no. i.e. 4, 5, and 6 of VDC Mithuawa, Rauthat District.

Microscopical examination of each stool sample was carried out separately for identification of the eggs of intestinal helminth parasites. The following results were obtained from the stool test report.

Area wise prevalence of intestinal helminth parasites among people of ward no. 4, 5 and 6 of VDC Mithuawa revealed that the infection rate was highest i.e. 96 (64.00%) in ward no. 6 and lowest i.e. 44 (29.33%) in ward no. 5. Similarly, the infection rate in ward no. 4 was found to be 63 (42.00%).

The infection rates of intestinal helminthes in 3 different localities were more or less correlated with living standard and literacy rate of the people of their respective area. Overall 203 (45.11%) people of the studied area were found to be infected with intestinal helminth infection. The difference in the prevalence of intestinal parasitic infection among ward no. 4, 5 and 6 were found to be significant.

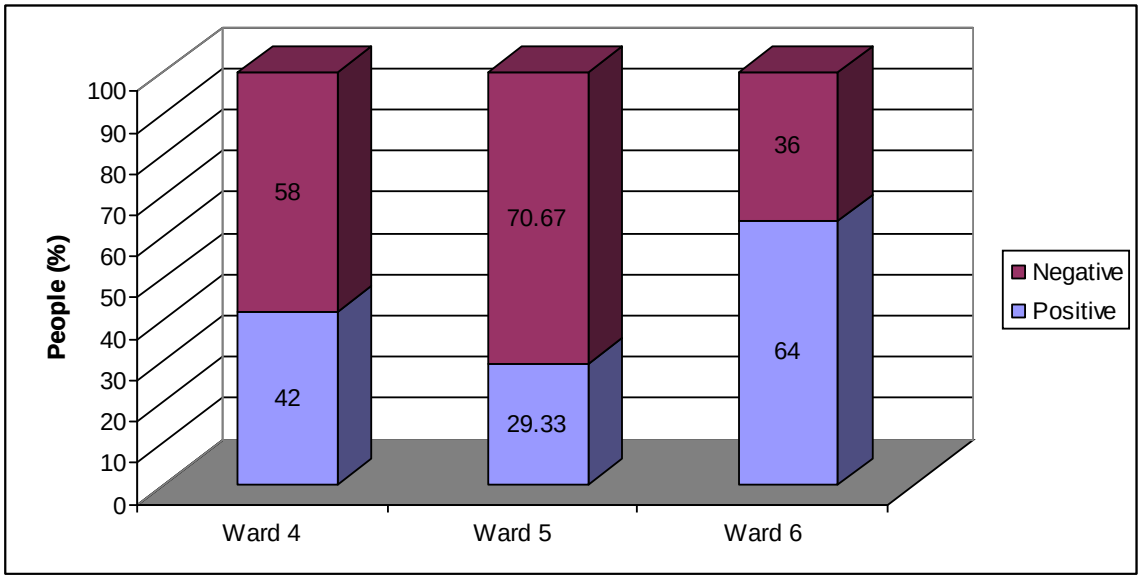


Fig. 8: Representation of area wise prevalence of helminth parasites

(2) Sex-wise Prevalence

(Fig. 9) reveals that out of 450 examined stool samples of people of ward no. 4, 5 and 6; 240 were of males and 210 were of females. Out of 240 males stool samples examined 120 (50%) were found to be positive for intestinal helminth parasites. Similarly, out of 210 female stool samples examined, 83 (39.52%) were found to be positive for intestinal helminth parasites. Hence, the infection rate was found higher in females than in males.

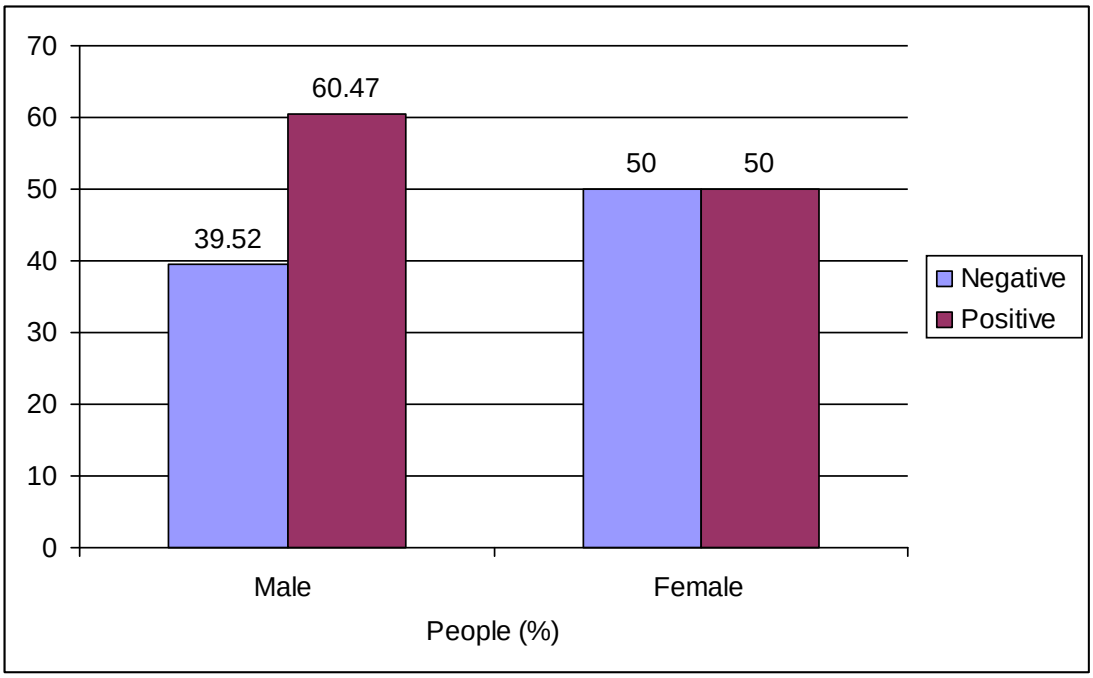


Fig. 9: Representation of sex wise prevalence of intestinal helminths parasites

3. Sex wise prevalence of intestinal helminth parasites among people of ward no 4, 5 and 6

The analytical study of the table 11, Fig. 10 shows that males (50%) were more infected with intestinal helminth parasites than females (39.52%).

