An-Najah National University
Faculty of Graduate Studies

Prevalence and Seasonal Variation of Intestinal Parasites among Primary School Children in Qalqilia District, Palestine.

By

ZAHRA WAHEEB ABED EL-FATAH KHUDRUJ

Supervisor

PROFESSOR DR. MOHAMMED S. ALI-SHTAYEH

Co-Supervisor

DR. YAHYA R. FAIDY

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This thesis was successfully defended and approved on November/ 2000

By:

Committee members		Signature
1. Prof. Mohammed S. Ali-Shtayeh Prof. of Biological Sciences	(Supervisor)	
2. Dr. Yahya R. Faidy Associate Prof. of Medical Micrbiology	(Co-supervisor)	
3. Dr. Suleiman Al- Khalil Associate Prof. of Medical Chemistry	(Internal Examiner)	
4. Dr. Tamer Essawi Associate Prof. of Micrbiology	(External Examiner)	

TO

MY DEAR HUSBUND FOR HIS SUPPORT, MY DEAR KIDS: AYSHA, SALEH AND GHOWTH, FOR THEIR PATIENCE, AND ENDURANCE DURING DIFFICULT TIMES WHILE I AM A WAY WORKING OR STUDING; MY DEAR MOTHER, FATHER AND SAMAH, FOR THEIR GREAT HELP AND ENCOUREGMENT- WITH RESPECT AND LOVE.

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Prevalence and Seasonal Variation of Intestinal Parasites Among Primary School Children in Qalqilia district, Palestine

Abstract

The prevalence and seasonal variations of intestinal parasitic infections were assessed among 1329 (667 males, 662 females) primary school children (6-12 years old) in Qalqilia District, during the period February- November 1999.

Parasitologic examinations were performed on collected stool specimens using the (wet mount and Zinc sulfate flotation concentration methods). Data on socio-economic status, personal hygienic habits, sanitary facilities, parents educational levels and awareness about intestinal parasites of surveyed children were collected using a questionnaire.

405(30.5%) of the 1329 stool specimens examined were positive for one or more intestinal parasite; 50.2% of the cases were males and 49.8% were females.

Etiological agents of intestinal parasitic infections were found in primary schoolchildren in the surveyed area included; *Enterobius vermicularis* 11.0%, *Entameoba histolytica* 7.1% and *Giardia Lambilia* 6.9% were the most prevalent intestinal parasites detected.

The highest prevalence rate of intestinal parasitic infections occurred in spring (April) (48.1%) and autumn (November) (27.8%). No significance difference in the prevalence rate was found between in the three localities surveyed. However, the highest incidence rate occurred in Azzun 36.0% followed by Qalqilia (30.4%) and Hableh (24.2%).

Personal hygienic habits, sanitary facilities conditions, socio-economic status, parents' educational levels and awareness about intestinal parasites were found to be strongly associated with the intestinal parasitic infections.

CHAPTER ONE

GENERAL INTRODUCTION

Chapter one

General introduction

1.1 Introduction

Intestinal parasitic diseases rank among the world's 10 most causes of disease, disability and morbidity (Arya, 1999). These diseases are widely prevalent in developing countries, probably due to poor sanitation and inadequate personal hygiene (Crompton & Savioli, 1993; Omer *et al.*, 1991; 1993 Kan & Poon, 1987). About 60% of the world's population in 1998 were infected (infested) with the gut parasites (Gagandeep *et al.*, 1998). The commonest parasitic infections (infestations) reported globally include *Ascaris lumbricoides* 20%, Hookworm 18%, *Trichuris trichiura* 10% and *Entamoeba histolytica* 10% (Kang *et al.*, 1998). The intestinal nematode infections caused by (*A. lumbricoides*, *T. trichiura*, *hookworms* and *Schistosomas*) are recognized as a major health problem, and are estimated to infect over one quarter of the world's population, causing significant nutritional and educational insults (Geissler *et al.*, 1998). However, epidemiological data about intestinal parasitic infections are sparse in most of the developing countries including Palestine.

Intestinal parasitic infections affect human health with varying degrees, starting from problems in ingestion, digestion and absorption (e.g., anorexia, some nutrients mal-absorption and anemia) (Hadju *et al.*, 1996; Eve *et al.*, 1997; Oberhelman *et al.*, 1998), and ending with death resulting from intestinal obstruction (King *et al.*, 1990). Maternal iron deficiency anemia and reduced fetal growth are associated with chronic parasitic infections (Weigel *et al.*, 1996). For all these reasons the intestinal parasites has received a great deal of attention in the last few years (Ali-Shtayeh *et al.*, 1989; WHO, 1986).

To prevent intestinal parasitic infections, sanitary measures are very important. These include intermediate host control and improvement in housing, sewage disposal and water supply (Abedel-Hafez *et al.*, 1986; Kasuya *et al.*, 1989; Roose, 1997). Develoux *et al.* (1990) stated that personal and domestic cleanliness is probably the most important factor in the reduction of intestinal protozoa. Detailed knowledge about the ecology and epidemiology of a parasite forms the basis of a control program (Weidong *et al.*, 1996).

1.2 Intestinal parasitic diseases in Palestine

Some aspects of the epidemiology of intestinal parasitic infections was investigated in Nablus area (located in the center of the west bank of Jordan) by Ali-Shtayeh *et al.* (1989) over a six-year period, and in the Jordan valley area (subtropical area) by Orabi (2000). In Nablus area, *E. histolytica* was the most prevalent intestinal parasite followed by *Giardia* *lambilia* and *A. lumbricoids*. These parasites showed seasonal variation with the highest incidence rates occurring in summer and early autumn, which was attributed to the higher temperatures and more frequent use of wastewater irrigation during these seasons (Ali-Shtayeh *et al.*, 1989). In the Jordan valley area incidence rate of intestinal parasitic infections was found to be relatively high 45.5%, with *G. lambilia* comprising the most prevalent intestinal parasite followed by *E. histolytica* (Orabi, 2000). This was attributed to environmental conditions and use of wastewater for irrigation of many crops that enhance the transmission and development of intestinal parasites. No other published studies on prevalence rates among preschool or schoolchildren were reported from Palestine, especially in the semi-coastal areas of the West Bank.

1.3 Definitions

Epidemiology, is the study of disease behavior within population of hosts. It is a quantitative science which relies on statistical methods for the accurate measurements of disease parameters and mathematical technique for the provision of a theoretical framework to aid the in interpretation of field and experimental observations (Nelson, 1990).

Infection prevalence describes the proportion of individuals within a community that are infected with a parasite (Guyatt & Bundy, 1993).

1.4 Incidence of intestinal parasites

Amebiasis (caused by *E. histolytica*) is a severe health problem in many tropical and sub-tropical areas of the developing countries (Rivera *et al.*, 1998). It is believed to affect about 480 million people worldwide and leads to about 40, 000 –110, 000 deaths per year (Roche & Bento, 1999; Utezinger *et al.*, 1999).

G. lambilia, a flagellated protozoa, has been reported worldwide with prevalence rate ranging from 2%-60%, and being similar for both sexes, with incidence rate (14%) occurring in children below 10 years of age (Cross, 1984). *G. lambilia* is waterborne, and this route has been the cause of waterborne outbreaks of epidemics of diarrhea in both adults and children (Lindo *et al.*, 1998; Chute *et al.*, 1987). A study about the etiology of diarrhea and its potential sources found that *G. lambilia* was the second etiologic agent for diarrhea in children under six years of age (Giugliano *et al.*, 1986). In older children and adults, *G. lambilia* was the most frequent parasite identified, followed by *E. histolytica* (Giugliano *et al.*, 1986). Giardiasis has also been identified frequently in USA and Canada (Renton *et al.*, 1999).

An overall world estimation, indicated that in 1981, 480 million people were carriers of *E. histolytica* in their intestinal tract (WHO, 1986). Reinthaler *et al.*, (1988) found *E. histolytica* to dominate in adults and *G. lambilia* to dominate in children 2-5 years of age. From 1965-

1982, more than 50 waterborne outbreaks of *G. lambilia* affecting 20, 000 person were reported, however many waterborne epidemics remain unreported (WHO, 1986).

It has been estimated that 1470 million people are currently infected with *A. lumbricoides* all over the world of which 120 - 250 million are suffering from related morbidity (Giessler *et al.*, 1998).

Considerable variations in the global prevalence and intensity of protozoan and helminthic infections have been attributed to differences in geographical climatic factors, human activities and socioeconomic status (WHO, 1981). Kan & Poon (1987) found that in highly endemic areas, due to the ease and frequency of transmission, high prevalences were associated with high intensities of infection. The prevalence of soil transmitted helminthes infections was also found to be higher among more active children from the ages of 4-12 years, this may be attributed to more efficient fecal-oral rout of transmission or enhanced susceptibility due to lake of immunity (John *et al.*, 1998). King *et al.* (1990) reported that intestinal parasitic infections were common among pregnant women in the third world countries.

The incidence of intestinal parasites can vary widely even in small areas and between the rainy and dry seasons, so precise studies are needed to define the seasonal fluctuation in the incidence of intestinal parasites (Reinthaler *et al.*, 1988).

1.5 Diagnosis

The frequency of parasite detection increases with increasing number of stool samples examined (giving total of 6 samples per person at different times) will give accurate result up to 90% (Kang *et al.*, 1998). Examining the stool specimens by various technique will give more accurate results (Goldsmid, 1981). Usually, there is a difference between the number of positive samples and the actual infection prevalence. Infected individuals that may be negative by direct stool examination because of technical problems initiated in sampling the stool for eggs and variation in sensitivity of coprological techniques. Diagnosis by direct examination rarely 100% sensitive since the probability of detecting eggs may depend on the number of samples examined (Guyatt &Bundy, 1993).

Identification of *E. histolytica* trophozoites has been usually made on the basis of nuclear morphology and the presence of ingested red cells, where as *G. lambilia* trophozoites and cysts has been identified by morphological criteria and nuclear characteristics (Shetty *et al.*, 1990). Other than laboratory methods for diagnosis of intestinal parasitic infections, X-ray reports describe the appearance of parasitic infections (Khan *et al.*, 1982).

Some intestinal nematodes may be visualized during barium meal examination, for example, *A. lumbricoides*, but many helminths become apparent on X-ray only after they have been dried and classified (Khan *et al.*, 1982).

1.6 Mode of transmission

The intestinal parasites are transmitted in many ways but the commonest mode of which is the fecal-oral route (Reinthaler *et al.*, 1988; WHO, 1986). This mode of transmission varies in its appearance, as it may appear in hands contamination, when hands become contaminated with the feces after defecation especially when water is used for cleaning the anus (Han *et al.*, 1986). Fingernail contamination following anal itching is also reported. Buscher & Haley (1972) found eggs of *Entrobeius vermecularis* with active larvae under the fingernails of some children. Needham *et al.* (1998) stated that the use of human feces as a fertilizer is likely to expose most people to fecal-borne soil transmitted helminth infections. Geophagy (soil eating) might be an important factor in transmission of geo-helminthes among children (Geissler *et al.*, 1998). Walking barefooted and drinking unprotected well water increase the infection and the density rate of helminths (Elkins, 1984).

Water contamination is another mode of transmission. *G. lambilia* cysts are transmitted through water supplies contamination; also it may be transmitted by direct spread from person to person or through the use of communal toilets. (Mason *et al.*, 1986). Ali-Shtayeh *et al.* (1989) stated that *E. histylotica*, *G. lambilia* and *A. lumbricoides*, may infect humans through polluted water, soil, vegetables or other polluted foods. Buscher and Haley (1972) found that *Hymenlopus nana* requires no intermediate host to complete its life cycle. However, it was not clear from this study whether man is regarded as the primary source for human infections or food and drink contaminated with the feces of infected rodents. Mason *et al.* (1986) also concluded that epidemiology of *H. nana* is not well understood, but its ability is unlike most other tapeworms to complete their development to an adult from an ingested egg, and that infection is associated with contamination of fingers or foods with feces. Baldawi *et al.* (1989) stated that human infection can be acquired from eggs of *H. nana* in rodent feces, but this type of infection is uncommon.

1.7 Predisposing factors

Anderson (1986) discussed the predisposing factors for intestinal parasitic infections, and concluded that causes of predisposition are probably many and varied. They include behavioral, social, genetic and nutritional factors. Utizinger *et al.* (1999) relate the variation in intestinal parasitic infections to many factors dealing with the infection such as personal hygiene, nutritional status, environmental factors and the nature of the infective stage. Studies conducted on intestinal helminths infections, stress has been placed on behavioral and social factors, but studies on lab rodents and nematode infections of these rodents showed that the genetic and nutritional factor are probably of great significance (Anderson, 1986). Poverty, with its attendant lack of sanitation, is well known as a predisposing factor to parasitic infections (Arene & Akabogu, 1986; Mason *et al.*, 1986). It has been suggested that helminths infections are more sensitive to improvement in sanitation than other intestinal organisms, and comparisons of helminths prevalence may therefore be a reliable indicator of the impact of these improvements on health status of the community (Mason *et al.*, 1986). Also the latter authors have suggested that the prevalence of intestinal parasitic infections may be a sensitive indication of the effectiveness of improved sanitation facilities.

