CHAPTER-1
INTRODUCTION

1.1 Parasitism

Parasitism is defined as an intimate and obligatory relationship between two heterospecific organism during which parasites are metabolically dependent on host (Chang, 1999).

Parasites are those organisms that receive nourishment and shelter from another organism. Where they live and host is the organism that harbours the parasites (Chatterjee, 1998).

The parasites are biologically and ecologically associate with host. The effects of parasites on the host are not constant but depend upon various factors. Sometimes is not so evident while sometimes producing adverse effect on host leading to pathogenic condition.

Parasites are a major invader of people in developing countries. Parasitic infection are the most wide spread like all chronic human infection. It often causes debility and fatal diseases. Many new opportunistic and reemergence of diseases are reported from different parts of the world. People are more susceptible to infection of parasitic diseases due to the unhygienic management, malnutrition and ignorance about complicated life cycle of the parasites. Parasites are easily transmitted from individuals to individuals; that is animal to animal, animal to man, and man to man. Through a wild range of means.

The intestinal parasites of man are cosmopolitan in distribution causing very serious health problem in the developing countries where disease, ignorance and poverty are interlocked. Owing to their ubiquity and despite their high rate of infection in these regions, physicians and public

health authorities show little interest in their control (WHO, 1981). Not all of the known human intestinal parasitic infections have properly been estimated in the world. Hence, available prevalence figures in developing countries of the south-east Asian regions including Nepal are not reliable.

Intestinal parasitic diseases are ranked among 20 most fatal infection in tropical countries of Asia, Africa and Latin America in 1977-1978 (Davis 1980). So many different species of intestinal parasites can infect humans. The five important group of intestinal parasite are *Giardia, Amoeba,* roundworm, hookworm and tapeworm.

In the past, the prevalence of intestinal parasites has sharply decreased (from over 70% to less than one percent) in Japan (Yokogawa *et al.*, 1983), Taiwan (Chen *et al.,* 1991) and in Korea (Chai *et al.*, 1993) as a result of various control measures applied. Intestinal parasites caused 5119 mortality (death) of people due to symptomatic diarrhea and cholera in Nepal during 12 months (2001/2002) of period.

Children are the pillars of a nation. Healthy children make the nation strong. But when they are unhealthy, a country has to face invalid manpower. Health is an integral part of development. Health is most important think in our life. Because without good health no one can give their best in their life. Children are more infected than adult because of the lack of awareness about sanitation, playing in soil and dirty place, which helps to transmit the parasite. Contaminated nails carry ova and cyst of parasites which also helps to carry infection by swallowing. Infants are infected by carelessness of their parents. Most of the parents are careless due to lack of knowledge. Due to poverty they do not enough money to feed balanced diet to their children and no small idea about the disease. But only few parents think deeply about their children.

Intestinal parasitic infection rate incase of school children was found to be decreased in past few years according to data from Family Planning Association, School Health Program, Nepal (Maharjan, 2004). But the decreasing rate of infection is not satisfactory. The program could be effective if the children and their parents are given awareness about the preventive measures of such parasites.

1.2 Introduction of Intestinal Parasites

Parasites are those organisms, which receive nourishment and shelter from another organisms where they live and host are the organisms which harbours the parasites (Chatterjee, 1998). The parasites are biologically and ecologically associated with host. The effect of parasites on host is not constant but depend upon various factors. Those parasites, which live on intestine of host are known as intestinal parasite. The intestinal parasites are generally the protozoan and helminthes.

1.2.1 Intestinal protozoan parasites

A protozoan parasite consists of a single cell like unit which is morphologically and functionally completed (Chatterjee, 2001). They cause serious health problem for human. Some common intestinal protozoan parasites are *Entamoeba histolytica, Giardia lamblia, Entamoeba coli, Isospora, Tichomonas hominis, Balantidium, Cyclospora, and Cryptosporidium* etc.

1.2.1.1 Entamoeba histolytica

Geographical distribution: Worldwide. More common in tropics and subtropics than in the temperate Zone.

Habitat: Trophozoite of *Entamoeba histolytica* live in the mucous and sub mucous layers of the large intestine of human.

Morphology: *Entamoeba histolytica* has three stages in its life cycle.

a. Trophozoite: It is regular and not fix in shape and size ranges 18-40µm in, average being 20 to 30 µm. It is feeding stage.
b. Pre-cystic: It is smaller in size varying from 10-20µm in diameter. It is round or slightly ovoid in shape. It is a transitory stage.
c. Cystic stage: It is round and surrounded by highly retractile membrane. Cystic wall size varies from 5 to 20µm. Initially the cyst is uninucleate but the mature cyst is quadrinucleate, which is infective stage.

Mode of Infection: Transmission of *E. histolytica* from human to human is effected through its encysted stage and infection occurs through the ingestion of these cysts. Faecal contamination of drinking water, vegetables and food are the primary causes.

Pathogenicity: Infection of *E. histolytica* commonly called amoebiasis. Amoebiasis is two types;

a. Invasive Amoebiasis: When clinical symptoms result, the disease is referred to as invasive amoebiasis. Possibly only about 10% of infection result in invasive amoebiasis (smyth, 1996).
b. Non-invasive Amoebiasis: A high percentage of individuals infection with *Entamoeba* show no symptoms of disease. This condition is called as non-invasive amoebiasis and sometimes also called luminal amoebiasis.

Amoebiasis is second leading cause of death from parasitic disease worldwide (stanly, 2003). In developing world, amoebiasis causes some 450 million infections per annum, about 50 million incidents and about 100000 deaths (smyth, 1996). *Entamoeba histolytica* is potent pathogens that secretes proteolytic enzymes that dissolve host tissue and host cells and engulfs RBCs. The presence of low haemoglobin both in males and

females infected with *E. histolytica* proves that this is the causative agent of low Hb concentration in Nepalese people (Ghimire *et al*., 2005).

1.2.1.2 *Giardia lamblia*

Geographical Distribution: It is worldwide in distribution.

Habitat: The parasite live in the duodenum and upper part of the jejunum occasionally invading the bile duct.

Morphology: In exist in two phase: trophozoite and cystic.

a) Trophozoite: It is bilaterally symmetrical pear shaped. Measuring about 14µmin long and 7µm in broad. The dorsal surfaces convex while ventral surface is concave provided with sucking disc, with the help of which the parasites are firmly attached itself to intestinal wall. It is feeding phase.
b) Cyst: The fully formed cyst is oval in shape and measures 12µm long by 7µm broad. It is infective phase.

Mode of infection: Cyst are passed in the faeces. Transmission is through faecal-oral route i.e. *Giardia* cyst passed in the faces of a person result into a new infection when swallowed by another person.

Pathogenicity: The disease caused by *G. lamblia* is called Giardiasis. It is recognized as one of the most common agents for diarrhea worldwide. Giardiasis is also known as flagellate diarrhea. *Giardia lamblia* has worldwide distribution with an incidence of 1-30%. In the USA it is now considered to be the most common intestinal parasite of human and the leading cause of diarrhea due to protozoan infection in human (Smyth, 1996). Toxin produced by the parasites can cause allergic manifestation, fever, anemia as well as enteritities and some time chronic cholecytopathy.

1.2.2 Intestinal Helminthes 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 endoparasites 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.

1.2.2.1 Hymenolepsis nana

Geographical Distribution: Cosmopolitan in distribution.

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

Morphology: It exist 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 1 mm. It is also known a s dwarf tapeworm.
b) Proglottides: The number of segment is about 200. A mature segment measures 0.3mm in length by 0.9mm in breadth.
c) Eggs: Eggs are oval or spherical in shape, measuring 30 to 45µm in diameter. There are two distinct membrane: outer membrane is

thin and colorless, 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.

1.2.2.2 *Ascaris lumbricoides*

Geographical Distribution: *Ascaris lumbricoides* 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 as high as 90%. The infection results in malnutrition and relation of growth in children but other symptoms associated with both the larval and adult stages include pneumaonitis, asthma, diarrhea, nausea, abdominal pain and anorexia.

1.2.2.3 *Trichuris trichiura*

Geographical 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 measures 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 50µm in length and 25µm 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 children 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.

1.2.2.4 *Ancylostoma duodenale*

Geographical 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 portion f soil. Infection occurs when man walks base foot on the faecally contaminated soil 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 sites 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.

1.2.2.5 *Strongyloides stercoralis*

Geographical 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 2.5

mm in length and 40-50µm in diameter. Male are shorter and broader than female. Eggs are thin-shelled, transparent and oval. The egg measures about 55 µm in length by 30 µm 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).

1.2.2.6 *Enterobius vermicularis*

Geogrpical 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 measures 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, being plano-convex i.e., flattened on one side and convex on the other. Measuring about 50 to 60 µm in length by 30µm in breadth and surrounded by a transparent shell. Contain a coiled tadpole-like larva.

Mode of Infection: Children are the usual victims and familiar infection is common. Transmission is effected from one person to another by the ingestion of eggs. The first infection is either contagious form close association or due to contaminated food and drink. Person handling the night-clothes and bed linens of infected patients often contract the infection. There is also a possibility of the infection being 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.

CHAPTER-2
AIMS AND OBJECTIVES

2.1 General Objectives

The general objective of the study is to find the status of the intestinal parasites along with awareness in children.

2.2 Specific objectives

- To determine the prevalence rate of intestinal parasite in the children of age group 1-14 years.
- To determine the socio-economic aspects in relation to intestinal parasites.
- To determine the prevalence rate of intestinal parasites (helminthes and protozoan) infection ethnic wise, feeding habit wise and rate of concurrent infection (i.e. single, double and multiple species infections) of the persons.
- To assess the knowledge, attitudes and practices in study population in relation to transmission of intestinal parasites.
- To bring awareness about different aspect of intestinal parasites.
- To develop the recommendation for future planning regarding the control of intestinal parasites.

CHAPTER-3
LITERATURE REVIEW

3.1 History of Parasitology

Up to the middle of the seventeen Century knowledge of parasitology was limited to recognition of the existence of a few common external parasites such as lice, fleas and few internal parasites like tapeworms, *Ascaris*, pin worm and guinea worms. However, they were considered as natural products of human bodies. Even Rodolphi and Bremser also supported this idea (Chandler, 1961).

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

During the later half of 17^{th} Century Francesco Redi, "Grandfather of Parasitology" stated that maggots developed form eggs of flies. At the same time, Leeuwenhoek perfected microscopes and discovered *Giardia* in his own stool and other protozoans in rain water, saliva etc (Chandler, 1961).

Rodolphi (Linnaeus of parasitology) classified all the parasites known upto his time. In 1773, Muller discovered cercaria larvae but as protozoan.

In 1782, Dubini discovered human hookworm. Similarly, Leoss (1898) made the discovery of penetration of penetration of the skin hookworm larva.

Lamble, in 1859, first discovered the parasite *Entamoeba histolytica*. In 1865, Leuckart first worked out the life cycle of *Enterobius vermicularis.* Later, Losch in 1875 proved its pathogenic nature.

In 1876 Normand first reported *S. stercoralis*. Leuckart 1882 reported that parasitic and free living generation of human S*trongyloides* were past of some life cycle.

In 1838, the parasite *Ancylostoma duodenale* was first discovered by an Italian physician Angelo Dubini.

The pathogenesis and mode of entrance of larva into human was worked out by Loss in 1898.

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

The whipworm, first observed in 1761 by Roederer, was placed in 1771 by Linnaeus in the genus *Trichuris*. Grassi in 1887 and Fulleborn in 1923 carried out its complete life cycle.

Many parasitologist have studied human intestinal parasite, some recent studies on human intestinal parasites are as follows:

3.2 Literature Review in International Context

Cosgrove (1960) recorded the prevalence of intestinal parasites in hospital in patients and out patients by examining 2500 consecutive fecal specimens submitted to the laboratory over 2 years period (1955-57). Zinc sulphate centrifugal floatation and iron haematoxyline stained smears were used. Intestinal parasites were found in about 29% of specimens. Approximately 50% of the positive specimens contained more than1 specimens of parasites *G. lamblia* was the most common protozoan. *E. histolytica* was present in about 4%. The most common helminthes were *T. trichiura* and hookworm.

Peroz and Felix (1965) compared the incidence of parasites in three different population groups and found 86% positive cases among them. While the percentage was almost equal in children and office employees (82% and81% respectively), in craftsneb it was much higher (95%), due to deficient sanitary and hygienic conditions of their living conditions. The parasitic incidence in the 258 positive cases were. *E. coli*, 51.55%, *G. lamblia*, 20.92%, *E. histolytica*, 20.15% and *A .lumbricoides*, 10.85%.

Roman and Gonzlez (1969) studied the intestinal parasitism in children in different villags of the province of Grandda and disposed by coprological examination and with adhesive tape. Two thousand two hundred and ninety three samples were analyzed, 1157 of fasces and 1142 with adhesive tape. Sampling was carried out in40 schools in 6 villages. Twelve single or associated species were detected. The most frequent parasite was *E. vermicularis* (64.53%) followed by *T. trichiura* (11.12%), and *H. nana* (4.17%) of the protozoan. The most frequent were *E.coli* (21.19%) and *G. lamblia* (20.24%) followed by *E. nana* (8.34%). Three important foci of helminthes were located. La mala with 82.35%, *E. vermicularis*, Torrenueva with 24.04%, *T. trichuira* and La mamola with 12.24%, *Hymenolepsis nana*. La char was the village, which gave the highest percentage of intestinal protozoan (60.12%).

Chen (1970) reported about causation and the practices, with regard to treatment and prevention of ascariasis of a rural Malay community. The most common belief was thus children eating a side dish, lauk containing fish, the milk of mature coconut, peanuts and eggs causes ascariasis, the vast majority (92.2%) of households used piperazine or santonin preparation for treatment, some (38.5%) combining this with traditional treatment village herbs and talismans. The use of talismans and food toboos against children constituted the main attempts at prevention. The

whole community indiscriminately disposed of human excreta behind bushes close to human dwellings. None of the households encouraged hygienic habits on the part of their children, such as washing of hands before the handling of food.

Roberts (1970) investigated that the intestinal parasites were fairly common in African patients. *Taenia* was rare in Kariba & not uncommon in charter, which was cattle-owning area. Hookworm was much more common in the Abercorn district of Zambia. *S. monsoni* was more common in Kariba (7.1%of all stools) than in Kariba (22.2% of all urine). *G. lamblia* was more common in Kariba than in charter. These figures indicated that these were a considerable difference in distribution of intestinal parasites over the country due to possible variations of climate, altitude & rainfall.

Chong-Hwan *et al*., (1971) studied the prevalence of intestinal parasites in Korea. A survey of intestinal parasitic infection among Korean people had been carried out during July 1961 to December 1970. A total of 2250 sample examined, 1803 (i.e. 80.1%) were positive for intestinal parasites. Among them, 46% for *A. lumbricoides*, 6.8% for hookworm, 1.6% for *E. vermicularis*, 0.78% for *H. nana*, 0.3% for *Taenia* spp was recorded. Among protozoan parasite, 6.4% of *E. histolytica* and 5.1% *G. lamblia* were also recorded. In context of sexual distribution, female showed higher prevalence than male.

Kyung *et al*., (1972) carried out the prevalence of intestinal parasites in Roka soldier during the period from April 1970 to December 1971. Stool sample were collected from Army troops, 1755 from recruits during basic training and 245 stool specimens from student of (Republic of Korea Army) Roka Nursing school of Taegu area. Overall prevalence was

recorded rate for intestinal parasites found to be 88%. Specific prevalence was recorded 28.1% A. *lumbricoides*, 79.3% of *T. trichiura,* and 14.2% of hookworm. The incidence of *E. vermicularis,* out of 822 samples was 19.8% from anal swab and *E. histolytica* was recorded in 4.2% among 541 samples.