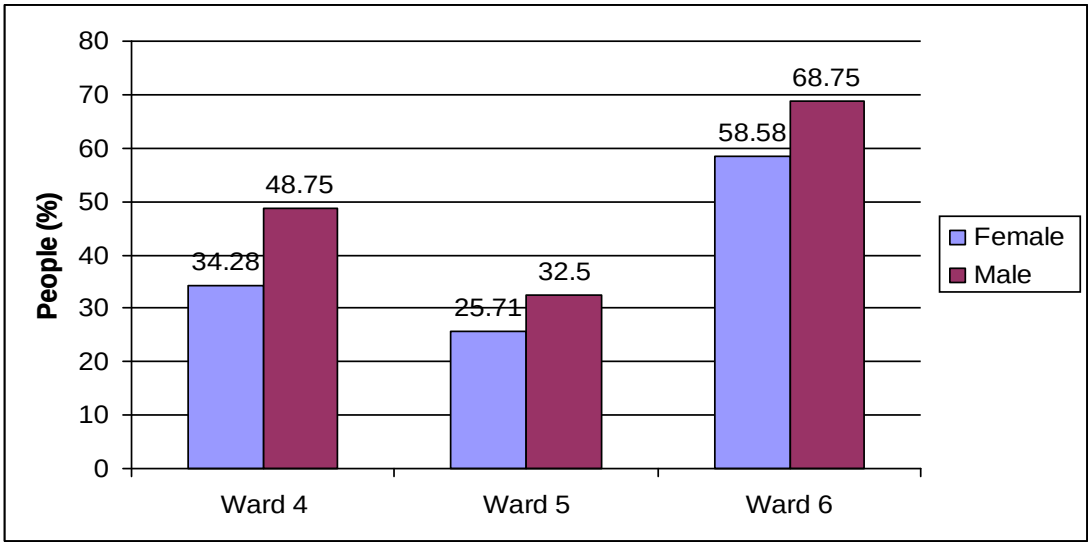


Fig. 10: Representation of sex-wise prevalence of intestinal helminth parasites among people of ward 4, 5 and 6

4. Age-wise prevalence of intestinal helminth parasites among people of ward no. 4, 5 and 6

In people of ward no 4, the distribution of intestinal helminth parasites was found to be maximum in above 60 years age group (55.54%) and minimum in 10-20 years age group (36.36%). Similarly in ward no 5, maximum in 50-60 years age group (40.54%) and minimum in 20-30 age group (14.29%) and in people of ward no. 6 maximum distribution of intestinal helminth parasites was found in 10-20 years age group (75.00%) and minimum in 30-40 years age group (54.54%).

Table 2: Distribution of intestinal helminth parasites in different age-groups among people of ward no. 4, 5 and 6

Age group year	Ward No. 4			Ward No. 5			Ward No. 6			Total		
	No. of obs.	Positive result		No. of obs.	Positive result		No. of obs.	Positive result		No. of obs.	Positive result	
		No.	%		No.	%		No.	%		No.	%
0-10	9	5	55.56	11	3	27.27	10	7	70.00	30	15	50.00
10-20	11	4	36.36	13	4	30.78	12	9	75.0	36	17	47.22
20-30	19	7	36.84	21	3	14.29	24	15	62.50	64	25	39.06
30-40	32	14	43.75	24	5	20.83	33	18	54.54	89	37	41.57
40-50	35	13	37.14	34	10	29.41	42	27	64.29	111	50	45.04
50-60	33	14	42.42	37	15	40.54	23	16	69.56	93	45	48.39
60-above	11	6	55.54	10	4	40.00	6	4	66.67	27	14	51.85
Total	150	63	42.00	150	44	29.33	150	96	64.00	450	203	45.11

5. Infection rate of specific intestinal helminth parasites

Table 3, Fig. 12 shows the infection rate of specific intestinal helminth parasites in 203 infected stool samples of people of three different wards (i.e. ward no. 4, 5 and 6) of VDC Mithuawa. Out of 203 samples infectedwith helminth parasites, the prevalence of specific helminth parasites are as follows: 83 samples were infected with *A. lumbricoides*, 66 with *A. duodenale*, 46 sample with *T. trichiura*, 52 with Taenia sps. 39 with *H. nana* and 13 samples with *S. stercoralis*

Table 3: Specific helminth parasites in the people of three different wards

S.N.	Parasites	No.of males infected	% from total 240 male samples examined	No. of female infected	% from total 210 female sample examined	Total infected no	% from total positive cases (203)	% from total sample examined 450
1	*A. lumbricodes*	48	20.00	35	16.67	83	40.89	18.44
2	*A. duodenale*	32	13.33	34	16.19	66	32.51	14.67
3	*T. trichiura*	25	10.42	21	10.00	46	22.66	10.22
4	*Taenia* sps.	28	11.67	24	11.43	52	25.61	11.56
5	*H. nana*	22	9.17	17	8.09	39	19.21	8.67
6	*S. sterocralis*	8	3.33	5	2.38	13	6.40	2.89

6. Group wise prevalence of intestinal helminth parasites

The analytical study of the table 14, Fig. 13 reveals that the distribution of *A. lumbricoides* was the highest (18.4%) among people of ward no. 4, 5 and 6 were as *S. stercoralis* was the lowest (2.89%) among some wards. The comparative study concluded that the infection rate with different specific type of intestinal helminth parasites was higher in people of ward no 6 than in ward no 4.