1.8 Occurrence

Intestinal parasitic infections persist wherever poverty, inadequate sanitation, insufficient health care and overcrowding are entrenched (Eve *et al.*, 1997; Arene & Akabogu, 1986). Ascariasis is a mirror of socioeconomic status reflection of environmental practices and is an indication of the presence or lack of health awareness. In the poor urban habitations, environmental factors promote the survival and transmission of intestinal parasites and aggravate or alleviate the impact of these infections on people (Cromptan & Savioli, 1993; Kan & Poon, 1987). Other factors which might possibly affect local infection levels are those related to the population in itself, also determine the parasite prevalence (WHO, 1986).

1.9 Seasonal variation

The incidence of intestinal parasites has been reported to have seasonal variation in Nablus area in the West Bank of Jordan, with the lowest prevalence rates occurring in winter months; the incidence rate increases with increasing temperature to reach a peak in summer months (Ali-Shtayh *et al.*, 1989). The time of the year is very important in the interpretation of the epidimiologic data, since high temperature and humidity favor the development of intestinal protozoa. Reinthaler *et al.* (1988) found that the rate of *E. histolytica* infection was highest at the end of the rainy season. Also, Kligler & Olitzki (1933) detected seasonal variation in the prevalence of *A. lumbricoids* and *T. trichiura* in the Jewish inhabitants of Jerusalem (Jjumba-Muksa & Gunders, 1971). In contrast, Collins & Edwards (1981) stated that the climatic factors are probably not the reason for the different frequencies of *A. lumbricoid* and *T. trichiura* infections, since *T. trichiura* eggs are much less resistant to moisture and temperature variations. The optimum infection of *H. nana* was in the warmer months of the year, May through October. Also in this period the children wear the least clothes, which probably increases the chances of fecal contamination of the hands, finger-nails and thus subsequent infection (Buscher & Hally, 1972).

1.10 Effect of environmental factors on transmission of intestinal parasites

WHO (1986) identified determinants of the high prevalence rates in the developing countries in both tropical and subtropical climates. These determinants include poverty, inadequate sanitation, absence of safe drinking water supplies, ignorance of health promoting practices, high birth rates and ecological conditions favorable to the survival, multiplication of many disease vectors, and intermediate hosts responsible for transmitting infection to human being.

The provision of piped water would be expected to be associated with reduction of parasite prevalence, particularly where transmission is influenced by contact with infected water or poor hygiene or where the parasite is waterborne. Mason *et al.* (1986) expected for the same infections to occur less frequently if clean water is readily available, these infections may be transmitted by water contact (Schistosomiasis), direct fecal contamination (Hymenlopiasis) or the consumption of contaminated water (Giardiasis).

Crompton & Savioli (1993) showed that the contamination of the vegetables that are grown in rural areas was attributed to the use of fertilizers prepared from human excreta or untreated sewage effluents. They assumed that *E. histolytica* and *G. lambilia* cysts were the contaminants of urban slums environments and were found frequently in drinking water supplies.

The prevalence and intensity of soil transmitted helminthiasis among children is an indication of the standard of living and environmental sanitation as well as other socioeconomic factors like family size and income, food availability, dietary practices standard of child care, and other cultural characteristics of the community (Kan & Poon, 1987). Many investigations in North America, Europe and else where have documented that closed communities are borne to high prevalence of intestinal parasitism, because of lake of good hygienic conditions, in these studies Amebiasis and Giardiasis were the most prevalent protazoan infections (Omer *et al.*, 1991).

Study conducted by Siddiqui *et al.* (1981) in Saudi Arabia found a low infection rate of intestinal parasites, which they related to the topography, climate of the area and the uncrowded location of the houses on terraces. Cancrini *et al.* (1989) and Alkija (1986) attributed the heavy infection rates to poor sanitation and overcrowding. In Labrador, Canada, intestinal parasites were found to be low which was attributed to severe environmental conditions, topography, changes in people behavior in food preparation and sanitation (Sole & Carole, 1980).

1.11 Distribution according to age, sex, and residency

Intensity of infection with intestinal helminthes tends to vary according to age, generally being highest throughout the vulnerable years of childhood (Eve *et al.*, 1998). Anderson (1986) found that in the areas of endemic infections, the age at which the maximum intensity occurred at 5-10 years old for *A. lumbricoids* and *T. trichiura*, where as Hookworm prevalence increased with increasing age (Booth *et al.*, 1997). School age children have been the highest intensity of infection with *T. trichiura.* (Ramdath *et al.*, 1995; Brooker *et al.*, 1999). Guatt *et al.* (1999) stated that it could be possible to use prevalence of infection in school aged children as a tool for predicting prevalence in the communities. Olsen (1998) and Guyatt *et al.* (1999) stated many advantages of sampling children at schools to represent the community.

Most studies on ecological and epidemiological aspects of the parasites reported changes in prevalence and intensity of infection in relation to age. (Weidong *et al.*, 1996), with both sexes equally affected in children (Kan & Poon, 1987). *H. nana* is a common parasite of man as well as rodents in many parts of the world, the prevalence in males and females was similar, but infections were encountered much more frequently in children and adolescents than adults (Buscher & Haley, 1972). In contrast, *G. lambilia* infection progressively increased in individuals of older age (Omer *et al.*, 1991).

National parasitological surveys show that the prevalence of infection for each parasite can vary widely within a country (Booth & Bundy, 1992), in relation to geographical distribution. Hlaing *et al.* (1984) reported that *A. lumbricoids* was endemic in the developing countries in the tropics. Hookworm infections are particularly a problem of the agricultural areas with excess water sources, which play an essential role in the maintenance of the hookworm infections in the community (Massoud *et al.*, 1980). In the developed countries the level of helminthes infection in man is low without spread of chemotherapy or vaccination. At the same time in the developing countries the level of infection is very high where the implementation of hygiene still low, due to financial and social problems. (Roose, 1997). The natural conditions in the environment have great effect on intestinal parasites through its effect on the survival of the intermediate hosts (Hall *et al.*, 1982).

1.12 Objectives

This study was aimed at:

1. Obtaining data on the incidence and distribution of intestinal parasites in school children in Qalqilia District (a semi-coastal area);
2. Detecting any seasonal variation in the prevalence of intestinal parasites;
3. Investigating the effects of sex, area, socio- economic conditions, and time of the year on prevalence of intestinal parasitic infections.

CHAPTER TWO

MATERIALS, SUBJECTS AND METHODS

Chapter Two

Materials, Subjects and Methods

2.1 Study sites

This epidemiological study was carried out in Qalqilia district (Qalqilia city, and Azzun and Hableh villages) (map 2). Qalqilia district is a semi-coastal area, of 40,000 inhabitants, and located about 68 Km west of Jerusalem (map 1). The urbanized area of Qalqilia city stretches over 4,000 donums, and the agricultural area stretches over 75,000 donum (Qalqilia Directorate of Agriculture, 1999). The main trees growing in the district includes olives and citrus trees. Several vegetables are mainly grown in greenhouses. Summer months are hot and humid, with a maximum monthly average temperature of 29.1 C° during September (the hottest month); winter is moderately cold, with a minimum monthly average temperature of 14 C° during January (the coldest month). The annual rainfall during 1999 was (197.5 mm), with the highest amount of rainfall (115.5 ml) was in January (Qalqilia Directorate of Agriculture, 1999; Tulkarm Meteorology Department, 2000).

Qalqilia city and about 80% of the houses of Azzun and Hableh villages have sewage disposal and piped water supply systems. Municipal piped water is generally used for drinking and other domestic uses, however about 20% of the houses in Azzun and Hableh villages that are far from the center of the village, use septic tanks for wastewater disposal, and rainfall wells for domestic use and drinking water. Solid waste is disposed off in a landfill, in Jayous village.

2.2 The main environmental problems in Qalqilia District

Main environmental problems in Qalqilia area as in other parts of West Bank in general are related mainly to solid waste (collection, disposal and treatment) including: lack of sanitary landfills or recycling factories, wastewater sewage systems and treatment plants and lack of environmental awareness. Overuse of agricultural pesticides, uncontrolled urbanization, insufficient environmental monitoring and enforcement of environmental laws are also major contributors to environmental problems in the area.

2.3 Study population

A total of 1329 school children (667 males, 662 females) aged 6-12 years old attending 8 primary schools in Qalqilia City, Azzun and Hableh Villages (Appendex A, Table A.5) , were investigated for intestinal parasites on four occasions (February, April, September and November 1999), to account for possible seasonal fluctuations in incidence of intestinal parasitic infection.

2.4 Collection of clinical samples

Fresh stool samples were collected from the participating school children on each sampling occasion.

1) Each participant was given a plastic lidded container with spatula one day before the collection date.
2) Each cup was labeled (using permanent marker) with the child's full name, age, grade, school name and date.
3) Instructions about how to properly deliver a stool sample (uncontaminated) were explained to the participants, and were asked to bring the sample to school next morning.

Simplified instructions and leaflet about intestinal parasitic infections were given to the schoolchildren (Appendix B).

2.5 Processing of specimens

Formaline fixation:

The samples were first inspected macroscopically for presence of parasitic worms. Each sample was mixed thoroughly using wooden applicator, 10 ml of 10% formaline were added (Lindo *et al.*, 1998) and the sample mixed thoroughly again. Then the samples were examined microscopically by direct wet mount and concentration methods.

2.5.1 Wet mount method

Wet mount method (Roche and Benito, 1999), the standered method for stool examination, was used to examine each sample.

A drop of normal saline was applied on a clean slide, and about 2 mg of stool were held on a wooden applicator and emulsified in the normal saline drop. The smear was then stained with lugol's iodine, covered with a clean cover slip and examined microscopically, by scanning the whole area of the cover slip, under the low power (X10) objective for parasitic larvea and eggs identification, and X40 objective for protozoan cysts and trophozoites identification.

The resulted solid waste (slides and wooden applicators) was disposed off into a disinfectant solution (sodium hypochlorite solution with 2000 ppm chlorine) overnight, before it was discarded.

2.5.2 Concentration method

Each sample was concentrated by zinc sulfate ($ZnSO_4$) flotation method (Oberhelman, 1998) as follows:

1) Sample was stirred thoroughly and strained using a wet piece of gauze in a centrifuge tube, centrifuged at 2000 rmp for three minutes

and supernatant discarded.

2) Eight ml of tap water were applied to the sediment and centrifuged at 2000 rpm for three minutes, and supernatant discarded. The sample was washed several times with tap water until the supernatant became clear.

3) Thirty three percent w/v Zinc sulfate dissolved in water was added to the sediment, mixed and centrifuged at 2000 rpm for half a minute. Then the centrifuge tube was left for one minute undisturbed for the next step.

4) Using a wire loop, 2 drops from the surface film were taken, applied to a clean slide, covered with a clean cover slip and examined microscopically, by scanning the whole area of the cover slip under X10 and X40 objectives.

5) Intestinal parasites were identified using various taxonomic keys, monographs and textbooks in parasitology,

2.6 Epidemiological data

Epidemiological data were collected using a questionnaire which was constructed to assess: child's family socio-economic status, personal hygiene practices, sanitary facilities, parent's educational levels and knowledge about intestinal parasites (Levav *et al.*, 1995).

The questionnaire was written in simple Arabic (Appendix B). The children who donated stool samples in November, 1999 were asked to fill the required information in the questionnaire. The questionnaire was explained to the children before they were asked to fill in the necessary information.

2.7 Statistical analysis

Chi-square test (χ^2) was used to detect significant associations between localities, gender, seasons on prevalence rate of intestinal parasites detected, using Epi-Info program.

CHAPTER THREE

RESULTS

CHAPTER THREE

RESULTS

A total of 1329 school children, 662 females and 667 males aged 6-12 years old were surveyed for intestinal parasitic infections in Qalqilia city, Azzun and Hableh villages, in the period between February and November, 1999. Out of 1329 samples, 405 were positive, being infected with one or more intestinal parasite with prevalence rate of (30.5%, 405/1329).

3.1 Etiological agents

Five intestinal parasites were encountered in this study. These parasites were differed significantly as causative agents of intestinal parasitic infections in schoolchildren from different localities ($P<0.05$), with *Enterobius vermicularis* (11%, 146/1329) being responsible for the highest percentage of cases, followed by *Entamoeba histolytica* (7.1%, 94/1329), *Giardia lambilia* (6.9%, 92/1329), *Hymenolopus nana* (0.5%, 6/1329) and *Taenia saginata* (0.1%, 1/1329). Total incidence rate of multiple parasitic infections was (5%, 66/1329) (Table 3.1; Figure 3.2; Appendix A, Table A.1).

