AL-TAHADI UNIVERSITY
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PREVALENCE OF INTESTINAL PARASITES AMONG PRIMARY SCHOOLCHILDREN IN SIRT-LIBYA

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Science.

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بسم الله الرحمن الرحيم

وَمَا تَوْفِيقِي إِلَّا بِاللَّهِ عَلَيْهِ
تَوَكَّلْتُ وَإِلَيْهِ أُنِيبُ .

صدق الله العظيم

الآية ﴿88﴾ من سورة هود

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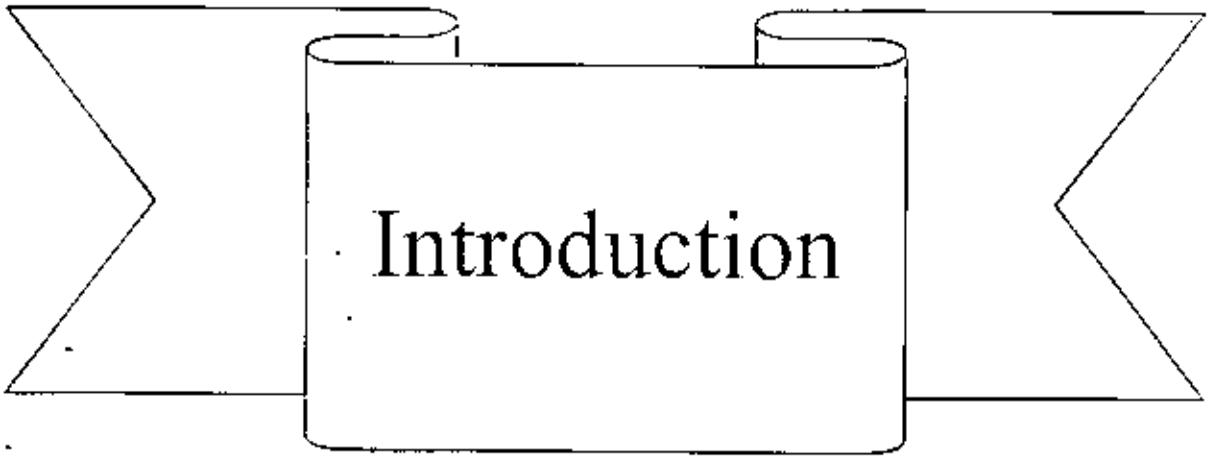

Introduction

1. INTRODUCTION

Intestinal parasitic infection are among the major diseases of public health problems in many countries . Although many advanced studies have been done in this field during the 21st century . All show still million or billion of world communists are suffering from intestinal parasitic infection . Human intestinal parasites infection are widely distributed throughout the world especially in areas where poverty , lose of hygiene and sanitation . lack of public water supply , lower socio-economical groups , an inadequate environment condition and over-crowding prevail in under-developed tropical and subtropical countries (Biolley *et al* ., 1990 : Kelana, 1993 ; Saygi *et al*.,1995 and Borda *etal*.,1996). The impact of these diseases is greater in developing countries where 80 % (16 million) of deaths in 1993 were attributed to infectious and parasitic diseases (WHO, 1995) .

The prevalence of parasitic infection at any given time and place is determined by combined effect of three main factors: (1) a source of infection. (2) a mode of transmission (3) the presence of a susceptible host (Neva and Brown , 1994) . Not all parasites are pathogenic, the presence of parasites unknown pathogencity or which are non-pathogenic is still relevant , because these organisms have similar life cycles and transmission routes (Levinson and Jawetz 1998) .

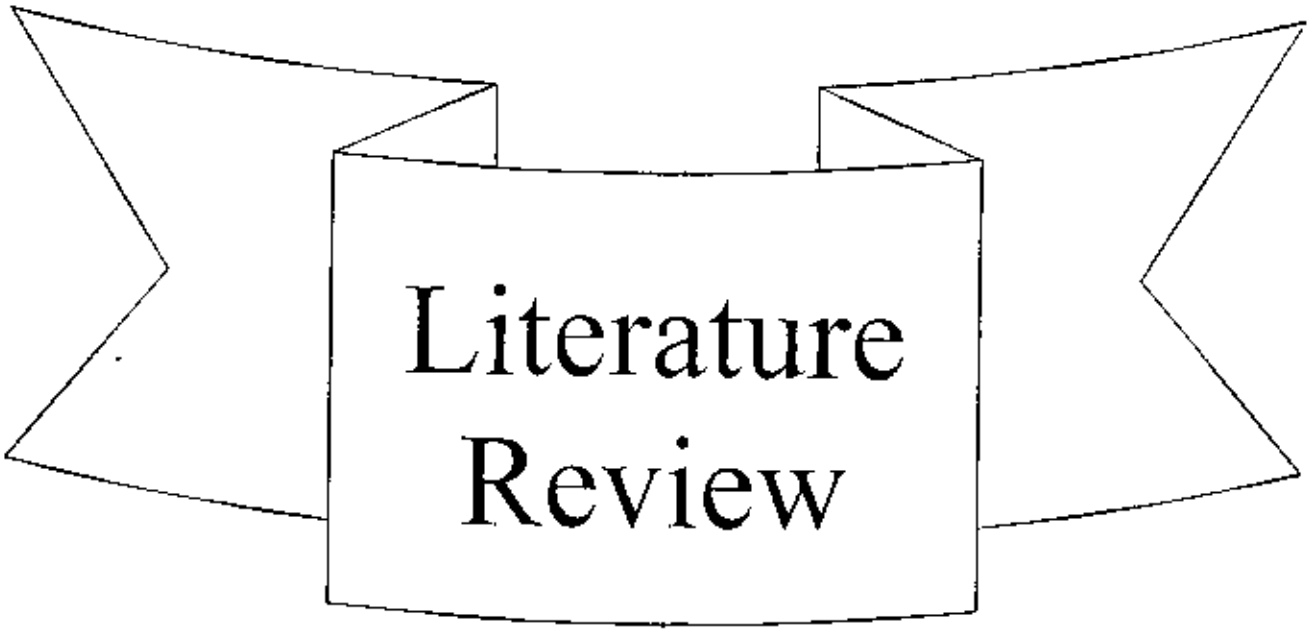
Children are more susceptible to water and food-born infections because their immune systems are not fully developed and their activities and hygiene practices put them at greater risk of infection than older age group (Arfaa , 1994 , Bahman , 1992 and Fabiana lara and Carolina , 2002). Infection with intestinal parasites has been

associated with stunting in linear growth , physical weakness and low educational achievement in schoolchildren (Nokes *et al* , 1991) . The chances of infection are increased by environmental conditions favouring the extracorporeal existence of the parasite and by lack of sanitation and communal hygiene (Neva and Brown, 1994) . The school environment is important as well as the home environment because children stay most of the day in the school classes , so it reflects its effect on their health (Michael *et al.* , 1986) .

Bad environment features observed in school as well as in popular areas are risk factor to the infection and contribute to increase the prevalence of intestinal parasitic disease . (Gaye *et al.*, 1994) . Many magnitudes of traditional control measures have failed to curb the parasitic infection (David and Liu ,1994) . The control of parasitic diseases includes many procedures viz reduction of the sources of infection in human being by therapeutic measures, education in personal prophylaxis to prevent dissemination of infection , sanitary control of water , food , living and working conditions and waste disposal , control of reservoir hosts and vectors (Neva and Brown , 1994) . Prevalence of parasitic infection differ from region to region because of several environmental , social and geographical factors (Legesse and Erko , 2004) . Few studies have been done on the prevalence of intestinal parasitic infection in Libya (Dar and Friend , 1979 ; Dar *et al* , 1979 ; El-Boulaqi *et al* , 1980 ; Al-Tawaty *et al* , 1998 ; Bugharara *et al* , 1999 and El-Ammari *et al* , 2004 a , b) . There are still several localities for which epidemiological information is not available .

In developing country like Libya , the epidemiological patterns of parasitic diseases are further complicated by the arrival of large number of migrant workers leading to destabilizing effects on the normal pattern of disease transmission .

The aim of this study is to determine (1) The prevalence and types of intestinal parasites both pathogenic and non-pathogenic in representative sample of primary schoolchildren in different district authorities of Sirt city, (2) The detailed comparison of the distribution pattern of these parasites among these children and (3) The role of school environment on the spread of parasitic infection among schoolchildren and (4) Investigate the relationships between parasitic infection and demographic , behavioral , socio-economic and environmental factors associated with the parasitic infection .


Literature
Review

2. LITERATURE REVIEW

Human parasites still account for large loss of life, wide spread morbidity and the retardation of economic development in many countries . It has been reported that the prevalence rates of parasitic diseases are high and a total number of protozoan and helminthic infections currently existing worldwide out numbers the total world population , because of the multiple infection (WHO , 1986). Intestinal parasitic infection is considered to be one of the most common tropical diseases in developing countries and the prevalence in these countries ranges from 30-60% (WHO, 1987) .

A large number of literature made on intestinal parasites in human and their control measures, protozoa and helminthes infection are still endemic in many countries particularly in the developing ones where sanitary and ecological factors favour their prevalence and spreading (Sabbour and Farid , 1978) .

The parasitic diseases are the major medical problem when they predispose to malnourishment and impairment of physical and mental development in children. Intestinal parasites can lead to reduced immunity , calory and protein deficiency, vitamin A deficiency and eventually death (Kelana , 1993) . Many suggestion play important role for the study from the point of view of human health and hygiene .

The first report on the intestinal parasites in children in closed community was conducted in Benghazi city by Dar and Friend (1979). Dar *et al* . (1979) studied the incidence and prevalence of parasitic infection in primary school children in Benghazi. The study revealed that

overall prevalence was 27.6%, the higher infection among *Giardia Lamblia* and *Hymenolepis nana*, while the lower infection among *Entamoeba histolytica*, *Ascaris Lumbricoides* and *hookworms* . The prevalence of intestinal parasites in primary school children in Benghazi city, Libya, was studied by El-Boulaqi *et al.*(1980) . The results showed that 75.6%, 68.8% of children were infected with protozoa and helminthes respectively. The most common parasites were *A.lumbricoides*, *Entamoeba coli*, and *E.histolytica*. The sex of children had no effect on the prevalence, but age, culture and socio-economic status had some impact .

A study conducted by Annan *et al.* (1986) on the prevalence of intestinal parasites in pre-school children in Ghana, they found 11 parasites in them. There was no sexual differences in prevalence of these parasites which varied from village to village . Elgindy *et al.* (1986) examined the parasitic infection in school students in Suez Canal with the possible immunological changes. Revealed that in Port Said, the commonest parasite was *G. lamblia* 20.4%, followed by *A. lumbricoides* 18.4% and the less common was *Schistosoma haematobium* 3.1%. In Ismailia, the commonest parasite was *S . haematobium* 31.4% , followed by *Enterobius vermicularis* 18.2% and the less common was *Taenia saginata* 0.4% .In Suez , the commonest parasite was *E . vermicularis* 20.2% , followed by *E . histolytica* 19.3 % and the less common was *S .mansoni* 1.9 % .

Hammouda *et al.* (1986) investigated the impact of parasites on the nutritional status of infected school-children in both urban and rural areas of the western regions of Saudi Arabia . The study revealed that the effect of parasitic infection on the growth parameters of children was

light, but was evident on heamoglobin level , particulary in rural areas , and those infected with more than one parasites had anemia . Michael *et al.* (1986) studied the role of schools environment on the spread of parasitic infections among school children in a King Mariute, Alexandria, Egypt . They observed that the light, ventilation and types of floors of classes had a significant impact on the prevalence of most parasites. Also, pollution of drinking water, contamination of door lockers, and presence of cysts and /or ova of parasites in sweeping were associated with higher rates of parasitic infections .

Wilson *et al.* (1987) made detailed investigation on the prevalence of schistomes and intestinal worms in Morondava . Data was collected on nutrition , agriculture and the use of water . The result revealed that in two schools within the areas of a major irrigation scheme the prevalence of *Schistosoma* was 69% and 50% . Those children were suffer from at least with one other intestinal worm. In a school outside the main irrigation area, the prevalence was much lower 7% , but nutritional standards were also lower .