Table 4: Positivity of different types of intestinal helminth parasites among people of ward no. 4, 5 and 6

S.N.	Parasites	Ward no. 4		Ward no. 5		Ward no. 6		Ward no. 4,5 and 6	
		Positive cases		Positive cases		Positive cases		Positive cases	
		No.	% (150)	No.	% (150)	No.	% (150)	No.	% (450)
1	*A. lumbricoides*	26	17.33	18	12.00	39	26.00	83	18.44
2	*A. duodenale*	19	12.67	12	8.00	35	23.33	66	14.67
3	*T. trichiura*	15	10.00	9	6.00	22	14.67	46	10.22
4	*Taenia* sps.	14	9.33	8	5.33	30	20.00	52	11.56
5	*H. nana*	12	8.00	6	4.00	21	14.00	39	8.67
6	*S. Stercoralis*	4	2.67	1	0.67	8	5.33	13	2.89

7. Single or concurrent infection of intestinal helminth parasites among people of ward no 4, 5 and 6

Table 15, Fig. 14 reveals that out of 203 (45.11%) infected people of ward no. 4, 5 and 6 the intensity of infection i.e. 65.02% showed single infection, 22.66 % showed double infection and 12.31% showed multiple infection. The multiple infection was recorded higher in people of ward no 4.

The double infection was of *A. lumbricoides* and hookworm or *A. lumbricoides* and *T. trichiura* or hookworm and *H. nana* or *A. lumbricoides* and *Taenia* sps. or *A. lumbricoides* and *H. nana* or hookworm and *T. trichiura*. The multiple infections were of *A. lumbricoides*, hookworm and *T. trichiura* or *A. lumbricoide and*

hookworm and *Taenia* sps. and *A. lumbricoide*, *T. trichiura* and *Taenia* sps. Hence among the double and multiple infection, *A. lumbricoides* and hookworm were found to be common among people of ward no. 4, 5 and 6.

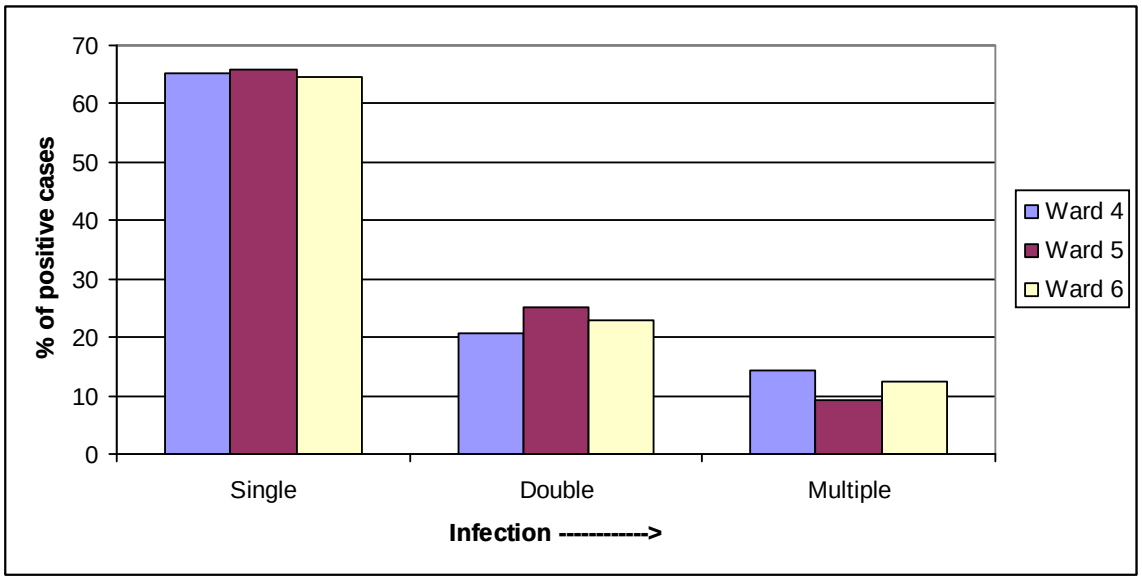


Fig. 12: Representation of single or concurrent infection of intestinal helminth parasites among people of ward no. 4, 5 and 6

CHAPTER-VI

DISCUSSION AND CONCLUSION

The gastro-intestinal parasites are ranked among 20 most fatal infection in tropical countries of Asia, Africa and Latin America in 1977 -1978 (Davis, A. 1980). The intestinal parasitic diseases caused by helminthes chronically affect about one third of the world's population, which for 1990 was calculated at 5,300 million people. The inhabitants of developing countries, particularly tropical countries, tend to be most affected which effects their social and economic situation. World-wide, the helminth infections are roughly estimated to occur with the following frequency: ascariasis 1,000 million, enterobiasis 400 million, hookworm infections 500 million, enterobiasis 400 million, storngylidiasis 100 million and taeniasis 70 million. Ascariasis, trichuriasis and hookworm infections have been reported in 150 of 208 countries. The cost of infections by intestinal parasites is huge. The cost of infections by intestinal parasites is huge. The present study has tried to add some information on the condition of helminth parasitic infection in a localized area of Nepal like Rautahat.

The present study has been carried out on intestinal helminthiasis among people in Mithuawa VDC of Rautahat in the present study out of 450 interviewed persons, 314 (69.78%) person were not used toilet, (see fig-2). Rai et al., (2001) had reported from rural village else where in Nepal that over 80% of households had no toilets. Similarly, Gupta, D. (2003) had reported from leprosy patients and non-leprosy people of Anandaban Leprosy Hospital, Caliper that 61% person were not used toilet.