3.2 Prevalence of intestinal parasitic infections and etiological agents in the different localities

Infection rates found to be comparable among the three localities, Azzun village (36%, 138/383), Qalqilia city (30.4%, 188/619) and Hableh village (24.2%, 79/327), (P>0.05) (Table 3.1; Figure 3.6; Appendix A).

Prevalence rates of the different intestinal parasites were also comparable in the different localities (P>0.05) except for *E. histolytica* and *E. vermicularis* (P<0.05). *E. histolytica* was the most prevalent parasite in **Azzun** village (10.4%, 40/383), followed by **Hableh** village (19/327, 5.8%) and **Qalqilia city** (5.7%, 35/619). *E. vermicularis* was most prevalent in **Qalqilia city** (14.5%, 90/619) followed by **Azzun** village (9.7%, 37/383) and **Hableh** village (5.8%, 19/327) (Table 3.1; Figure 3.5; Appendix A, Table A.1).

3.3 Seasonal variation in intestinal parasitic infections

Prevalence rate of intestinal parasitic infections was found to differ significantly in the different seasons (P<0.05), with the highest prevalence rate occurring in spring (48.1%, 154/320), followed by autumn (27.8%, 102/363), summer (26.2%, 86/329), and winter (19.9%, 63/317) (Table 3.1; Figure 3.3).

Prevalence rates of the different intestinal parasites encountered were comparable among the four seasons ($P<0.05$) except for *E. histolytica* and *E. vermicularis*. The later was the most prevalent in spring (32.2%, 103/320) and in summer (6,4%, 21/329), whereas *E. histolytica* was the most prevalent in autumn (9.4%, 34/363) and summer (8.8%, 29/329). Also multiple parasites were mot prevalent in spring (9.1%, 31/320) and autumn (5.2%, 19/363) (Table 3.2; Figure 3.5; Appendix A, Table A.1)

3.4 Incidence rate distribution by gender

Incidence rate of intestinal parasitic infections was slightly higher in females (32.6%, 216/662) than in males (28.3%, 189/667), ($p>0.05$). (Table 3.1; Figure 3.1; Appendix A, Table A.1).

Male and female schoolchildren were equally affected by different parasites except for *G. lambilia* which was higher in females (8.6%, 57/662) than in males (5.2%, 35/667) (Table 3.1; Appendix A, Table A.1).

Table 3.1 Distribution and prevalence rate (%) of the intestinal parasites in the 3 surveyed areas on the basis of gender and locality.

Locality	Qualqilia			Azzun			Hableh			Total		Total (M+F)
	Females N =305	*Males* N =314	Total N=619	*Females* N =192	*Males* N =191	Total N=383	*Females* N =165	*Males* N =162	Total N=327	*Females* N =662	*Males* N=667	N =1329
E. histolytica	17(5.6)	18(5.7)	35(5.7)	24(12.5)	16(8.3)	40(10.4)	10(6.1)	9(5.6)	19(5.8)	52(7.9)	42(6.3)	94(7.1)
G. lambilia	10(3.3)	23(7.3)	33(5.3)	20(10.4)	17(8.9)	37(9.7)	14(8.5)	8(4.9)	22(6.7)	57(8.6)	35(5.2)	92(6.9)
E.vermicularis	46(15.1)	44(14.0)	90(14.5)	20(10.4)	17(8.9)	37(9.7)	7(4.2)	12(7.4)	19(5.8)	71(10.7)	75(11.2)	146(11)
H. nana	2(0.7)	2(0.6)	4(0.6)	0	1(0.5)	1(0.3)	1(0.6)	0	1(0.3)	3(0.5)	3(0.4)	6(0.5)
T. saginata	0	0	0	1(0.5)	0	1(0.3)	0	0	0	1(0.2)	0	1(0.1)
E.vermicularis+ E. histolytica	4(1.3)	4(1.3)	8(1.3)	5(2.6)	3(1.6)	8(2.1)	4(2.4)	0	4(1.2)	13(1.2)	7(1.0)	20(1.5)
E. histolytica + G. lambilia	5(1.6)	3(1.0)	8(1.3)	3(1.6)	5(2.6)	8(2.1)	1(0.6)	4(2.5)	5(1.5)	7(1.1)	14(2.1)	21(1.6)
G. lambilia + E.vermicularis	6(2.0)	3(1.0)	9(1.6)	4(2.1)	1(0.5)	5(1.3)	2(1.2)	2(1.2)	4(1.2)	9(1.4)	9(1.3)	18(1.2)
E.vermicularis + H. nana	0	0	0	1(0.5)	0	1(0.3)	1(0.5)	1(0.6)	2(0.6)	2(0.3)	1(0.1)	3(0.2)
H. nana + *E. histolytica*	0	0	0	0	0	0	0	1(0.6)	1(0.3)	0	1(0.1)	1(0.1)
E. histolytica + E.vermicularis + G. lambilia	1(0.3)	0	1(0.2)	0	0	0	0	0	0	0	1(0.1)	1(0.1)
G. lambilia + H. nana	0	0	0	0	0	0	1(0.5)	1(0.6)	2(0.6)	1(0.2)	1(0.1)	2(0.2)
Total	91(29.8)	97(30.9)	188(30.4)	78(40.6)	60(31.4)	138(36)	41(24.8)	38(23.5)	79(24.2)	216(32.6)	189(28.3)	405(30.5)

Table 3.2 Distribution and prevalence of intestinal parasitic infections (%) in schoolchildren by season through out 1999.

	WINTER N=317	SPRING N=320	SUMMER N=329	AUTUMN N=363	TOTAL N=1329
E. histolytica	26(8.2)	5(1.6)	29(8.8)	34(9.4)	94(7.1)
G. lambilia	22(6.9)	13(4.1)	22(6.7)	35(9.6)	92(6.9)
E.vermicularis	10(3.2)	103(32.2)	21(6.4)	12(3.3)	146(11.0)
H. nana	1(0.3)	2(0.6)	2(0.6)	1(0.3)	6(0.5)
T. saginata	0	0	0	1(0.3)	1(0.1)
Multiple parasites	4(1.3)	31(9.7)	12(3.7)	19(5.2)	66(5.0)
Total	63(19.9)	154(48.1)	86(26.2)	102(27.8)	405(30.5)

3.5 Effects of personal hygienic habits on intestinal parasitic infections

Significant associations were found between personal hygienic habits (washing hands after using toilet and before eating, washing fresh fruits or vegetables and the degree of cleanliness of drinking water when the child outside the home), and intestinal parasitic infections; as the personal hygienic practices improved the infection rate decreased and vice versa. (Table 3.3- 3.6; Figure 3.7- 3.8).

Table 3.3 Distribution of cases by hand washing after using toilet.

Answer	*Positive (%)*	*Negative*	*Total*
Always	24(14%,24/174)	150	174
Sometimes	40(32%, 40/124)	84	124
No	22(73%, 22/30)	8	30
Total	86(26%, 86/328)	242	328

(χ^2 =50.65, df=2, $p<0.05$)

Table 3.4 Distribution of cases by hand washing before eating.

Answer	*Positive (%)*	*Negative*	*Total*
Always	23(7.0%, 23/159)	136	159
Sometimes	34(10.4%, 34/126)	92	126
No	29(8.8%, 29/43)	14	43
Total	86(26.2%, 86/328)	242	328

(χ^2 =49.17, df=2, p<0.05)

Table 3.5 Distribution of cases by washing fresh fruit or vegetable before eating.

Answer	*Positive (%)*	*Negative*	*Total*
Always	18(23%, 18/150)	132	150
Sometimes	35(27%, 35/115)	80	115
No	33(67%, 33/63)	30	63
Total	86(26%, 86/328)	242	328

(χ^2 =39.02, df=2, p<0.05)

Table 3.6 Distribution of cases by degree of drinking water cleanliness when the child outside the home.

Answer	*Positive (%)*	*Negative*	*Total*
Clean	21(14%, 21/151)	130	151
Seems to be clean	39(28%, 39/137)	98	137
Not clean	26(65%, 26/40)	14	40
Total	86(26%, 86/328)	242	328

(χ^2 =43.29, df=2, p<0.05)

3.6 Effects of sanitary facilities conditions on intestinal parasitic infections

Sanitary facilities conditions were found to significantly affect the prevalence rates of intestinal parasitic infections among schoolchildren. Presence of adequate sanitary facilities (e.g., availability a safe drinking water, presence of municipal piped water and municipal wastewater disposal system) were found to be associated with lower levels of intestinal parasitic infections. Absence of adequate sanitary facilities (e.g., presence of rain fed wells, wastewater disposed in septic tanks or in an open canals, presence of wastewater flowing in the roads in the living area) were, on the other hand, associated with higher levels of intestinal parasites (Tables 3.7-3.11).

Table 3.7 Distribution of cases by the source of drinking water.

Answer	*Positive (%)*	*Negative*	*Total*
Municipal piped water	61(21%, 61/291)	230	291
Collection wells	25(68%, 25/37)	12	37
Springs	0	0	0
Total	86(26%, 86/328)	242	328

(χ^2 =36.81, df=1, p<0.05)

Table 3.8 Distribution of cases by degree closer to the water source.

Answer	*Positive (%)*	*Negative*	*Total*
Completely closed	38(18%, 38/214)	176	214
Closed but not completely	39(38%, 39/103)	64	103
Completely opened	9(82%, 9/11)	2	11
Total	86(26%, 86/328)	242	328

(χ^2 =32.72, df=2, p<0.05)

Table 3.9 Distribution of cases by the wastewater disposal method.

Answer	*Positive (%)*	*Negative*	*Total*
Municipal disposal system	62(24%, 62/214)	176	214
Septic tanks	14(26%, 14/103)	64	103
Open canals	10(63%, 10/11)	2	11
Total	86(26%, 86/328)	242	328

(χ^2 =8.13, df=2, p<0.05)

Table 3.10 Distribution of cases by presence of wastewater flowing in the roads of the living area.

Answer	*Positive (%)*	*Negative*	*Total*
Always	18(78%, 18/23)	5	23
Sometimes	34(40%, 34/86)	52	86
No	34(16%, 34/219)	185	219
Total	86(26%, 86/328)	242	328

(χ^2 =53.03, df=2, p<0.05)

3.7 Effects of family socio-economic status on intestinal parasitic infection

Socio-economic status of the family was found to be related to the prevalence rate of intestinal parasitic infections among schoolchildren. Higher prevalence rates were found to be associated with lower family income and lower household space (e.g. indoors available house area (Tables 3.11-3.13).

Table 3.11 Distribution of cases by the fathers work.

Answer	*Positive (%)*	*Negative*	*Total*
Worker	20(15%, 20/133)	113	133
Farmer	25(50%, 25/50)	25	50
Employee	19(38%, 19/50)	31	50
Private work	19(21%, 19/90)	71	90
Un-employed	3(60%, 3/5)	2	5
Total	86(26%, 86/328)	242	328

(χ^2 =30.96, df=4, p<0.05)

Table 3.12 Distribution of cases by the family income.

Answer	*Positive (%)*	*Negative*	*Total*
Low	10(100%,10/10)	0	10
Median	19(32%, 19/60)	41	60
High	57(22%,57/258)	201	258
Total	86(26%, 86/328)	242	328

(χ^2 =31.33, df=2, p<0.05)

Table 3.13 Distribution of cases by number of house rooms.

Answer	*Positive (%)*	*Negative*	*Total*
Tow or less	48(83%, 48/121)	73	121
Three	14(25%, 14/57)	43	57
More than three	24(16%,24/150)	126	150
Total	86(26%, 86/328)	242	328

(χ^2 =, df=2, p<0.05)

3.8 Effects of Parents educational level on intestinal parasitic infections

Higher prevalence rates were found in children coming from parents with lower educational levels (p<0.05) (Table 3.14-3.15).

Table 3.14 Distribution of cases by mother educational level.

Answer	*Positive (%)*	*Negative*	*Total*
Illiterate	4(50%, 4/8)	4	8
school	60(22%, 60/270)	210	270
Diploma or higher	22(44%, 22/50)	28	50
Total	86(26%, 86/328)	242	328

(χ^2 =12.61, df=2, p<0.05)

Table 3.15 Distribution of cases by father educational level.

Answer	*Positive (%)*	*Negative*	*Total*
Illiterate	4(57%, 4/7)	3	7
school	58(23%,58/251)	193	251
Diploma or higher	24(34%, 24/70)	46	70
Total	86(26%, 86/328)	242	328

(χ^2 =7.07, df=2, p<0.05)

3.9 Effects of awareness about intestinal parasites on intestinal parasitic infections

Knowledge about mode of transmission of intestinal parasites, did not seem to affect the prevalence rate (Table 3.17- 3.22; Figure 3.16).