A study conducted by Ayhan *et al.* (1988) on the prevalence of intestinal parasites in the students of two primary schools in Ankara. In this study only two parasites were detected , namely *G.lamblia* (11.5%) and *E.vermicularis* (8%). Reinthaler *et al.* (1988) in El Salvador , studied the prevalence of intestinal parasites, in children with diarrhea and revealed that the prevalence rate was 49% , of which 53.4% showed a single infection, 31.7% double, 3% triple and 1% quadriple infection. Sterba *et al.* (1988) studied the gastrointestinal parasites among agricultural workers in the south Bohemian region in Czehoslovakia , they noted that seven species of parasites : *T.saginata* (0.3 %) ,

E.vermicularis (10.1%), *G.lamblia* in 1.0%, *Endolimax nana* (0.8%), *E.coli* (0.7%) , *Entamoeba hartmani* (0.2%) , and *Chilomastix mesnili* (0.5%) . The study showed that the greatest number of parasites was found in students of the secondary agricultural and technical school. The prevalence of parasitic infection among patients attending King Abdulaziz Univarsity hospital, Jaddah. was studied by Al-Fayez and Khogheer (1989) . They found that the prevalence rate was 31.3% and *E .histolytica* and *G. lamblia* were commonest protozoan parasites .

A study conducted by Develoux *et al.* (1989) on the prevalence of intestinal parasitic infection in children in Niamey (Niger). The most common parasitic infection were giardiasis 31.7% and amoebiasis 12.8%. The only commonly recovered helminth was *H. nana* 10.8% . Mercado *et al.* (1989) conducted a survey on entero- parasitic infection in children from five schools in Santiago, Chile, The most parasitic elements were found in the following percentages : *Blastocystis hominis* 51.8 % , *E . vermicularis* 39.9% , *G.lamblia* 32.1, *E.histolytica* 7.8 %, *H.nana* 2.1% and *A .lumbricoides* 0.4 % .

Robertson *et al.* (1989) made detailed studies on soil-transmitted helminth infections in school children from Cocle province. Republic of Panam. The overall prevalence of *A.lumbricoides*, *hookworm* and *Trichuris trichiura* infections were found to be 18.2, 12.0 and 27.5% respectively. There were significant differences between the infection values for children attending the different schools, but not with respect to age or sex . Shirokasuya *et al.* (1989) conducted a survy on the prevalence of parasitic infection in school children . in Thiland and found the most common parasities were hookworms, 26.3% followed by *E.nana* 11.4 % , *Strongyloides stercorialis* 11.2 % , *G.lamblia* 7.7 % ,

Opisthorchis viverrini 7.5 % *E.coli* 6.9 % . and *E. histolytica* 4.5 % . Biolley *et al.* (1990) studied the prevalence of intestinal parasites in school-children in Chile. they found that the prevalence rate was 85.4% . the commonest parasites were *G.lamblia* . 37.8 % . *T .trichura* 22.2 % , and *A.lumbricoides* 12.6%. Among commensal parasites *E.coli* 45% and *E.nana* 33.33% were the commonest. Bosman *et al.* (1991) conducted a study on the prevalence and intensity of intestinal parasites in children at Futa Dialon . republicat of Guinea . they found that the prevalence of intestinal protozoa was 58.5% in Daka. 63.3% in Timbia madina and 76.5% in sombili . while infection rates for helminthes were 10.4 % . 24.7% and 47.7 % respectively .

A study conducted by Coskun (1991) on prevalence of intestinal parasites in primary school students in Turkish. and detected six different parasites in them. because of bad social status and environmental condition. The most common pathogenic protozoa and helminthes were *A.lumbricoides* 12 % . followed by *G.lamblia* 9 % . *H.nana* 7.1 % . *E.histolytica* 6 % and *T.trichiura* 2.6% respectively. Gurses *et al.* (1991) study the intestinal parasites in primary school children of different socio-economic status and environmental condition in Turkish . The age rang was between seven and 13 years. 43 % of the patients were females and 57 % of the patients were males . The study revealed the overall prevalence of parasite incidence was 29.3 % . *G.lamblia* 15.7 % was the most common parasite detected. followed by *E. vermicularis* 10.5% and *A .lumbricoides* 2.3 % . Morsy *et al.* (1991) conducted a study on the endoparasites in two primary schools (6-12 years old) in Qualyob city in Egypt . and revealed that sichistosomiasis (8.8 %) . amoebiasis (7.81%) . giardiasis (9.05 %) . ascariasis (9.05 %) . and enterobiasis (0.9 %) . and endoparasites transmitted by autoinfection represented 9.84 % .

Omar *et al.* (1991) conducted a survey on intestinal parasitic infection in school-children of Abha (Asir) , Saudi Arabia , they found 11 common parasites in them. and 24.4% of them were infected with one or more species . They found the most common pathogenic protozoa was *G.lamblia* 10.9 % . followed by *E .histolytica* 4.1% . The non-pathogenic protozoan . *E. coli* had the highest prevalence rate 11.3 % . Koksal *et al.* (1992) investigated the intestinal parasites in primary school students in Trabzon . They found that overall prevalence rate was 65 %. The study revealed that *A. lumbricoides* 15.7 % , *T.trichiura* 22.85 % , *G. lamblia* 7.14 % . A study on intestinal parasitic infections in schoolchildren from rural and urban areas in Pemba Island . Zanzibar. Tanzania revealed that all individuals were infected with helminthes . and more than 97 % of them were infected with more than one species and there was no significant difference between results from the urban and the rural areas (Albonico *et al.*, 1993) .

Al-Sekait *et al.* (1993) studied the prevalence of pathogenic intestinal parasites in Saudi Arabia schoolchildren .The study revealed that the intestinal pathogenic parasites were found in 22.6 % of children . The major parasites detected were *G.lamblia* (13.5 %) , *S.mansoni* (3.8%), *E. histolytica* (2.5 %) , *H. nana* (2.5 %) , *A. lumbricoides* (2.0 %) and *E.vermicularis* (1.0 %) . Prevalence of intestinal parasites was significantly associated with child's age , sex , fathers educational level , non-public water supply and inadequate latrine type . The highest risk group was children 6-8 years old , whose father were illiterate and had no latrine .

Erko and Tedla (1993) studied the transmission of schistosomiasis and soil transmitted parasites in northwest Ethiopia . the study revealed

that the prevalence rates for *S. mansoni* and other intestinal helminthes were computed. They noted that the human behaviour and waste disposal were observed to be conducive for transmission of schistosomiasis and other parasites infection . Meloni *et al.* (1993) conducted a survey on the prevalence of *G.lamblia* and other intestinal parasites in children , dogs, and cats from Aboriginal communities in the west Kimberley region of Western Australia . They found *G.lamblia* was the most prevalent parasite in children 32.1 % and adults 12.5 % . The high prevalence rates of *G. lamblia* and other enteric parasites in this survey are indicative of poor living conditions and low levels of hygiene . Nimri (1993) . Examined the prevalence of *B. hominis* infections in preschool children in northern Jordan . The study revealed that *B. hominis* was found in 63 (25%) of 250 stool specimens of the cases examined . 38 (15 %) of these specimens contained this parasite alone . The a appearance of severe symptoms was associated with increased numbers of parasite in the diarrheic specimens .

Enekwechi and Azubike (1994) preformed detailed studies on the prevalence of intestinal parasites among the school children in Nigeria . The study revealed that *A. lumbricoides* was 20.8 % . followed by *T.trichiura* 15.3 % , *Necator americanus* 13.0 % , *T. saginata* 2.3 % , *S.stercoralis* 1.3 % and *S.mansoni* 0.3 % and intestinal protozoa parasites were *E.histolytica* 6.8 % and *G.lamblia* 0.1 % , the overall infection was 31.9 % for males and 27.5% for females and the infection rate was more prevalent in male and female children in the age (10-12 years) . Hassan (1994) made a study on the parasitic infection in primary and secondary schools in Giza Governorate , Egypt . And the study revealed that the parasites transmitted by autoinfection (entrobiasis 1.1% . *H.nana* 6.2%) .

followed by the skin penetration (*Ancylostoma doudenale* 5.7%) and contaminated food (amoebiasis 22.4 % , ascariasis 1.5 %) .

Kappus *et al.* (1994) study intestinal parasites in the United States. they found that the prevalence rate was 20 % and the most common protozoan parasites were *G.lamblia* 7.2 % , *E.coli* 4.2 % , *E.nana* 4.2 % , *B.hominis* 2.6 % and *E.histolytica* 0.9% and helminthes were *hookworms* 1.5 % , *T. trichiura* 1.2 % and *A.lumbricoides* 0.8 % . A study conducted by Nimri and Batchoun (1994) on prevalence of *Cryptosporidium sp.* in elementary school children in northern Jordan , revealed that a *Cryptosporidium sp.* was found in 40 specimens (4 %). however , only 15 specimens had *cryptosporidium sp.* alone. and these 15 specimens were from symptomatic children with diarrheic stool , Contact with animals was evident and where contaminated drinking water could have been a major source of infection .

Norhayati *et al.* (1994) studied the infection rate and relationship of enterobiasis with socio-economic status in children aged 1-8 years in a rural area in Malaysia. The study revealed that the relation to age and sex groups and the rate of infection was significantly higher in older children (5-7 years) .They showed 40.4% were infected with *E.vermicularis*. In an epidemiological study on intestinal parasites in Northern Morocco , 4643 stool samples were examined , out of which 2637 were positive for intestinal parasites and the total number of detected parasites was 4816 (Jimenez-Albarran and Odda , 1994) .

The prevalence of intestinal parasites among children living in Gombak , Malaysia was determined by Rajeswari *et al.* (1994) . They found that overall prevalence rate was 62.9 % and the prevalence was

association with socio- economic status . water supply . and family size . Al-Eissa *et al.* (1995) examined the prevalence of intestinal parasites among children in Saudi Arabia . In this study the most affected age group was 5-9 years and they found the commonest protozoan parasites was *G. lamblia* 9 % and *E. histolytica* 5 % while the helminthes , was *H. nana* 2 % followed by *E . vermicularis* 2 % .

Nikolic *et al.* (1995) conducted a survey on intestinal parasite infection in schoolchildren in Sebria .They found that 31% of the children infected with *G.lamblia* . *E. vermicularis* . *A. lumbricoides* and *T.trichiura* .they noted that the results showed that the chemotherapy to be an important in the control of intestinal parasitic infections . Palmer and Bundy (1995) studied the epidemiology of human *hookworms* and *A.lumbricoides* infestations in rural Gambia . they found *hookworms* probably *N. americanus* and *A. lumbricoides* were the most prevalent helminthes at prevalence levels of 30 % and 25 % respectively . Other parasites present were *T.trichiura* 2.4 % and *S.mansoni* 1.5 % . Saygi *et al.* (1995) studied the prevalence of intestinal parasites in students of adult educational center in sivas . Turkey . They found that 57 had more than one parasite . 87 had only protozoa . The infection rate of parasites was as following : *G.lamblia* 8.2 % . *E.histolytica* 1.2 % . *E.coli* 17.9 % . *A. lumbricoides* 2.3 % . *T. trichiura* 0.8 % . *E. vermicularis* 12.6 % . *T.saginata* 16.7 % . *H. nana* 1.0 % .

Borda *et al.* (1996) studied the prevalence of intestinal parasites among children in San Cayetano . Argentine . The study showed that high prevalence of intestinal parasites in these areas as a result of poor environmental . lack of public water supply . They found that the infection with *G.lamblia* was 27 % followed by *hookworms* 29 %. *E.coli*

27 % , *E. vermicularis* 4 % , *S. stercoralis* 2 % and *A. lumbricoides* , *T.trichiura* , *T.saginata* , *Isospora beli*, *Iodamoeba butschlii* , and *Balantidium coli* (each 0.5%). Mahdi *etal.*(1996) . Studied the occurrence of *Cryptosporidiosis* among Iraqi schoolchildren . They found that the frequency distribution of *Cryptosporidium* among 114 positive cases with intestinal parasites was 18.3 % . the boy to girls ratio was 1 : 2 among the *Cryptosporidium*-positive children . The associated symptoms were fever and vomiting .