Rao *et al*., (1973) worked on the prevalence of intestinal parasites in two villages of Bhograi block Balasere district, Orissa. A total of 256 stool samples were collected from healthy rural community of Orissa and analyzed. The overall prevalence for intestinal parasites was 83.9% where as specific prevalence recovered was 58.2% of *A. lumbricoides*, 4707% of hookworm, 3.5% of *E. vermicularis*, 0.4% of *T. trichiura,* 0.4% of *H. nana,* 5.8% of *E. histolytica* and 8.2% of *G. lamblia.*

Fujii *et al*., (1974) investigated the helminthic infections of humans in 2 areas, Kumanogawa and Hongu, along the upper Kumano River of Wakayam prefecture. General infection rates in the 2 areas were 31.1% & 22.6% respectively. *Trichuirus* was the most common species in both areas 17.5% & 15.9% on average, respectively. The infection rate of *Ascaris* was as low as 3.6% or 3.5% in each area. Hookworm was found only on low incidences as 0.5% or 0.4% respectively. *A. duodenale* exceeded *N. americanus* (in ratio of 4:1). Mewtagonimus yokagawai was fairly prevalent in Kumanogawas 16.7% on average & 20.1% -28.2% among adults over 31 years of age; in Hongu area the rates were only 5.2% on average & 5.8- 10.2% even among adults. Helminthic infections still remain quite prevalent in these areas.

Cutting JW (1975) carried out a survey of intestinal parasitism in a Yaviza community on the pan American Highway route in eastern Panama. A total of 202 stool samples were examined 90% of samples

were found to be positive for any one intestinal parasite. Specific prevalence found was 80% of *T. trichiura*, 62% of *A. lumbricoides*, 41% of Hookworm, 7% of *S. stercoralis*, 0.5% of *H. diminata*, 16% of *E. histolytica* and 5% of *G. lamblia.*

Arora *et al*., (1976) studied the prevalence of intestinal parasites in rural community in Jammu Kashmir. A total of 436 stool samples were collected from healthy person and analyzed. Specific prevalence was recovered as 16.5% *Giardia* (i.e. maximum prevalence) followed by 8.3% of *E. histolytica*, 6% of *A. lumbricoides*, 4.6% of Hookworm, 2.8% of *E. vermicularis*, 1.8% of *H. nana* and 0.5% of *T. trichiura* from this study.

Chiua *et al*., (1979) worked on the prevalence of intestinal parasitic infections among in habitants of Tan ran village, Nontov Country, Taiwan. Out of 417 stool samples collected, maximum prevalence rate was shown by *A. lumbricoides* i.e. 81.5% followed by 73.6% of *T. trichiura*, 30.9% Hookworm, 4.5% of *G. lamblia*, 3.1% of *E. histolytica*, 0.7% of *S. stercoralis*, 0.2% of *T. solium* and 0.2% *of T. saginata*.

Massound *et al*., (1980) worked on the prevalence of intestinal helminthes in Khuzestan, southern Iran. Examination of a total of 16361 stools sample from people in 105 villages and 14 small towns revealed high prevalence of Roundworm, Hookworm, *T. trichiura* and *H. nana.* Hookworm was twice prevalent in rural area than in urban areas.

Ejezie (1981) surveyed on 5,595 primary school children in Lagos State showed that most of the children were over loaded with parasitic infections, which included malaria (37.7%), Schistosomiasis (13.4%), ascariasis (74.2%), trichuiriasis (75.8%), hookworm (29%) & taeniasis (49.5%). Multiple infections were observed with about 16.2% harboring

all the causative organisms of the parasitic diseases enumerated above. The high prevalence of parasitic infestations was among children is an index of the community's low level of health and also of inadequate health education.

Datta BND (1981) carried out the intestinal parasitic infections in pre-school children in lower socio-economic community in Delhi. A total of 2493 stool specimens were collected from them January to December 1975. 17.4% of Giardiasis, 9.6% Ascariasis, 7.9% of *H. nana,* 2.9% of Amoebiasis, 2.7% of Ancylostomiasis, 2.6% of *E. vermicularis*, 1.4% of Trichiuriasis and 8.9% of Taeniasis was found. 68.1% of artificially feed infants and 34.3% of breast feed infants were found to be infected which proved the significance of breast-feeding.

Ralna *et al*., (1984) worked on the prevalence of intestinal parasitic infection in some urban localities of Solon district of Himachal Pradesh. Out of 156 stool samples examined 54.5% were positive for one or more intestinal parasitic infection. Specific prevalence recovered was 12.8% of *G. lamblia*, 5.8% of Hookworm, 3.8% of *E. histolytica*, 4.5% of *A. lumbricoides*, 1.9% of *H. nana* and 0.6% of *T. trichiura*.

Lall R (1985) investigated the intestinal parasitic infection in a section of population of Port Blair, Andaman and Nicobar islands. A total of 1109 stool samples were collected from OPD patient attending G.B Pant Hospital. Out of 1109 sample 668 (i.e.60.2%) were found to be positive for one or more parasites, 63% of single, 3.8% of multiple infection were detected. Specific prevalence was recovered as 18.6% of *A. lumbricoides,* 5.4% of *T. trichiura*, 4.3% of *E. histolytica,* 3.4% of hookworm, 3% of *G. intestinalis,* 1.2% of *S. stercoralis*, 0.7% of *E. vermicularis.,* 0.2% of *H. nana* and 0.1% of *Taenia* spp.

Develoux *et al*., (1986) worked on the intestinal parasitic disease of school children in Republic of Niger. Coprologic survey revealed strong prevalence of Amoebiasis in all the studied area, giardiasis was more frequent in dry areas. As for helminthes *H. nana* was met everywhere. The prevalence of *Ancylostoma* found to be decreasing gradually from south to north.

Fagberbro-Beyioku & Oyerinde (1987) examined microscopically the stool samples from 1659 children, aged 15 years and below in metropolitan Lagas and showed 71.9% and 68.3% infection with *T. trichuira* and *A. lumbricoides* respectively. While the infection rate with hookworm was 22.5%. Infection with more than one parasite was also very common.

Diaz *et al*., (1988) studied the prevalence of three intestinal parasites (*G. lamblia*, *E. coli & E. nana*) in the humans of the province of Granada, Spain, according with the age and sex of the hosts and the season on which the samples were taken. The total parasitaion rate was 9.5% and the greater parasitation belonged to *G. lamblia* (4.9%). Statistically significant differences with regarding the age and sex have not been found. The distributions according to the season only show significant differences for *E. nana.*

Garcia Lopez *et al*., (1989) studied the intestinal parasites in child population of the Vega of Granada. Total 137 faecal samples were analyzed 82 from boys and 55 form girls. The direct examination, Telemann method & adhesive tape were the methods employed. The total parasitation rate was 17%. The parasite species found were *E. vermicularis* (8.75%), *E. coli* (1.45%), *G. lamblia*(1.45%) & *E. Hartman*(0.72%).

Mao (1991) up to date , 30 species of protozoa 12 species of cestodes, 26 species of trematodes, 23 species of nematodes, 2 species of gordius and 1 acanthocephalan species had been reported as parasites of man in main land China.

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

Kappus *et al*., (1994) examined 216275 stool specimens by the state diagnostic laboratories in 1987 and found 20% positive. Percentages were highest for protozoan. The most commonly identified helminthes were nematodes: hookworm (1.5%), *T. trichiura* (1.2%), & *A. lumbricoides* (0.8%).

Xu *et al*., (1995) investigated the sample randomly in 2848 different study sites, with about 500 people from each sites and covered total population of 1477742. By examination of the stool using Kato-Katz thick smear and larval culture techniques, overall prevalence of *A. lumbricoides*, *T. trichiura* and hookworm infection were found, 47%, 18.8% and 17.2%, respectively. Higher prevalence of ascariasis and trichiuriasis were found in the age group of 5-9, 10-14, 15-19 years and among adults for hookworm students, farmers and fishermen were the occupational group with high infection rates.

Bangs *et al*., (1996) worked on two occasions to determine the prevalence of intestinal parasites in Indonesia. Overall, 478 subjects i.e. 10% of the

population from three villages were sampled. Using a standard wet mounts technique, 15 different species of parasites were found. Hookworm was the highest prevalent parasites in all age groups. The other helminthes were *A. lumbricoides* (46-57%) & *T. trichuira* (15-25%).

Amin (1997) examined a total of 250 non-Saudi males over 21 years of age. A total of 143 parasites were detected in their school specimens. Twenty (13.99%) were *Blastocystis hominis* while other parasites were 123 (86.01%). The other protozoan parasites were found, *G. lamblia* (16.8%), *E. histolytica* (10%), *E. coli* (6.4%), *Chilomastix mesnili* (5.6%), *T. hominis* (1.2%) & *E. nana* (0.8%). The helminthes were *A. lumbricoides* (4%), *H. nana* (3.2%), *E. vermicularis* (1.2%) & *T. trichuira* (0.8%).

Mafiana *et al*., (1998) investigated the prevalence of soil transmitted helminthes parasites in children in Abeokuta, the capital city of Ogun State, Nigeria. Fecal examinations of 1,060 children revealed a prevalence of 64% for *A. lumbricoides*, 21.9% for *T. trichuira* & 14.5% for hookworm.

Paul *et al*., (1999) carried out a study to determine the prevalence and intensity of intestinal helminthic infections. The age of children were 7-13 years and were belonging to lower socio-economic status. The collected stool samples were processed by modified formalin ethyl acetate sedimentation technique. The children infected with one or more of the intestinal parasites were 177. The intestinal parasitic helminthes were. *A. lumbricoides, T. trichuira* and hookworm. The overall prevalence of infection was 82%. The *A. lumbricoides* was the most prevalent 75%, followed by *T. trichiura* 66% and hookworm 9%.

Chukiat *et al*., (2000) studied the *H. nana* infection in Thai children. Stool examination was performed on 2,803 children from orphanages and primary school. *H. nana* infection was found only in children from orphanages with a prevalence of 13.12%. Males had statically significant higher prevalence of infections than females.

Lee *et al*., (2000) worked on a survey on the school children Kaohusiung Country. This study was conducted among school children from September to December 1999. The overall infection rate in 305 children was 17%. The most common intestinal parasites detected were *A. lumbricoides*, Hookworm, *T. trichiura*, *H. nana* and *G. lamblia*. The male had highest infection rate than females (11%). The infection rates for protozoan cysts were as follows; *E. coli* (25%), *E. histolytica* (1.8%), *Endolimax nana* (21.4%), *I. butschlii* (1.8%) and *G. lamblia* (0.9%). In cello tape and anal swab examinations (165 samples), the prevalence ratio of *E. vermicularis* was 20.6%.

Toma *et al*., (2001) studied the *Strongyloides* infection conducted by faecal examination and subsequent treatment of the population on a model Island (KumeIsland) in Okinawa, Japan for 5 years from 1993 to 1997. More than 1200 persons, accounting for 17% to 20% of the persons and subjected received faecal examinations each year. The positive rate in 1993 was found to be 9.7%.

Sofia *et al*., (2001) worked on the intestinal parasitic infection in the University Campus of Aligarh. Faecal samples of 3695 persons complaining for diarrhea, dysentery, abdominal pain and other bowl disturbances were examined. Out of total sample, 2152 samples (58.24%) were found to be positive for *E. histolytica*, *A. lumbricoides, G. lamblia.* Among them, *E. histolytica* showed highest prevalence rate (37.5%),

while *A. lumbricoides* showed least infections rate (5.71%).

Xia *et al*., (2002) investigated a cross sectional study was performed to assess the prevalence and soil transmitted nematodes infection in school children Mafia Island. Hookworm infection was widespread (72.5%) where as *T. trichiura* was less prevalent (39.7%) and *A. lumbricoides* was present at a low prevalence (4.2%), mainly in urban area. In a sub sample of the study population both *Nectar americanus* and *A. duodenale* were found, although *N. americanus* was more present. This survey was followed by a parasitological evaluation of Mebendazole treatment using (500mg) dose.

Nishiura *et al*., (2002) carried out the study on prevalence, intensity and associated socio-cultural and behavioral risk factors of *A. lumbricoides* among children in rural communities in the Northern area of Pakistan. Prevalence and intensity of *A. lumbricoides* in 492 children from five rural village in northern area of Pakistan was examined. The overall prevalence of *A. lumbricoides* was 91% with geometric mean egg count intensities of 3985 eggs per g. The most intense *A. lumbricoides* infections were found in children aged 5-8 years, Univariate analysis associated *A. lumbricoides* intensity with age ($p=0.0004$), location of household ($p<0.01$), defecation practices ($p=0.02$), soil eating habit ($p<0.01$), hand washing after defecation ($p<0.01$), and living with children under 5 years old ($p=0.02$). The result indicated that there were certain clear risk factor in *A. lumbricoides* transmission and its intensity was influenced by age related behavioral and environmental factors that contribute to exposure.

Bong-Jin *et al*., (2003) worked on a small state survey to investigate the status of intestinal protozoa and helminthes infection of inhabitants in

Roxus City, Mindoro, Philippines. A total 301 stool sample 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 (0.8%), *E. vermicularis* (0.3%). The protozoan infection status revealed that *E. coli* was the most frequent (15.0%). *Iodomoeba buetschlii* and *E. histolytica* were found but few. The multiple infections more than two parasites was 29.6% and double infection with *A. lumbricoides* and *T. trichiura* was common. The intestinal helminthes infections were highly prevalent in this area.

Miller *et al*., (2003) examined the presence of intestinal protozoan and helminthes infections and their associations with clinical signs and symptoms in children in Trujillo, Venezuela. The point prevalence of protozoan infection was 21% for *G. lamblia*, 1.0% for E. *histolytica /dispar*, 4% for *E. coli*, 16% for *Blastocystis hominis* and 89% for *Crytosporidium.* Prevalence of helminthes infection was 11% for *Ascaris*, 11% for *T. trichiura*, 0.0% for *S. stercoralis* and 2% for *H. nana.*

Saksirisampant *et al*., (2004) studied the intestinal parasitic infections among children in an orphanage in Pathum Thani province- Infection caused by intestinal parasite is still a common health problem especially in children from developing countries. Orphans are a group of under privileged population in society. To evaluate the intestinal parasitic infections in children an orphanage in Pathum Thani province, Thailand, stool samples were collected during a cross-sectional study in April 2001. Examinations for intestinal parasites were performed by using simples smear. A total of 106 pre-school orphans (60 male and 46 female), aged 10.0-82.0 months, and were recruited for the study. There were 86 individuals (81.1%) 45 males and 41 females, infected with at least one

parasite. Interestingly, most of the parasites identified were protozoa. The infections caused by *Giardia lamblia* were 37.7% and *Entamoeba histolytica* was 3.7%. The only one helminthes parasite detected was *S. stercoralis* (0.9%).

Rim *et al*., (2004) carried out the prevalence of intestinal parasite infection on a national scale among primary school children in Laos. Parasitological survey was carried out on a national scale including 17 provinces and the Vientiane Municipality. A total of 29,846 stool specimens were collected from primary school children from May 2000 to June 2002 and examined once with the cellophane thick smear technique. The cumulative egg positive rate for intestinal helminthes was 61.9%. By species, the rate for *Ascaris lumbricoides* was 34.9%, hookworm 19.1%, *T. trichiura* 25.8%, *Ophisthorchis vivierrini* 10.9%, *Taenia* spp. 0.6% and *Hymenolepis* spp. 0.2%.

Kebede *et al*., (2004) studied the real time PCR to identify *Entamoeba histolytica* and infection in prisoners and primary-school children in Ethiopia. Faecal samples were therefore collected from 365 primary-school students and 409 prisoners from various region of Ethiopia. Each of these samples was checked for *Entamoeba* infection by the microscopical examination of formalether concentrates.

Tchuente *et al*., (2004) examined the prevalence of abundance of *Schistosoma haematobium* and soil- transmitted helminthes infections among school children in Loum, Cameroon. A total of 1600 pupils attending five schools in Loum, Littoral province, Cameroon with the specific aim. Prevalence of *S. haematobium* was 62.8% with an abundance of 54 eggs/10ml urine. For the STH these were 47.7% and 6/9 eggs per gram of faeces for *Trichiuris trichiura,* 65.5% and 3636 EPG for

A. lumbricoides, and 1.4% and <0.1EPG for hookworm. Most children (90.3%) were infected with at least one of these four species the largest proportion (34.3%) carrying two species; 27.4% carried three and 1.1% carried concurrently all four species of parasite.