Table 3.16 Distribution of cases by knowledge about the method by which the intestinal parasites transmitted.

Answer	*Positive (%)*	*Negative*	*Total*
Smelling dirty air and dust	47(30%, 47/172)	125	172
Touching any thing dirty	11(27%, 11/56)	45	56
Eating any thing dirty	28(18%, 28/100)	72	100
total	86(26%, 86/328)	242	328

(χ^2 =1.52, df=2, p>0.05)

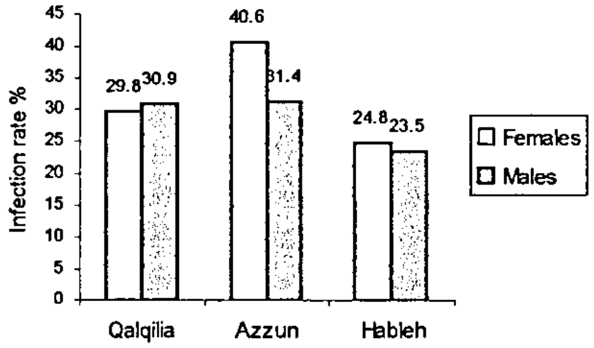


Figure 3.1 Distribution of intestinal parasitic infections in schoolchildren in the three localities by gender.

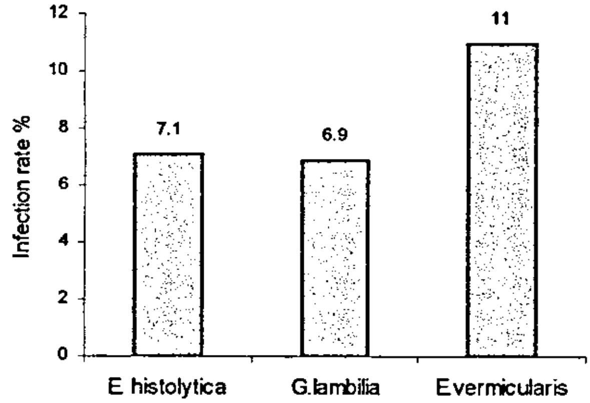


Figure 3.2 Distribution of the most prevalent intestinal parasites in schoolchildren through out 1999.

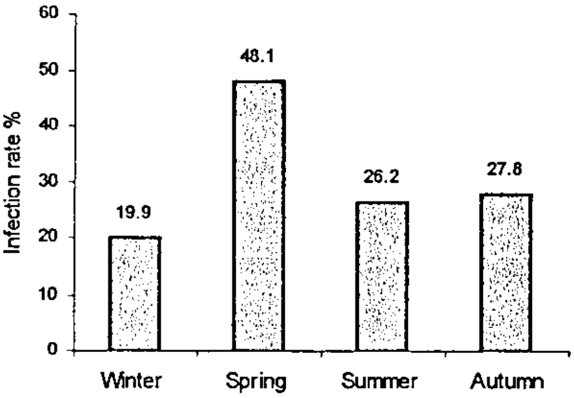


Figure 3.3 Distribution of intestinal parasitic infections in schoolchildren by season.

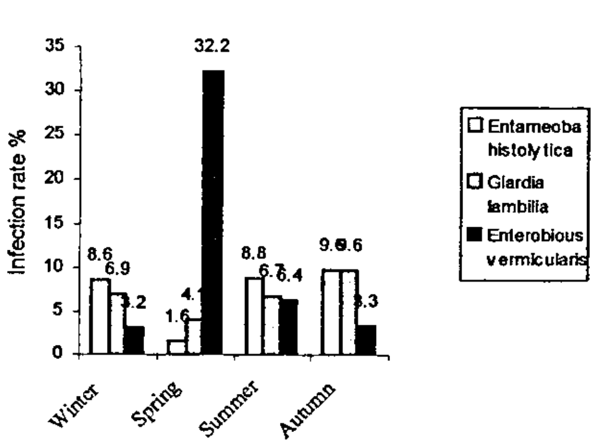


Figure 3.4 Distribution of most prevalent intestinal parasitic infections in schoolchildren in the four seasons.

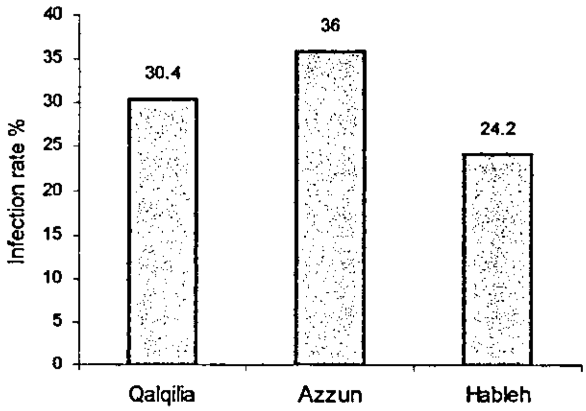


Figure 3.5 Distribution of intestinal parasitic infections in schoolchildren by locality.

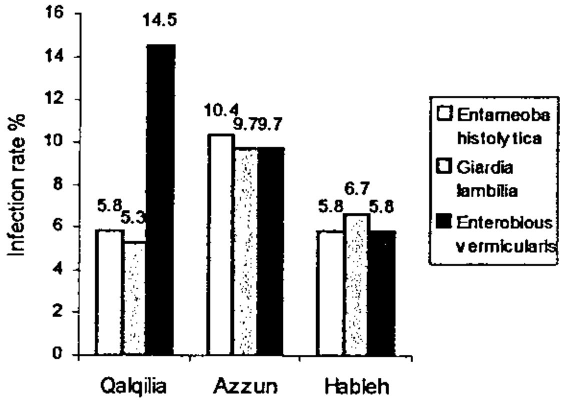


Figure 3.6 Distribution of the most prevalent intestinal parasitic infections in schoolchildren in the three localities.

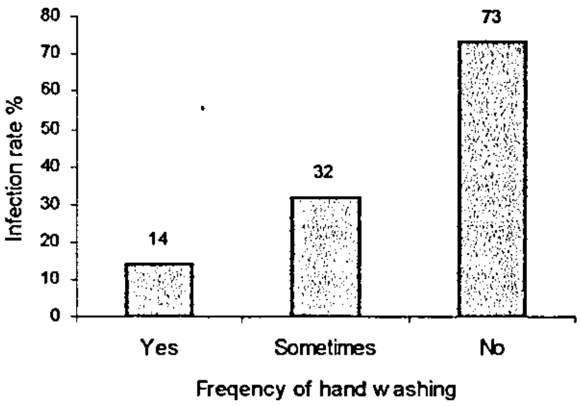


Figure 3.7 Distribution of cases by hand washing before eating.

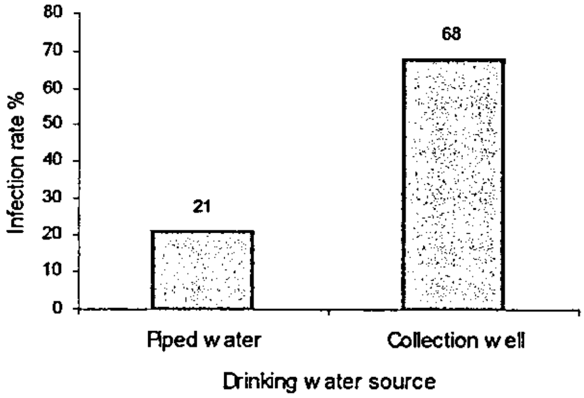


Figure 3.8 Distribution of cases by source of drinking water.

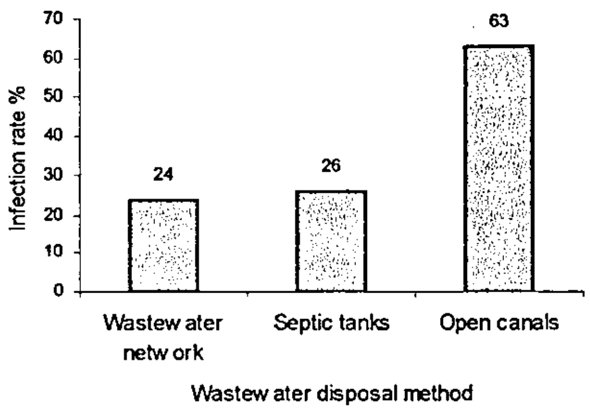


Figure 3.9 Distribution of cases by wastewater disposal method.

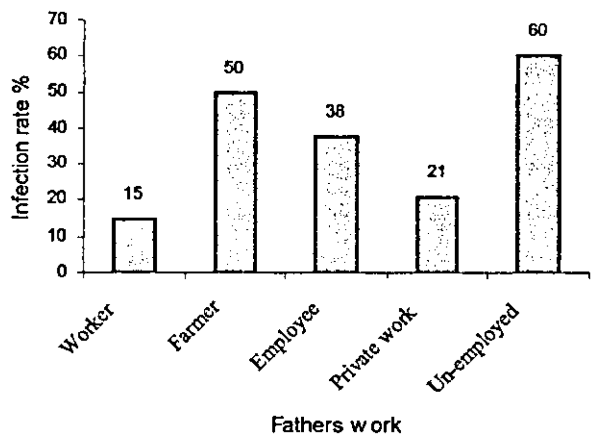


Figure 3.10 Distribution of cases by fathers work.

Figure 3.11 Distribution of cases by the family income.

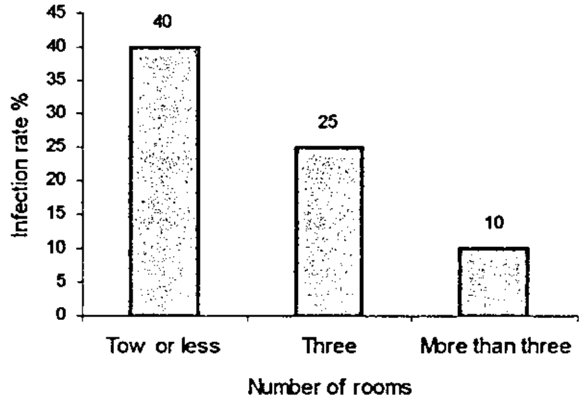


Figure 3.12 Distribution of cases by number of house rooms.

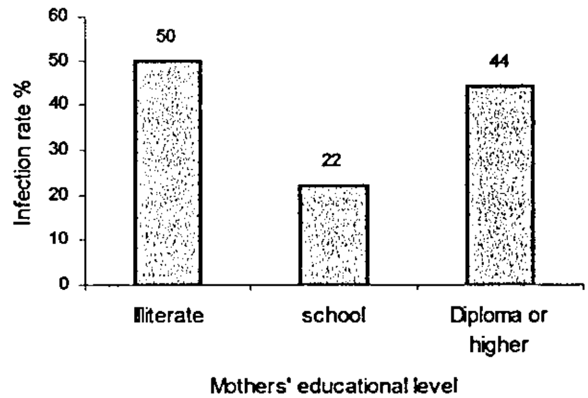


Figure 3.13 Distribution of cases by mothers' educational level.

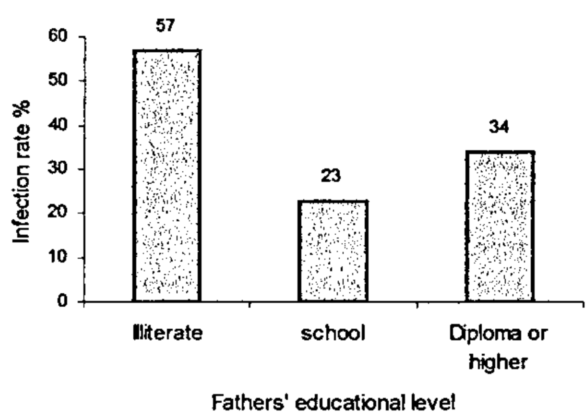


Figure 3.14 Distribution of cases by fathers educational level.

CHAPTER FOUR

DISCUSSION

Chapter Four

Discussion

4.1 Incidence of intestinal parasitic infections in Qalqilia district

This study demonstrated clearly the high prevalence rate of intestinal parasitic infections 30.5% in schoolchildren in Qalqilia district. However prevalence rate in Qalqilia district (Semi-coastal area) was relatively lower than that found in preschool children in the Jordan valley area (Al-jeftlik) (subtropical environment) (45.5%) (Orabi, 2000). This can be attributed to lower hygienic and socioeconomic conditions and use of wastewater irrigation in the latter area. On the other hand, prevalence rate of intestinal parasitic infections in schoolchildren in Qalqilia district was lower than that reported for some developing countries including Bolivia (65%) (Cancrini *et al.*, 1989), and north Thailand (48.7%) (Kasuya *et al.*, 1989).