Kabatereine *et al* . (1997) studied a cross-sectional survey on intestinal parasitic infections in primary school-children in Kampala Uganda . They found *T. trichura* (28 %) , *hookworms* (12.9 %) and *A. lumbricoides* (17%) were the commonest parasites . however *S. mansoni* , *S. stercoralis*, *E. vermicularis* , *E. coli* and *E. histolytica* were less common . They found that refuse dumps were the main source of infections . Mahfouz *etal.* (1997) . Made a study on the prevalence of intestinal parasitic infections among preschool children in an urban squatter settlement in Alexandria . Egypt . The study revealed that the stool samples were collected from 658 preschool children below 5 years of age and examined for intestinal parasites . Overall prevalence rate of infections with the intestinal helminthes and protozoa were 47.3 % and 31.5 % respectively . which were very high compared to previously reported figures for this age group in Egypt .

Curtale *et al.* (1998) made a study on anemia and intestinal parasitic infections among school children in Behera Governorate. Egypt. The study revealed that the prevalence of anemia in the area was high (90%) . The most common intestinal parasitic infection were *G.lamblia* 24.7 % , *E.histolytica* 17.5 % and *S.mansoni* 20.7 % . In this study found

that , *G.lamblia* was statistically significantly correlated with low haemoglobin levels ($P<0.05$) .

El-Buni and Khan (1998) reported an overall prevalence rate of 12.88 % : 6.24 % *G. lamblia* , 3.94 % *E .histolytica* , 2.62 % *E. coli* and 0.07 % *T. hominis* of protozoan intestinal parasites among the children attending the children's hospital in Benghazi .In another study done by Magambo *et al.* (1998) in southern Sudan , stool samples of 275 children (age 6-15 years) were examined for parasitic infection . The rate of infection was about (13.1%) with the *hookworms* followed by *S . stercoralis* (3.3%) , *T. trichiura* (1.8 %) . however *A.lumbricoides* and *cestodes* were not detected in population , the most common intestinal protozoan were *E. coli* (37.8 %) , *E. histolytica* (28.4 %) , and *G. lamblia* (9.8 %) respectively . The results showed that the infection rate was slightly higher in males than females .

In cross-sectional study of intestinal parasites Boia *et al.* (1999) in Novo Airao, state of Amazonas , Brazil. they found 87.6% had one or more parasites and *A.lumbricoides* 35.1% , *E.histolytica* 29.1% , *G.lamblia* 17.4 % . Bugharara *et al.* (1999) made a study in Benghazi , Libya , stool samples of 188 children (age 1-4 years) suffering from diarrhea were examined for parasitic infection . The infection rate of *E.histolytica* (18.6 %) was the highest . followed by *G. lamblia* 5.85 % , *Cryptosporidium sp.* 3.19% and *E.coli* 2.12 %, respectively . Glickman *et al.*(1999) studied the children intestinal parasites in Guinea , the results revealed that the prevalence was 53.5 % . the most common parasites were *hookworms* 35.7 % . followed by *A.lumbricoides* 19.8 % , *T. trichura* 12.2 % and *S. stercoralis* 10.1% . A study conducted by Paul *et al.* (1999) on the prevalence and intensity of intestinal helminth

infection among primary school children in Visakhapatnam . The overall prevalence of infection was 82% . The most common parasite was *A.lumbricoides* with prevalence of 75% followed by *T.trichiura* 66% and *hookworms* 9 % .

Plonka and Dzbenski (1999) studied the epidemiological situation of infection with intestinal parasites among seven-year old children attending first classes of elementary schools in Poland; the study revealed an overall prevalence was *E. vermicularis* (16.45 %) , *A. lumbricoides* (2.8%). *G. lamblia* (1.02 %) , *E.coli* (0.73 %) , and *T. trichiura* (0.29 %) . The result showed that the decreasing frequency of infection with intestinal parasites and a little influence on the epidemiological situation of intestinal parasites in the affected regions . Reyes *et al.* (1999) A study conducted in Bogota . Colombia . among 198 rural school- children ages 5 to 15 years demonstrated that the prevalence of *A. Lumbricoides* was 36.4 % , *T.trichiura* 34.8% , *hookworms* 18.2 % , and *S.stercoralis* 4.5% . In addition 51 % of the children were at risk of malnutrition . 83 % had low hematocrit levels , and 55% had low hemoglobin levels . Most of these children had a deficit in learning capacity .

Yassin *et al.* (1999) made a study on the prevalence of intestinal parasites among schoolchildren in Gaza city , Palestine , they found that the overall prevalence was 27.6 % and *G. lamblia* 62.2 % was the most frequent .Chakma *et al.* (2000) studied the prevalence of anemia and worm infection among school children (6-14 years) in tribal areas of Madhya Pradesh. The results revealed that 30.3% of children had severe anemia and 50 % of children had intestinal parasites the most common parasites were *hookworms* (16.3%) and *A.lumbricoides*(18.5%) . Habbari *et al.* (2000) conducted a study in Beni-Mellal , Morocco , on the possible

health risk associated with environmental pollution on the transmission of parasitic infection . The result revealed that the waste water use in the area leading to high risks of parasitic infections .

Lee *et al.* (2000 a) conducted a survey on intestinal parasites among children and adolescent living in Legaspi city . the Philippines , the infection rates of primary school children . preschool children and adolescents were 95.5 % . 64.7 % . and 87.5 % . respectively . The infection rates were 51% with *T.trichiura*. 40 % with *A.lumbricoides* , 23.4 % with hookworms , 15.6 % with *I.buschlii* . 14.1% with *E.nana* . 9.4% with *E.coli* and 7.8 % with *G.lamblia*. There were 33 cases with multiple infection (51.6 %) . Lee *et al.* (2000 b) investigated on the intestinal parasites infection in school children in Kaohsiung County . They found four species of helminthes (*A.lumbricoides* followed by *hookworms* . *T.trichiura* and *H. nana*) and three species of protozoa (*G.lamblia* . *E.coli* and *B.hominis*) were detected . Males and females had the infection rates of 24% and 11% respectively . The infection rate of a boriginal and non-boriginal children were 17 % and 14 % . respectively . In this study noted that the infection rate of intestinal parasites among rural primary school children in this region remains high .

Rajaá *et al.* (2000) conducted detailed studied on the prevalence and focal distribution of *schistosomes* infection and their relation to the environmental factors in school children in Yemmen . This study revealed that a *schistosomes* infection rate of 37 % . The S.*mansoni* prevalence was35 % . S.*hematobia* was 5 % and mixed infections were 3% . The infection rates with other parasites were as follows : Giardiosis 18%. Amoebiosis 14 % . ova of *H. nana* was seen in 13 % . Taeniosis affected 13 % and *E.vermicularis* 1% . No significant association was

found with the age of the child , parent's education , availability of latrine or household stand pipe water .The prevalence of intestinal parasites and their relation to anemia and nutritional status of school children in Gaza , Palestine was studies by Shubair *et al.* (2000) . The study revealed that the overall prevalence was (24.6 %) , *G. lamblia* (62.2 %) was the commonest parasite followed by *A .lumbricoides* (20 %) and *E. histolytica* (18 %) . No correlation was observed between sex and prevalence of anemia . A study conducted by Yamamoto *et al.* (2000) on effect of intestinal helminthiasis on nutritional status of school children in Sinilona, Philippines . They found that the prevalence of *Ascaris* and *Trichuris* was 40.3 % and 71.4 % respectively , and 36.4 % of infected children had both *Ascaris* and *Trichuris* infections .

Saifi and Wajihullah (2001) conducted a survey on the intestinal parasitic infection in school children aged 5-13 years in Ujhani town of District Budaun (uttar Pradesh) . The study revealed that 38.41% of schoolchildren were harboring one or more intestinal parasites . Among protozoan *E .histolytica* exhibited the highest rate of infection 14.98 % , while *G.lamblia* had the prevalence rate of 7.08 % . Among helminthes, *A.lumbricoides* had prevalence rate of 10.62 % , whereas *H. nana* exhibited only 2.72 % . However mixed protozoan and double infections with helminth parasite had prevalence rate as low as 1.36 % and 1.63 % , respectively . In this study found that the high prevalence of intestinal parasitic infection in schoolchildren reflects the low socio-economic status and poor hygienic and sanitation conditions .

A study conducted by Lee *et al.* (2001) on a survey of the infection rate of *E. vermicularis* among students in four primary schools in Gangwn-do, Korea . The study revealed that the 8.5 % were infected

with *E.vermicularis* demonstrated by the adhesive cello tape anal swab method . The infection rate ranged from 8.3 % to 11.8 % among the four schools . The infection rate of males and females was 10.7 % and 7.7 % respectively. They found that confirmed cases were treated with albendazol three times at an interval of 15 days .

Merid *et al.* (2001) studies intestinal helminthic infection among children at Lake Awassa Area , South Ethiopia . The study revealed that the overall prevalence for at least one helminthic infection was 92.7 % . The most prevalent parasites were *A.lumbricoides* (76 %), *Hookworms* species (62.5 %) *T. trichiura* (60 %) and *S. mansoni* (33 %) . Three cases of Heterophid infections transmitted by eating raw fish were also recorded. The study by Prado *et al.* (2001) on the prevalence and intensity of infection by intestinal parasites in schoolchildren aged 7 to 14 years living in the city of Salvador . The study revealed that the prevalence of infection by at least one species of protozoa or helminthes was 66.1% . Prevalence of infection by helminthes increased with age . For all helminthes species male children presented the highest prevalence .

Thiong'o *et al.*(2001) examined the intestinal helminthes and *schistosomiasis* among school-children in Kenya . They found that the overall prevalence of *S. mansoni* was 31.6 % , *hookworms* 36.8 % , *T.trichiura* 21.8 % and *A. lumbricoides* 16.5 % . the infection with *S. mansoni* in (34.9 %) girls is higher than boys (28.6 %) , whereas infection with *hookworms* is higher in boys (39.0 %) than girls (34.5 %) .

Adekunle and Lola (2002) made a study on intestinal parasites and nutritional status of Nigerian children . Results revealed that the 55.8% of the children had no intestinal parasites while 44.2 % of the children were

found to have one form of the intestinal parasites . For the helminthes , 39% were *Ascaris* . 28.4 % *Trichuria* and 26.5 % for *hookworms* while the protozoa , 35.3 % were *E. coli* , 32.5 % *Entamoeba histolytica* and 19.7 % *Trichomonas homins* . A study done by Agha Rodina and Teodorescu (2002) on prevalence of intestinal parasites in schoolchildren in three localities (Rimal , Jabalia village , Jabalia Refugee camp) , in Gaza Governorates Palestine . The prevalence rate was higher in the rural area (53.3 %) followed by the Refugee camp (48.8 %) and urban area (33.0 %) . Many cases of poly parasitism were detected , especially in the rural area. The main intestinal parasites were *E. histolytica* , *G.lamblia* and *A.lumbricoides* , with a high prevalence level . Prevalence levels of *T. trichiura* and *H. nana* were low in all investigated localities .

Erosie *et al.* (2002) studied the prevalence of *hookworms* infection and hemoglobin status among rural elementary schoolchildren in southern Ethiopia . The overall prevalence rate was found to be 69 % . Of the 292 positive children . 1.4 % had quadrate infection , 9.3 % triple infection . 30.0 % double infection , and 59.3 % single infection . Eight species of parasites were recorded , the most dominant was *A.lumbricoides* (40 %) followed by *hookworms* species (26.8 %) and *T.trichuria* (14.7 %) . The overall prevalence of anemic condition (below normal level of hemoglobin) was found to be 20.6 % (87/422) . Low level of hemoglobin was not significant associated with *hookworms* infection .