Regarding mode of transmission from the total of 83 aware only 29 (35%) had knowledge about mode of transmission of intestinal helminthiasis (Table 1). Regarding treatment of parasitic infection, if was seen that 11% people preferred to be treated traditionally by Dhami and Jhankri fig .7).

The report based on stool test was done during the year of 2064/2065 in District Hospital, Gaur, Rautahat shows that 370 patients came to the hospital for their stool test.

Out of 450 stool samples examined, 203 (45.11%) samples were found positive for one or more specific intestinal helminth parasites (see table 3). Khanal, M. (2005) found 88.28% prevalence of intestinal parasites in Tharu and Muslim community of Kapilvastu District, Nepal. This finding is also supported by Rai *et al,*. (2002).

In the present study, 6 different species of intestinal helminthes were found i.e. 4 species of nematodes and two species of cestodes. Trematode infection was not found. The laboratory record of District Hospital, Gaur, Rautahat also showed ova of hookworm, A. *lumbricoides*, Taenia species, T. *trichiura* in the patients.

The study showed that intestinal helminth infections among people in Mithuawa VDC of Rautahat was characterized by higher prevalence of soil transmitted helminth parasites, A. *lumbricoides* (18.44%) followed by hookworm (14.67%),*T.trichura* (10.2%), H. *nana* (8.67%) and S. *stercoralis* (2.89%) were found (Table .4).

It is in agreement with the report published by WHO (1993) according to which infection by soil-transmitted helminthes has been increasingly recognized as an important public health problem, particularly in developing countries. My finding also consider with the report presented by Rai *et al,*. (1994) according to which the annual rate of the positivity for soil transmitted helminthiasis (i.e. A. *lumbricoides*) had the highest prevalence rate than the others (i.e. T. *trichiura* and hookworm).

Sherchand (1997) did a stool survey on intestinal parasites in rural village of Dhanusa District. Out of 604 samples examined 60% were found to be positive: 12% hookworm infections, 8.5% A. *lumbricoides*, 6% T. *trichiura*, 4% S. *stercoralis* and 2% E. *vermicularis*. This result is also similar with the present study.

Rai *et al.,* (2001) did similar research in hilly area in western Nepal (Achham). They found nine species of parasites (five species of helminthes and four species of protozoa) of which A. lumbricoides was the commonest one (32%) followed by hookworm (29%), T. *trichiura* (24%) and others. This result is in agreement with the present study.

Gupta (2002) examined 280 stool samples of Leprosy patients and non-leprosy people of Anandaban Leprosy Hospital, Lalitpur, 133 (47.5%) samples were found positive of which the prevalence of hookworm was the highest 27% followed by A. lumbricoides (23%), Taenia species (11%), H. nana (2.5%) and T. trichiura (4%). This result is also similar to the present study.

Khanal (2005) examined 350 stool samples of Tharu and Muslim community of Kapilbastu District. 309 (88.28) samples were found positive of which the prevalence of A. lumbricoides was the highest (43.14%), hookworm (33.71%), H. nana (12%), Taenia species (2.5%) and T. *trichiura* (2%). This result is in agreement with the present study.

These species are also reported by Gupta (1998), Navitsky *et al*,. (1998), Kharel (2000), Rai (2000), Pradhan (2001), Karki (2003), Chaudhary (2004) and Parajuli (2004).

Out of six helminth parasitic species A. *lumbricoides* was the commonest (18.44%), followed by hookworm (14.67%), T. *trichiura* (10.22%), Taenia sp. (11.56%), H. *nana* (8.67%) and S. *stercoralis* (2.89%) (Table .4).

The analytical study showed that the distribution of A. *lumbricoides* (18.44%) was the highest whereas S. *stercoralis* (2.89%) was the lowest in people of ward no. 4, 5 and 6 of VDC Mithuawa (Table .4).

Karki (2003) examined stool samples among Magar community in Palpa. The most commonly found intestinal helminthes were A. *lumbricoides* (50.32%), followed by hookworm (24..27%), T. *trichiura* (17.2%), Taenia sps. (8.28%), H. *nana* (6.37%) and S. *stercoralis* (1.91%). This result is also in agreement with the present study.

In present study, out of 203 positive cases, 132 (65.02%) showed single infection, 46 (22.66%) showed double infection and 25 (12.31%) showed multiple infection. The multiple infection were more in people of ward no. 4 (14.29%) and 6 (12.50%) than ward no. 5 (9.09%). The single infection was almost similar in three different wards. (fig.12)

Karki (2003) reported that out of 105 positive cases, 54 (51.43%) harboured a single infection, 37 (35.24%) double infection and 14 (13.33%) showed multiple infection.

In the present study, sex-wise prevalence of intestinal helminthiasis among people pf ward no. 4, 5 and 6 were done. Altogether the males (50%) were more infected than females (39.52%).

Results were almost uniformly distributed in both males (76.5%) and female (76%) in rural hill areas of Western Nepal (Achham).

Khanal (2005) showed that sex-wise prevalence of intestinal parasites in two ethnic groups of Kapilvastu District, males were found to be more infective (48%) than the females (40.23%). This result is in agreement with the present study.

In the present study the people of ward no. 4,5 and 6 were grouped into 7 groups i.e. (0-10), (20-30), (30-40), (50-6-) and (60 and above) years. Among these age groups more infection (51.85%) by the helminthiasis were recorded in above 60 years age group. Overall distribution of intestinal helminthiasis in people of ward no 4 was found to be maximum in 60 years above age group (55.54%) and minimum in (10-20) years age group (36.36%). Similarly in ward no.5 maximum in (50-60) years age group (40.54%) and minimum in 20-30 years age group (14.29%) and in people of ward no. 6 maximum distribution of intestinal helminth parasites was found in 10-20 years age group (75%) and minimum in (30-40) years age group (54.54%)

Rai (2000) showed more infection rate (i.e. 68%) in > 30 years age group in Khumaltar by intestinal helminth parasites. This result is in agreement with the present study.