High incidence rates in our population of intestinal parasites among schoolchildren may be associated with several factors; overcrowding classrooms, lack of hygienic latrines (toilets), and practice of unhygienic habits (Oslen, 1998). Children surveyed (4-15) are also considered (Kan & Poon, 1987) to be as the highest risk group. Children at this age group are more independent, most active, and are least careful about personal hygiene and cleanliness. Therefore, they are most easily and frequently exposed to infection and re-infection. Higher intestinal parasitic infections were also associated with overcrowding, lack of personal hygiene, stored water and food contamination and lack of latrine maintenance (Hall *et al*., 1982; Omer *et al*., 1991).

4.2 Etiological agents

Five species of intestinal parasites in Qualqilia district were identified as compared with nine in Nablus area (Ali-Shtayeh *et al*., 1989) and four in Al-Jeftlik area (Orabi, 2000). *Enterobious vermicularis*, *Entameoba histolytica* and *G. lambilia*, prove to be the most prevalent intestinal parasites in schoolchildren in the study area.

Despite the fact that stool examination is not the diagnostic method of choice for *E. vermicularis* (Goldsmide, 1981), this parasite proved to be the most prevalent intestinal parasite in the surveyed area, being encountered in 11% of the children examined. Since it was not possible to carry out the Scotch tape method for accurate estimation of *E. vermicularis* prevalence, it is likely that the actual prevalence is even higher than demonstrated here in this study. The high prevalence of *E. vermicularis* can be related to overcrowding classrooms, where infected and uninfected children were gathered together. No suitable hygienic latrines (toilets) were available at schools and there were no possibility for the children for hand washing with soap and water after defecation to break down the cycle of infection and re-infection. Although, in this work, *E. histolytica* and *G. lambilia* were the most prevalent in winter, summer and autumn, *E. vermicularis* had its highest incidence rate (32.2%) during spring ($p < 0.05$). *E. vermicularis* infection was probably facilitated by crowded indoor living, high humidity and moderate temperature of spring months (Beaver *et al.*, 1973). It was also the fourth most prevalent intestinal parasite in Al-Jeftlik area (Orabi, 2000), and the eighth in Nablus area (Ali-Shtayeh *et al.*, 1989) and Saudi Arabia (Abed El-Hafez *et al.*, 1986). In Malatya in orphan children (7-11 years old), on the other hand, it was the most prevalent intestinal parasite with prevalence rate of 35.1%, followed by *G. lambilia* and *E. histoytica* (Durmaz *et al.*, 1997). Also in Papua New Guinea and Irian Jaya *E. vermicularis* was considered the most common intestinal parasite (Barnish & Ashford, 1989).

E. histolytica and *G. lambilia* were the second and third most prevalent intestinal parasites in this study, but were the first and second most prevalent intestinal parasites in Nablus area (Ali-Shtayeh *et al.*, 1989), Jordan valley (Orabi, 2000) and Saudi Arabia (Abed El-Hafez *et al.*, 1986). The hot humid climate in summer and cold rainy winter favor the development of these protozoan parasites (Rinthaler *et al*., 1988). These parasites have direct life history, being transmitted from human to human by feco-oral route during which cysts are discharged in human stool leading to widespread contamination of the environment occurs and eventually infective stages are swallowed by new hosts (Roche & Benito, 1999; Crompton & Savoili, 1993 and Abed El-Hafez *et al*., 1986). Also poor public health conditions and personal hygiene and inadequate health education serve to promote the spread of parasites that are transmitted from person to person like *E. histoytica* and *G. lambilia* (Crompton & Savoili, 1993). Whatever the pathway is through water, food or direct spread to passing the parasites to reach the host, hands and fingers seems to play an essential role in conveying the parasites from the source to the susceptible host (Han *et al*, 1986). As hands readily get contaminated after defecation especially when water is used for cleaning the anus, however, thorough washing with soap and water can decontaminate them. Therefore, health education on hand washing with soap and water after defecation and before food handling is very important.

4.3 Helminth parasites

In this study only three helminth parasites were isolated, *E.*

vermicularis, *H. nana* and *T. saginata*. Whereas other helminth parasites like *T. trichiura*, *A. lumbricoides*, hookworms...etc, were absent. This may be attributed to the absence of wastewater irrigation of the vegetables or salad crops that are grown in the Qalqilia district. On the other hand, the later parasites were found to occur in Nablus area were wastewater irrigation is frequently practiced, Saudi Arabia and many parts of the world (Ali-Shtayeh *et al.*, 1989; Kan & Poon, 1987; Abed El-Hafez *et al.*, 1986).

4.4 The area with the highest prevalence rate

Highest prevalence rate (36%) encountered in Azzun village schoolchildren, may be related partially to source of water (rainfall fed water), and type of supply and method of wastewater disposal (septic tanks) which can increase the risk of water contamination (Cutting & Hawkins, 1982).

4.5 The season with the highest prevalence rate

Spring has the highest incidence rate throughout the year ($p<0.05$). *E. vermicularis* had its highest incidence rate (32.2%) during spring. Moderate temperatures and humidity and indoor crowding seem to facilitate *E. vermicularis* infections (Beaver *et al.*, 1973). On the other hand *E. hitolytica*, has its lowest incidence rate during the year. This may be related to the prevailing moderate environmental conditions, which may not favor the epidimiologic cycle of that protozoan parasite.

The highest incidence rates of intestinal parasitic infections in autumn and summer may be partly related to high humidity and temperature that prevailed during this period, which favor the epidimiologic cycle of the protozoan parasite, *E. hitolytica* (Reinthaler *et al.*, 1988). Thus, the time of the year is very important in the interpretation of the epidimiologic data.

In this work, incidence rate in autumn was higher than that found in summer. This increase seems to coincide with the summer holiday (first of June till the last of August), during which interaction of primary schoolchildren with each other in an overcrowded environment usually decreased.

Winter has the lowest incidence rate, prevailing relatively hard environmental conditions may play an important role in the inhibition of epidimiologic cycle of intestinal parasites. The incidence of intestinal parasites has been reported to have seasonal variation in Nablus area, with the lowest prevalence rates occurring in winter months (Ali-Shtayh *et al.*, 1989).

4.6 The prevalence rate according to gender

Males and females schoolchildren seem to be equally affected by intestinal parasitic infections. However, females (32.2%) have higher incidence rate, than males (28.7%). This slight difference may be related to differences in social and hygienic habits practiced by both sexes.

4.7 Effect of Personal hygiene habits on prevalence rate

Personal hygienic habits seem to be strongly correlated with prevalence rates of intestinal parasitic infections. Practice of appropriate personal hygienic habits seems to decrease intestinal parasitic infections in schoolchildren of the study areas. Hygienic conditions level in schools of the study areas are very low, with no possibility of hand washing with soap after using toilet or before eating, which in tern enhance intestinal parasitic infections transmission.

Intestinal parasitic infections are widely prevalent in developing countries, this has been attributed to poor sanitation and inadequate personal hygiene (Kan & Poon, 1987; Omer *et al.*, 1991; Crompton & Savioli, 1993). Lack of personal hygiene has been demonstrated to correlate well with higher prevalence rate of intestinal parasitic infections (Hall *et al.*, 1982).

4.8 Prevalence rate on basis of sanitary facilities conditions

The present work demonstrated that the use of proper sanitary facilities seems to decrease prevalence rate of intestinal parasitic infections. These include improving in housing and sewage disposal and water supply (Abedel-Hafez *et al.*, 1986; Kasuya *et al.*, 1989; Roose, 1997). The prevalence of intestinal parasitic infections was therefore thought to be a sensitive indication of the effectiveness of improved sanitation facilities (Mason *et al.*, 1986). Also the provision of piped water would be expected to be associated with reduction in parasite prevalence, particularly where transmission is influenced by contact with infected water or poor hygiene or where the parasite is waterborne (Mason *et al.*, 1986).

4.9 Prevalence rate and family socio-economic status

The present work demonstrated that family socio-economic status seems to affect the prevalence rate of intestinal parasitic infections with high infection rates being associated with low family socio-economic status.

Poverty, with its attendant lack of sanitation, is well known as a predisposing factor to parasitic infections (Arene & Akabogu, 1986; Mason *et al.*, 1986). The prevalence and intensity of some intestinal parasitic infections among children is an indication of the standard of living and environmental sanitation as well as other socioeconomic factors like family size and income, food availability, dietary practices standard of child care, and other cultural characteristics of the community (Kan & Poon, 1987).

This work also demonstrated that parents educational levels seems to affect intestinal parasitic infections significantly. The lower the educational level of the father or the mother, the higher the intestinal parasitic infection rate is.

REFERENCES

References

Abedel-Hafez, M. M., El-Kady, N., Bolbol, A. S. & Baknina, M. H. Prevalence of intestinal parasitic infections in Riyadh district, Saudi Arabia. *Annal of Tropical Medicine and Parasitology*. . 1986; **80**(6): 631-634.

Alakija, W. Prevalence of intestinal parasitic disease agents in stools of people in a rural area of Nigeria. *Annals of Tropical Medicine and Parasitology*. 1986; **80**(5): 545-547.

Ali-Shtayeh, M. S., Shaheen, S. F., Abu-Zeid, I. & Faidy, Y. R. Prevalence and seasonal fluctuation of intestinal parasitic infections in Nablus area, West Bank of Jordan. *Annals of Tropical Medicine and Parasitology*. 1989; **1**: 67-72.

Anderson, R. M. The population dynamics and epidemiology of intestinal nematode infections. *Transaction of the Royal Society of Tropical Medicine and Hygiene*. 1986 ; **80**: 686-696.

Arene, F. O. & Akabogu, O. A. Intestinal parasitic infections in pre-schoolchildren in the Niger delta. *Journal of Hygiene, Epidemiology, Microbiology and immunology*. 1986; **30**(1): 99-102.

Arya, S. C. Global warming and performance of drugs used to treat Parasitic and other diseases. *Annals of Tropical Medicine and Parasitology*. 1999; **93** (2): 207-208.

Baldawi, F. A., Mahdi, N. K. & Abul-Hafez, B. A. Resistence of mice to infection with the human strain of *H. nana*. *Annals of Tropical Medicine and Parasitology*. 1989; **83**(3): 275-277.

Barnish, G., Ashford, R. W. Occasional parasitic infections of Man in PapuaNew Guinea and Irian Jaya (New Guinea), *Annals of Tropical Medicine and*

Parasitology. 1989; **83**(2): 121-135.

Beaver, P.C, Kriz, J. J & Lau, T. J. Pulmonary nodule caused by *Enterobius vermicularis*. *American Journal of Tropical Medicine and Hygein*. 1973; **22**(6): 711-713.

Booth, M. & Bundy, D. A. comparative prevalence of *A. lumbricoides*, *T. trichiura* and hookworm infections and the prospects for combind control. *Parasitology*. 1992; **105**: 151-157.

Booth, M., Bundy, D. A., Albonico, M., Chwaya, H. M. & Alawi, K. S. Associations among multiple geohelminth species infections in schoolchildren from Pemba Island. *Parasitology*. 1997; **116**: 85-93.

Booth, M., Mayombana, C., Machibya, H., Masanja, H., Odermatt, P., Utzinger, J. & Kilima, P. The use of morbidity questionnaires to identify communities with high prevalence of schistosome or geohelminth in Tanzania. *Transaction of the Royal Society of Tropical Medicine and Hygiene*. 1998; **92**: 484-490.

Brooker, S., Peshu, N., Warn, P. A., Mosobo, M., Guyatt, H. I, Marsh, K. & Snow, R. H. The epidemiology of hookworm infection and its contribution to anemia among pre-schoolchildren on the Kenyan coast. *Transaction of the Royal Society of Tropical Medicine and Hygiene*. 1999; **93**: 240-246.

Buscher, H. N. & Haley, J. Epidemiology of H. Nana infections of Punjabi villagers in west Pakistan. *Transaction Journal of Tropical Medicine and Hygiene*. 1972; **21**(1): 42-44.

Cancrini, G., Bartoloni, A., Paradisi, F. & Nunez, L. E. Parasitological observations on three Bolivian localities including rural communities, cities and institutions. *Annals of Tropical Medicine and Parasitology*. 1989; **83**(6): 591-594.

Chute, C. G., Smith, R. P., & Baron, J. A. Risk factors for endeimic giardiasis. *AGPH.* 1987; **77**(5): 585-587.

Collins, R. F. & Edwards, L. D. Prevalence of intestinal helminths and protozoan in a rural population segment of the Dominian Repuplic. *Transaction of the Royal Society of Tropical Medicine and Hygiene.* 1981; **75**(4): 549-550.

Crompton, D. W. T. & Savioli, L. Intestinal parasitic infections and urbanization. *Bulletin of the World Health Organization.* 1993; **71** (1): 1-7.