Haque *et al*., (2004) worked on the epidemiological and clinical characteristics of acute diarrhea with emphasis on *Entamoeba histolytica* infection in preschool children in an urban Slum of Dhaka, Bangladesh. The epidemiology, clinical features, nutritional status, and studied in 289 Bangladeshi children (147 boys and 142 girls), 2-5 years old. The most common pathogens isolated form dysenteric stool were *S. flexneri* (11.6%), *Aeromonas* spp. (10%), *E. histolytica* (8.7%) *Campylobacter jejunii* (5.8%), *P. shigelloides* (4.3%) and *A. caviae* (4.3%).

Chandrasena *et al*., (2005) studied the intestinal parasites and the nutritional status of Veddah children in Sri Lanka. This study describes and compares the intestinal parasites and nutritional statuses of primary school children of Veddah (local indigenous population) and Sinhalese (more advanced society) in rural Sri Lanka. Children attending years 1-3 (age range 6-15 years) at Dambana primay school (Veddah) and Wewata primary school (Sinhalese) were included in the study. Stools and blood samples were examined for evidence of intestinal parasites and anemia. There was a high prevalence of *G. intestinalis* and *B. hominis* (*Giardia* 7.8% and 6.2%; *Blastoystis* 17.2% and 17.3% at Dambana and Wewatta , respectively) in both communities the predominant helminth being *N. americanus* (20.3% at Dambana and 14.8% at Wewatta: P>0.05). A greater proportion of boys than girls were underweight and stunted in both communities.

Park *et al.,* (2005) worked on the status of intestinal parasite infections

among children in Bat Dambang, Combodia in March 2004. A total of 623 fecal specimens was collected from Kindergarten and school children and examined using the formalin-ether sedimentation technique. The infection rate of intestinal was 25.7% (boys, 26.2%; girls 25.1%) and infection rates of intestinal helminthes by species were, as follows: *Echinostoma* spp. 4.8%, hookworm 3.4%, *Hymenolepis nana* 1.3% and *Rhabditis* spp. 1.3%. The infection rates of intestinal protozoa were; *E. coli* 4.8%, *G. lamblia* 2.9%, and *E. histolytica* 0.8%. There were no positive egg cases of *A. lumbricoides* or *T. trichiura*.

Chaudhry *et al*., (2005) studied the prevalence of gastro-intestinal parasites in15 years old children in Muzaffarabad city were 29.26%. Protozoal infection was higher than helminth infestation. Prevalence of *G. lamblia* (11.8%) was higher than *E. histolytica* (5.9%), *A. lumbicoides* (3.8%) was the most prevalent helminth followed by hookworm (2.4%). Prevalence of all other helminthes namely *E. vermicularis*, *T. trichiura*, *H. nana* and *T. saginata* ranged from 1.0 to 1.7%. Mixed infection was seen only in 3.1% children. Rural children had higher prevalence of parasites than children living in city but difference was statistically non-significant. The education of mother was singe and most important factor that influenced that prevalence of parasites in the children. The children of educated mother had 3.5 times less chance of being infected with parasites.

Aimpun, *et al.*, (2005) carried out the survey for intestinal parasites in Belize, Central America. A stool survey was carried out in 5 villages in the Toledo district of the Central American country of Belize. Eighty two percent of total population of 672 participated. 66% of the population was found to have one or more intestinal parasites. The most common infection was hookworm (55%) followed by *A. lumbricoides* (30%),

E.coli (21%), *T. trichiura* (19%), *G. lamblia* (12%), *I. butschlii* (9%) and *E. histolytica/ dispar* (6%). The other parasites found were *E. hartmani, S. stercoralis, E. nana, I. beli* and *C. mesnili.* Children were more often infected than adults and more females had hookworm infections.

Zali *et al*., (2005) worked on the prevalence of intestinal parasitic pathogens among HIV- positive individuals in Iran. Parasites are important enteric pathogens among patients with HIV infection. There have been very few reports on the prevalence of intestinal parasites among such patients in Iran. A total 206 stool samples were collected. The overall prevalence of intestinal parasites was 18.4%. More specifically, the following parasites were identified; *G. lamblia* (7.3%), *B. hominis* (4.4%), *E. coli* (3.9%) and *Cryptosporidium parvum* (1.5%). Other parasites observed included *S. stercoralis* and *H. nana* in two cases and *Dicrocoelium dendriticum* in one.

Zakai, Haytham 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 low prevalence of intestinal parasites among the study group reflects the outstanding health and hygienic care in primary schools visited.

King *et al*., (2006) carried out the prevalence and intensity of

Strongyloides fuelleborni kellyi and other intestinal helminthes in children 5 years of age or under living near Kanabea . Papua New Guinea. Of 179 samples, 27% of the children tested positive for *Srongyloides*. With 81% of these children being a year or less in age. Overall, 68% of the children had one or more infection including *A. lumbricoides* and hookworm as well as *Strongyloides.*

Park *et al*., (2006) determined the status of *Enterobius vermicularis* infection among children (3-10 years) in 39 kindergartens and primary school were examined using the cello-tape and swab method during July and August 2000. Of 1,661 children examined. 307 (18.5%) were found to be positive for *E .vermicularis* 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 of girls (15.4%). However, positive rates were not significantly dependent on age.

Hung *et al*., (2006) studied the intestinal helminthes infection in an ethnic minority commune in southern Vietnam. A program to control intestinal helminth infections, based on stool surveys, mass treatment of children below 17 years, improvement of sanitation and health education was performed between 1997 and 1999 in Phan Tien an ethnic minority community in mountainous southern Vietnam. Before intervention, 28.6% of children excreted eggs of at least one parasite, hookworm being the most common (23%), followed by *T. tichiura* (1.9%), *H. nana* (1.9%), *E. vermicularis* (0.9%), *A. lumbricoides* (0.5%) and multiple kinds of helminthes (0.5%). *Stongyloides stercoralis* was never detected.

Akkus *et al.*, (2006) worked out the effect of social-demographic

characteristics and hygienic habits on the prevalence of *Enterobius vermicularis* in primary school children. In our country, parasitic disease in children and in particular, those caused by *Enterobius 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 parasite.

Gunduz *et al*., (2006) studied the prevalence of intestinal parasites in children with gastrointestinal symptoms associated with socio-economic conditions in Manis 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 detected by the cellophane tape method in 221 (10.3%) out of 2,160 patients. The positive cases were evaluated from underdeveloped and developing areas.

Goz *et al*., (2006) worked on the distribution of intestinal parasites in children ranging from 6-14 years old coming from 23 Nisan primary school in Hakkari. In this study total of 114 stool samples from 60 male students and 54 female students were examined for intestinal parasites. One or more intestinal parasite were found in 66 (57.8%) out of total of 114 student. *G. intestinalis* (28.9%), *B. hominis* (23.6%), *E. coli* (12.2%) and *A. lumbricoides* (6.14%) were most prevalent parasites.

Soldan *et al*., (2006) carried out the intestinal parasitism in children of Trujillo (peru) to create a prevention and control program. Fecal samples

of 489 children were examined. The general prevalence of intestinal parasites was found to be 68%. The most frequent pathogenic enteroparasites were *G. lamblia (*26.4%), *Cyclospora caytaensis* (12%), *H. nana* (2%), *H. diminuta* (1.6%) and *Cryptosporidium* spp (1%).

Chandrasena *et al*., (2007) carried out the growth status and intestinal parasitic infections among a group of children displaced by war in Sri 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 anthelmintics was recommended.

Koltas *et al*., (2007) studied the importance of the detection of amoebic antigens in stool samples for the diagnosis of *Entamoeba histolytica* infection, 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 diarrhoea, who lived in the provinces of Adana and Mersin, in southern 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, 535 females) aged 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. trichiurs*

(10.4%), *Taenia.* spp (9.6%), *S. haematobium* (0.6%) and *E. vermicularis* (0.3%). The prevalence of *A. lumbricoides*, hookworm, *Taenia* spp., *S. mansoni* and *S. stercoralis* in the urban center were similar to those in the rural communities. The study demonstrates the need for urgent intervention programs against intestinal helminthiases and Schistosomiasis in the study area.

Kassem *et al.*, (2007) studied the intestinal parasitic infection among children and neonates admitted to Ibn–sina hospital sirt, Libya. A total of 350 stool samples from 196, males and 154 female children and neonates admitted in Ibn–sina hospital sirt, were examined from June 2001 to May 2002, to determine the prevalence of intestinal parasites. Intestinal parasitic infections were identified in 196 (56%) of children and neonates. No intestinal helminthic parasites were detected but 13 intestinal protozoan parasites were detected. The most prevalent protozoan was *E. histolytica/E. dipar* (36.57%) *B. hominis* (12.57%), *G. lamblia* (10.29%), *I. belli* (3.43%), and *B. coli* (0.86%) to the latter was detected in non-Libyan children. The result showed significant difference exist between the prevalence of pathogenic and non-pathogenic protozoan parasite ($P<0.05$). High prevalence of *E. histolytica* and *G. lamblia* in both sexes.

Woerdermann *et al*., (2007) worked on the prevalence and risk factors of intestinal parasite in Cuban children. To determine the prevalence and risk factors of intestinal parasite infections in children in urban and rural settings in two Cuban municipalities. A total 1320 Cuban school children aged 4-14 were tested by stool examination for intestinal parasite infection and evaluated by parental questionnaire for a number of common environmental, sanitary, socio-economic and behavioral risk factors. Prevalence of intestinal parasite infection were 58% in Fomento

and 45% in San Juan y Martinzz; for helminth infections, these were 18% and 24% and for protozoa infection, 50% and 29% respectively.

Ben Musa *et al.*, (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 10% formalin and examined by routine microscopy using normal saline and Lugol's iodine preparation as well as the formal ethyl concentration method after a storage period of 12 moths 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, Candida albicans in their stool of which 6.3% was infected with intestinal parasites.

Wani *et al*., (2008) worked on the prevalence of intestinal parasites and 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.

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 form 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 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.

Nayebzadeh *et al.*, (2008) carried out a survey of the prevalence of *E. vermicularis* infection in nursery schools in Khorramabad, Iran. 1220 cases from 30 nursery schools were tested. The prevalence rate of infections was 507% overall. There was a significant difference in respect of children's educational level and family population between infected and non-infected groups. 5.7% prevalence as compared with other cities shows, that the infection rate of the oxyariaisis is low in nursery school in Khorrambad.

Areeshi *et al.*, (2008) studied the *Cryptosporidium* species causing acute diarrhoea 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 boy

weights, heights and weight –for -age Z scores. Faecal samples were collected and each checked for intestinal parasites 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.

Oninla *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. Overall, 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 intensities 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 giardiasis (P>0.05) between children drinking water from protected and unprotected sources.

3.3 Literature Review in National Context

Sharma, B.P. (1965) was the pioneer of such works in Nepal who conducted study of patients in Bhaktapur by random sampling method in order to ascertain the incidence of Roundworm infection. A total of 976

stool samples (430 from adult males, 317 from adult females) and 820 from children of both sexes under 12-years age were collected over a period of 5 years. The result showed that 32% of adult males. 44% of adult females and 49% of children were found to be infected with the parasites. This gave an overall incidence of 40% of the respondents with parasite. Among them 40% of *Ascaris lumbricoides,* 2056% of *Trichuris trichiura* and 1.94% of *Ancylostoma duodenale,* 1.62% of *Giardia lamblia*, 0.922% of *Taenia* spp and 6.86% of *Entamoeba histolytica* were reported.

Romana and Kasprazak (1966) worked on the fauna of intestinal protozoa in children and youth from przam. The total incidence of protozoan infection was 54%. Among of them, *E. coli* (24%), *Lamblia intestinalis* (21%), *E. nana* (18%), *D. fragilis* (16%), *E. hartmani* (5%), *E. histolytica*, *C. mesnili* and *E. hominis*(3%) in each were found and *I. butschlii* was 2% of the 202 person of 1 to 18 years old

Sharma and Tuladhar (1971) carried out the extensive study of intestinal parasites among auxiliary health workers in Kathmandu. They examined 80 stool samples of which 10 candidates i.e. 12.5% did not show any infestations. The rest 70 i.e. 87% respondent were suffered from different types of protozoan, 8 helminthic infection. Among them 61 i.e 78.75% of them were suffered from single infection and 7 i.e. 75% suffered from multiple infection. Among them 41.25% of Roundworm, 27.5% of Hookworm, 10% of *Tichuris trichiura*, 5% of *Entamoeba histolytica* and 3.75% of *Giardia lamblia* were recorded.

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

In (1974) progress report of Bhaktapur 8, 9, 10 words reported 89.6% infection rate of intestinal parasites.

Soulsa (1975) carried out a survey of the prevalence of intestinal parasite in Pokhara and found very high incidence. He observed that dirty finger bails might play an important role in the transmission of intestinal parasites.

Lynch *et al*., (1978) worked on the prevalence of hookworm and other helminthes in British Gorkha recruits reported 89% of healthy appearing individuals were infected with hookworm, 49% with roundworm and 36% with whipworm.

Acharya (1979) reported that the intestinal infestation like giardiasis, amoebiasis, ascariasis, ancylostomiasis, fasciolisis and taeniasis were common in Nepal.

Nepal and Palfy (1980) worked on the study of prevalence of intestinal parasites in the Mahanchal Panchayat. Out of 225 examined stool sample 95.3%were positive. The most common parasites were roundworm (63.5%) followed by hookworm (34.2%), *E. histolytica* (28.8%) and *G. lamblia* (28.4%).

Bol and Roder (1981) studied the soil -transmitted nematodes in Lalitpur district. They observed A. *lumbricoides* , *N. americanus*, *A. duodenale*, *T. trichuira* and *S. stercoralis* as the soil-transmitted nematodes.

IFPPCP (1981) examined 4696 stool samples in Panchkhal area in which 3475 (74%) stools were positive. The infection rate of *Ascaris* was 37% followed by hookworm (47%), *T. trichuira* 254 stool samples were positive.

Estevez *et al*., (1983) studied the intestinal parasites in remote western village of Nepal and reported 83.3% of individuals positive for hookworm, 52.8% for roundworm and 5.5% for whipworm infection.

IFPPCP (1984) examined 416 stool sample of school children of Panchkhal. Out of which 112 (27%) cases were positive. The common intestinal helminthes were *Ascaris,* 22(20%), hookworm, 53 (47%) and *Trichuris*, 53(47%). In Bhaktapur the project examined 412stool samples of which 295(72%) were positive.

Sugari *et al*., (1985) conducted the finding of helminthes infections, in 737 Nepalese people living in Gandaki, Dhaulagiri, Lumbini and Sagarmatha zone of Nepal and 26 Japanese living in Kathmandu. The overall helminthes infection rate was 36.8% including roundworm (50.3%), hookworm (44.1%), whipworm (47.6%), pinworm (1.2%) and *Taenia* spp. (0.1%).

Morel AM (1986) carried out the specification of human hookworm in Eastern hills of Nepal. A total of 757 human faecal samples from 1982 to 1985 were examined and found 17% positive for hookworm. 10 samples were for S*trongyloides*.

Rai and Gurung (1986) worked on the intestinal parasitic infection in high school level student of Birgunj city. Collected 200 stool samples and examined by direct smear technique over a period of 16 days. The rate of incidence of roundworm was the highest (35%) followed by hookworm (14%). The overall infection rate was 69% and the result showed that the boys were less infected than the girls.

Geollman R (1988) carried out an extensive disease survey in Patan hospital's general out patient's clinic from December 1986 to November 1987. A total of 79,404 people were diagnosed during this years, and the incidence of related intestinal parasites was found to be 1.7% of *E. histolytica*, 2.7% of *G. lamblia* and 8.5% of hookworm.

Gupta *et al*., (1988) collected 285 stool samples from Kirtipur. Among them 192 i.e. 67036% was found to be positive for intestinal parasite. Out of these 192 positive stool samples, 49 cases were infected with protozoan parasite, 9.12% by *G. lamblia* and 9.47% by *E. histolytica* out of 155 samples. Out of 285 stool samples, 54.38% were positive for helminthes highest prevalence was exhibited by *A. lumbricoides* i.e by 25.65% of *T. trichiura*, 4056% of *A. duodenale*, 2.46% of *H. nana* and 0.55% of *T. solium*.

Houston *et al*., (1990) studied about the helminthes infections among Peace Corps Volunteers station in rural regions of Nepal indicated 14% were positive for Hookworm, 3% for Whipworm, and 82% for Roundworm.