Sherchand (1997) showed that the parasitic infection was the highest (31%) in the age group 6-9 years.

Pradhan (2001) also reported that maximum infection (i.e. 45%) by the intestinal helminth parasites was recorded in 10-15 years age-group.

Khanal (2005) reported that maximum infection (87.5%) by the intestinal helminth parasites was recorded in 60 years above age group. This result is in agreement with the present study.

In present study, 11.34% people of ward no. 4, 5 and 6 preferred to traditional type of treatment by Dhami and Jhakri. (fig-7)/

Gupta (2002) reported that 15% of leprosy patients preferred to be treated by Dhami and Jhakri. This result is also agreement with the present study. Similarly, Chaudhary (2003) reported that 15.6% people believed in Dhami and Jhakri for their treatment.

The result showed that the prevalence of intestinal helminthiasis was high in people of ward no. 4 i.e. 63 (42%) and in no. 6 i.e. 96 (64%) than the ward no. 5 i.e. 44 (29.33%). (fig -8). This maybe because of the illiteracy, usual practice of open field defecation, walking barefoot and lack of knowledge of parasitic infection as well as mode of transmission of diseases. This was confirmed by the questionnaire study.

The people of ward no. 5 were comparatively low infected (29.33%) then the ward no. 4 (42%) and 6 (64%) respectively. This maybe because the data collected and analyzed for the present study had people of ward no. 5 who were more literate, aware and with good sanitary and hygienic conditions when compared to that of people of ward no. 4 and 6. The people of ward no. 5 have more knowledge of parasitic infection as well as mode of transmission of parasites than the people of ward no. 4 and 6.

The highest prevalence (61.11%) was found in the farmer. This maybe due to contamination of their hands and fingers when working in the fields.

Poor sanitary condition, drinking water taken from the open ground water sources like pond, river and well might have enhanced the percentage of parasitic infections in the rural community. More over, they are little educated and know very little about the parasites and the mode of transmission. Most people used to keep their domesticated animals at the adjacent room of their houses which may lead to the contamination of food and drinking water. The highest prevalence (51.85%) of parasitic infection was found in the above 60 years age group. It maybe because of their illiteracy, weak personal hygiene and low resistance (immunity) power of the body.

The traditional beliefs for the treatment of parasitic infection by Dhami and Jhakri have lead to more severity in parasitic infections.

The people of ward no. 4 and 6 were the community of Kami, Damai, Sharki, Chamar, Dusad, Nuniya and Tatma. They were the main untouchable ethnic castes with higher parasitic prevalence rate. It is because of poverty, lower economic conditions and they spend very less money for their health care and for the fulfillment of nutrition.

So regularly and timely control measurement should be undertaken otherwise the situation might be aggravated to such an extent that man and animals may become vulnerable to a number of parasitic diseases as well as other transmissible diseases which will be beyond our reach. It may be assumed that similar situation might be prevailing in other places of our country, which are yet to be investigated.

CHAPTER- VII

RECOMENDATION

- People should be encouraged for sanitary improvements including personal hygiene and environmental sanitation.
- Avoid walking bare foot and use gloves and foot wears during working on farms to prevent soil-transmitted helminthes.
- Prevention of soil contamination with faeces and sewage and disinfection of contaminated soil.
- People should be aware enough so that they could know about the parasitic infections or its mode of transmission.
- People should be convinced about the need of sanitary toilet for defecation.
- Consumption of unwashed fruits and vegetables or washing with contaminated water should be prevented.
- Avoid eating raw and uncooked meat should be carried out.
- Public health education in the school curriculum must be made compulsory.
- Local healers should be trained so that they can treat the infected people by the medical point of view in rural area where the medical professionals are not available.
- The research works on the prevalence of intestinal parasites and prevention should be encouraged.

REFERENCES

Agbolade, Olufemi Moses, Ndubuisi Chinweilke Agu, Olusey Olusegun Adensaya,

Akkus, Sittika and Dilek Dayanir Cingil 2005. Turkiye Parsitology Dergisi 29(10); 39-42.

Al-Maldani, A.and Mahfouz, A.A. (1995). Prevalence of intestinal parasitic infections among Asian female housekeepers in Abha district Saudi Arabia. South East Asian J. Trop. Med. Public Health 26 (11) 135-137.

Almerie, Muhammad, Q., Muhammad, S., Azzouz, Mohamad,A. Abdessamad., Mohamad A. Mouchh Mohammad W. Sakhani, Mohammad S. Alsibai, Abeer Alkafri and Mohammad T. Ismail. 2008. Prevalence and risk factors for giariasis among primary school children in Damascus, Suria . Saudi Medical Journal 29(2);234-240.

Ben Musa, Najla,A. and R., Ibrahim(2008) . Long term formalin preserved stool specimens for fetection of intestinal parasites from school aged children in Tripoli, Libya. Egyptian society of Parasitology. 37(3): 1049-1054.

Bhattarai, M.P., Regmi, P.R., Pokharel, D.C. and Shrestha, J.K. (1998). Disease patterns of the patient attending medicine unit of free mobile specialist health camp in Taplejung. JNMA. Vol. 38.

Blangero, S.W., Blangero,J., Robinson, E.S., Adhikari, B.N., Upreti, R.P. and Pyakurel, S. (1993). Helminthic infection in Jiri Nepal: analysis of age and ethnic group effects. Journal of institute of medicinal vol., 15p : 210-216.