Cross, J. H. Recent advances in human protozoa parasites of the gastointestinal tract. *Journal of Tropical Medicine and Hygiene.* 1984; **70** (5): 151-158.

Cutting, W. A, Hawkins, P. The role of water in relation to diarrhoeal disease. *Journal of Tropical Medicine and Hygiene.* 1982; **85**: 31-39.

Develoux, M., Alarou, A. & Mouchet, F. High prevalence of giaerdiasis in an urban population in Niger. *Journal of Tropical Medicine and Hygiene.* 1990; **93**: 355-356.

Elkins, D. B. A survay of intestinal helminths among children of different social communities in Madras, India. *Transaction of the Royal Society of Tropical Medicine and Hygiene.* 1984; **78**: 132-133.

Durmaz, B., Yakinci, C., Rafiq, M., Durmaz, R. The prevalence of intestinal parasites among orphan and primary school children in Malatya. *Acta parasitologica Turcica.* 1997; **21**(4): 391-394.

Eve, E., Feraz, E., & Thatcher, V. E. Parasitic Infections in Villagers from Three Districts of Brazilian Amazon. *Annals of Tropical Medicine and Parasitology.* 1997; **1**: 79-87.

Gadandeep, K., Mary, S. M, Prasanna, D. R, Jasper, D. D, Minne, M. M, Muliyil, J. P. Prevalence of intestinal parasites in rural southern Indians. *Tropical Medicine and international health.* 1999; **3**: 74-75.

Geissler, P. W., Mwaniki, D., Thiong, F. & Friis, H. Geophagy as a risk factor for geohelminth infections: a long study of Kenyan primary schoolchildren. *Transaction of the Royal Society of Tropical Medicine and Hygiene.* 1998; **92**: 7-11.

Giugliano, L. G., Bernardi, J. C., Vasconcelos, J. C., Costa, C. A. & Giugliano, R. Longtudinal study of diarrhoeal disease in a peri-urban community in Manaus (Amazon-Brazil). *Annals of Tropical Medicine and Parasitology.* 1986; **80**(4): 443-450.

Goldsmid, J. M. Intestinal parasitic infections of man in Tasmania. *Transaction of the Royal Society of Tropical Medicine and Hygiene*. 1981; **75**(1): 110-111.

Guyat, H. L., Brooker, S. & Donnelly, C. A. Can prevalence of infection in school-aged children be used as an index for assessing community prevalence?. *Parasitology.* 1999; **118**: 257-268.

Guyatt, H. L. & Bundy, D. A. Estimation of intestinal nematode prevalence: influence of parasite matting patterns. *Parasitology.* 1993; **107**: 99-106.

Hadju, V., Stephenson, L. S., Abadi, K., Mohammed, H. O., Bowman, D. D. & Parker, R. S. Improvement in appetite and growth in helminthes-infected schoolboys, three and seven weeks after a single dose of Pyrantel Pamoate. *Parasitology.* 1996; **113**: 497-504.

Hall, A., Latham, M. C., Crompton, D. W., Stephenson, L. S. & Wolgemuth, J. C. Intestinal parasitic infection of men in four regions of rural Kenya. *Transaction of the Royal Society of Tropical Medicine and Hygiene*. 1982; **76**(6): 728-733.

Han, A. M., Oo, K. N., Aye, T. & Hlaing, T. personal toilet after defecation and the degree of hand contamination according to different methodes used. *Journal of Tropical Medicine and Hygiene.* 1986; **89**: 237-241.

Hlaing, T., Saw, T., Aye, H. H., Lwin, M. & Myint, T. M. Epidemiology and *A. Lumbricoides* in Okpo village, rural Burma. *Transaction of the Royal Society of Tropical Medicine and Hygiene.* 1984; **78**: 497-504.

Holland, C. V., Asaolu, S. O., Crompton, D. W., Whithehead, R. R. & Coombs, I. Targeted anthelmentic treatment of schoolchildren effect of frequency of application on the intensity of *A. lumbricoids* infection in children from rural Nigerian villages. *Parasitology.* 1996; **113**: 87-95.

Jjumba-Mukasa, O. R. & Gundersa, A. E. Changing pattern of intestinal helminth infections in Jerusalem. *American Journal of Tropical Medicine and Hygiene.* 1971; **20(1)**: 109-115.

Kan, S. P. & Poon, G. K. Prevalence, distribution and intensity of soil transmitted helminthiases among Malaysian children. *Public health.* 1987; **101**: 243-251.

Kang, G., Mathew, M. s., Rajan, D. P., Daniel, J. D., Mathan, M. M., Mathan, V. I. & Muliyil, J. P. Prevalence of Intestinal Parasites in Rural Southern India. *Tropical Medicine and International Health.* 1998; **1**: 70-75.

Kasuya, S., Khamboonruang, C., Amano, K., Murase, T., Araki, H., Kato, Y., Kumada, Y., Koyama, A., Higuchi, M., Nakamura, J., Tomida, K. & Makino, S. Intestinal parasitic infections among schoolchildren in Chiang Mai, northern Thailand: and analysis of the present situation. *Journal Tropical Medicine and Hygiene.* 1989; **92**: 360-364.

Khan, M. A., Latham, F., Samarik, S. & Edeson, J. F. X-Ray Identification Of Parasitic Infections In The Western Region of Saudi Arabia. *Annals of Tropical*

Medicine and Parasitology. 1982; **76**(5): 499-505.

King, P. A., Duthie, S. J. & Ma, H. K. Intestinal helminths in pregnant Vietnamese refugees. *Transaction of The Royal Society of Tropical Medicine and Hygiene*. 1990; **84**: 723.

Levav, M., Mirsky, A. F., Schantz, P. M., Castro, S., Cruz, M. E. Parasitic infection in malnourished school children: effects on behaviour and EEG. *Parasitology*. 1994; **110**: 103-111.

Lindo, J. F., Levy, V. A., Baum, A. K. & Palmer, C. J. Epidemiology of Giardiasis and Cryptispordiosis in Jamaica. *American Journal of Tropical Medicine and Hygiene*. 1998; **59**(5): 717-721.

Mason, P.R., Patterson, B. A. & Loewnson, R. Piped water supply and parasitism in Zimbabwean schoolchildren. *Transaction of The Royal Society of Tropical Medicine and Hygiene*. 1986; **80**: 88-93.

Massoud, J., Arfaa, F., Jalali, H. & Keyvan, S. Prevalence of intestinal healminths in Khuzestan, southwest Eran. *American Journal of Tropical Medicine and Hygiene*. 1980; **29**(3): 389-392.

Needham, C., Kim, H. T., Hoa, N. V., Cong, L. D., Michael, E., Drake, L., Hall, A. & Bundy, A. P. Epidemiology of soil transmitted nematode infection in Ha Nam Province, Vietnam. *Tropical Medicine and International Health*. 1998; **11**(3): 904-912.

Nelson, G. S. Microepidemiology, the key to the control of parasitic infections. *Transaction of The Royal Society of Tropical Medicine and Hygiene*. 1990; **84**: 3-13.

Oberhelman, R. A., Guerrero, E. S., Fernandez,M. L., Silio, M., Mercado, D., Comiskey, N., Ihenacho, G. & Mera, R. Correlation between Intestinal Parasitosis, Physical Growth, And Psychomotor Development among Infants and Children from Rural Nicaragua. *The American Society of Tropical Medicine and Hygiene*. 1998; **58** (4): 470- 475.

Olsen, A. The proportion of helminthes infections in a community in western Kenya which would be treated by mass chemotherapy of schoolchildren. *Transaction of the Royal Society of Tropical Medicine and Hygiene*. 1998; **92**: 144-148.

Omar, M. S., Al-Awad, M. E. & Al-Madani, A. A. Giardiasis and ameobiasis infections in three Saudi closed communities. *Journal of Tropical Medicine and Hygiene*. 1991; **94**: 57-60.

Orabi, M. A. Epidemiological study of intestinal parasites in pre-school children in Al-Jeftlik area- Jordan valley. MSc thesis 2000, An-Najah National University, Nablus, Palestine.

Ramdath, D. D., Simeon, D. T., Wong, M. S. & Grantham-McGregor, S. M. Iron status of school children with varying intensity of *T. trichura* infection. *Parasitology*. 1995; **110**: 349-351.

Reinthaler, F. F., Mascher, F., Klem, G. & Sixl, W. A survey of gastointestinal parasites in Ogun state south west Nigeria. *Annals of Tropical Medicine and Parasitology*. 1988; **82**(2): 181-184.

Renton, J. I., Blathrwick, J., Bwie, W. R., Fyfe, M., Khan, M., Li, A. King, A., McLean, M., Medd, L., Moorehead, W., Ong, C. S. & Robertson, W. Epidemic and endemic sero prevalence of antibodies to *Cryptosporidium* and *Giaradia* in residents of three communities with different drinking water supplies. *The American Journal of Tropical Medicine and Hygiene*. 1999; **60** (4): 578- 583.

Rivera, W. L, Tachibana, H. & Kanbara, H. Field study on the distribution of *E. histolytica* and *Entamoeba dispar* in the Northen Philippines as detected by the polymerize chain reaction. *The American Society of Tropical Medicine and Hygiene.* 1998; **59** (6): 916- 921.

Roche, J. & Benito, A. Prevalence of intestinal parasite infections with special reference to *E. histilytica* on the islands of Bioko (Equatorial Guidena). *American Journal of Tropical Medicine and Hygiene.* 1999; **60** (2): 257-262.

Roose, M. H. The role of drugs in the control of parasitic nematode infections: must we without? *Parasitology.* 1997; **144**: S137-S144.

Shetty, N., Narasimha, M., Raghuver, T. S., Elliot, E., Farthing, M. J. & Macaden, R. Intestinal amoebiasis and giardiasias in southern indian infants and children. *Transaction of the Royal Society of Tropical Medicine and Hygiene.* 1990; **84**: 382-384.

Siddiqui, M. A. The prevalence of human parasites in Al-Baha, Saudi Arabia, a preliminary survey. *Annals of Tropical Medicine and Parasitology.* 1981; **75**(5): 565-566.

Sole, T. D. & Croll, A. Intestinal parasites in man in Labrador, Canada. *American Journal of Tropical Medicine and Hygiene.* 1980; **29**(3): 364-368.

Utzinger, J., Goran, E. K., Marti, H. P., Tanner, M. & Lengerler, C. Intestinal amoebiasis, giardiasis and geohelminthiases: their association with other intestinal parasites and reported intestinal symptoms. *Transaction of the Royal Society of Tropical Medicine and Hygiene.* 1999; **93**: 137-141.

Weidong, P., Xianmin, Z., Xiaomin, C., Crompton, D. W., Whithehead, R. R., Jiangqin, X., Hiangeng, W., Jiyuan, P., Yang, Y., Weixing, W., Kaiwu, X.& Yongxin, Y. *Ascaris*, people and pigs in a rural community of Jiangxi province, China. *Parasitology.* 1996; **133**: 545-557.

Weigl, M. M. Calle, A., Armijos, R. X., Vega, I. P., Bayas, B. V. &

Montenegro, C. E. The effect of chronic intestinal parasitic infection on maternal and perinatal outcome. *International Journal of Gynecology and Obstetrics.* 1996; **52**: 9-17.

WHO. Major parasitic infections: a global review. *World health statistics.* 1986; **39**(2): 145-160.

WHO. Intestinal protozoan and helminthic infections. WHO technical report series No. 666. 1981;Geneva.

Zmiro, D., Ferley, J. P, Collin, J. F, Charrel, M., & Berlin, J. A follow-up study of gastrointestinal diseases related to bacteriologically substandered drinking water. *American journal of public health.* 1987; **77**(5): 582-584.

Appendix A

Table A.1 Distribution and prevalence rate (%) of intestinal parasites in the primary schoolchildren, during the period from February- November, 1999, by locality and season.