Lee *et al.* (2002) conducted a survey on the intestinal parasitic infection among primary schoolchildren in Kampongcham , Cambodia . The overall infection rate of intestinal parasite was 54.2 % (males , 57.3%, females . 50.8 % .The infection rate of intestinal helminthes by

the species were as follows : *A.lumbricoides* 26.3 % , *Echinostoma sp.* 15.6 %, *hookworms* 6.4 %, *Opisthorchis sp.* 4.0 % , *Rhabditis sp.* 2.4 % , and *T.trichiura* 0.4%. The infection rates of intestinal protozoa were as follows : *E. coli* 7.6 % , *G. lamblia* 3.2 % , *I. butschlii* 3.2 % , and *E.histolytica* 0.8 % . More than two different kinds of parasites were found in 16.7 % of the stool samples . The results showed that intestinal parasites are highly endemic in this area .

Lindo *et al.* (2002) examined the prevalence of intestinal parasites among young children in Guyana and found the most common intestinal helminth parasite was *hookworms* (28.2 %) , followed by *A.lumbricoides* (18.8 %) and *T.trichiura* (14.1 %) . Among the protozoan infections *G.lamblia* was detected in 10.5 % of the study population while *E.histolytica* appeared rarely . Mahdi and Ali (2002) studied the intestinal parasites in Iraqi patients with sickle-cell anemia patients . They revealed that out of 40 sickle-cell anemia , 25 (62.5 %) had parasitic infections . In health comparison group , 26 of 175 individuals (14.8 %) had intestinal parasitic infections . The most common intestinal isolated parasites in the sickle-cell patients were *B. hominis* (36 %) , *G.lamblia* (28 %) and *C.parvum* (5%) . Muniz-Junqueira and Queiroz (2002) reported that food intake was the main cause of protein-energy malnutrition among children infected with *G.lamblia* .

Rao *et al.* (2002) conducted a study to assess the status of intestinal parasites and anemia was carried out among the pre-school children of Gonad tribal community in Madhya Pradesh . The results revealed that 48 % of pre-school children had intestinal parasitic infection. Common parasites observed among them were *H. nana* , *hookworms* and *roundworms* . High prevalence of anemia (86.7 %) was

observed among them . They found that the high prevalence of intestinal parasitic infections and anemia could be due to indiscriminate defecation , low socio-economic status , ignorance and low standard of personal hygiene . Shrestha (2002) made a study on intestinal parasitic infestation in healthy urban and rural school children of Lalitpur district in the age group between 7-12 years old . A total of 81.94 % of the children were found infected with parasites . Both rural and urban children exhibited similar pattern of infection . A very great prevalence of helminthes especially *A.lumbricoides* and *T.trichuria* compared to protozoan was observed . Among rural and urban children , total *A.lumbricoides* infection was 73.45 % and 71.66 % and *T. trichuria* infection was 27.27 % and 37.91% respectively. 78.36 % and 84.07 % of the male . and 92.45 % and 73.72 % of the female children from the urban and rural respectively were found infected with the protozoan and helminthes .

Waikagul *et al.* (2002) made a cross-sectional study of the prevalence of intestinal parasitic infections among schoolchildren in Nan Province , Northern Thailand . Results revealed that the rate of helminthic infection was 60.0 % , while protozoa accounted for 36.2 % of infections. mixed infections were common , resulting in a total prevalence of both parasites of 68.1 %. Helminthic parasites . were *A.lumbricoides* (21.7%), *hookworms* (18.5 %) . *T. trichiura* (16.3 %) , *O. viverrini* (1.7 %) , *S. stercoralis* (0.9 %) and *E. vermicularis* (0.9 %) . The protozoan infections were *E. coli* (25.8 %) . *G. lamblia* (5.3 %) . *E. nana* (2.5 %) , *E.histolytica* (1.4%). *B.hominis* (0.8%). *C.mesnili* (0.3%) and *I.butschlii* (0.1) . this study emphasizes the need for improved environmental hygiene i.e. clean water supplies and enhanced sanitation . in affected communities .

A study done by Escobedo *et al.* (2003) on prevalence of intestinal parasites in schoolchildren in five communities in the Border region of far West Texas . The study revealed that the parasitic disease test positive in first-grade children , San Elizario independent school was *E. nana* 1 (5.8 %) followed by *B.hominis* 9 (52.9 %) , *E.hartmanni* 1 (5.8%) , and *E. coli* 1 (5.8%) . In Canutillo independent school district the common parasite was *B. hominis* 29 (13.9 %) followed by *G. lamblia* 10 (4.8 %) , *E. nana* 4 (1.9 %) , *E. coli* 10 (4.8 %) and *H. nana* 2 (1.0 %) . In Sierra Blanca the common parasites were *E.coli* 1 (50.0 %) and *H.nana* 1 (50.0%). In Fort Hancak the prevalence of parasites was *B.hominis* 9 (13.4 %) followed by *G.lamblia* 5 (7.5 %) , *E.nana* 6 (9.0%), *E.coli* 3 (4.5 %) , *I.butschilii* 1 (1.5 %) and *C. mesnili* 1 (1.5 %) .

Ferreire *et al.* (2003) studied the occurrence of intestinal parasites and commensal organisms among children attending a school in Minas Gerais . Brazil . They found that 72 schoolchildren revealed 59.7 % positive with 4 types of protozoa and 5 types of helminthes . It can be concluded that it is necessary to monitor the health conditions of this population . A study conducted by Handzel *et al.* (2003) on the prevalence and distribution of *Schistosoma* and geohelminth infections in Western Kenya : implication for anthelminthic treatment . The study revealed that the examined for egg of *S. mansoni* , *S.haematobium* , and intestinal helminthes . House , school . and water sources were mapped using a geographic information system . The mean school prevalence of *S. mansoni* infection was 16.3 % .

Moyou-Somo *et al.* (2003) studied the epidemiology of pleuropulmonary paragonimiasis among pupils in the peri-urban zone of Kumba town , Cameroon. The study revealed that eggs of *paragonimus*

africanus were found in stools and /or sputum of pupils with symptoms of paragonimiasis was 12.3 % (38 of 309) . In this study showed that the stool examinations include some intestinal parasites as *A.lumbricoides* 29.45 % , *T. trichiura* (6.47 %) , *N. americanus* (2.27 %) , *S .stercoralis* (1.62 %) , *E. vermicularis* (0.65 %) , and *E. histolytica* (4.53 %) . Saksirisampant *et al.* (2003) studied the prevalence of intestinal parasitic infections among children in an Orphanage in Pathum Thani province . The most parasites identified were protozoa. *B.hominis* was found at the highest prevalence (45.2 %) . The infection caused by *G.lamblia* was (37.7 %) and *E. histolytica* was (3.7 %) . Other non-pathogenic protozoa found were *T. hominis* (39.6 %) , *E .coli* (18.8 %) , and *E. nana* (3.7 %) . The only case of helminth parasite detected was *S. stercoralis* (0.9 %) . They found that no history of diarrhea symptoms was recorded among these orphans .The health education as well as routine surveillance is necessary in order to control the infections .

Ulukanligil and Seyrek (2003) conducted a survey on a demographic and sanitary condition of school in Sanliurfa , Turkey. This study revealed that the prevalence of helminthic infections was 77.1 % of the schoolchildren in Shanty town , 53.2 % in apartment district and 53.1 % of rural area. *A. lumbricoides* was the most prevalent species and followed by *T.trichiura* , *H.nana* and *Taenia* species in three schools. Sanitation survey indicated that the tap water was limited Shanty town school , toilet's sanitation was poor, available no soaps on lavatories and garbage piles were accumulated around the schools in Shanty town and rural area , While the school in apartment area was well sanitized . These results indicated that burden of parasitic infection and poor sanitation condition constituted public health importance among to the Shanty town schoolchildren . Adebolu and Badmus (2004) made a comparative study

on intestinal parasites amongst secondary school pupils in Ikare Akoko , south-western Nigeria . The study revealed that out of the 200 pupils examined 95 (47.5%) were positive with the presence of one type of intestinal parasite . The following parasites were identified : *hookworms* (40 %) , *A.lumbricoides* (45.5 %) , *T.trichiura* (5.5 %) and *T. saginata* (12.5 %) . Infection was found to be higher in pupils attending public secondary school than those attending private secondary schools .

Agbaya *et al.* (2004) studies intestinal helminithiasis among school children in Agboville in Southern Coted'Ivoire . The results showed that 135 students out of the 360 admitted for the first exam were infected . The prevalent parasite species were *N.americanus* (15 %), *T.trichiura* (13.6 %). *S.mansoni* (10 %) .28 % of 135 infected students were infected by more than one parasite . The prevalent parasites in re-infected patients were *T.trichiura* (16.3%). *S.mansoni* (12.5 %) the most frequent parasites species where those transmitted cutaneously . Bitkowska *et al.* (2004) studied the occurrence of intestinal parasites among children attending first classes of the elementary schools in Poland .They found that the parasites most frequently encountered in the examinations included: *E.vermicularis* (15 %) , *A.lumbricoides* (0.83 %) , *G. Lamblia* (0.69 %) , *E. coli* (0.60 %) and *T.trichiura* (0.12 %) the overall percentage of the infected children amounted to 15.4 % . The highest number of infected children was found in the province Warminsko-Mazurskie (29.6 %) , the smallest in Slaskie (8.8 %) . The number of infected among children habiting country (19 %) was significantly higher than among those from the towns (10.4 %) .

Dada and Erinle (2004) studied the prevalence of human gastro-intestinal parasites among 350 primary schoolchildren in Ondo state ,

Nigeria .The results suggest a very high prevalence of intestinal parasitosis (40.9 %) among the pupils . Four different intestinal parasites were encountered . The respective infection rates of each parasite were ; *A.lumbricoides* (14.9 %) . *E.histolytica* (13.7 %) . *T.trichiura* (6.9 %) . and *hookworms* (5.4 %) . Infection in males (40.6 %) was comparable to that in females (41.3 %) . Cases of multiple infections showed that *A.lumbricoides* occurred frequently in double infections with *hookworms* or *T.trichiura* . In triple infections , only the triad of *A.lumbricoides* , *hookworms* and *T. trichiura* was found .

El-Ammari *et al* (2004 a,b) studied the intestinal parasites among Libyan , non-Libya Arab and non-Arab residents of Benghazi , revealed that 14.1 % Libyans . 18.5 % non-Libyan Arabs and 16.7 % non-Arabs were infected with one or more of nine species of protozoan and seven species of helminth parasites . The protozoan parasites were the pathogenic *E.histolytica* and *G.lamblia* and the non-pathogenic *E.dispar*, *E.coli*, *E.nana* , *C. mesnili* , *B. hominis* , *I. butschlii* and *E. hartmanni* . The helminth parasites , *A. lumbricoides* , *E.vermicularis*, *A. duodenale* , *T. trichura* , *H. nana* , *T. saginata* and *S .mansoni* .A study conducted by Fried *et al.* (2004) on food-borne intestinal trematodes in humans . The study revealed that food-borne trematodes are still endemic in some parts of the world and are most prevalent in remote rural among school-age children , low-wage earners , and women of child-bearing age . Intestinal fluke diseases are aggravated by socio-economic factors such as poverty , malnutrition and declining economic condition .

Kebede *et al.* (2004) studied the use of real-time PCR to identify *E. histolytica* and *E. dispar* infections in prisoners and primary schoolchildren in Ethiopia . The study revealed that each of these samples

was checked for *Enatamoeba* infection by the microscopical examination of formal-ether concentrates . DNA was then extracted from 213 samples (27.6 %) found *Entamoeba*-positive . and run in areal-time PCR with primers, based on the ssu-rRNA gene sequences of *E.histolytica* and *E. dispar* , that allow DNA from the two species to be distinguished . Although *E. dispar* DNA was identified in 195 (91.5 %) of the 213 samples checked by PCR . no *E. histolytica* DNA was detected . A study conducted by Legesse and Erko (2004) on prevalence of intestinal parasites among schoolchildren in a rural area close to the southeast of Lake Langano , Ethiopia . The results showed that 217 (83.8%) had one or more parasites, prevalence of *hookworms* was the highest (60.2 %) , followed by *S.mansoni* (21.2 %) , *T.trichiura* (14.7 %) *Taenia Spp.* (13.9 %) , *E. histolytica/E. dispar* (12.7 %) . *A.Lumbricoides* (6.2 %) . and *G.lamblia* (6.2 %) and *S. stercoralis* (5.8%) , in that order . An association was not found between *hookworms* infection and low haematocrit value of the study subject .