Rai *et al*., (1991) showed the prevalence of various intestinal parasites in Kathmandu valley. The overall prevalence between two sexes. Intestinal parasites where more common among children (<15 years) than in adults (>15 years). *A. lumbricoides* was the common parasite followed by hookworm, *Taenia* spp., *E. vemicularis* and others. Among protozoan parasites, *G. lamblia* was the most common followed by *E. histiolytica.*

Blangero *et al*., (1993) examined the helminthes infection in Jiri, concluded that roundworm, whipworm and hookworm were endemic in Nepal and are the major health problem for the population.

Sherchand *et al*., (1994) studied the intestinal parasites in Kathmandu valley and reported 28% of parasitic load among subjectively healthy adults, where as 62.7% total parasitic load was recorded among children with patients having abdominal discomfort. Among protozoan prevalence of *G. lamblia* was highest among the sick children. In healthy children the prevalence of mixed parasitic infection was 2.1% and 7% in healthy

adults, while 13.3% prevalence of mixed parasitic infection was 2.1% and 7% in healthy adults, while 13.3% prevalence was found in sick children and 11.5% in sick adults.

Rai *et al*., (1995) worked on the status of intestinal parasites at TU Teaching Hospital, the positive rate of intestinal parasites was seen to be varying from 29.1% to 44.2%. Children were found to be infected more frequently than adults. The *Ascaris lumbricodes* not only topped the list but also showed the static incidence throughout the study period.

Sherchand *et al*., (1997) carried out the stool survey on intestinal parasites in rural village of Dhanusha district, southern Nepal. Out of 604 children of aged 0-9 years, examined 63.1 were found positive for at least one intestinal parasite. Hookworm infection superseded all the parasites found were *A. lumbricoides, T. trichiura, E vermicularis, S. stercoralis, H. nana, E. histolytica, E. coli, G. lamblia, Cryptosporidium* and C*yclospora* etc.

Rai *et al.*, (1999) studied the *Ascaris,* Ascariasis and its present scenario in Nepal and suggested *Ascaris* as leading human parasite and also reported as major causes of public health problem. That study also reported that over 75% people were infested by *Ascaris lumbricoides* in rural areas, where as hospital based study in Kathmandu over a period of one decade also shown a static annual prevalence with mean of approximately 35%.

Kharel D.P. (2000) worked on the prevalence of intestinal Helminthes parasitic infestation in General and Hookworm in particular on Bhutanese Refugees settled in Jhapa district of Nepal. 144 stool samples were collected from, school ages children of Bhutanese Refugees, between 5-14 years, Nursery to class 4. Out of 144 stool samples examined, 67

(46.51%) were found positive for parasitic infestation among which hookworm were highly infested 35 (24.30%) in the school children. Sex-wise infestation rate were 49.25% in males and 50.74% in female children in general. Similarly age wise infection of hookworm was found high children between the 5-7 years, 23.28% in male and 25.35% in female. This result reveals that the numbers of parasitic infection are more in female than in male children.

Shrestha B (2001) carried out the intestinal parasitic infestations in healthy school children of Lalitpur district. Stool samples of 515 healthy urban and rural school children of 7-12 years age group were collected. Among them prevalence of *Ascaris lumbricoides* was found to be highest i.e. 73.45% in rural and 71.66% in urban children. Like this way prevalence of *T. trichiura* was found to be higher among children of urban i.e. 37.91% where as that of rural was27.27%, 78.36% and 84.07% of male , and 92.45% and 73.72% of female children from the urban and rural respectively were found infested with the protozoan and parasites.

Rai *et al*., (2002) worked on the contamination of sole with helminthes parasitic egg in Nepal. A total of 156 samples were collected from different part of Nepal (i.e. 122 from Katmandu valley and 34 from outside the valley). Among 156 samples, the overall contamination rate was 36.5%, (57/156). In Katmandu valley soil contamination rate was higher i.e. 48.3% during wet seasons compared with that of dry season i.e. 33.3% *A. lumbricoides, Toxocara* spp., *T. trichiura, Capillaria sp., Trichostrongylus* spp. And two spp. of cestoda (i.e *H. nana* and *H. diminuta*) were also recovered. *A. lumbricoides* was predominant in Katmandu valley while *Trichostrongylus* was the commonest one outside the valley.

Rai *et al*., (2002) studied the intestinal parasites among school children in rural hilly area of Dhadhing district Nepal. A total of 423 school children were included and 254 i.e. 60% of them were found to be positive for intestinal parasite. *Ascaris lumbricoides* was the most common (i.e. 199 i.e. 69.6%) parasite detected followed by Hookworm i.e. 19.2% and Whipworm 5.9%. *Giardia lamblia* was only protozoal parasite detected in this study i.e. 5.2% where as Dalit (backward class) had significantly higher prevalence i.e. 74.1%.

Parajuli R (2003) carried out the prevalence rate of intestinal parasite in Mushar 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. trichiura* (22.4%), *E. histolytica* (15.3%), *S. stercoralis* (8.19%), *G. lamblia* (7.65%), *H. diminuta* (4.37%) and *H. nana* (2.73%) and *Taenis* spp (1.63%).

Karki (2004) conducted a study among Magars 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 rate was found to be due to *A. lumbricoides* (50.32%), followed by hookworm (24.2%), *T. trichiura* (17.2%), *Taenia* spp. (8.28%), *H. nana* (6.37%) and *S. stercoralis* (1.91%).

Ghimire, T.R and Mishra, P.N. (2005) carried out the study to determine the prevalence of the intestinal parasites and to evaluate the types of intestinal parasites and haemoglobin concentration in the people of two areas of Nepal. The cross-sectional descriptive type of study was conducted from April 2005 to October 2005 in Kirtipur, Kathmandu and Gunjangar VDC, Chitwan, Nepal. A total of 400 stools were processed by

using a standard formalin-ethyl acetate concentration method, direct light microscopy, modified acid fast stain, oculo-micrometer and bisporulation assay. The blood was collected from the 59 solitary parasite positive persons, one concomitantly infected person and 17 parasite non-infected persons and examined by colorimeter. The total prevalence of intestinal parasites was 42.0% in which the prevalence of intestinal parasites was 42.0% in which the prevalence of males and females was 35.2% (58/165) and 46.8% (110/235) respectively with statistically significant ($P<0.05$, 95% CI).There was statistically of low concentration of haemoglobin in the helminthes and protozoa infected males and females with different age groups ($P<0.05$, 95% CI).

Sharma *et al*., (2005) studied the prevalence of intestinal parasitic infestation in school children in the northeastern part of Kathmandu valley, Nepal. This paper presents the status of intestinal parasites in public school children (1 to 10 classes) in a rural area. A total of 533 school children (269 girls and 264 boys, aged 4 to 19 years) were included in this study. The overall prevalence of parasite was 66.6% (395/533) with no significant difference between boys and girls ($P>0.05$). Tibeto-Burman children had a non-significant higher prevalence, compared with Indo-Aryan and Dalit children ($P>0.05$). Half (53.8%; 191/355) of children had multiple parasitic infections. Altogether, nine type of parasite were recovered. The recovery rate of helminthes was higher (76.9%) than protozoa (23.1%). *T. trichiura* was the most common helminthes detected, followed by hookworm, *A. lumbricoides* and others. *E. coli* was the most common protozoan parasite followed *E. histolytica, G. lamblia* and others.

Ghimire, T.R and Mishra, P.N. (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 Disease Hospital of Kathmandu, Nepal form May 2003 to April 2004. The total of 86 stool samples were collected from 86 HIV patients once and they were examined by direct smear methods and modified Kinyoun acid-fast stain. Here, 18 females (78.3%) out of 23HIV patients 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 no significant difference with months (χ^2=18.83, P>0.05). In this study, *Cyclospora* (19.8%), *Cryptosporidium* (14.0%), *Isospora* (3.5%), *Strongyloides* (10.5%), *Ascaris* (4.7%), *Giardia* (3.5%), *Hymenolepis nana* (2.3%), Hookworm (2.3%) and *Enterobius (*2.3%) were reported with statistically significant (χ^2= 18.3, P<0.05). The total prevalence of coccidian and non-coccidian parasites was 37.0% and 30.2% respectively with statistically significant (χ^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 acute 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.

CHAPTER-4
MATERIALS AND METHOD

4.1 Study area

Kanti Children's Hospital is situated in the about centre part of Kathmandu valley. It was established in 2019 Poush 22 (7 January 1963). This hospital was stared from 50 beds. It was supported by Soviet Sangh. For 7-8 years all aged group people were treated. Since 2027-sharwan-4 (July-1970) it is changed to Kanti Children Hospital.

Tulsi Giri was the first chairman of this hospital. The first chairman of the development committee was Ram Shankar Shrestha. There are 304 beds and 20 beds are provided in Emergency ward. The services of X-ray, Ultrasound, E-ces, pathology, Physiotherapy, Echocardiography are available.

Emergency ward gives services every time. OPD gives services 6 days in a week. Services of cardiology, Neohrology, Oncology are given in fix days. In Tuesday and Friday doctors from Teaching Hospital come there to check up the patient. One consultant gives services one day OPD and flow up in a week. In other days his duty is only rounding.

Daily 200-350 patients come there to check up, among them about 25-35 patients are related to intestinal parasitic diseases. The indoor services are medical, paying, neonlogy, oncology/ cardiology, surgical, NICU, PICU, SICU. The charge of OPD is Rs.10/- Poor children are treated freely. These patients are admitted who are suffering from Acute respiration infection, diarrhea, Enteric fever, Meningitis, skin infection. Since two years ago study of mediatric has been started.

4.2 Stool Sampling

Total of 328 stools sample were collected and examined during study period. Out of 328 stool samples, 189 stool samples were collected from two month of summer season and 139 stool sample collected from two month of winter season. The samples were collected from all ethnic background.

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 children of different castes were selected. Base line health survey was conducted in the Kanti Hospital with prepared questionnaire during second week of Shrawan to second week of Ashoj and Second week of Mangsir to second week of Magh. They (selected patient and their guardians) 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. Needles and sticks
8. Glass slides
9. Cover slip
10. Dust bin

4.3.1.2 Chemicals

1. Normal saline (0.85% Nacl)
2. Potassium dichromate (2.5% wt. by volume)
3. Iodine solution (1% wt. by volume)
4. Glycerin
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. 2.5gram 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 is filtered and kept in a stoppered bottle of amber color.

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 observed 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

In this study, 328 stained and unstained stool smears were prepared to

observe the various intestinal protozoan as well as helminthes parasites. Some of the methods are as follows:

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 lip 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 help of books and references, the presence or absence of yolk 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 .

4.3.4 Data Processing and Analysis

4.3.4.1 Data Collection

The primary data collected from pathology lab of Kanti Children's Hospital, Maharajgunj, Kathmandu, Nepal from the age group of 1 to 14 were collected. With the help of questionnaire collected the knowledge, attitude and behaviour of patients and their parents.

4.3.3.2 Data Analysis and Interpretation

Thus obtained data from the examination of stool as well as questionnaire survey were edited, coded, tabulated and analyzed using appropriates statistical tools. Analysis of data was done on the basis of age, sex, feeding habit, infection rate and social and cultural aspects of the children. These analyzed data were interpreted by representing with table, bar-diagram and pie chart, drawing graph of suitable data.

CHAPTER-5
RESULTS

The study was conducted upon the children of Kanti hospital from August 2007 to May 2008. During survey, about 328 stool samples were collected.

The result of study was discussed on following.

1. Stool samples collection and examination.
2. Data collection on survey basis and questionnaire basis.

5.1 Stool Samples Collection and Examination

Total of 328 children 123 were found to be positive. Prevalence of intestinal parasite in male was 38.76% and 36.00%in female.

Age and sex-wise respondents

During the study period 328 children and their parents were interviewed. Out of 328 children, 178 (54.26%) were male children and remaining 150 (45.73%) were female. Hence, the population of patients was found higher in male than female.

Table No. 1: Age and sex-wise respondents

Age group	Male		Female		Total	
	Total no. of respondent	Percentage (%)	Total no. of respondent	Percentage (%)	Total no. of respondent	Percentage (%)
0-2	50	28.08	26	17.33	76	**23.17**
3-5	41	26.96	38	25.33	79	**24.08**
6-8	38	21.34	27	18.00	65	**19.81**
9-11	27	15.16	34	22.66	61	**18.59**
12-14	22	12.35	25	16.66	47	**14.32**
Total	**178**		**150**		**328**	

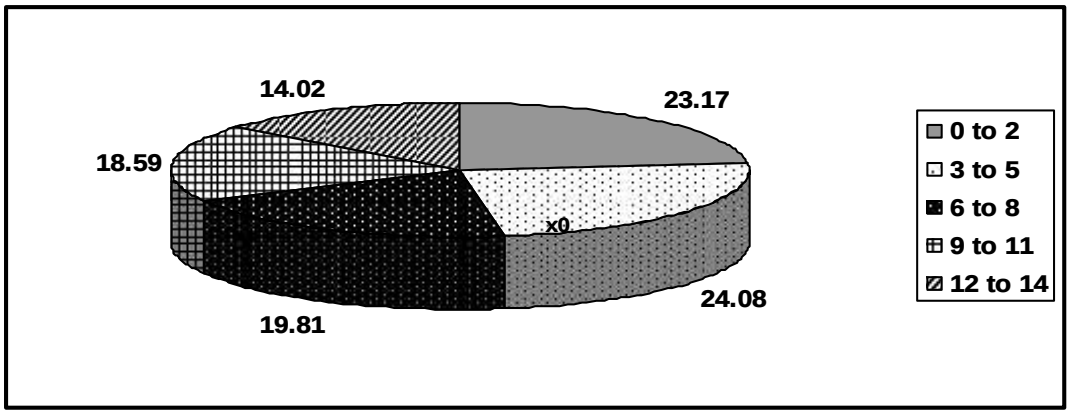

Fig. No. 1: Age wise respondents

Age and sex wise prevalence of intestinal parasites

Age wise study for prevalence of intestinal parasites reveals that males and females of age 9-11 years were found to be maximum (56.92%) and minimum in 0-2 year's age group (23.68%). Statistically the prevalence of intestinal parasites according to the age was significant (χ^2=18.88). From the below table we can see that the male and female of age 9-11 years were found to be highest prevalence and 0-2 years had least prevalence rate. Similarly, the sex wise study for prevalence of intestinal parasite showed that 69 of male (38.76%) and 54 of female (36%) were found to be infected with the intestinal parasites.

Table No. 2: Age and sex wise prevalence of intestinal parasites

Age group	Male			Female			Total		
	Total no. of samples examined	No. of positive samples	Per (%)	Total no. of samples examined	No. of positive samples	Per (%)	Total no. of samples examined	No. of positive samples	Per (%)
0-2	50	12	24.00	26	6	23.07	76	18	23.68
3-5	41	18	43.90	38	14	36.94	79	32	40.50
6-8	27	10	37.63	34	11	32.35	61	21	34.42
9-11	38	21	55.26	27	16	59.25	65	37	56.92
12-14	22	8	36.36	25	7	28.00	47	15	31.91
Total	**178**	**69**	**38.76**	**150**	**54**	**36.00**	**328**	**123**	**37.50**

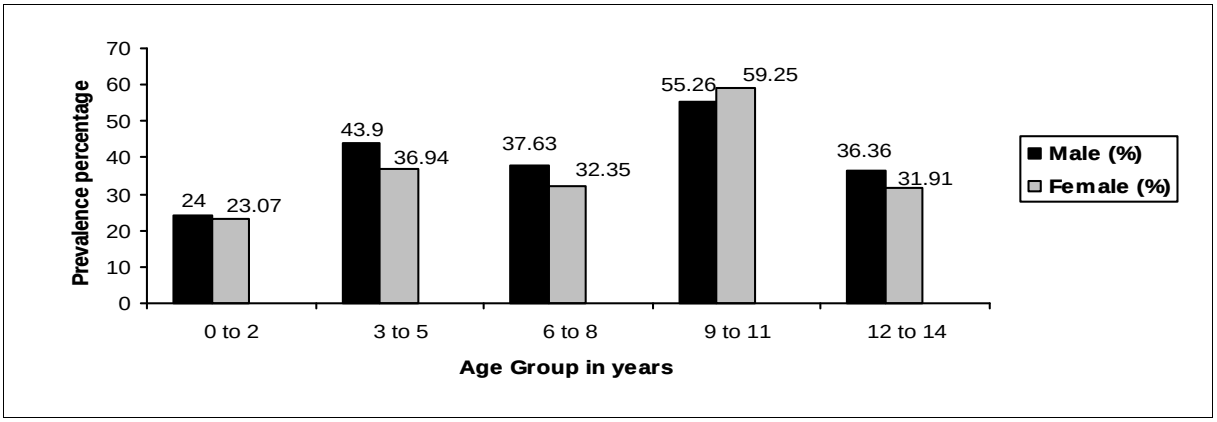

Fig. No. 2: Age and sex wise prevalence of intestinal parasites

Statistically, different in the prevalence of intestinal parasites according to the sex group was found to be significant (χ^2= 0.24).