	Qualqilia					Azzun					Hableh					Total
parasite	Winter N=158	Spring N=152	Summer N=151	Autumn N=158	**Total** N=619	Winter N=76	Spring N=87	Summer N=109	Autumn N=111	**Total** N=383	Winter N=83	Spring N=81	Summer N=69	Autumn N=94	**Total** N=327	N=1329
E. histolytica	8(5.1)	4(2.6)	14(9.3)	9(5.7)	35(5.7)	13(17.9)	0	9(8.3)	18(10.6)	40(10.4)	5(6)	1(1.2)	6(8.7)	7(7.4)	19(5.8)	94(7.1)
G. lambilia	10(6.3)	8(5.3)	3(2)	12(7.6)	33(5.3)	6(7.9)	2(2.3)	16(14.7)	13(11.7)	37(9.7)	6(7.2)	3(3.7)	3(4.3)	10(10.6)	22(6.7)	92(6.9)
E.vermicularis	6(3.8)	63(41.4)	15(9.9)	6(3.8)	90(14.5)	2(2.6)	26(29.9)	4(3.7)	5(4.5)	37(9.7)	2(2.4)	14(17.3)	2(2.9)	1(1.1)	19(5.8)	146(11.0)
H. nana	1(0.6)	2(1.3)	0	1(0.6)	4(0.6)	0	0	1(0.9)	0	1(0.3)	0	0	1(1.4)	0	1(0.3)	6(0.5)
T. saginata	0	0	0	0	0	0	0	0	1(0.9)	1(0.3)	0	0	0	0	0	1(0.1)
E.vermicularis + E. histolytica	0	5(3.3)	2(1.3)	1(0.6)	8(1.3)	0	6(6.9)	1(0.9)	1(0.9)	8(2.1)	1(1.2)	1(1.2)	2(2.9)	0	4(1.2)	20(1.5)
E. histolytica + G. lambilia	0	2(1.3)	2(1.3)	4(2.5)	8(1.3)	0	0	2(1.8)	6(5.4)	8(2.1)	0	0	0	5(5.3)	5(1.5)	21(1.6)
G. lambilia + E.vermicularis	2(1.3)	6(3.9)	1(0.7)	0	9(1.6)	0	4(4.6)	1(0.9)	0	5(1.3)	0	4(4.8)	0	0	4(1.2)	18(1.4)
E.vermicularis + H. nana	0	0	0	0	0	0	0	1(0.9)	0	1(0.3)	0	1(1.2)	0	1(1.1)	2(0.6)	3(0.9)
H. nana + E. ***histolytica***	0	0	0	0	0	0	0	0	0	0	0	1(1.2)	0	0	1(0.3)	1(0.1)
E. histolytica + E.vermicularis + G. lambilia	0	1(0.7)	0	0	1(0.2)	0	0	0	0	0	0	0	0	0	0	1(0.1)
G. lambilia + H. nana	0	0	0	0	0	0	0	0	0	0	1(1.2)	0	0	1(1.1)	2(0.6)	2(0.2)
Total	27(17.1)	91(59.9)	37(24.5)	33(20.9)	188(30.4)	21(27.6)	38(43.7)	35(32.1)	44(40.0)	138(36)	15(18.1)	25(30.9)	14(20.3)	25(26.6)	79(24.2)	405(30.5)

Table A.2 Effect of the localities (independent variable) on the infection rate of intestinal parasites and χ^2 results.

Dependent variable	*Independent variable*	Results	χ^2	*df*	*P-value*
Infection rate of different parasites	The three Localities	Not significant	2.6	2	>0.05
Infection rate of the Separate parasites	Locality	Not significant, except for *E. histolytica* which was the highest in Azzun (10.4%), *E. vermicularis* which was the highest in Qalqilia (14.5%)	7.9 14.3	2 2	>0.05 <0.05 <0.05

Table A.3 Effect of the seasons (independent variable) on the infection rate of intestinal parasites and χ^2 results.

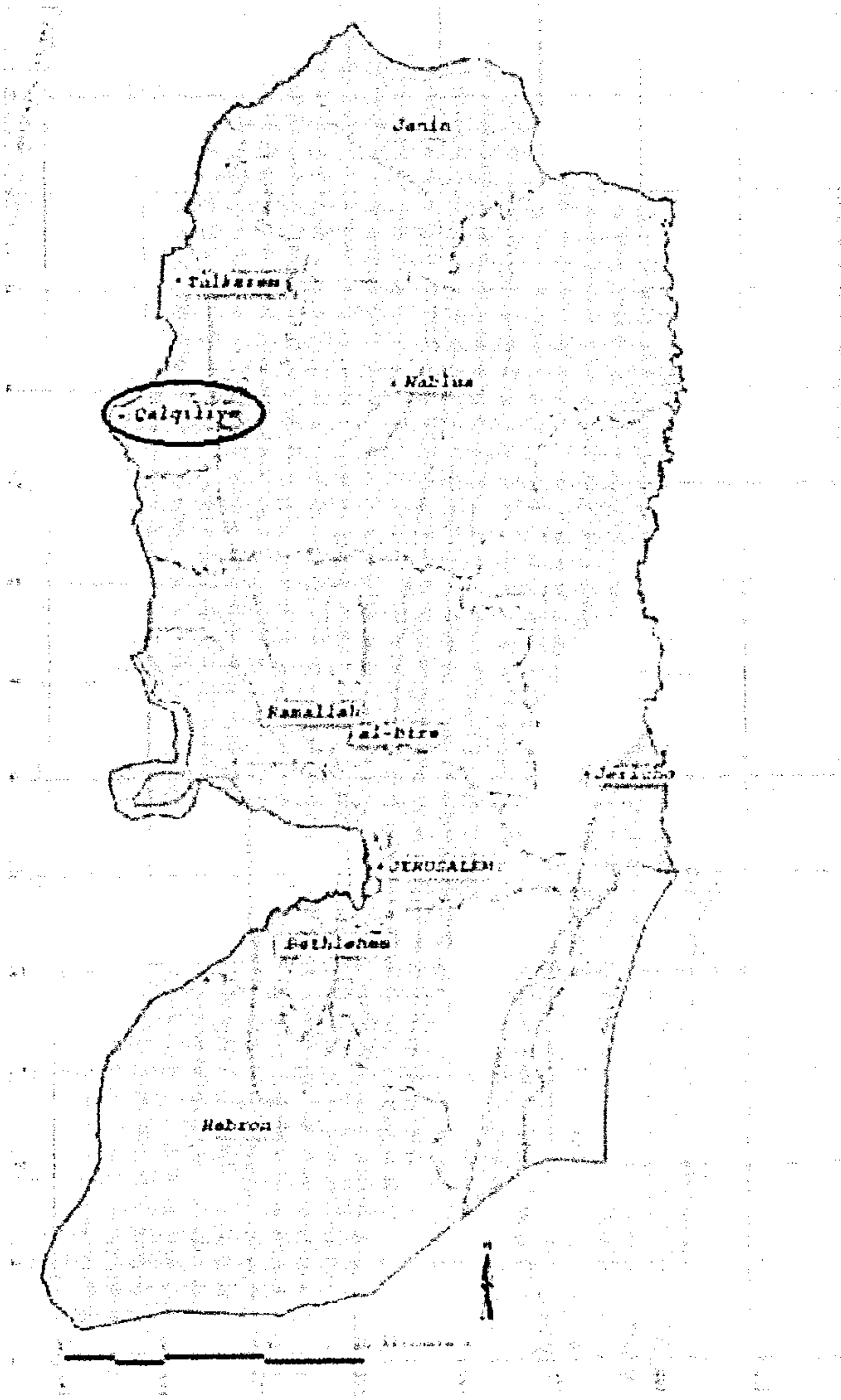
Dependent variable	*Independent variable*	*Results*	χ^2	*df*	*P-value*
Infection rate of different parasites	The four seasons	Significant	33.97	3	<0.05
Infection rate of the Separate parasites	Season	Not significant, except for *E. histolytica* which was the highest in autumn (9.4 %), *E. vermicularis* which was the highest in spring (32.2%) and multiple parasites which was the highest in spring (9.7%)	17.82 141.04 22.91	3 3 3	>0.05 <0.05 <0.05 <0.05

Table A.4 Effect of the gender (independent variable) on the infection rate of intestinal parasites and χ^2 results.

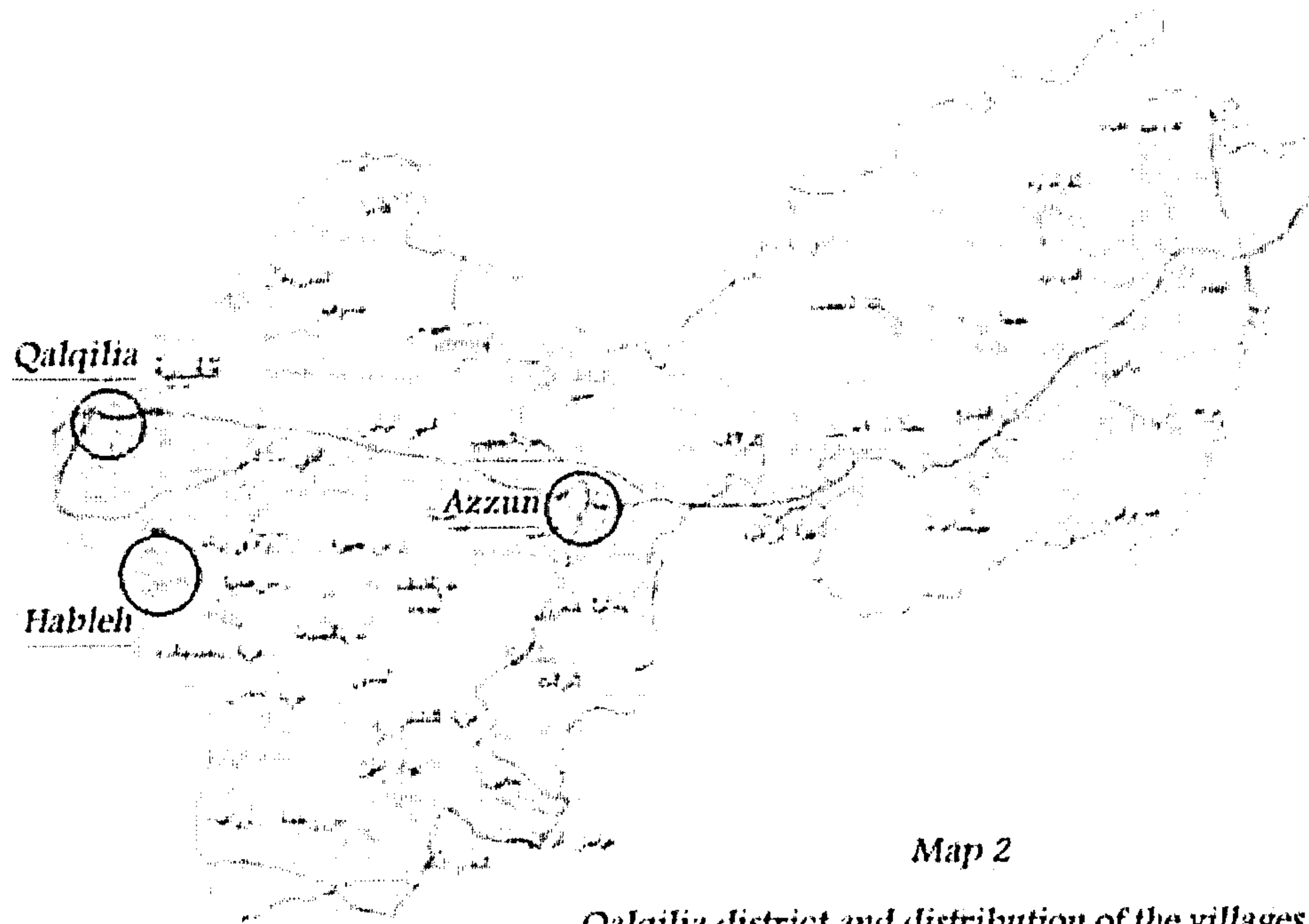
Dependent variable	*Independent variable*	*Results*	χ^2	*df*	*P-value*
Infection rate of different parasites	Both sexes	Not significant	1.04	1	>0.05
Infection rate of the separate parasites	Gender	Not significant, except for G. lambilia it was the highest in females (8.6%)	5.08	1	>0.05 <0.05

Table A.5 Distribution of subjects and by school name.

School Name	Gender	Number of children survayed	Number of infected cases
Al-Murabiteen	Males	159	50
Falasteen	Males	155	47
Al-Esra	Females	160	45
Qalqilia Females	Females	145	46
Azzun Males	Males	191	60
Azzun Femalea	Females	192	78
Hableh Males	Males	162	38
Hableh Females	Females	165	41
Total		1329	405



Map I
Situation of Qalqilia district in the West Bank (Palestine)



Map 2

Qalqilia district and distribution of the villages

Appendix B

Participant questionnaire

A) Identification data:

a. Triple name of the child --------- --------- ----------

b. Birth date ----\----\19---

c. Gender: 1.Male. 2.Female.

d. Interview date: ---\---\1999.

e. School name -----------------------------

f. Residence: 1. Quaqilia. 2. Azzun. 3. Hablah.

B) Personal hygiene habits:

a. You wash your hands after using the toilet: 1.Yes, always. 2. Sometimes. 3. No.

b. You wash your hands before eating: 1.Yes, always. 2. Sometimes. 3. No

c. Upon eating any fresh fruits or vegetables, you wash it: 1.Yes always. 2. Sometimes. 3. No.

d. When you are out side the home you drink from water source: 1.Sure about its cleanliness. 2.Seems to be clean. 3.Does not matter its level of cleanliness.