Nematian *et al.* (2004) examined the prevalence of intestinal parasitic infections in primary schoolchildren living in Tehran and their association with socio-economic factors and hygienic habits . The study revealed that the data on health and socio-economic status and health-related behaviours . collected via questionnaires . The prevalence rate of intestinal parasitic infection was 18.4 % , coinfection with two or three parasites was seen in 2 % with increase in educational level of parents (especially mothers) . Girls showed a significantly higher positive rate than boys . According to the results , low level of education and consequently poor socio-economic and hygienic condition of families appear to powerful determinants of infection .

Quadros *et al.* (2004) conducted a survey on the intestinal parasites in nursery schools in lages , Southern Brazil , the overall prevalence of helminthes and protozoa was 70.5 % , affecting 61.4 % of male and 74.5 % of female children . The most prevalent parasites were *A.lumbricoides* (35 %) , *G.lamblia* (14 %) , *T.trichiura* (13 %) . Rai *et al.* (2004) studied the effect of enteric parasitosis on nutritional status of schoolchildren in remote hilly areas in Nepal . The study revealed that *A.lumbricoides* was the most common parasite detected (72.6 %) followed by *hookworms* (16.2 %) and others . Protozoan infections were very low (<6.0 %) . Of the total positive children , 15.4 % had multiple infections .

Zakai (2004) studied the prevalence of intestinal parasitic infections among primary schoolchildren in Jeddah , Saudi Arabia . The study revealed that the 22 (9.5%) of 231 stool samples were positive . They found that *G. lamblia* was the most prevalent 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 . Champetier de Ribes *et al.* (2005) made investigation on intestinal helminthiasis in schoolchildren in Haiti in 2002 . The study revealed that *A. lumbricoides* (27.3 %) , *T.trichiura* (7.3 %) , *N.americanus* (3.8 %) , *H.nana* (2 %) , *Taenia sp.* (0.3 %) , and *S. stercoralis* (0.2 %) . The helminth prevalence was higher in rural (38.4 %) compared to urban areas (30%) . There was no significant difference in prevalence by sex and age . The importance of geohelminths changed from one department to another with the highest prevalence found in the Southern department of Grande Anse (73.7 %) and the lowest prevalence in the Center department (20.6 %) . Five out of the country's nine departments had a similar prevalence varying from 25.5 % to 28.2 % . intestinal helminthic polyparasitism was observed in a

percentage of infested schoolchildren comprise between 3.4 % and 28.6% according in relation to the geographical area . Dancesco *etal.* (2005) studied the intestinal parasitosis in a village of Cote d'Ivoire . The study revealed that the 416 persons were examined : 371 children of which 343 were school and preschool children . aged 4 to 15 years . 28 young children aged 6 months to 3 years . and a group of 45 adults . The prevalence of intestinal parasites was 84.8 % in children (with 76.7 % polyparasites) and 29.0 % in adults. Parasitic infectious transmitted from person to person was frequent among children : 37.3% pinworms in schoolchildren , 30.3 % amoeba cysts and 30.3% flagellate . Infections transmitted by soil were predominant . with 62.1% round worms (78.6 % in schoolchildren aged 7 to 10 years) . El-Astal (2005) . Conducted a survey on the prevalence of intestinal parasites among children in Khan Younis Governorate . Gaza strip . Palestinian authority .They found that the prevalence rate was 32.4 % . *A.lumbricoides* was found to be the most common parasite (12.8 %) . followed by *G.lamblia* (8.0 %) . *E.histolytica* (7.0 %) . *E.coli* (3.6 %) . T.trichiura (1.6 %) . and *H.nana* (1.0 %) . *E.vermicularis* was detected with the scotch tape preparation . Of the examined children . 20.9 % were positive for *E. vermicularis* .

Graczyk *et al.* (2005) made study on the association of *B. hominis* and *E. nana* with diarrhea stool in Zambia school-age children . The overall prevalence of *E. nana* . *S. haematobium* . *B.hominis* . *G.lamblia* . *C. parvum* , *Encephalitozoon intestinal*, and *S. stercoralis* was 64.3 % . 59.1 % . 53.8 % . 19.4 % . 8.6 % . 8.6 % . and 1.1 % . respectively . Only the associations between infection with *B. hominis* and *E. nana* with diarrhea were statistically significant . Although *B.hominis* and *E.nana* are considered to be non pathogenic organisms . this survey supports the recent evidence that *B. hominis* and *E. nana* infections are associated with

deficient sanitation and low hygiene standards and can contribute to diarrhea in children in developing countries. Mote *et al.* (2005) studied the prevalence of parasites among 94 schoolchildren of five primary schools in Moyo district , Uganda . They revealed that 40 pupils , 22 boys and 18 girls were found infested with one or a combination of intestinal parasites. *Hookworms* affected 12.8 % of the children examined followed by *Schistosomiasis* (9.6 %) and *Ascaris spp.* (4.3 %) . The factors that favoured parasitic infestation could include climate . poor sanitation , poverty and lack of awareness about the outcomes of parasitic infestation.

A study conducted by Nascimento and Moitinho Mda (2005) on prevalence of *B.hominis* and other intestinal parasites in an community of Pitanga city , Parana state , Brazil . The study revealed that 128 (70.7%) showed protozoa and /or helminthes in stool samples . The most prevalent species were *E. nana* (33.7 %) , *B. hominis* (26.5 %) , *G.lamblia* (18.2%), *E.coli* (17.1 %) . *A.lumbricoides* (16.0 %) . *I.butshlii* (9.4 %) . and *Ancylostomatidae* (7.7 %) . The high frequency of *B. hominis* demonstrated by this study indicated the need to include laboratory techniques that enable identification of the parasite on a routine basis .

Suwansaksri *et al.* (2005) study the prevalence of intestinal parasites among the local people in lum pra due village . Thailand . The study revealed that the stool examination from 153 villagers (63 males and 90 females) was performed . The infection rate was 68 % . The rate of infection in male (72 %) was higher than in female (62 %) . Most of the infected cases (88 %) were in the age group 41-60 years .

Ijagbon and Olagunju (2006) conducted a survey on intestinal helminth parasites among school pupils was undertaken in five primary

schools in Iragbiji , osum state , Nigeria . The results showed that 402 (72.0 %) of the samples were positive for various intestinal helminthes with *A.lumbricoides* (46.0 %) , *Ancylostoma spp* (20.5 %) , *S. stercoralis* (0.6 %) , *Fasciola hepatica* (0.6 %) , *T. trichiura.* (0.2 %) and mixed infection of *Ascaris* and *hookworms* 1.9 % . Sex and age factors did not affect the pattern of infection since the parasites were found in both sexes and all age groups but with varying degrees . The study shows that school pupils carry heavy intestinal parasites burden , which is an index of the prevailing unhygienic environment .

Patel and KhandeKar (2006) made study on prevalence of intestinal parasitic infections among primary schoolchildren in Dhahira region of Oman . The overall prevalence rate was 38.7 % . They found that the prevalence of protozoan infections was 36 % while helminthes infection was 9.4 %. in this study the prevalence of *E.histolytica/E.dispar* was 24 % , *Giardia sp.* 10.5 % and *E. coli* 1.4 % . the *hookworms* (*A. duodenale* , *N. americanus*) , *A. lumbricoides* , *T. trichiura* , *H. nana*, *Taenia sp.* , *E. vermicularis* and *strongyloides* infection .

Sadaga (2006) studied the prevalence of intestinal parasitic infections among primary schoolchildren in 13 schools found in Derna district , Libya . The results showed that 31 % of the children examined were infected with one or a combination of up to two parasites . The detected parasites were *G.lamblia* , *B. hominis* , *E. histolytica / E. dispar* , *E. coli* , *E. hartmanni* , *E. vermicularis* , *A. lumbricoides* and *H. nana* with infection rates 12.7 % , 6.7 % , 6.6 % , 3.2 % , 1.0 % , 0.6 % , 0.1 % and 0.1 % respectively . The result revealed that a significant differences was seen between the rate of infection and each of parent's education , socio-economic status of children parents , family size of children and

number of rooms in the children houses . However , there was a significant differences between infection and source of drinking water .

Materials and Methods

3. MATERIALS AND METHODS

1. Area of study :

Sirt city is located on the South Mediterranean coast . It's a far of 480 Km^2 east of the Libya's capital "Tripoli" (Figure 1) . It is occupying an area of approximately 69 Km^2 with an average of population 140,000 (National information Board, Sirt. 2004). Sirt has Mediterranean climate with moderate winter and hot summers, the relative humidity ranges from 67 to 71%. The average monthly temperature during the winter ranging from 10 to17C°, and may reach 25 to 40C° in the summer . The average annual rainfall exceeds 253 mm (Source: Sirt Meteorological office, Personal communication. 2004) .

2. Collection of stool samples :

Eight schools (57.14% of the total number of city primary schools) and 1548 primary school-children (72.5% of the total number of city primary school-children) form the basis of this study. The sampling method was designed to provide a representative sample of primary school-children for each one of the district authorities and hence for the city of Sirt as a whole (Table1) .

2.1 School visits and distributed package:

This cross-sectional study was carried out between November 2003 to April 2004. Each child was given a sealed plastic bag containing a covering letter, a questionnaire and a 20-ml disposable screw-capped universal container. A self-adhesive label with child's number, school and grade was affixed directly on to the plastic bag . Children were asked by

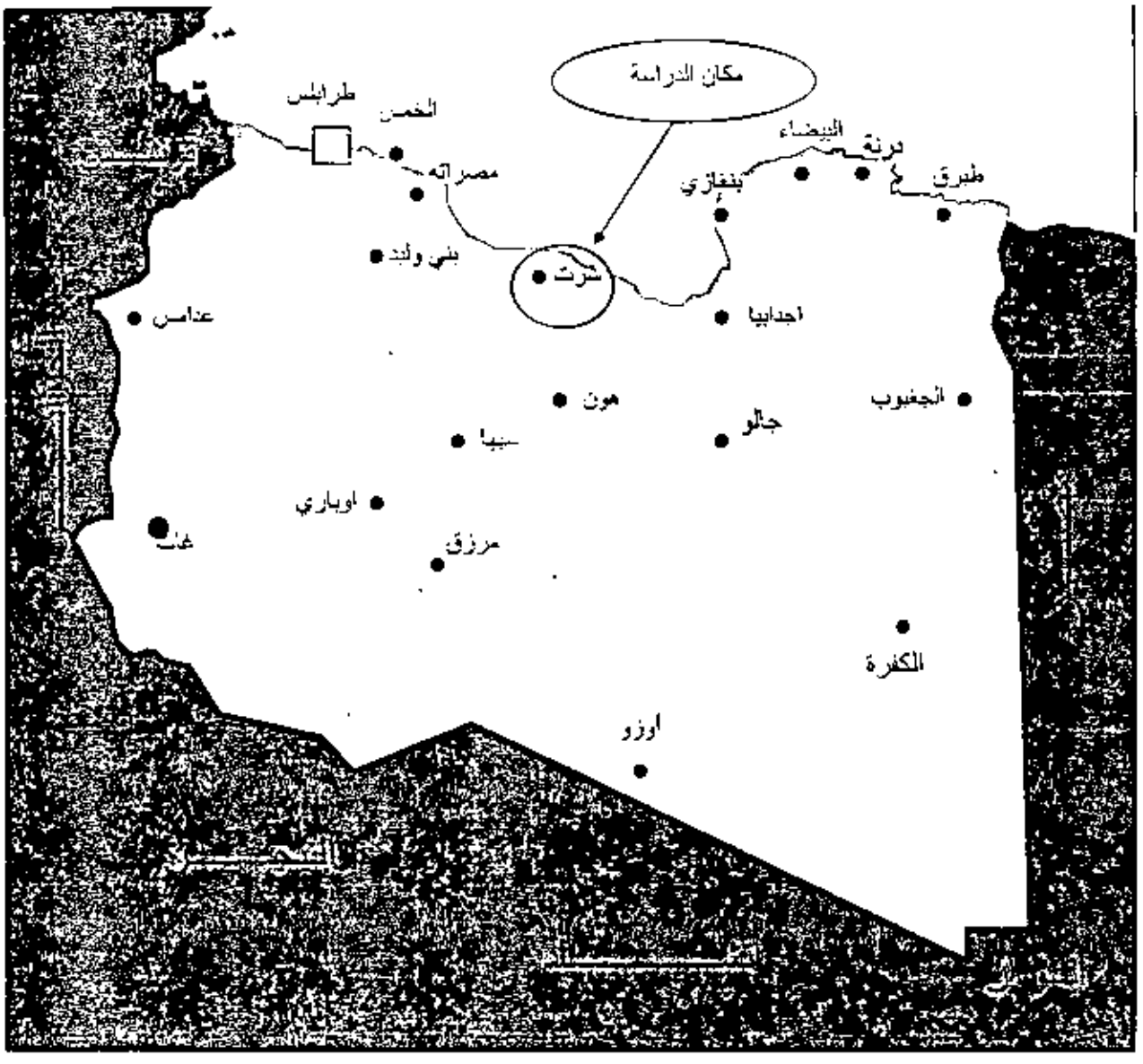


Figure 1 : Map of Libya showing place of the study (Sirt city) .