Bol, J.P.M and Roder, E.C. (1981). Soil Transmitted Nematodes in Lalitpur District in Nepal. Journal of Institute of Medicine 3(2) : 167-178

Bong-Jin, K., Mee-sun, O., D-ong – II, C., Tai-soon, Y and Kyu-Jee., L (2003). The intestinal parasite infection status of inhabitants in the Roxus city, the Philippines. Korean Journal of Parasitology. 41(2) : 113-115.

CBS (2002). Population census (2001). HMG/n. National Planning commission secretariat Central Bureau of Statistics. Ram Shah Path, Thapathali, Kathmandu, Nepal.

Chandrasena, T.G.A,N., A.C.D. de Alwis, L.D.R. de Silva, R.P.Morel and N.R. De silva 2005. Intestinal parasitoses and the nutritional status of

Veddah children in Sri Lanka. Southeast Asian Journal of Tropical Medicine and Public Health. 35(2); 255-259.

Cheng. T.C., (1999), General Parasitology Academic Press, California.

Dorea, R.C., Salata, E., Padovani, C.R. and des-Anjor, G.L. (1996). Control of parasitic infections among school children in the peri-urban area of Botucatu Sao Paulo, Brazil. Rev. Soc, Bras. Med. Trop. 29(5) 425-430.

Fernandez, M.C., verghese, 5., Bhuvaneshwari, R., Elizabeth, S.J., Mathew, T., Anita, A. and Chitra, A.K. (2002). A comparative study of the Intestinal parasites prevalent among children. Living in Rural o Urban setting in an around Chinnai, Journal of communicable disease. 34 (i): 35-39.

Geollman, R. (1988). Incidence of Disease in Patan Hospital in General OPD. Journal of Nepal Medical Association. 26 (3) : 9-21.

Ghimire, T.R. and Mishra, P.N. (2006). Intestinal parasites in the human Immunodeficiency virus Infected patients in Kathmandu, Nepal. The Nepalese Journal of Zoology, 1: 9-19.

Gunduz, Tura, M., Mete Deminel, Tonay Inceboz, Selma Tosun and Kor gastrointestinal symptoms associated with socio-economic conditions in Manis region. TURKIYE PARASITOLOGY DERGISI. 29(4): 264-267.

Gupta, R. and Gupta, H.N. (1988). Studies on the Infection rate of Human Intestinal parasites of kirtipur. Journal of Nepal Medical Association 26 (4) : 23-29.

Hiroshi, N., Hirohisa, I., Hirosoma, T., Changazi, M.A., Hussian, G.A., Kurode, Y. and Katoh, T. (2002). Ascaris Lumbricoides among children in rural communities in the Northern Area, Pakistan: prevalence, Intensity and Associated socio-cultural and Behavioral Risk Factors. Acta Tropica. 33 : 223-231.

Integrated Family Planning & Parasite Control Project (IFPPCP):

Annual Progress Report, Vol. 1, 1980.
Annual Progress Report, Vol. 1, 1981.
Annual Progress Report, Vol. 1, 1982.
Annual Progress Report, Vol. 1, 1983.
Annual Progress Report, Vol. 1, 1984.
Annual Progress Report, Vol. 2, 1985.
Annual Progress Report, Vol. 1, 1986.

Karki, B.M.S and Parija, S.C.(1997). Intestinal Parasitic infections in Dharan (Nepal) : A hospital based study. Journal of communicable disease Vol. 30 NO. (4) pp : 295-296.

Kassem, Hamed H, Hana Abdolsalam Zaed and Gazala, A., Sadaga. Intestinal parasitic infection among children and neonatus admitted to ibn-Sina hospital Sirt, Libyo. Journal of the Egyptian Society of Parasitology. 37(2): 371-380.

Kaur, R., Rawa,.D., Kakker, M., Uppal, B. and Sherma, V.K.(2002). Intestinal Parasites in children with diarrhoea in Delhi, Indian. Southeast Asian Journal of Tropical Medicine and Public Health. 33 (3) : 725-729.

Khetan, R.P. (1980). Incidence of Parasitic Infection in Narayani Zone. Journal of Nepal Medical Association. 18(4) : 29-31.

Koyabashi, J., Hasegawa, H., Forli, A.A., Nishimura, N.E., Yamanaka, A., shimabukuru, T. and Sata, Y. (1995). Prevalence of intestinal parasitic infestion in five farms in Holambra Sau Paulo Brazil. Rev. Inst. Med. Trop Sao Paulo. 37 (1) 15-18.

Lee, J.W., Park, Gab-Man, P., D.U., Lee, Soon-Jung, P. and Tai-son, Y. (2000). Intestinal Parasitic Infections at an institution for the Handicapped in Korea . Korean Journal of Parasitology. 38 : 119-181.

Lynch.,P.and Parry, E. (1978). Prevalence of Hookworm and other helminthes in British Gorkha recruits and the efficiency of Pyrantel pamoatee (combination) as an antihelminthic in this situation. Trans. Royal, Society of Tropical Med. Hygiene vol. 72. Pp 658-659.

Menan, E.L. Nebavi, N.G., Adjetey, T.A., Assavo, N.N., Kiki Barro, P.C and Kone, M. (1997). Profile of intestinal helminthiasis in school aged children in the city of Adidjan. Bull Soc, pathol. Exot 90 (1) 51-54.

Miller, S.A.,Carlos, L.R., Elan, R. and Vicente, S. (2003). Intestinal parasitic infection and Associated Symptoms in children Attending Day-care centers in Trujillo, Venezuela. Tropical Medicine and International Health 8 (4) : 342-347.

Navarete, N. and Torres, P. (1994). Prevalence of infection by intestinal helminthes and protozoa in school children from coasted locality in the province of valdivia, chile. Bol. Chil. Prasitol. (49) 343: 79-80.