Sex wise prevalence percentage of single species intestinal parasites

The analytical study of table number 3 shows that, out of 328 samples, before treatment 123 samples were found to be positive in which 69(38.76%) were male and 54(36%) were female. Result from the stool examination showed that *Giardia lamblia* was the most prevalent protozoan parasite with 28 (15.73%) and 19(17.33%) out of 178 and 150 stool samples in male and female children respectively. Similarly *Ascaris lumbricoides* was the most prevalent helminthes parasites with 20(11.23%) and 10(6.66%), out of 178 and 150 stool samples in male and female children respectively.

Table No.3: Sex wise prevalence percentage of single species intestinal parasites

Name of parasites	Male		Female		Total	
	No of Positive cases	Per (%)	No. of positive cases	Per (%)	No. of positive cases	Per (%)
Entamoeba histolytica	11	6.17	18	12	29	8.84
Giardia lamblia	28	15.73	19	12.66	47	14.32
Ascaris lumbricoides	20	11.23	10	6.66	30	9.14
Ancylostoma duodenale	4	2.24	2	1.33	6	1.82
Trichiuris trichiura	3	1.68	0	0	3	0.91
Strongyloides stercoralis	1	0.56	4	2.66	5	1.52
Hymenolepsis nana	1	0.56	1	0.66	2	0.60
E.vermicularis	1	0.56	0	0	1	0.30
Total	**69**		**54**		**123**	

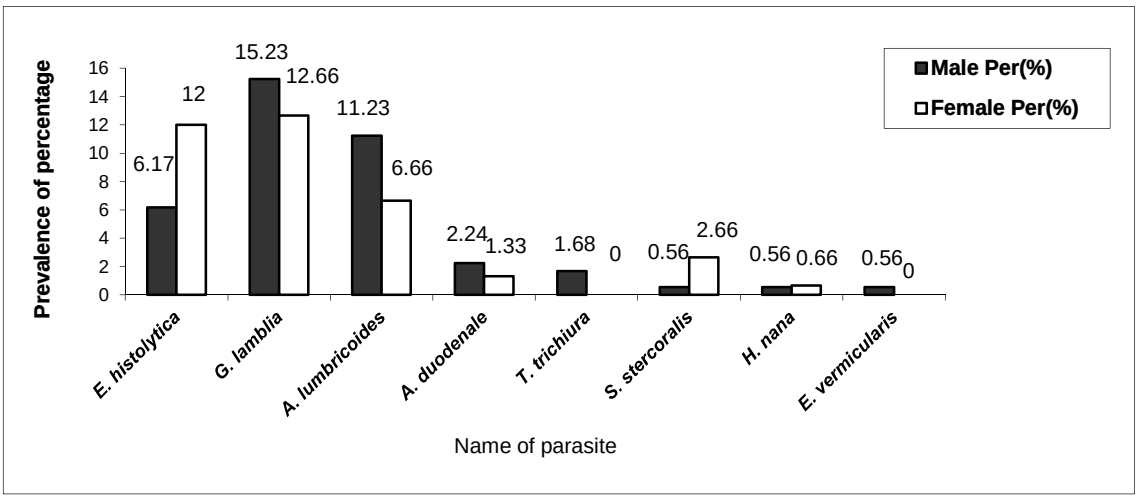

Fig. No. 3:- Sex wise prevalence percentage of single species intestinal parasites

Age wise prevalence of intestinal parasites

Out of 328 samples, 123 children were infected with at least one kind of parasites. The largest percentage of parasites was found in the age group 9-11 in which 56.92% (37 out of 61) children were infected and the second largest was among the group 3-5 years in which 40.50% (32 out of 79)were infected. However, the least prevalence of parasite was found in the age group 0-2 in which 23.68% (18 out of 76) children were infected.

Table No. 4:- Age wise prevalence of intestinal parasites

Age	Obs No.	Positive cases																	
		E. histolytica		*G. lamblia*		*A. lumbricoides*		*A. duodenale*		*T. trichiura*		*S. stercoralis*		*H. nana*		*E. vermicularis*		Total	
		No.	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No**	**%**	**No.**	**%**
0-2	76	7	9.21	7	5.26	4	5.26	-	0	-	0	-	0	-	0	-	0	18	23.68
3-5	79	10	12.65	14	17.72	6	7.59	-	0	-	0	-	0	1	1.26	1	1.26	32	40.50
6-8	65	5	7.69	8	12.30	4	6.15	2	3.07	1	1.53	1	1.53	-	0	-	0	21	34.42
9-11	61	5	8.19	16	26.22	9	14.75	2	3.27	1	1.63	3	4.91	1	1.63	-	0	37	56.92
12-14	47	2	4.25	2	4.25	7	14.89	2	4.25	1	2.12	1	2.12	-	0	-	0	15	31.91
Total	**328**	**29**		**47**		**30**		**6**		**3**		**5**		**2**		**1**		**123**	

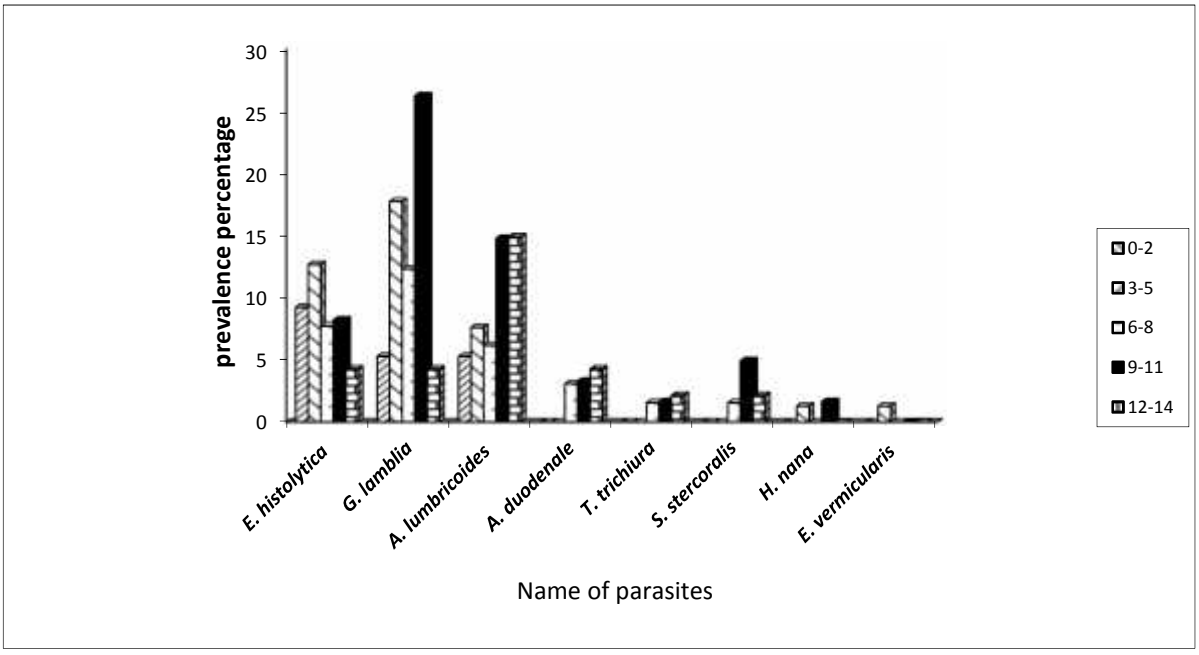

Fig No. 4:- Age wise prevalence of intestinal parasites

Sex wise prevalence of specific protozoan parasites

The analytical study of the table no. 5 shows that the distribution of *G. lamblia* (14.66%) in males and (12.66%) in females children. While, that of *E. histolytica* (6.17%) in males and (12%) in females children. The comparative study concluded that the infection rate with protozoan parasites was higher in males than in females children respectively.

Table No 5:- Sex wise prevalence of specific protozoan parasites

Sex	Obs. No.	Positive cases					
		E. histolytica		*G. lamblia*		Total	
		No.	%	No.	%	No.	%
Male	178	11	6.17	28	14.60	39	11.89
Female	150	18	12	19	12.66	37	11.28
Total	**328**	**29**		**47**		**76**	

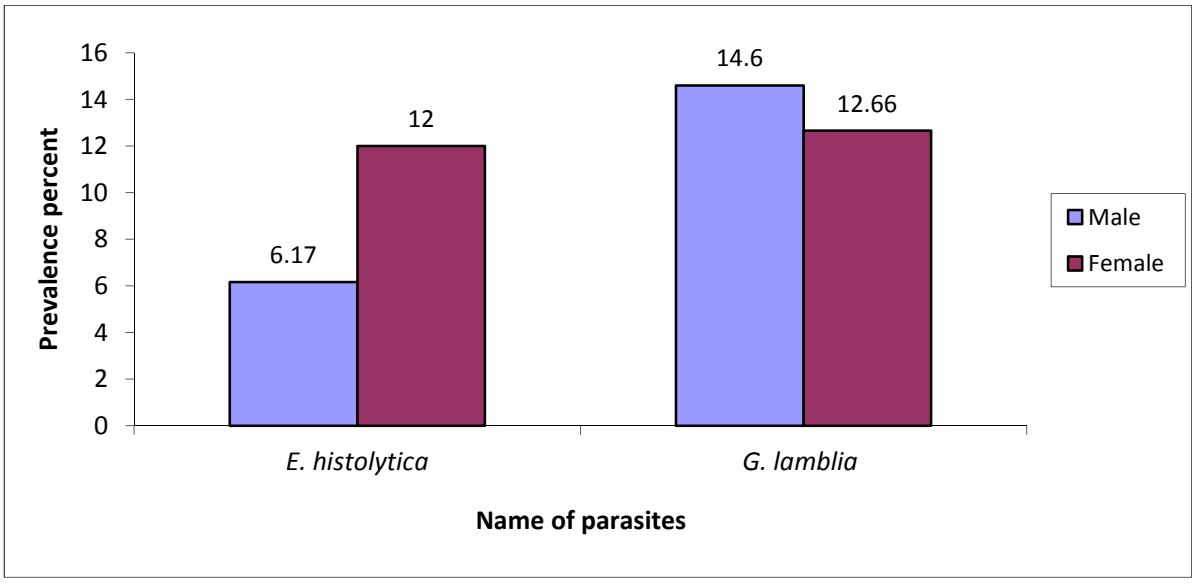

Fig. No. 5:- Sex wise prevalence of specific protozoan parasites

Sex wise prevalence of specific helminthes parasites

The below table shows that, the distribution of *A. lumbricoides* (11.23%) was the highest, followed by hookworm (2.24%), *T. trichiura* (1.68%), *S. stercoralis*, *H. nana*(0.56%), *E. vermicularis* (0.56%) in males children. Similarly, distribution of *A. lumbricoides* was the highest (6.66%), followed by hookworm (1.33%), *S. stercoralis* (2.66%) and *H. nana* (0.66%) in females children.

Table No. 6:- Sex wise prevalence of specific helminthes parasites

Sex	Obs. no.	Positive cases													
		A. lumbricoides		*A. duodenale*		*T. trichiura*		*S. stercoralis*		*H. nana*		*E vermicularis*		Total	
		No.	%	No.	%	No.	%	No	%	No.	%	No.	%	No.	%
Male	175	20	11.23	4	2.24	3	1.68	1	0.56	1	0.56	1	0.56	30	9.14
Female	150	10	6.66	2	1.33	-	0	4	2.66	1	0.66	-	-	17	5.18
Total	**328**	**30**		**6**		**3**		**5**		**2**		**1**		**47**	

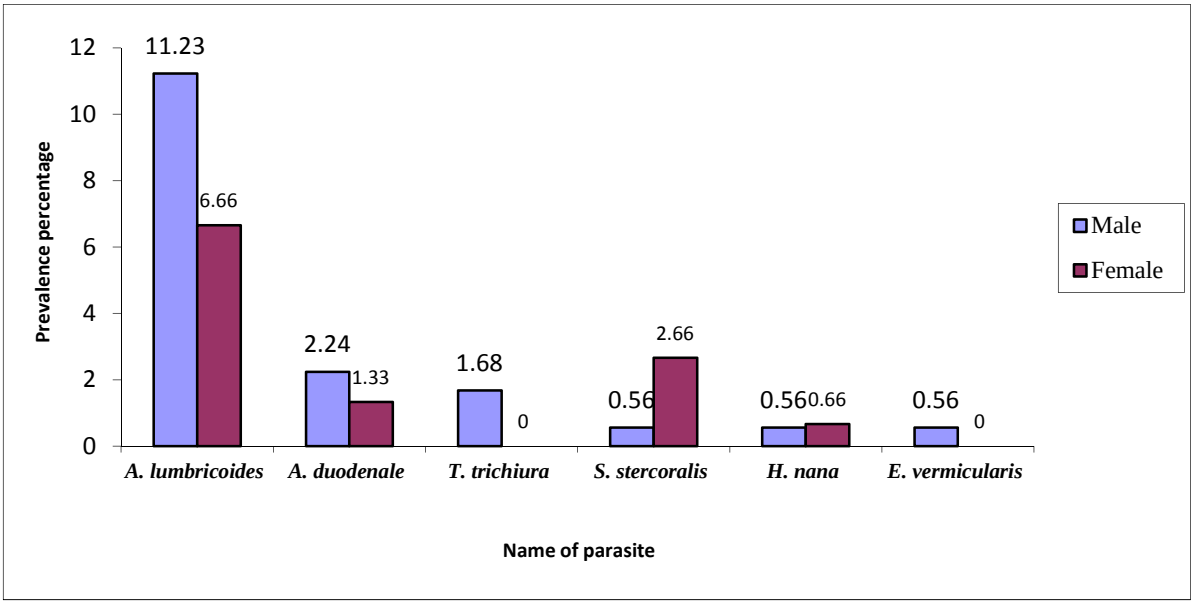

Fig. No. 6:- Prevalence of specific helminthes parasites

Prevalence of parasites on month wise in summer season and winter season

During sample collection, 189 stool samples were collected in the two month of the summer season, i.e. second week of Shrawan to second week of Ashoj and 139 stool sample collected from winter season. Maximum numbers of samples were collected in the month of Bhadra and least number of samples was collected in month of Poush. Highest percentage (46.83%) of parasites was found in the month of Bhadra and least percentage (23.91%) of parasites was found in the month of Poush.