Table 1 : The number of primary school and school-children included in the study .

District authority.	Total number of primary schools included.	Total number of primary school children included in the study .	Selected schools per district in the study.
Khaleeg Sirt	2	348	Kaleeg Eltahaddy ,Shahda yanair
Sirt Al –markaz	2	353	Elfatih . Iben Khaldoon
Elfatih	2	412	Talaea Elnasser, Shahda Tagreft
Elrebat-Alamammi	2	435	Sanaa Yossif, Almajd
Total	8	1548	

their class mistress to deliver the bags to their parents and was asked to provide , on the next day , a stool sample . At the second vist , the containers were collected .

3. Questionnaire:

A questionnaire were distributed to eight primary school-children, filled by the Childs guardian. This questionnaire was prepared and designed for collect information from each school-children included name , age , sex , member of the family , level of the parent's education and socio-economic status (Index).This collecting information from questionnaire may be directly associated with the prevalence of parasitic infection. The questionnaire was written in Arabic and later translated into English for analysis .

4. Parasitological examination :

Fresh stool samples (colour : brown, blackish , yellowish brown , black, green or yellow) were collected from those schoolchildren (who agreed to participate in the study) in clean , numbered Plastic container with caps. The consistency (degree of moisture)of stool samples was checked, including four characteristic formed , soft , loose , and/or watery according to criteria set by the world health organization (WHO,1991).The samples after collection were brought to the laboratory of Zoology Department , Faculty of Science for further examination .

4.1. Direct method (direct wet mount technique, saline and iodine smears) (Markell *et al.*, 1999 and Nobale, 1994) :

Procedure :

Saline and iodine smears were prepared on one glass slide and the following was done :

1 - one drop of saline was put in the middle of the left half of the slide and a drop of iodine solution was put in the middle of the right half .

2 - About 2mg of the stool sample (forming a cone on the lower end of the wooden stick) were taken from inside the faecal sample and then mixed with the drop of saline. A second portion of stool was mixed with the drop of iodine then both were covered with glass covers and examined microscopically. Examination of the slide was started from the top left hand corner, the slide was moved a cross the microscopic stage and the field was examined until the objective reached the other edge of the field. At first examination started by using 5x or 10x eye-piece to have a general view of the slide, then more comprehensive examination , when required, was done using 40 x eye-pieces. The procedure was repeated when indicated. Each field examined by the 40x objective to check for the presence of protozoa. The use of 5x or 10x eye-piece is satisfactory .

4.2. Sedimentation method (formalin-Ethyl Acetata method) (Zeibig, 1997) :

This method concentrate parasitic stages present in a large amount of faeces in to small a mount of sediment .

Procedure:

1- A small a mount (5-15gm) of fresh faeces was added to a suitable contains and mixed well with 10-15ml of 10% formaline using applicator sticks. Allowed the mixture to stand for 30 minutes for fixation . This step killed and preserved protozoa, larvae, and most of the eggs .

2- Strained the mixture through two layers of dampened surgical gauze into 15ml conical centrifuge tube. and added enough formalin to nearly fill the tube .

3- This suspension was centrifuged at 1500 rpm for 10 minutes. The sediment was re-suspended in saline or formalin and re-centrifuged if the sample contained excessive debris .

4- The washed stool sediment was re-suspended in 7ml of 10% formalin and added 4ml of ethyl acetate. Stopper the tube and shake it vigorously for 30 second. Carefully the stopper was removed away from the face as organic vapor might cause spurting of faecal debris. This step extracted fats from the faeces and reduced bulk. Did not use if any small amount of debris was present or if original specimen contained mucus the stopper did not remove .

5- The tube was centrifuged for 10 minutes. at 1500 rpm .A small drop of faecal sediment and one drop of iodine stain were then mixed together on a slide . A cover glass slide was added , and then the entire preparation was examined microscopically in the same way as in the direct wet mount examination. Unstained preparations were examined for cyst, eggs. and larval forms of parasites .

5. Identification and measurements :

The trophozoites and / or cysts of protozoan , and eggs and / or adults of helminthes found in stool sample of children were identified using the keys and descriptions given by Neva and Brown (1994) , and Zeibig (1997) . The length and width of cysts and eggs were measured with the aid of a calibrated ocular micrometer microscope using

appropriate magnification power (x10 and x40) to confirm specific identifications . Photographs for the encountered intestinal parasitic stages were taken .

6. Analysis of the Data :

Stools without any intestinal parasites were categorized as negative and those , which contained the same , as positive . The positive cases were further sub-divided into (a) single , or (b) mixed parasitic infection depending on the number of species and their combinations present in the stools . The data for the prevalence of different intestinal parasites in each sample (locality , age , sex , behavior of the children and seasonal distribution) were recorded . Seasons were tabulated pooling the monthly data into : Autumn – September , October , November ; Winter – December , January , February ; Spring – March , April , May and Summer – June , July , August .

7. Statistical analysis :

The data were subjected to relevant statistical analysis. Chi-Squared (X^2) test was carried out after definition of the contingency tables to detect the relationship between the prevalence of the intestinal parasites and the following parameters : sex , age , seasons and the risk factors . X^2 values were tabulated to know the significance or otherwise of the comparisons .

Results

4. RESULTS

4.1. Prevalence :

The study was carried out on 1548 primary schoolchildren belong to eight schools distributed in different district authorities of Sirt city . The results show that out of the total 1548 stool samples of primary schoolchildren , 905 stool samples of males and 643 of females . Parasitic infection was identified in 583 (353 (22.8 %) males and 230 (14.9%) females) giving an overall prevalence of 37.7 % (Fig. 2) .

The results revealed that , seven intestinal protozoan parasites were found during the examination of stool samples .These parasites were *Entamoeba histolytica / E. dispar*.(plate 1) , *Entamoeba coli* (plate 2) , *Endolimax nana* (plate 3 A) , *Iodamoeba butschlii* (plate 3B). *Giardia lamblia* (plate 4) , *Blastocystis hominis* (plate 5 A) and *Isospora belli* (plate 5B) . All parasitic stages were identified through the characteristic features of their cysts and trophozoites . However , only cysts were seen for *E. nana* , *I. butschlii* , *B. hominis* , and *I. belli* no helminth intestinal parasites were detected .

The most common pathogenic protozoan parasite detected was *B. hominis* with the highest prevalence at 17.9 % (277/1548) followed by *E. histolytica / E. dispar* 14.8 % (229 / 1548) , *G. lamblia* 9.9 % (154/1548) , and *I. belli* 4.8 % (74/1548) . Among the non-pathogenic parasites the highest infection was detected for *E. coli* 2.9 % (45/1548) followed by *E. nana* 2.2 % (34/1548) , whereas *I. butschlii* recorded at low prevalence rate 1 % (15/1548) in primary schoolchildren (Table 2 , 3 and Fig. 3) . The apparent differences in overall prevalence were statistically significant

Figure (2) : Prevalence of total positive and negative cases of intestinal parasites in primary school children from Sirt (N = 1548) :

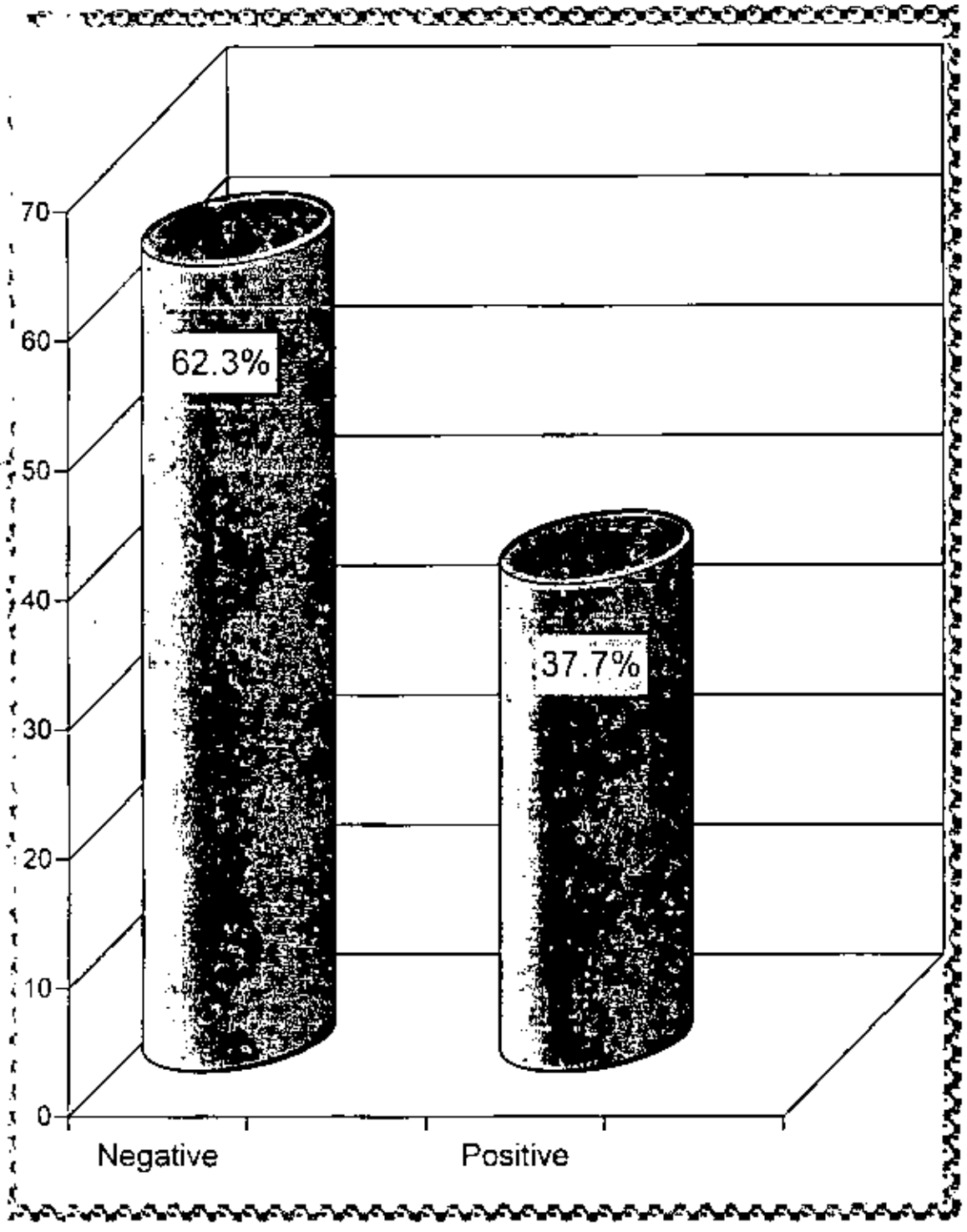


Table (2) : Overall prevalence (%)of intestinal parasites in primary schoolchildren from Sirt (N = 1548) :