Navisky, R.C., Dreytuss, M.L., Shrestha ,J., Khatry, S. K., Stoltztus, R.J. and Lbonico, M.A.(1998). Ancylostoma duodenale in Responsible for Hookworm infections among pregnant women in the rural plains of Nepal. Journal of parasitology, 84: 647-651.

Nepal, M and Palfy, B.(1980). A study of prevalence of intestinal parasites in the Mahankal Panchaytat and their relation with haemoglobin levels. Journal of Institute of Medicine. 2:175-182.

Nikolic, A., Djurkovia, D.O and Bobic, B. (1998). Intestinal parasitic infections in Serbia. Srp. Arh. Cetok.Lek. vol.126, no. 1-2 ; 1-5.

Olsen, A., Samvelson, H. and Onyango-Ouma, W. (2001). A study of Risk factors for intestinal Helminth infection using epidemiology and Anthropological approaches. Journal of Biasocial Science. 33 : 569-584.

Parajuli, R.P., Mishra, P.N. and Joshi, D.D. (2004). Prevalence of intestinal parasites in Mushar community of Chitwan district Fourth National Conference on Science and Technology, March 23-26, Royal National Academy of Science and Technology, 2004,SSZ. PS-9 334 P.

Park, Jae-Hwan,Eun- Taek Han Won-Heekim, Eun-Hee Shin, Sang-Mee Guk. 2006. A survey of Enterobius vermicularis infection among children on western and southern coastal islands of Republic of Korea. Korean Journal of Parasitology. 43(4): 129-134.

Paul, I., Gnanamani,G.and Nallam,N.R.(1999). Intestinal helminth Infections among school children in Vasakhapatnam. Indian journal of pediatrics 66(5) sep-oct: 669-673.

Rai,R.B.(2000). Prevalence of Intestinal Helminth Parasites in general and Taenia sps. in detail, particularly in Bote and Darai Comunities of Vyash Municipality -5, kumatari, Tanahun District of Nepal. A thesis submitted to the Central Department of Zoology, T.U. : 54-65

Rai, S.K., Hari, K., Abe, A., Ishimaya, S., Rai, G., Ono, K. and Uga, S. (2002). Intestinal parasites among school children in Rural Hilly Area of Dhading District, Nepal.

Rai, S.K., Takeo, M., Kazuo, O., Yako, O., shoji, U., Rai, N. and Shrestha, H.G. (2000-2001). Intestinal parasitosis in an " Unknown Disease Outbreak" Hit Rural Hilly Area in Western Nepal. Journal of Nepal Medical Council.2(2): 61.

Rai, S.K. and Gurung, C.K. (1986). Intestinal Parasitic Infection in High School Level students o f Birgunj city, Journal of Institute of medicine, 8:33-38.

Rai, S.K., and Rai, G. (1999). Ascaris, Ascariasis and its present Scenario in Nepal . Journal of Institute of Medicine 21 : 243-250.

Rai, S.K., Kubo, T., Nakamishi, K., Sumi, K., Shibata, H., Matsvoka, A. and Shrestha, H.G. (1994). Soil Transmitted Helminthic Infection in Nepal. The journal of Japanese Association of Infections Disease . 68 (5) : 625-630.

Rai, S.K., Nakashishi, M., Khadka, J.B., Shrestha, M.K., Sharma, C.M. and Shrestha, H.G. (1991). Intestinal Parasitoses in Kathmandu, Nepal. Asian conference in Medical laboratory technology, 4th Bangkok, Thai and Proceeding of the Asian conference in medical laboratory Technology.

Rai ,S.K., Uga, S., Ono, K. and Rai, G. (2000). Contamination of soil with Helminth parasites Eggs in Nepal. Southeast Asian Journal of Tropical Medicine and Public Health. 31 (2) : 388-393.

Rai, S.K., Nakanishi, M., Khadka, J.B., Sharma, C.M., Shrestha, M.K. and Shrestha, H.G. 1991. Intestinal parasite in Kathmandu, Nepal. Asian Conference in Med. Sobora. Techno. Fourth, Bangkok, Thailand.

Rao, V.G., Yadav, R., Bhondeley, M.K., Das, S., Agarwal, M.C. and Jiwary, R.S. (2002). Worm infestation and Anaemia : A public Health problem among Tribal pre-school children of Madhya Pradesh . Journal of communicable disease 34 (2) : 100-105.

Sharma, B.K., Shiba, K.R., Diyo, R.R. and Deepali,R.C.(20050). Prevalence of intestinal parasitic infestation in school children in the northeastern part of Kathmandu valley, Nepal. Southeast Asian Journal of Tropical Medicine and Public Healthy. 35(3): 501-505.

Sharma, B.P., (1965). Roundworms and their infestations. Journal of Nepal Medical Association 3(2): 120-123.

Sharma, R.P. and Tuladhar, N.R., (1971). A study on intestinal parasites among auxillary health workers in Kathmandu. Journal of Nepal Medical Association 9(4): 257-261.

Sherchand,J.B. and Cross, J.H. (1996) Cyclospora Diarrhoea at the Kanti Children's hospital Nepal. Paper present, Ed. In XIV international conference for tropical medicine and Malaria. " New goal for the 21st century" Nagasaki, Japan Nov 17-22:296.

Shrestha, D. (1997). Prevalence of intestinal parasites in primary children of Dharan and their, knowledge attitude and Practice about parasites. BPKHS, Dharan.

Smyth, H.M., Dekriminasky, R.G., Niwas ,S., Sota, R.J. amd Jolly,P.E. (2001). Prevalence of Ascaris lumbricoides and Trichuris trichiura and Associated Socio-damographic variables in four Rural Honduras Communities. Memories do Instituto Oswald Cruz. 96 (2). 167-174.