Table no. 7(a):- Prevalence of parasites on month wise in summer season

Month	No. of samples	No. of positive samples	Percentage
Shrawan	68	26	38.23
Bhadra	79	37	46.83
Ashoj	42	11	26.19
Total	189	74	39.15

Table no. 7(b):- Prevalence of parasites on month wise in winter season

Month	No. of samples	No. of positive samples	Percentage
Mangsir	51	26	45.09
Poush	46	11	23.19
Magh	42	15	35.71
Total	139	39	35.26

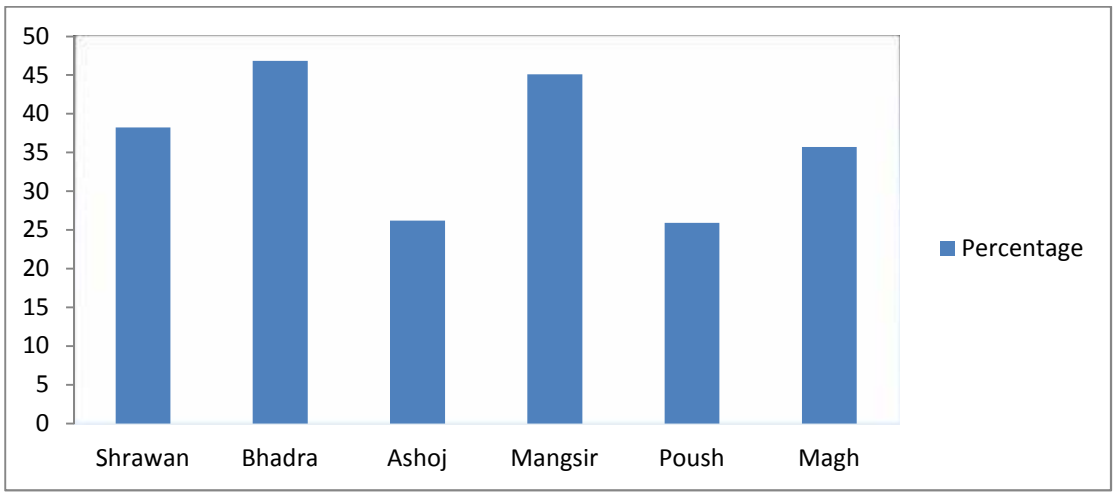

Fig. No. 7: Prevalence of parasites on month wise in summer season and winter season

Sex wise intensity of infection by parasites

Out of 178 males children, 62(89.85%) showed single infection, 6(8.69%) showed double infection and 1(1.44%) showed multiple infection. Similarly, out of 150 females children, 51(94.44%) single infection and 3(5.55%) double infection.

Table no. 8:- Sex wise intensity of infection by parasites

S. No.	Sex	Total sample collected	Total positive cases	Single infection		Double infection		Multiple infection	
				No.	%	No.	%	No.	%
1	Male	178	69	62	89.85	6	8.69	1	1.44
2	Female	150	54	51	94.44	3	5.55	-	0
3	**Total**	**328**	**123**	**113**	**91.86**	**9**	**7.31**	**1**	**0.81**

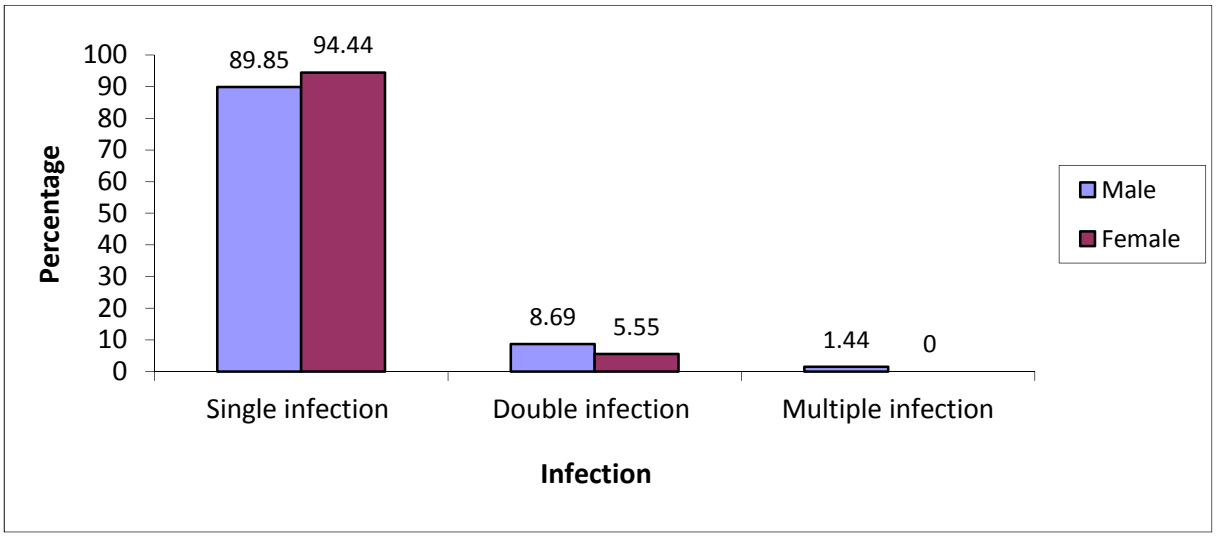

Fig. No. 8:- Sex wise intensity of infection by parasites

Age-wise intensity of infection by parasites

The result of study indicates that multiple infections were recorded in age group 12-14, 1(6.66%). Likewise, double infections were maximum in age group 12-14, (26.66%). However single infections were maximum in age group 9-11, 34 (91.89).

Table no. 9:- Age-wise intensity of infection by parasites

Age	Total sample collected	Total positive sample	Single infection		Double infection		Multiple infection	
			No.	%	No.	%	No.	%
0-2	76	18	18	100	-	0	-	0
3-5	79	32	32	100	-	0	-	0
6-8	61	21	19	90.47	2	9.52	-	0
9-11	65	37	34	91.89	3	8.10	-	0
12-14	47	15	10	66.66	4	26.66	1	6.66
Total	**328**	**123**	**113**	**91.86**	**9**	**7.31**	**1**	**0.81**

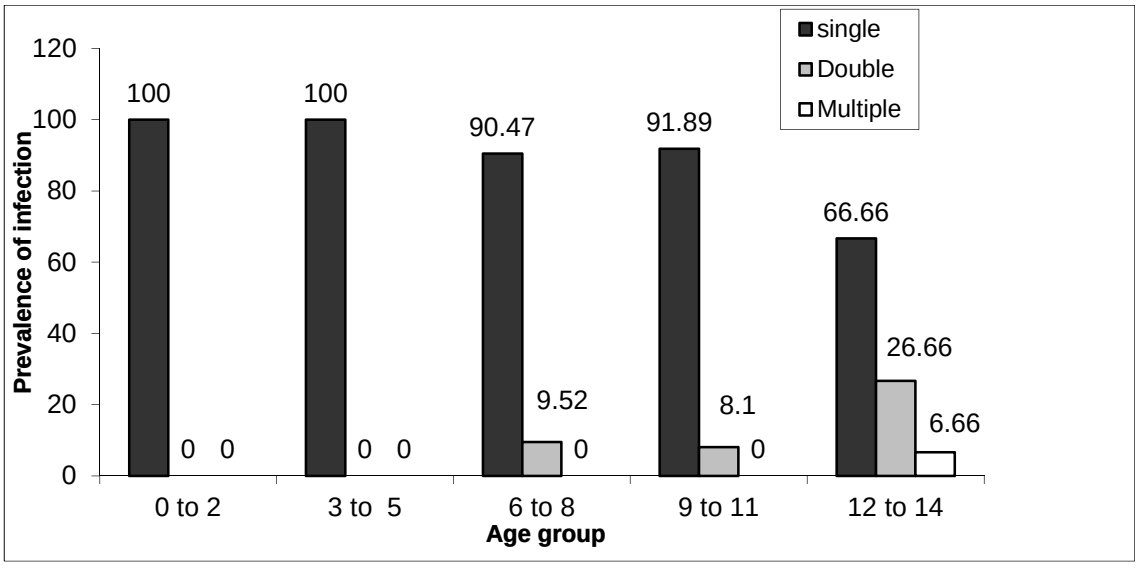

Fig no. 9:- Age wise intensity of infection by parasites

5.2 Data collection on survey basis and questionnaire basis

Interviews were also carried out in same population of children whose stool examinations were done. Those children who could not answer

themselves their interview were taken with the help of their parents. The results from the survey analysis and stool examinations are as follows:

Children's way of defecation

Out of 328 children, maximum 86.30% used toilet, in which 36.4% were found to be positive for intestinal parasites during stool examination where as minimum (4.0%) children used open place for defecation in which 53.8% respondents were found to be positive for intestinal parasites. 9.8% use pot toilet mainly the children under the age of 3 years used this type of pot.

Table No. 10: Children's way of defecation

S. N.	Category	No. of Respondents	Percentage (%)	No. of positive samples	Prevalence (%)
1.	Toilet	283	86.30	103	36.40
2.	Pot toilet	32	9.80	13	40.6.
3.	Open place	13	4.00	7	53.80
	Total	**328**	**100%**	**123**	

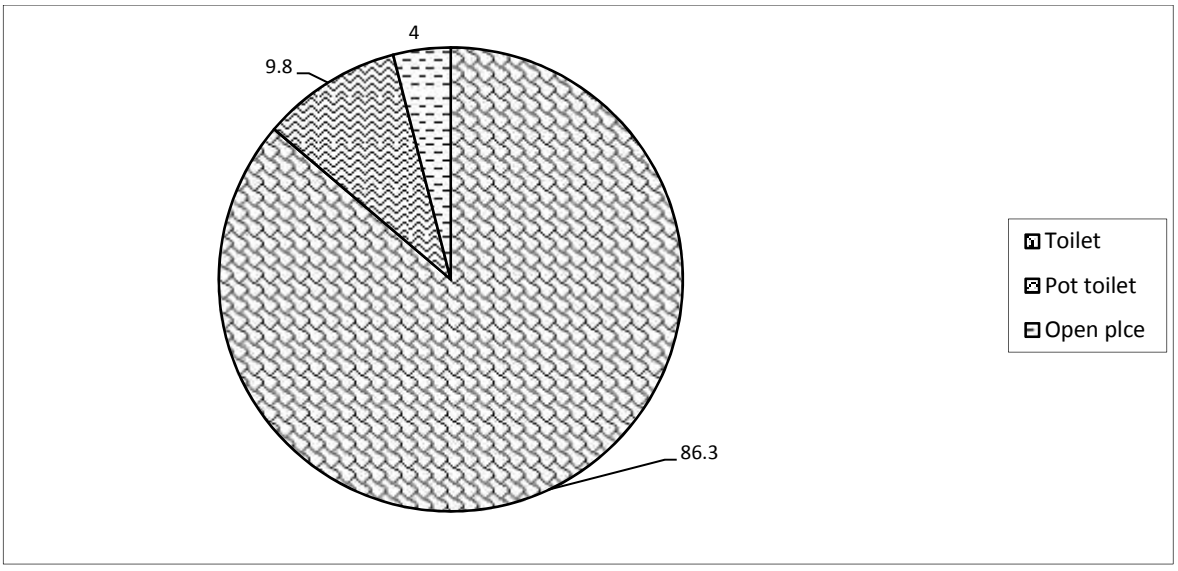

Fig No.10:- Children's way of defecation

Drinking water used by respondents

During survey study, 328 respondents 13.70% used water from tap without boiled or any treatment. Below table indicates that maximum positive (79.3%) cases of intestinal parasites were reported from those children drink only filter water. However 45.10% children drink boiled water, 7.60% drink filtered water after boiling and rest 15.90% used chlorinated water for drinking purpose.

Table No. 11: Drinking water used by respondents

S.N.	Category	No. of respondent	Percentage (%)	No. of positive sample	Prevalence (%)
1.	Boiled	148	45.10	38	25.70
2.	Filtered	58	17.70	46	79.30
3.	Boiling after filter	25	7.60	4	16.00
4.	Chlorination	52	15.90	12	23.10
5.	None	45	13.70	23	51.1
	Total	**328**	**100%**	**123**	

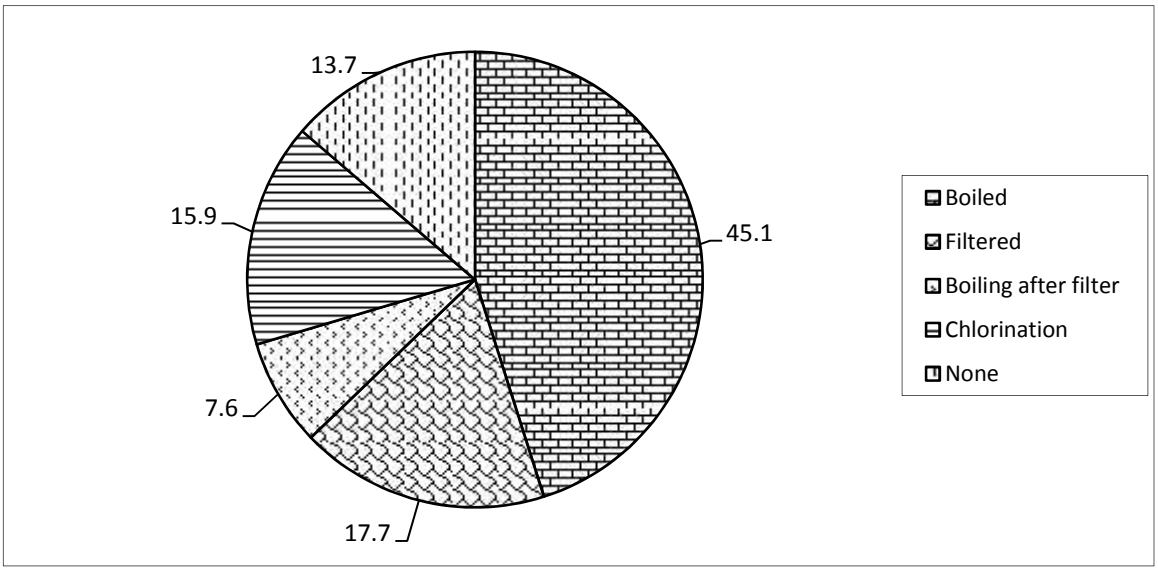

Fig No. 11: Drinking water used by respondents

Source of water used by respondents

From the below table, it reveals that out of 208 respondents maximum (63.4%) used the tap water to drink where as least number of children 5 (1.5%) used river water for drinking purpose, and 65(19.8%) children use government supply and remaining children used the other sources of water like well, market jar, Dhunge Dhara etc. Not only that most of the parents neither treated water nor filtered for drinking purpose but also they used directly for drinking.

Table No. 12: Source of water used by respondents

S. N.	Category	No. of respondent	Percentage (%)
1.	Tab	208	63.4
2.	Well	28	8.5
3.	River	5	1.5
4.	Market (Jar water)	10	3.0
5.	Dhunge Dhara	12	3.7
6.	Govt. Supply	65	19.8
	Total	**328**	**100%**

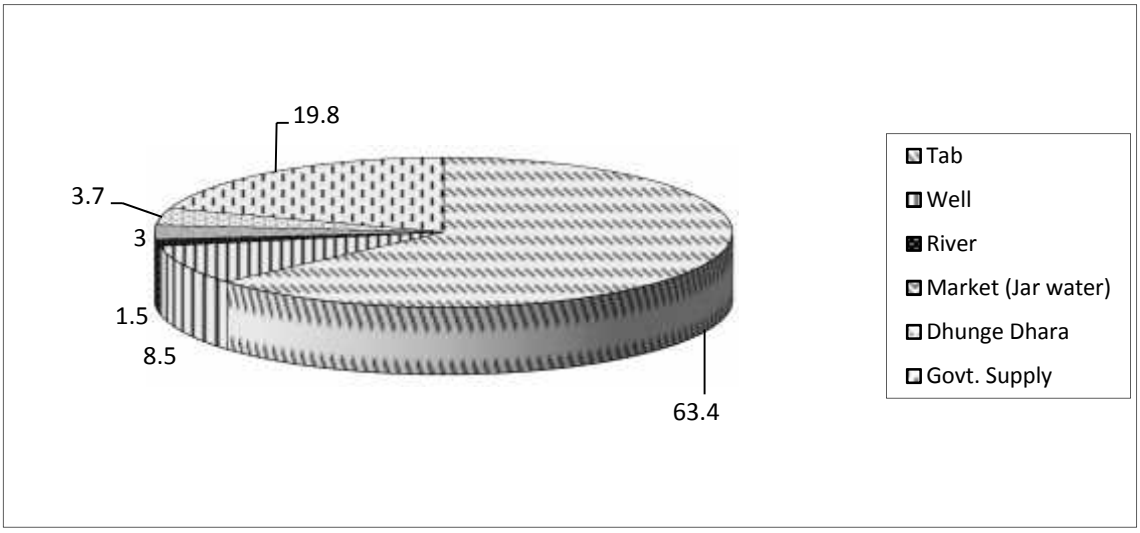

Fig No. 12:- Source of water used by respondent

Children's habit about cleaning hand

Out of 328 children during questionnaires were found that maximum number of children 106(32.3%) washed their hands properly after meal. Likewise about 83(25.30%) children washed their hands before meal and 68(20.73%) washed their hands after defecation. However least number of children 23(7.01%) wash their hands on every time as mentioned in the above table.