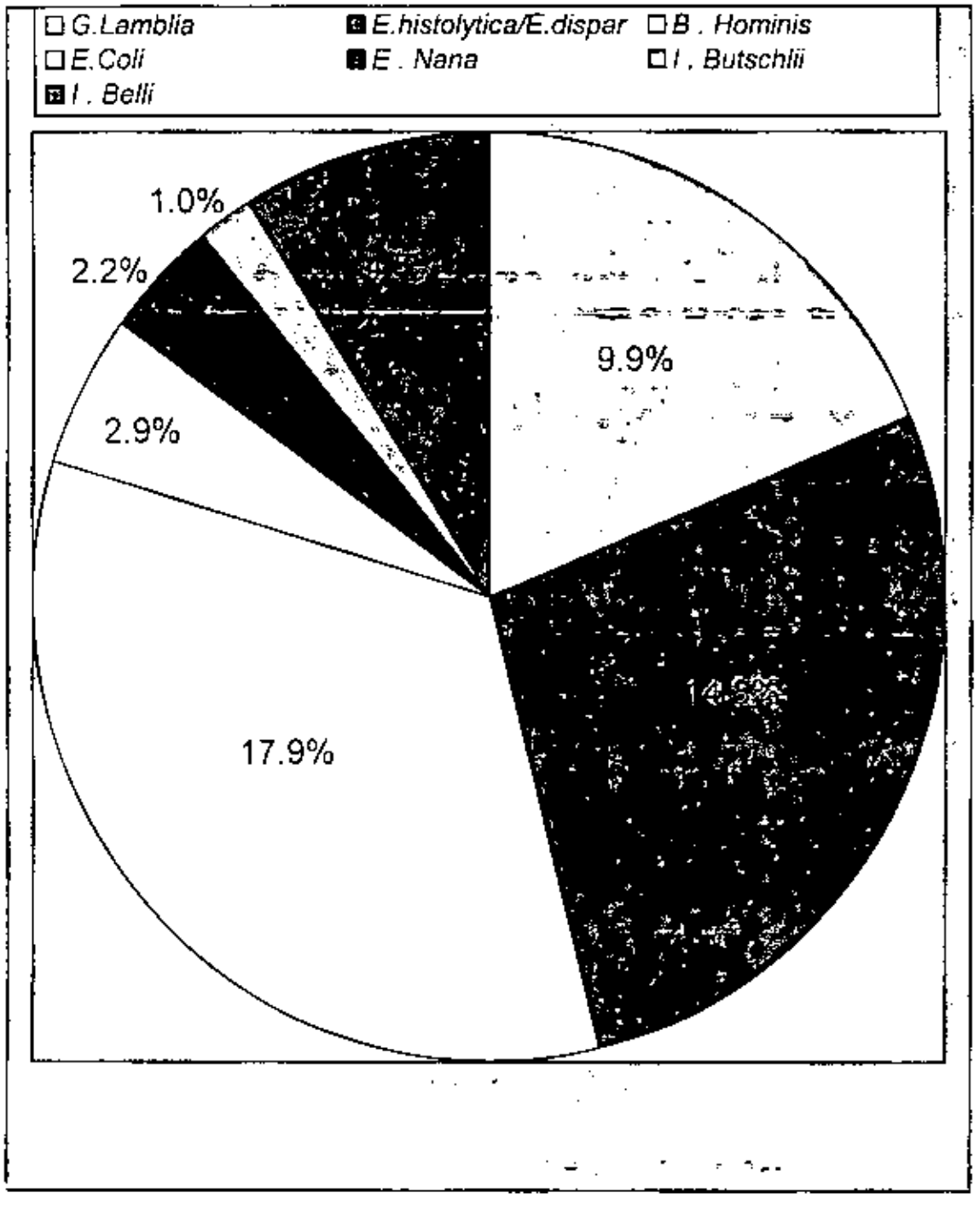
Types of parasites	Number infected children	Percentage (%)
E. histolytica / E.dispar	229	14.8 %
Entamoeba coli	45	2.9 %
Endolimax nana	34	2.2 %
Iodamoeba butshlii	15	1.0 %
Giardia lamblia	154	9.9 %
Blastocystis hominis	277	17.9%
Isospora belli	74	4.8 %

Table (3) : Prevalence of pathogenic and non-pathogenic parasites in primary schoolchildren (N = 1548) :

Pathogenic parasites	Number infected children	(%)
E. histolytica / E.dispar	229	14.8 %
Blastocystis hominis	277	17.9%
Giardia lamblia	154	9.9%
Isospora belli	74	4.8 %

Non-pathogenic parasites	Number infected children	(%)
Entamoeba coli	45	2.9 %
Endolimax nana	34	2.2 %
Iodamoeba butshlii	15	1.0 %

Figure (3) : Overall prevalence (%)of intestinal parasites in primary schoolchildren from Sirt (N = 1548) :



for each parasitic species (P = 0.000) . No such differences were noted in case of *B. hominis* (P = 0.246) . There were a significant differences in prevalence between *E. histolytica / E. dispar* and each of *B. hominis* , *G. lamblia* , *E. coli* , *I . butschlii* (P = 0.000) . Also significant differences were detected between *G. lamblia* and each of *B. hominis* , *G. lamblia* , *I. belli* (P = 0.000) . No such differences were noted between *E. coli* and *E. nana* (P = 0.210) .

B. hominis had the highest prevalence (47.5 %) among the positive cases followed by *E. histolytica / E. dispar* (39.3 %) , *G. lamblia* (26.4 %) and *I. belli* (12.7 %) , whereas *E. coli* (7.7 %) , *E. nana* (5.8 %) and *I.butschli* (2.6%) had the lowest infection rates (Table 4 and Fig. 4) .

4.1.1 Prevalence and sex :

Infection was detected in both male and female children . The relationship between sex and intestinal parasitic infection is presented in Table 5 , 6 and Fig. 5 . Out of the total positive cases , males constituted 353 (22.8 %) and females 230 (14.9 %) .

B. hominis showed the highest prevalence among both sexes , when compared with other parasites . Among males , the overall prevalence of this parasite was 11.2 % (173/1548) and females the value was 6.7 % (104/1548) when tabulated sex-wise , the percentage of prevalence was 19.1 % (173/905) and 16.2 % (104/643) for males and females respectively . Overall prevalence between males and females showed a significant differences , the same trend was shown between overall prevalence and two sexes (P=0.000).

Table (4) : Prevalence of intestinal parasites in positive cases in primary schoolchildren from Sirt (N = 583) :

Types of parasites	Number infected children	Percentage (%)
E. histolytica / E.dispar	229	39.3%
Entamoeba coli	45	7.7%
Endolimax nana	34	5.8 %
Iodamoeba butshlii	15	2.6 %
Giardia lamblia	154	26.4%
Blastocystis hominis	277	47.5 %
Isospora belli	74	12.7 %

Figure (4) : Prevalence of intestinal parasites among positive cases in primary schoolchildren in Sirt (N = 1548) :

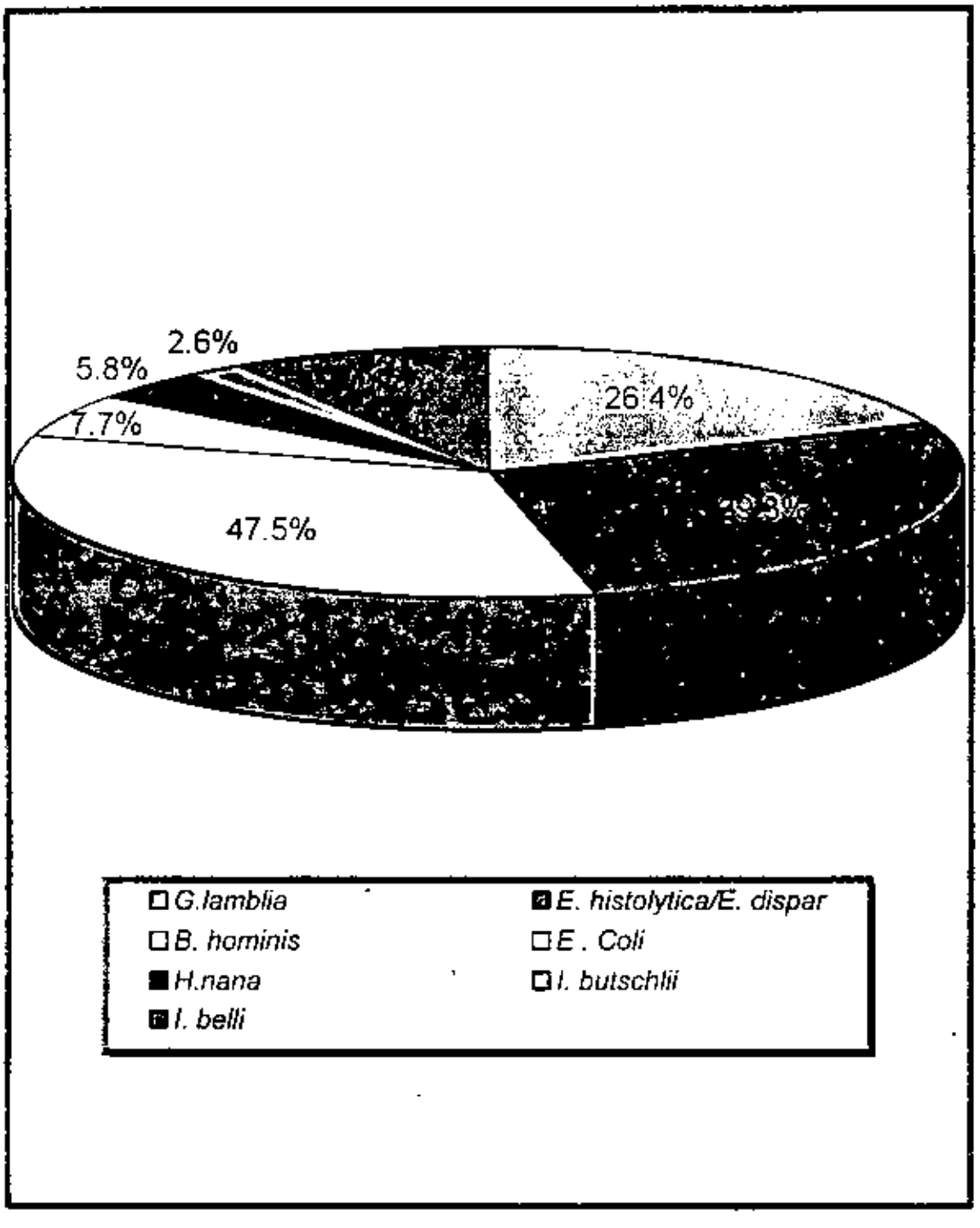


Table (5) :Overall prevalence of positive and negative infections among male and female children from Sirt (N = 1548) :

Infections	Male	Female	Total
Negative	552 (35.7)	413 (26.7)	965 (62.3)
Positive	353 (22.8)	230 (14.9)	583 (37.7)
Total	905 (58.5)	643 (41.5)	1548

Figure (5) :Overall prevalence of positive and negative infections among male and female primary schoolchildren in Sirt (N = 1548):