C) Sanitary facilities conditions:

a. Source of drinking water: 1.Munucial piped water. 2. Collection wells. 3.Springs.

b. The source of drinking water is: 1.Completely closed that the passage of any thing to it like dust is not possible. 2.Closed but not completely, allow the small things to pass. 3. Completely opened.

c. Wastewater disposed in: 1. Municipal wastewater disposal system. 2. Septic tanks. 3. Open canals.

d. In the living area there is wastewater flow in the street: 1.Yes, always. 2. Some times. 3.No.

e. Jewish settlements disposed its wastewater in the lands or water springs of my living area: 1. Yes treated wastewater. 2. Yes, raw waste waters. 3. No. 4. I don't know any thing about the matter.

D) Socio-economic status of the family:

a. Fathers work: 1.Worker. 2.Farmer. 3.Employee. 4.Private work. 5. Un-employed.

c. Family income: 1.Less than 3ooJD. 2.301-600JD. 3. More than 600JD.

d. Number of shelter rooms: 1. One- tow. 2. Three. 3. More than three.

E) Parents' educational level:

a. Mothers' educational level: 1. Illiterate. 2. School. 3. Diploma or Higher.

b. Fathers' educational level: 1. Illiterate. 2. School. 3.Diploma or Higher.

F) Knowledge about intestinal parasites:

a. Intestinal parasites transmitted by 1. Smiling any thing dirty (e.g. dirty air or dust). 2. Touching any thing dirty. 3.Eating any thing dirty (Stool contaminated).

b. Did you infected before with any of the intestinal parasites like, *E. hystilotica, G. lambilia, E. vermicularis, A.lumbricoides*, tape worms...etc: 1. Yes 2. No. 3. I don't know.

c. Did you have any of the following signs and symptoms, abdominal pain, diarrhea, anal itching, vomiting or weight loss, 1. Yes, always. 2. Some times. 3. No.

d. Did you do any stool analysis before: 1. Yes. 2. No.

e. If you answer the previous question with yes, the reason for the stool analysis was: 1. Described by the physician because I have signs of parasitic infection. 2. There are a family member infected with a parasite to be sure that I am clear from it. 3. As prevention, to make sure that I am clear from parasites.

f. Did you receive in the last three months any antiprotozal or anthelmintic drugs: 1. Yes. 2. No.

استبيان حول الإصابة بالطفيليات المعوية

أخي الطالب أختي الطالبة...

إن الهدف من هذا الاستبيان هو معرفة أسباب ومصادر الإصابة بالطفيليات المعوية في منطقة قلقيلية، من أجل الوصول إلى توصيات مناسبة.... إن المعلومات التي تؤخذ وخاصة الشخصية منها تعامل بالسرية وتستعمل فقط للأغراض الدراسية.

الرجاء الإجابة عن الأسئلة التالية بتعبئة الفراغ أو بوضع دائرة حول الإجابة التي تراها صحيحة.

1أ) الاسم الثلاثي ---------- -------- -----------

2أ) تاريخ الميلاد -----/-----/------

3أ) الجنس: 1. ذكر. 2. أنثى.

4أ) التاريخ -----/------/-----

5أ) اسم المدرسة -------------------------

6أ) منطقة السكن: 1. قلقيليه. 2. عزون. 3. حبله.

1ب) بعد استعمال المرحاض أغسل يدي بالماء والصابون: 1. نعم دائما. 2. أحيانا. 3. لا.

2ب) قبل تناول الطعام أغسل يدي بالماء والصابون: 1. .نعم دائما. 2. أحيانا. 3. لا.

3ب) عندما آكل أي خضار أو فاكهة طازجة أقوم بغسلها جيدا: 1. نعم دائما. 2. أحيانا. 3. لا.

4ب) عندما أكون خارج البيت: 1. لا أشرب سوى من ماء أثق انه نظيف. 2. اشرب من أي ماء اعتقد انه نظيف 3. أشرب من أي مصدر ماء موجود حتى لو كان بئر مكشوف .

1ج) المصدر الذي يزود البيت بالمياه:1. شبكة المياه من البلدية. 2.آبار جمع لمياه الأمطار. 3.ينابيع مياه.

2ج) المصدر الذي يزود البيت بالمياه مثل البئر أو الخزان: 1. مغلق بشكل محكم لا يصل الماء أي غبار أو حشرات. 2. مغلق بشكل يمكن وصول حشرات أو غبار للماء. 3. مفتوح بشكل كامل.

3ج) يتم التخلص من المياه العادمة(المجاري) المنزلية عن طريق: 1. تصريفها في شبكة صرف صحي (شبكة مجاري) من البلدية. 2. إلقائها في حفر امتصاصية. 3. إلقائها في قنوات مكشوفة في الشارع.

4ج) يوجد بالقرب من منطقة السكن مياه عادمة (مجاري)تسيل في الشارع: 1.نعم دائما. 2. أحيانا. 3. لا يوجد.

5ج) تتخلص التجمعات السكنية اليهودية(المستوطنات) القريبة من مكان السكن من المياه العادمة عن طريق: 1. إلقاؤها غير معالجة(مكررة) في الأراضي الزراعية أو القنوات المائية القريبة. 2. إلقاؤها معالجة(مكررة)في الأراضي الزراعية أو القنوات المائية القريبة. 3. لا تلقى مياه عادمة من المستوطنات في مكان سكني. 4. لا أعلم شيء عن الموضوع.

1د) عمل الأب: 1. عامل. 2. مزارع. 3. موظف4. عمل خاص. 5. عاطل عن العمل.

2د) مستوى دخل الأسرة: 1. أقل من 300دينار.2. 301–600دينار. 3. أكثر من 600 دينار.

3د) عدد غرف السكن: 1. غرفة واحدة إلى غرفتين. 2. ثلاث غرف.3. أكثر من ثلاث غرف.

1ة) مستوى تعليم الأم: 1. أمية. 2. المدرسة (توجيهي أو أقل). 3. دبلوم أو أعلى.

ة2) مستوى تعليم الأب: 1.أمي. 2. المدرسة (توجيهي أو أقل). 3. دبلوم أو أعلى.

و1) تنتقل الطفيليات عن طريق: 1. استنشاق (شم) أي شيء غير نظيف (الهواء، الغبار). 2. لمس أي شيء غير نظيف. 3. تناول أي شيء غير نظيف(ملوث بالبراز).

و2) هل أصبت في السابق بأي نوع من الطفيليات المعوية مثل الأميبيا، الجارديا، الدود شعري، الدودة الشريطية، دودة الإسكارس، أو غير ذلك: 1. نعم. 2. لا. 3. لا أدري.

و3) هل تعاني من أحد هذه الأعراض أو معظمها آلام في البطن، إسهال، حكة في فتحة الشرج، تقيؤ ونقصان في الوزن: 1. أحيانا. 2. دائما. 2. لا يوجد.

و4) هل قمت في السابق بعمل أي فحص للبراز:1. نعم. 2. لا.

و5) إذا كان جواب السؤال السابق نعم كان السبب:1.الطبيب طلب الفحص لأنه كان لدي أعراض مثل آلام في البطن وإسهال. 2. كان أحد أفراد العائلة مصاب بطفيل معوي لأتأكد من خلوي منه. 3. كنوع من الوقاية لأتأكد من خلوي من الطفيليات المعوية.

و6) هل تلقيت في الفترة الأخيرة (خلال ثلاث أشهر) دواء لعلاج الطفيليات المعوية (الديدان، أميبيا، أو جارديه): 1. نعم. 2. لا.

وشكرا جزيلا لتعاونكم

مع تحيات طالبة الماجستير

زهره وهيب خدرج

بسم الله الرحمن الرحيم

الطفيليات المعوية التي تصيب الإنسان

اعداد طالبة الماجستير: زهره وهيب خدرج

الطفيل: هو كائن حي يعتمد على كائنات أخرى في المأكل والمشرب والمأوى.

أمثلة على الطفيليات المعوية:

طفيليات وحيدة الخلية، مثل: الجارديه، الأميبا.

طفيليات متعددة الخلايا مثل: الدودة الشريطية، دودة الإسكارس، الدود الشعري.

كيف تنتقل الطفيليات المعوية:

تنتقل الطفيليات المعوية عن طريق تلوث الطعام، الماء أو الأيدي بالبراز. مثل عدم غسل الخضر وات والفواكه أو غسلها بشكل غير كافي، أو استعمال المرحاض وعدم غسل اليدين جيدا بالماء والصابون ثم تناول الطعام أو الشراب بعد ذلك (الغسل بالماء وحده لا يكفي).أو لعب الأطفال بالتراب ثم تناول الطعام دون غسل اليدين جيدا بالماء والصابون، أو أن يضع الطفل في فمه أشياء كانت قد لامست الأرض دون غسلها.

هل نستطيع رؤية الطفيليات المعوية بالعين المجردة:

طفيليات وحيدة الخلية، مثل: الجارديه، الأميبا، أو بيض الديدان متعددة الخلايا لا نستطيع رؤيتها بالعين المجردة، أما الطفيليات متعددة الخلايا فنستطيع رؤيتها بالعين المجردة، مثل: الدودة الشريطية، دودة الإسكارس، الدود الشعري.

ما هي أعراض الإصابة بالطفيليات المعوية:

إسهال، آلام في البطن والتي قد تكون حادة، غثيان، تقيؤ، غازات، تغير في لون البراز، رائحة كريهة للبراز، نقصان في الوزن، فقدان الشهية، فقر دم، سعال حاد جاف، حكة حول فتحة الشرج، حرارة مرتفعة.
إذا كنت تعاني من بعض هذه الأعراض فيجب عمل فحص براز فربما تكون مصابا بالطفيليات المعوية.

كيف أحمي نفسي من الصابة بالطفيليات المعوية:

- غسل اليدين جيدا بالماء والصابون قبل تناول الطعام وبعد استعمال المرحاض.
- ابقاء الأظافر قصيرة.
- غسل الفواكه والخضر وات الطازجة جيدا قبل تناولها.

- عمل فحوصا لجميع أفراد الأسرة التي يوجد فيها مصاب للتأكد من خلوهم من الإصابة.
- غسل ملابس أفراد العائلة بالماء الساخن والصابون وتعريضها للشمس لقتل أي طفيليات قد تكون فيها.
- إذا شعرت بآلام في البطن أو أحد الأعراض السابقة الذكر يجب مراجعة الطبيب وعدم تجاهل الوضع وعمل الفحوص اللازمة.
- النظافة الشخصية هي أفضل طريقة لتجنب الصابة بالطفيليات المعوية.

ملخص باللغة العربية

التغيرات الموسمية ونسبة انتشار الطفيليات المعوية بين أطفال مدارس المرحلة الأساسية في محافظة قلقيلية، فلسطين

زهره وهيب عبد الفتاح خدرج

الإشراف

بروفيسور د. محمد سليم اشتيه

د. يحيى راشد فيضي

تمت دراسة نسبة الإصابة والتغيرات الموسمية للطفيليات المعوية في الفترة ما بين شباط وكانون أول من 1999 بين أطفال مدارس المرحلة الأساسية(6-12 سنة) في محافظة قلقيلية، وذلك لمعرفة نسبة انتشار الطفيليات المعوية بين هؤلاء الأطفال، وإذا ما كان هناك تأثير للتغيرات الموسمية على نسبة الانتشار هذه. احتوت الدراسة على 1329 طفل مدرسة منهم 662 إناث و 667 ذكور. تم فحص العينات وذلك بتثبيتها بمادة formaline 10% أولا ثم فحصها بطريقتين:

Wet Mount Method and Concentration Method

أظهرت الدراسة أن (30.5%, 405/1329)من الأطفال كانوا مصابين بنوع واحد على الأقل من الطفيليات المعوية، وقد تم عزل خمسة أنواع من الطفيليات المعوية وكانت أكثر الطفيليات المعوية المعزولة انتشارا هي كالتالي:

Enterobius vermicularis (11%, 146/1329), *Entamoeba histolytica* (7.1%, 94/1329), *Giardia lambilia* (6.9%, 92/1329) and multiple parasitic infections was (5%, 66/1329).

أظهرت نتائج الدراسة أن هناك تغيرات موسمية في انتشار الطفيليات المعوية وكانت أعلى نسبة للطفيليات المعوية في فصل الربيع (48.1%) الخريف (27.8%) الصيف(26.2%) ومن ثم

الشتاء(19.9%). لم يكن هناك اختلاف كبير بين مناطق الدراسة الثلاث في نسبة الاصابة بالطفيليات المعوية ولكن كانت عزون هي أعلى منطقة في انتشارا الطفيليات المعوية (36%) . بشكل عام لم يكن هناك اختلاف كبير بين الجنسين في نسبة الإصابة بالطفيليات المعوية، ولكن كانت النسبة أعلى بين الإناث (32.6%) منها بين الذكور (28.3%) ولكن لم يكن للجنس دلالة إحصائية على نسبة انتشار الطفيليات المعوية.