Table No. 13:-Children's habit about cleaning hand

S.N.	Category	No. of respondent	Percentage (%)
1.	Before meal	83	25.30
2.	After meal	106	32.31
3.	After defecation	68	20.73
4.	After playing	48	14.63
5.	All of above	23	7.01
	Total	**328**	**100%**

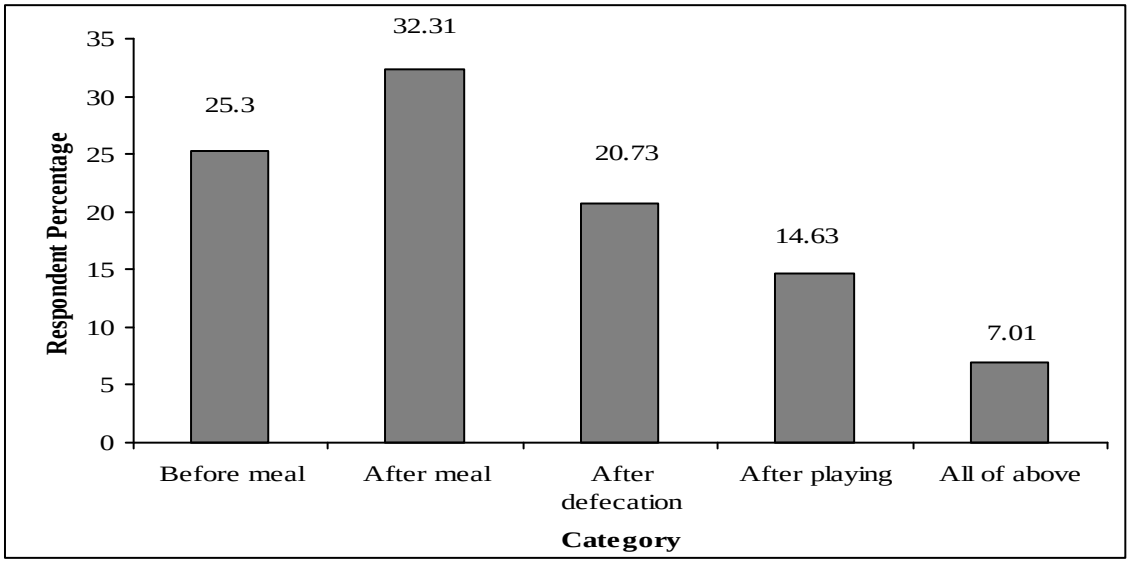

Fig No.13:- Children habit to cleaning hands

Children habit about method of cleaning hands

From the below table, reveals that maximum prevalence (52.80%) were recorded form those respondent who used only water to clean hand at different condition such as before meal, after meal, after playing, after defecation etc. Similarly, least prevalence i.e. 24.37% was recorded from those respondents who used water and soap to clean hands in different activities.

Table No. 14: Children habit about method of cleaning hands

S. N.	Category	No. of respondent	Percentage (%)	No. of positive sample	Prevalence (%)
1.	Water only	125	38.10	66	52.80
2.	Soap and water	160	48.78	39	24.37
3.	Both of above	43	13.10	18	41.86
	Total	**328**	**100%**	**123**	

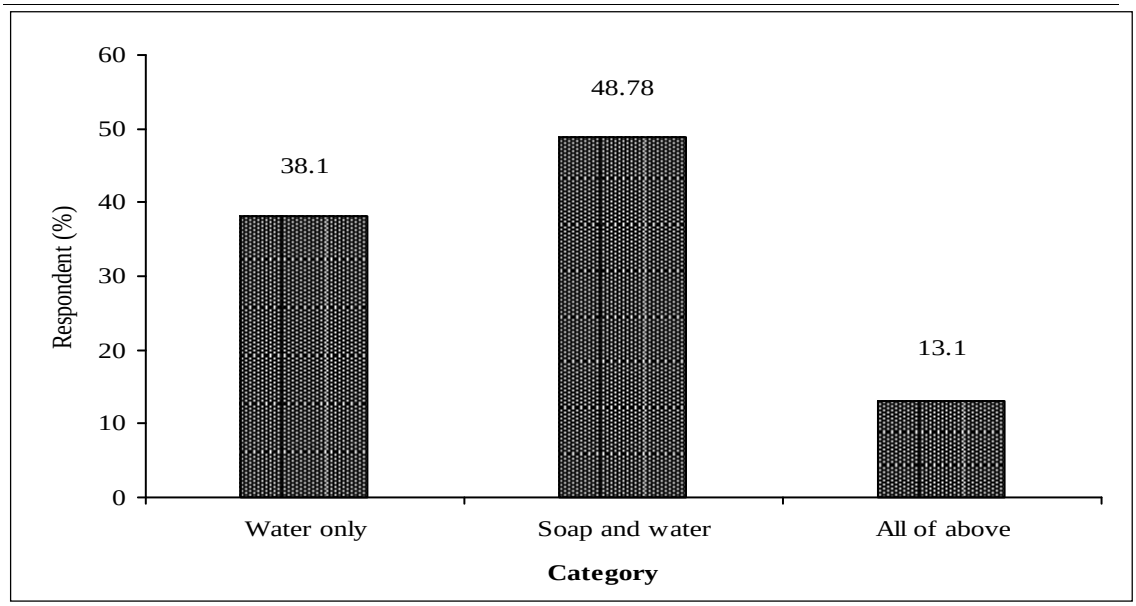

Fig No. 14:- Children habit about method of cleaning hands

Children's habit about cutting nails

Below table shows that out of 328 respondents, 184(56.09%) cut their nails regularly where as 12(3.65%) children cut their nails irregularly. Children's who cut their nails irregularly become highly infected i.e. (66.66%) with intestinal parasites. Likewise children who cut their nails regularly showed the least prevalence of parasites (34.78%).

Table No. 15: Children's habit about cutting nails

S. N.	Category	No. of respondent	Percentage (%)	No. of positive samples	Prevalence (%)
1.	Regularly	184	56.09	64	34.78
2.	Twice a month	92	28.04	34	36.95
3.	Once a month	40	12.19	17	42.50
4.	Irregularly	12	3.65	8	66.66
	Total	**328**	**100%**	**123**	

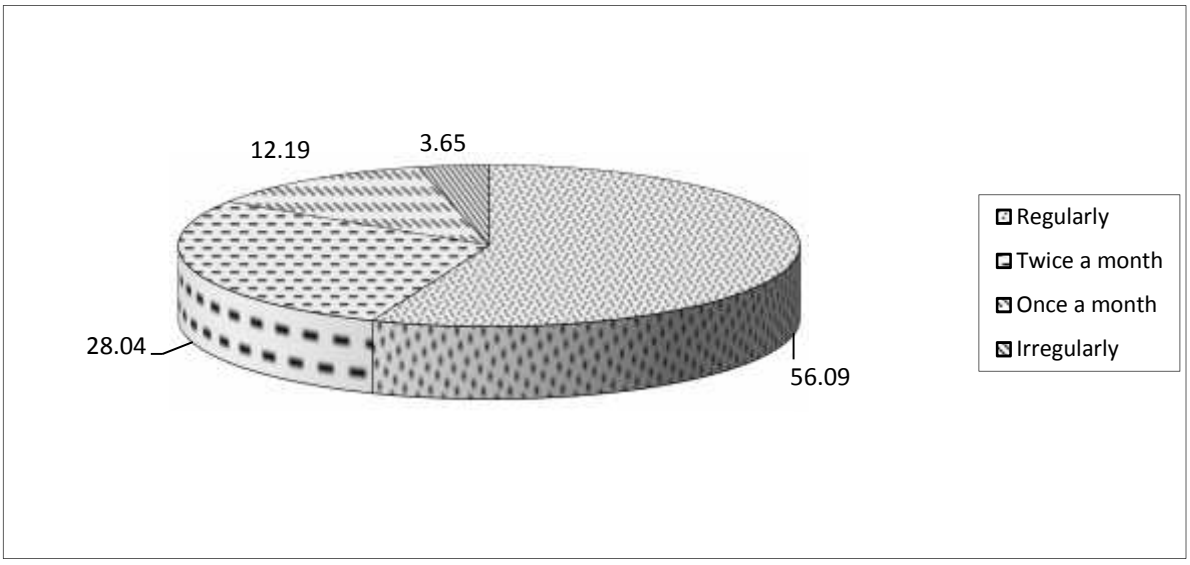

Fig No.15:- Children habit about cutting nails

Caste-wise prevalence of intestinal parasites

During the study period stool samples were collected from different castes. Out of 328 stool samples, 151 from Brahman and Chettri, which was the maximum stool samples where as least number of stool samples collected from Damai i.e. 12. During stool examinations were found that, the highest prevalence of parasites was recorded from Damai (58.33%) where least prevalence (21.05%) recorded from other castes.

Table No. 16: Caste-wise prevalence of intestinal parasites

S.N.	Cast	Total no. of sample examined	No. of positive sample	Prevalence
1.	Brahman and Chettri	151	58	38.41
2.	Gurung and Magar	38	21	55.26
3.	Rai and Limbu	19	8	42.10
4.	Lama, Tamang &Sherpa	32	12	37.50
5.	Newar	38	9	23.68
6.	Damai	12	7	58.33
7.	Others	38	8	21.05
	Total	**328**	**123**	

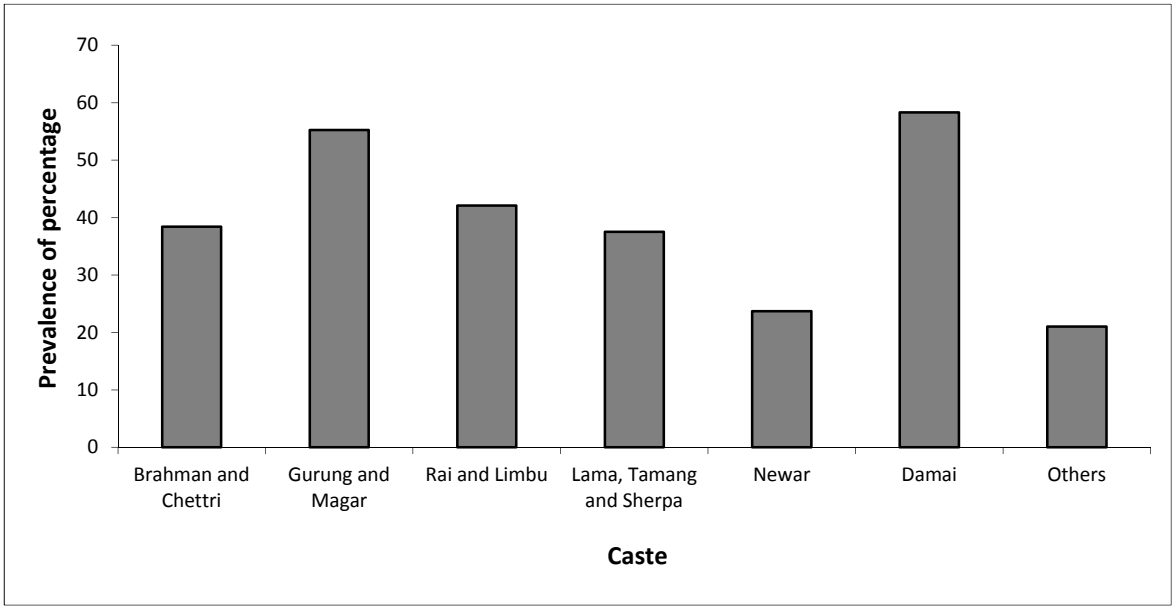

Fig No. 16: Caste-wise prevalence of intestinal parasites

Vegetarian and non-vegetarian respondents

On the basis of food habits, most of the respondents were non-vegetarian (92.69%). It was very high as compared to vegetarian (7.31%). Out of 328 non-vegetarians respondents (31.09%) eat mutton, chicken, followed by mutton chicken and buff (28.35%) and mutton only (14.02%). Very high prevalence found in those respondents who ate all type of meat.

Table No. 17:- Vegetarian and non-vegetarian respondents

S.N.	Category	No. of respondent	Percentage (%)	No. of positive samples	Prevalence (%)
1	Chicken only	14	4.26	4	28.57
2	Mutton only	46	14.02	7	15.21
3	Buff only	8	2.43	2	25
4	Mutton, chicken& buff	93	28.35	32	34.40
5	Mutton and chicken	102	31.09	54	52.94
6	Mutton and buff	15	4.57	5	33.33
7	Mutton, chicken& pork	12	3.65	6	50
8	Buff and chicken	9	2.74	4	44.44
9	Buff and pork	4	1.21	2	50
10	All	1	0.30	1	100
11	Vegetarian	24	7.31	6	25
	Total	**328**	**100%**	**123**	

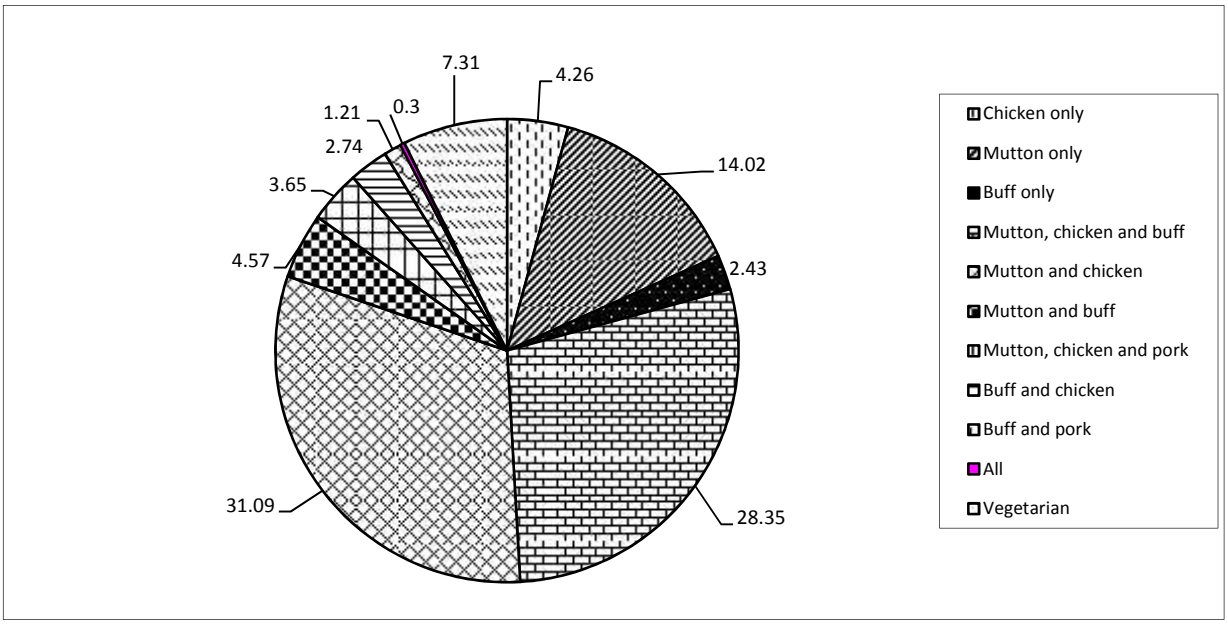

Fig No. 17: Vegetarian and Non-Vegetarian Respondent

CHAPTER-6
DISCUSSION

The gastro-intestinal parasites of human are cosmopolitan in distribution, causing serious health problem in developing countries as Nepal, where illiteracy, ignorance, poverty are interlocked. Despite their high rate of infections in these countries, physicians and public health authorities show little interest in their control (WHO, 1981). Intestinal parasitic diseases are ranked among 20 most fatal infections in tropical countries of Asia, Africa and Latin America in 1977-1978 (Davis, A. 1981). *Giardia lamblia* and *Entamoeba histolytica* are the major protozoan parasites where as *Ascaris lumbricoides*, *Trichuris trichiura* and hookworm are the major helminthic parasites. Almost 48% of people died due to cholera and diarrhoea in Nepal (CBS-2002). Morbidity because of intestinal parasites has always been an important public health problem in tropical region (Sherchand *et al*., 1996)

In the present study, the prevalence of intestinal parasite was found 37.50%. This prevalence was lower than those reported in other studies as 87.5% Sharma *et al*., 1971, 67.4% Gupta *et al*., 1988, 81.9% Shrestha, 2001, 77.1% Rai *et al*., 2002, 76.6% Chaudhary B, 2004, 66.9% Karki *et al*., 2004, 88% Pokhrel Y.B, 2005, 67.4% Ghimire *et al*., 2006, 45.32% Kandel S, 2008 in different area of Nepal.