Smyth, J.D. (1996). Animal Parasitology Low price edition, Cambridge University Press.

Sofia,M.A., Wajihullah and Hasan, B. (2001). Intestinal parasitic infection in the university campus of Aligarh. Journal of Communicable disease. 33 (4) : 216-220.

Soldan, O., Cordova Paz, F.,Vargas Vasquez, et al.,(2006). intestinal parasitism in Peruvian children and molecular characteristic of Cryptosporidium species. Parasitology Research. 98(6) May 2006:578-581.

Souls,A,V.O.(1975). Intestinal parasitism in Pokhara. Journal of Nepal Medical Association. 15(4): 9-13.

Sugunan, A.P., Murneker, M.V. and Sehgal, S.C. (1996). Intestinal parasitic infestation among different population groups of Andaman and Nicobar Island. J. Com. Dis. 23 (4) 253-359.

Suguri, S., Tongu, Y., Inatomi, S. and Pradhan, H.D. (1985). A survey on Human parasitic infection in Nepal. Journal of Parasitology. 34; 285-291.

Toma, A., Miyagi, I., Kamimura, K., Tokuyama, Y., Hasegawa, H., Slomo, M., Dahlan, D., Majid, I., Hasanuddi, I., Ngatimin, R., Mogi, M. and Kuwabara, N. (1999). Questionnaire survey and prevalence of Intestinal Helminthic infection in Barru salvwesi, Indonesia. Southeast Asian Journal of Tropical Medicine and Public Health. 30 (1) : 68-77.

Toma, H., Shimabukuro, I., Kobayashi, J., Tasaki ,T., Takara, M. and Sato, Y. 2001. Community control studies on Strongyloides infesction on a model Island of Okinawa, Japan. Southeast Asian Journal of Trop. Med. And Public Health. 31: 383-387.

Virk,K.J., Prasad, R.N. and Prasad, H. (1994). Prevalence of intestinal parasites in Rural Areas of District Shanjahanpur. Utter Pradesh J. Com. Dis. 26 (2) 103-108.

Waikagul, J., Krudstood,S., Radomyos, P., Radomyos, B., Chalemrut. K., Jonsuk unitgual, P., Kojima ,S., Looareesuwan and Thaineav W. Across sectional study of intestinal parasitic infections among school children in Nan province northern Thailand. Southeast Asian J. Trop.Med.Public Health 2002, 33 :456-461.

Wani, Showkat Ahmad, Dayaz Ahmad, Showkat A. Zargar, Zubair Ahmad, Pervaliz Ahmad and Hidayatullah Tak 2008. Prevalence of intestinal parasites and associated risk factor among school children in Srinagar City Kashmir, India. Jour. Of. Parasitology. 93(1):1541-1543.

WHO (1981) Intestinal protozoan and Helminthic Infections. Report of WHO Expert Committee. Technical report series.666.

WHO (1981). Guidelines for the Evaluation of Transmitted Helminthiasis and schistosomiasis at community level. Mimeographed Document. WHO/CTD/SIP/98.1. World Health Organization,Geneva.

WHO (1987). Intestinal Protozoan and helminthic Infections. Report of WHO Expert Committee, 1987, Tech Rep. ser: 749

Zakai, Haytham Ahmed 2005. Intestinal parasitic infections among primary school children in Jeddah, Saudi Arabia. Journal of the Egyptian society of Parasitology. 34(3): 783-790.

Annex

Questionnaire for Community Based Baseline Survey in Mithuawa VDC, Rautahat

1. Name:
   Locality:

2. Occupation:
3. Family type: Joint ( ) Nuclear ( )
4. Number of family members:
5. Sanitation system: Toilet ( ) Open ( ) Others ( )
6. Sanitation types: Disposal ( )Permanent toilet ( ) Others ( )
7. Are you literate? Yes ( ) No ( )
8. If yes, can you ….?

Read ( ) Read & write ( ) Under metric ( ) Metric ( )

9. Water availability: Yes ( ) No ( )

10. If yes, what types of water supply?

Tap water ( ) Tube well ( ) Well ( ) River water ( ) Others ( )

11. Do you use separate water supply for drinking, washing, cooking and other purposes? Yes ( ) No ( )

12. What type of food habit do you have? Vegetarian ( ) Non vegetarian ( )

13. If non-vegetarian, how frequently do you take a meat?

Daily ( ) Twice a week ( ) Once a week ( )
Once a month ( ) Once a quarter ( )Once a year ( )

14. Which meat do you take frequently?

Pork ( ) Chicken ( )Buff ( )Mutton( )Fish( )All ( )

15. From where do you bring meat?

Meat shop ( )Self made ( )Group sharing ( )Don't know ( )

16. How do you prepare meat to eat?

Raw meat preparation ( )Well- cooked ( )

Half cooked ( ) Barbique / Sekuwa ( )

17. Do you rear pigs? Yes ( ) No ( )

18. Do you have any separate sty for pigs? Yes ( )No ( )

19. Do you leave them freely at day time? Yes ( )No ( )

20. Do you know about taeniasis/helminthiasis? Yes ( )No ( )

21. Have any family member infected with taenia or other helminthes?

Yes ( )No ( )Don't know ( )

22. Have you encountered with any parasites before?

Yes ( )No ( )Don't know ( )

23. If yes, what types of parasites?

Tapeworm ( ) Hookworm ( )Roundworm ( )Pinworm ( )

24. Did you take medicine? Yes ( )No ( )Don't know ( )

25. Where do you go for treatment?

Private clinic ( )Health post ( )Health centre ( )

Date: ---------- Interviewer's name:----------

END OF THIS THESIS

5/6/20066