The present study shows that 37.50% of the children were infected by different kinds of intestinal parasite in which 38.75% were male children and 36% were female children. There was no significant difference in prevalence of parasites in between two sexes (χ^2cal= 0.24 χ^2cal< $\chi^2$0.05 at 1 d f).The finding of Rai *et al*., 2002, Chaudhary 2003 and Kandel S, 2008 were also close to these finding.

The total positivity was 123 out of 328 stool samples examined. This positivity contains eight type of intestinal parasites. *Entamoeba histolytical* (8.84%), *Girdia lamblia* (14.32%) are the protozoan parasites and *Acaris lumbricoides* (9.14%), *Trichuris trichiurs* (0.91%), Hookworm (1.82%), *Strongyloides strcoralis* (1.52%), *Hymenolepsis nana* (0.60%), *E. vermicularis* (0.30%) are the helminthic parasites. These parasites were also reported by Chaudhary (2003) in rural area of kirtipur, Maharajan K. (2004) in kirtipur, Ghimire *et al.,* (2005) in Kirtipur and Chitwan, Ghimire *et al*., (2006) in Sukra Raj Tropical and Infectious Disease Hospital, Teku, Kathmandu, Kandel S (2008) in Kanti Children's Hospital Maharajgunj, Kathmandu.

Regarding to protozoan parasites prevalence of *G. lamblia* was highest (14.32%) followed by *E. histolytica* (8.84%), which resembles with finding of Chaydhary (2003), Maharjan K (2004) and Kandel S (2008). Chaudhary (2003) found 11.4% *G. intstinalis*, 8.8% of *E. histolytica*, while Maharjan K (2004) found 19.55% *G. lamblia*, 7.69% *E. histolytica* and then Kandel S (2008) found 21.33% *G. lamblia*, 7.91%*E. histolytica*. According to FPA School Health Program, *G. lamblia* was most prevalent intestinal parasites followed by *E. histolytica* in school children of Kirtipur area. These protozoan parasites transmit very easily through contaminated food and water. The result of this study was similar to various study conducted by parasitologist in different time, Sherchand *et al*., (1997), Nepal and Palfy (1980), Rai *et al*., (1991), Shersth (1995).

Regarding to helminthes parasites, several previous studies had showed that *Ancylostoma duodenale* was the most common helminthes infection in Nepal (Esteven, *et al*., 1983, Navisky *et al*., 1998). A few other studies reported that *A. lumbricoides* was most common intestinal helminthes parasites in Nepal (Suguri *et al*., 1985, Geollman 1986, Rai, *et al*., 1997,

Rai, *et al*., 2001, Chaudhary 2004). The present study also shows the same result that *A. lumbricodes* was most prevalent helminth parasite (9.14%) followed by *A. duodenale* (1.82%), *S. sterocoralis* (1.52%), *T. trichiura* (0.91%), *H. nana* (0.60%) and *E. vermicularis* (0.30%). The present study coincides with other pervious study i.e. Kandel S (2008) and Maharjan K (2004).

The climatic environmental condition and human customs favor the prevalence of particular protozoan and helminth parasite. In present study high prevalence found in summer season (46.83%) and least prevalence sound in winter season (23.91%). Craig and Faust (1970) reported that in warm and moist climates, infection with several intestinal parasites was encountered in a large proportion of individuals in the population.

Fujita, *et al*., carried out an epidemiological survey for parasitic infection. Parasites were detected in 270 faecal samples, 57.4% of these specimens showed single infection, 28.9% showed double, 9.6% showed triple, 4.1% quadrapal and 0.4% quintupal infection. Likewise, Parajuli, R.P (2004) reported 32.8% single infection, 21.9% double infection and 45.3% multiple infection from Malpur VDC of Chitwan district. But in the present study, there were 91.86% single infection, 7.31% double infection and 0.81% multiple infection.

There was significance difference in age of respondent and infection of intestinal parasites (χ^2cal= 18.33, χ^2cal>$\chi^2$0.05 at 4 d.f.). The highest prevalence (56.92%) was found in 9-11 years of age group. This high prevalence can be explained on the basis of the poor health low nutritional values, playing in and out door games, regularly contact with soil as well as water. The minimum prevalence (23.68%) was observed in children of age group 0-2 year age. This low prevalence may be because

of feeding breast milk and taking care by their mothers properly. Besides, this age group had lower chance to expose to source of infection as well as they gained immunity from their mother. This result is supported by the result of Rai *et al*., (1991), Chaudhary, B.K. (2003), Maharjan, K.P. (2004).

The World Health Organization noted that human behaviors may influence the prevalence and intensity of intestinal infection (WHO, 1981). So the human behaviors such as open field defecation and cultural practices such as growing vegetables in faecally polluted gardens were all found to be contributing factors in transmission of parasites. Polluted water, infected or raw meat, bare footed was also conductive to the transmission (Sherchand, *et al*., 1997).

Outdoor defecation also serves to contaminate the water source responsible for parasitic infection. During present study it was found that 86.30% used toilet, 9.80% used pot toilet and mainly the children under the age 3 years use this type of pot. Rest of the children (4%) used other places such as field, ground roads etc.

According to drinking water 63.4% respondents used the tape water for drinking purpose. Among them 45.10% used boiled water and 13.70% used without treating water. Some children used mineral water (Jar), dhunge dhara, mul and government supply for drinking purpose. In which 15.90% respondents used water after chemical treatment like water guard, 17.20% respondents used water only filtering and only 7.60% respondent used water boiling after filtering.

According to behavior of washing their hand, the present study revealed that only 7.01% respondent washed their hands on every time, such as defecation, playing and before meal. While 48.78% respondent washed

their hand with soap and water, remaining respondents 38.10% did not give more priority in washing hand. Careless in cleaning hand is one of the main causes of parasitic infection.

Regarding behavior of cutting nails, majority of children 56.09% cut nails regularly. While rest of respondent 28.04% cut twice a month and only 3.65% cut their nail irregularly. This practice also helped in acceleration of prevalence of parasites. Since least prevalence 34.78% was recorded form those respondent who cut their nails regularly where as maximum 66.66% prevalence recorded from the respondent who cut their nail randomly.

Among the different ethnic castes, Damai had the highest prevalence 58.33% followed by other castes.

In the present study among 328 respondents, 304 were non-vegetarian and 24 were vegetarian. Out of 304 non-vegetarian 117 (38.48%) and 24 (25%) Vegetarian were found positive to intestinal parasite (χ^2= 1.71, for 1 d. f.). According to the subject of food prevalence of intestinal parasite is directly affected by feeding habit of people, According to Yam Bahadur Pokhrel 2005, there was no significant difference in prevalence of parasites in vegetarian and non- vegetarian. Maharajan K.P. (2004) and Kandel S. (2008) showed that distribution of intestinal parasites is independent on food habit.

CHAPTER-7
CONCLUSSION AND RECOMMENDATION

Conclusion

The climatic environmental conditions and humans customs favors the prevalence of a intestinal parasites. Craig and Faust (1970) reported that in warm and moist climates, infection with several intestinal protozoans or other helminthes (i.e. polyhelminthism) is encountered in a large proportion of individuals in the population.

Under their favorable circumstances, parasites may develop in epidemic proportions. In communities with high incidence of multiple infections the clinical and public health aspects are complex such as malnutrition, retardation in child growth, other symptom associated with both larval and adult stage includes pneumonities, asthma, diarrhea, nausea, vomiting, abdominal pain and anorexia.

Only taking anti-helminthes drugs in certain period of time (3 months or 6 months) helps to reduce the percentage of helminthes infection. 1-5 years children are provided anti-helminthes drug by government with vitamin A capsule for free in every six months. Remaining others, only a few used to take anti-helminthic drugs at a certain interval of time.

More-ever, every caste has their own traditions and cultures. Their culture may be also responsible for prevalence of intestinal parasites. Most of the people of lower caste mainly use buff. They prepare different varieties such as sekuwa, chowela, kachila consumed without proper cooking. Consumption of such type of meat is also responsible for the acceleration of intestinal parasites.

The infected patients were advised to use anti-helminthic drugs. During

survey, guardians were given various information about the causes and prevention measures of parasitic diseases.

Recommendation

On the basis of this study following recommendations are used for better prevention and control of intestinal parasites in Nepal.

1. Defecating habit of children should be changed and encouraged to use toilet for defecation.
2. Consumption of unwashed fruits and vegetables and washing with contaminated water should be prevented.
3. Awareness programs should be developed regarding the sanitation, personal hygiene, healthy eating habits and safe drinking water and people should be encouraged for sanitary improvements.
4. Animal husbandry should be managed by launching training program.
5. Basic health education programs should be conducted time to time in communities and schools for raising awareness towards the parasites infection prevention and control.
6. Advertising, as to prevention of parasitic infections, should be introduced through hand-outs, paper, leaflets etc.
7. Stool test for student conducted in school it will be better to relay information to their parents for the preventive measures and parents should be also informed about transmission of parasite.
8. Regular health checked up and stool checked up should be done free of cost in hospital and medicine should be given with subsidized price.
9. People should be provided the knowledge about use of filtered or boiled or chemically treated water for drinking purposes.
10. Health worker should be trained to make them familiar with newly emerging parasites.

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ANNEX-1

HYPOTHESIS TESTING

1. IN RELATION TO SEX AND POSITIVITY OF INTESTINLA PARASITES

S. No.	Sex	No. of positive sample	No. of negative samples	Total
1	Male	69	109	178
2	Female	54	96	150
	Total	**123**	**205**	**328**

Formulation of Hypothesis

Null Hypothesis-Ho: Positivity of intestinal parasites is independent on sex.

Alternative Hypothesis-H□: Positivity of intestinal parasites is dependent on sex.

Level of significance is taken as 5%

Degree of freedom (d.f.)= (c-1) (r-1)

= (2-1) (2-1)

=1

Test Statistic:- χ^2

Where $\chi^2= \sum((O-E)^2/E)$

S. No.	Observed frequency(O)	Expected frequency(E)	(O-E)	$(O-E)^2$	$(O-E)^2/E$
1	69	66.75	2.25	5.06	0.07
2	54	56.25	-2.25	5.06	0.08
3	109	111.25	-2.25	5.06	0.04
4	96	93.75	2.25	5.06	0.05
					$\sum((O-E)^2/E)=0.24$

Calculated value of χ^2=0.24, here degree of freedom= d.f.= 1

The tabulated value of χ^2 for 1 d.f. at 5% level of significance is 3.841.

Since calculated value of χ^2=0.24 is less than tabulated value of χ^2=3.841 for 1 d.f. at 5% level of significance, it is significant (p>0.05) and hence null hypothesis is accepted i.e distribution of intestinal parasites is independent on whether sex is male or female.

2. IN RELATION TO AGE GROUP AND POSITIVITY OF INTESTINAL PARASITES

S. No	Age group (years)	No. of positive sample	No. of negative samples	Total
1	0-2	18	58	76
2	3-5	32	47	79
3	6-8	21	40	61
4	9-11	37	28	65
5	12-14	15	32	47
	Total	**123**	**205**	**328**

Formulation of Hypothesis

Null Hypothesis-Ho:- Positivity of intestinal parasites is independent on age.

Alternative Hypothesis-H□ :- Positivity of intestinal parasites is dependent on age.

Level of significance is taken as 5%

Degree of freedom= (c-1) (r-1)

= (2-1) (5-1)

= 4

Test statistic:- χ^2

Where $\chi^2 = \sum((O-E)^2/E)$

S. N.	Observed frequency (O)	Expected frequency (E)	(O-E)	$(O-E)^2$	$(O-E)^2/E$
1	18	28.50	-10.5	110.25	3.86
2	32	29.62	2.38	5.66	0.91
3	21	22.87	-1087	3.49	0.51
4	37	24.37	12.63	159.51	6.56
5	15	17.62	-2.62	6.86	0.38
6	58	47.50	10.5	110.25	2.32
7	47	49.50	-2.5	6.25	0.12
8	40	38.12	1.88	3.53	0.09
9	28	40.62	-12.62	159.26	3.92
10	32	29.37	2.63	6.91	0.23
					$\sum((O-E)^2/E=18.88$

Calculated value of $\chi^2=18.88$. Here degree of freedom = d.f.= 4

The calculated value of χ^2 for 4 d.f. at 5 % level of significance is (9.488), it is highly significant (p,0.05) and hence null hypothesis is rejected i.e. distribution of positivity of intestinal parasite is dependent on age group.

3. IN RELATION TO FOOD HABIT AND POSITIVITY OF INTESTINAL PARASITES.

S. No.	Food habit	No. of Positive sample	No. of negative sample	Total
1	Vegetarian	6	18	24
2	Non-vegetarian	117	187	304
	Total	**123**	**205**	**328**

Formulation of Hypothesis

Null Hypothesis- Ho:- Positivity of intestinal parasites is independent of food habit.

Alternative Hypothesis-H□:- Positivity of intestinal parasites is dependent on food habit.

Level of significance is taken as 5%

Degree of freedom (d.f.) = (c-1) (r-1)

= (2-1) (2-1)

= 1

Test statistic:- χ^2

Where $\chi^2 = \sum((O-E)^2/E)$

S. N.	Observed frequency (O)	Expected frequency (E)	(O-E)	$(O-E)^2$	$(O-E)^2/E$
1	6	9	-3	9	1
2	117	114	3	9	0.07
3	18	15	3	9	0.6
4	187	190	3	9	0.04
					$\sum((O-E)^2/E= 1.71$

Calculated value of χ^2=1.71, here degree of freedom=d.f.= 1

The tabulated value of $\chi^2$for 1 d.f. at 5% level of significance is 3.841. Since calculated value of χ^2=1.71 is less than tablualted value of χ^2=3.841 for 1 d.f. at 5% level of significance it is insignificant and hence null hypothesis is accepted, i.e. distribution of intestinal parasites is independent of food habit.

4. IN RELATION TO CASTE AND POSITIVITY OF INTESTINAL PARASITES

S. N.	caste	No. of positive samples	No. of negative samples	Total
1	Brahman and Chettri	58	93	151
2	Gurung and Magar	21	17	38
3	Rai and Limbu	8	11	19
4	Lama, Tamang and Sherpa	12	20	32
5	Newar	9	29	38
6	Dalit	7	5	12
7	Ohter	8	30	38
	Total	**123**	**205**	**328**

Formulation of Hypothesis:

Null Hypothesis-Ho: Positivity of intestinal parasite is independent on caste.

Alternative Hypothesis-H□: Positivity of intestinal parasite is dependent on caste.

Level of significance is taken as 5%.

Degree of freedom=d.f.= (c-1) (r-1)

= (2-1)(7-1)

= 6

Test statistic:- χ^2

Where $\chi^2 = \sum((O-E)^2/E)$

S. NO.	Observed frequency(O)	Expected frequency(E)	(O-E)	$(O-E)^2$	$(O-E)^2/E$
1	58	56.62	1.38	1.90	0.03
2	21	14.25	6.75	45.56	3.19
3	8	7.12	0.88	0.77	0.10
4	12	12	0.00	0.00	0.00
5	9	14.25	-5.25	27.56	1.93
6	7	4.5	2.5	6.25	1.38
7	8	14.25	-6.25	39.06	2.74
8	93	94.37	-1.37	1.87	0.01
9	17	23.75	-6.75	45.56	1.91
10	11	11.87	-0.87	0.75	0.06
11	20	20	0.00	0.00	0.00
12	29	23.75	5.25	27.56	1.16
13	5	7.5	-2.5	6.25	0.83
14	30	23.75	6.25	39.06	1.64
					$\sum((O-E)^2/E) = 14.98$

Calculated value of $\chi^2 = 14.98$, here degree of freedom =d.f.= 6

The tabulated value χ^2 for 6 d.f. at 5% level of significance is 12.592. Since calculated value of χ^2(14.98) is greater than tabulated value of χ^2 (12.592) for 6 d.f. at 5% level of significance, it is significant and hence null hypothesis is rejected i.e. distribution of intestinal parasite is dependent on caste group.