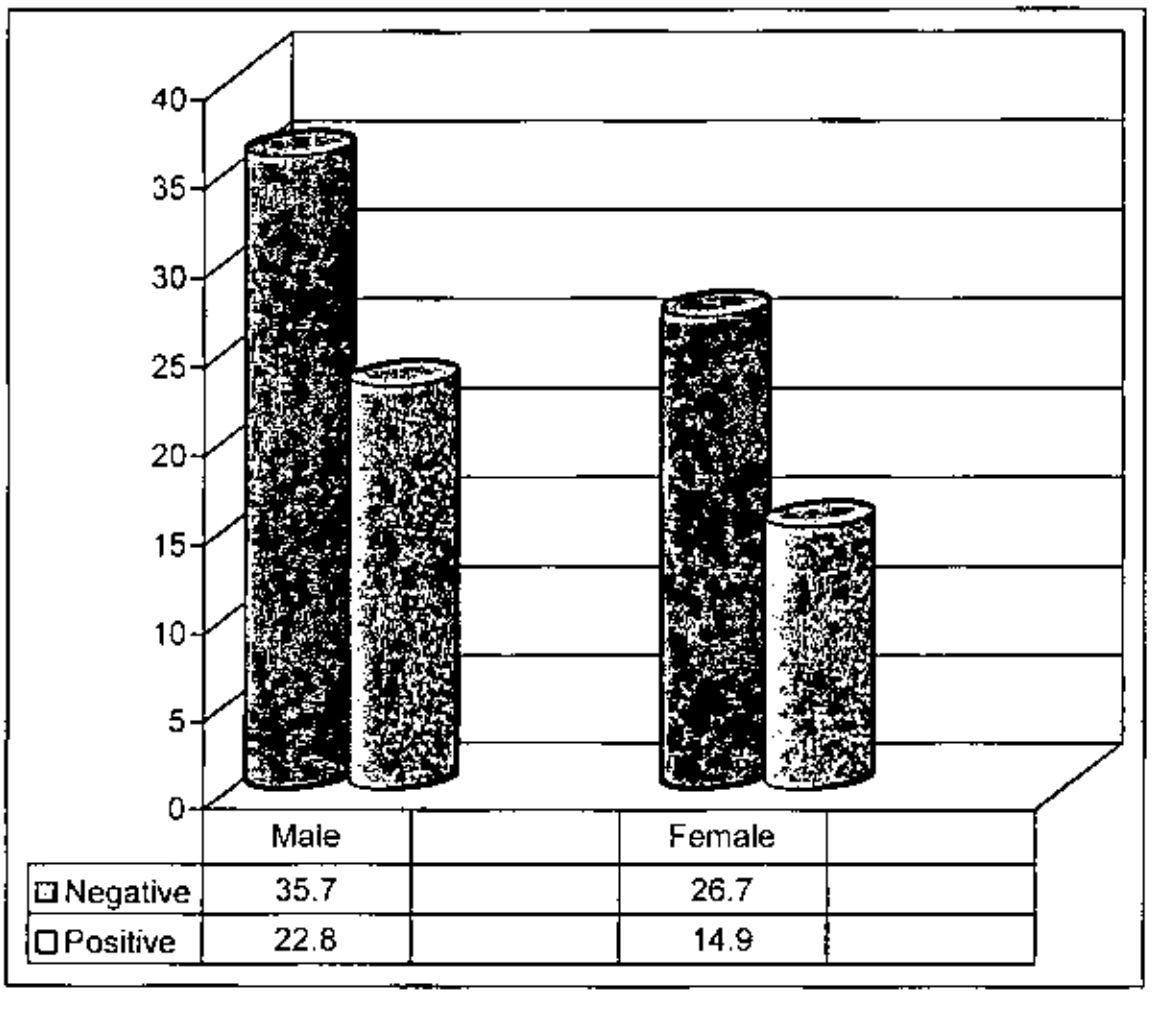


Table (6) : Prevalence of intestinal parasites in male and female in primary schoolchildren from Sirt (N = 1548) :

Types of parasites	Sex (N=1548)		Total
	Male(527)	Female(301)	
E. histolytica / E.dispar	142	87	229
Entamoeba coli	25	20	45
Endolimax nana	24	10	34
Iodamoeba butshlii	11	4	15
Giardia lamblia	98	56	154
Blastocystis hominis	173	104	277
Isospora belli	54	20	74

.* $\chi 2 = 9.782$; $P > 0.05$; $df = 9$; P-value = 0.368

E. histolytica / E. dispar was detected in 9.2 % (142/1548) of males out of the total examined children (1548) , whereas 5.6 % (87/1548) was noted among the females . Sex-wise prevalence of this parasite was 15.7% (142 out 905) and 13.5 % . (87 out 643) for males and females respectively .The result showed that there was a significant relationship between overall prevalence of this parasites and each of males and females (P = 0.000) , the same finding was noted between both sexes (P = 0.000) .

In the case of *G. lamblia* , 98 (6.3 %) males and 56 (3.6 %) females out of the total 1548 cases examined contained the trophozoites and / or cysts of this parasite in the stools . when tabulated sex-wise . the values where 10.8% (98 out 905) for the former and 8.7 % (56 out 643) for the latter respectively.There was a significant differences between overall prevalence of *G. lamblia* and each of males and females (P = 0.001) . The same trend was noted between the prevalence of this parasite in males and females (P = 0.000) .

Regarding the oocysts of *I. belli* showed the overall prevalence of 3.5 % among males and 1.3 % among females children . when tabulated sex-wise . the percentage prevalence were 6.0 % for males and 3.1 % for females

E. coli was detected in 25 (1.6 %) males and 20 (1.3 %) females out of 1548 examined children . Sex-wise prevalence. showed the percentage of 2.8 % for males and 3.1 % for females . There was a significant differences between the overall prevalence of this parasite and each of males and females (P = 0.000). such differences did not exist in the prevalence between males and females (P = 0.289) .

E. nana and *I. butschlii* were detected 2.2 % (34/1548) and 0.7 % (11/1548) respectively , when tabulated sex-wise prevalence . showed the percentage 2.7 % for males and 1.6 % for females in *E. nana* and 1.2 % for males and 1.33 % for females in *I. butschlii* respectively .On the other hand. the prevalence of intestinal protozoan parasites between the sexes being higher in males . No significantly different existed in the prevalence of intestinal parasites in children between males and females (P = 0.368) .

4.1.2 Prevalence and age :

The prevalence of intestinal protozoan parasites in different age groups (years) of children are given in Table 7 and Fig. 6 . The results revealed that high prevalence was detected among age groups 6 – 7 years old. The decrease among age groups 8 – 9 years old , the minimum prevalence was recorded among age groups 10 – 11 years old . Age had no significant influence on the prevalence of intestinal parasites (P = 0.236) .

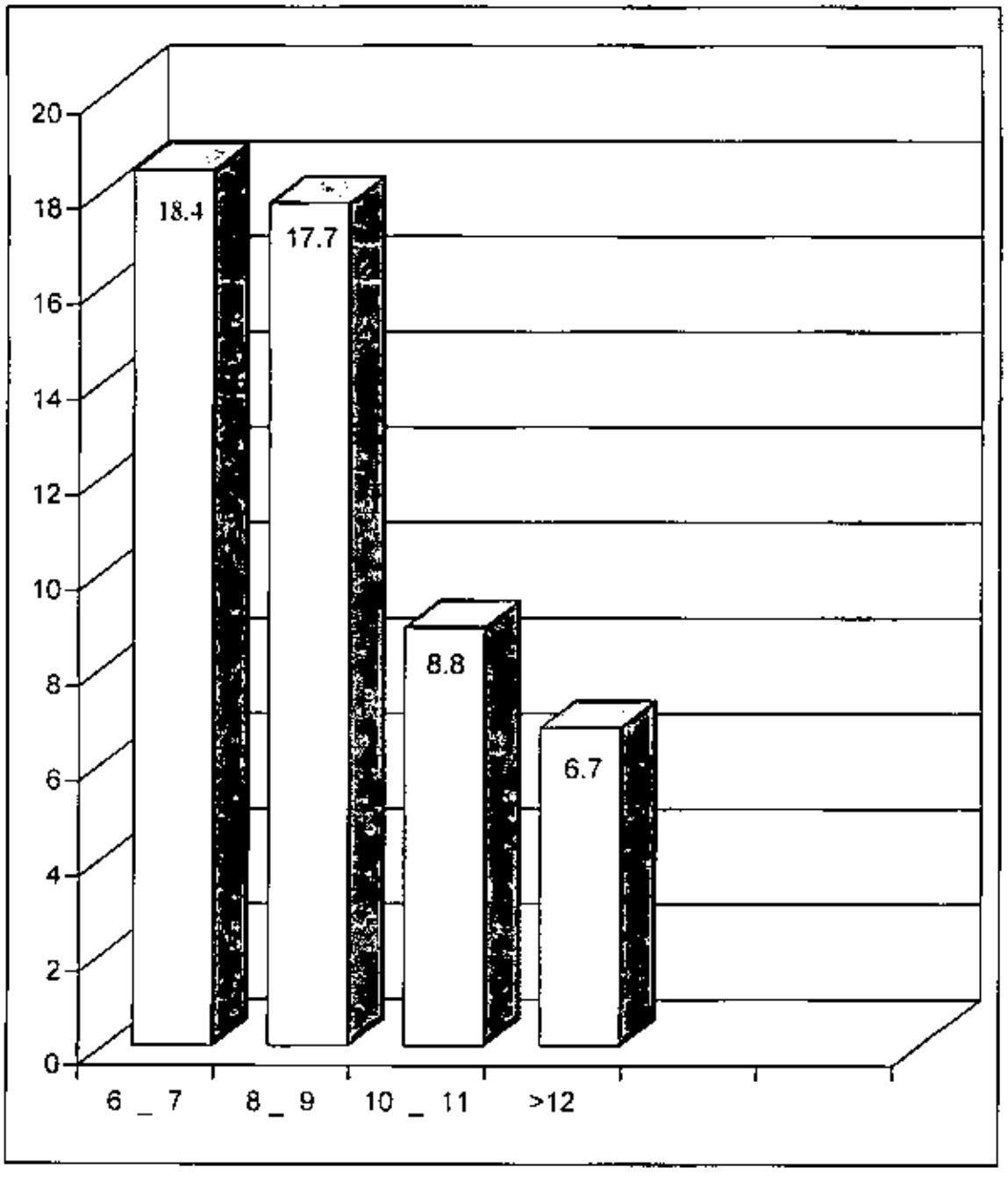
The minimum prevalence of parasites was discernible in the old age group of > 12 year . *B. hominis* showed the highest prevalence in all age groups followed by *E. histolytica / E. dispar* , *G. lamblia* and *I. belli* . The moderate prevalence was discernible in *E. coli* , *E. nana* . The low prevalence was detected in *I. butschlii* .

Table (7) : Prevalence of intestinal parasites in different age groups of primary schoolchildren from Sirt (N = 1548) :

Types of parasites	Age groups (years)				Total
	6-7	8-9	10-11	>12	
E. histolytica / E.dispar	114	54	33	28	229
Entamoeba coli	13	20	10	2	45
Endolimax nana	8	18	2	6	34
Iodamoeba butshlii	1	8	3	3	15
Giardia lamblia	48	49	36	21	154
Blastocystis hominis	86	106	40	45	277
Isospora belli	15	20	12	27	74

* $\chi 2 = 198.456$; $P > 0.05$; $df = 185$; P-value = 0.236

Figure (6) : Prevalence of intestinal parasites in different age groups of primary schoolchildren (N = 1548) :



4.1.3 Prevalence and months :

Table 8 and Fig. 7 shows the prevalence of intestinal protozoan parasites among schoolchildren in different months of study (November , 2003 to April 2004) . The general prevalence of protozoan parasites was higher in February (9.2 %) followed by April (8.6 %) and March (7.0 %) and the minimum prevalence was discernible during November (4.1 %) and December (3.1 %) . The results showed that there was a significant relationship between the prevalence of intestinal parasites and different months during the study (X^2 =20.813 ; P< 0.05 ; df = 5 ; p-value = 0.001) .

4.1.4 Prevalence of single and mixed infection :

The distribution of single and mixed prevalence of protozoan parasites among primary schoolchildren based on the occurrence of trophozoite and / or cysts of protozoan parasites in their stool samples (N = 1548) (Table 9 and Fig. 8) . The stools of 26.3 % (407 out 1548) of examined children contained the trophozoites and / or cysts of a single parasite (single prevalence) and 11.4 % (176 out 1548) contained more than one parasite (mixed prevalence) in different combinations . The data revealed that there was a significant differences between single and mixed infection (P= 0.000).

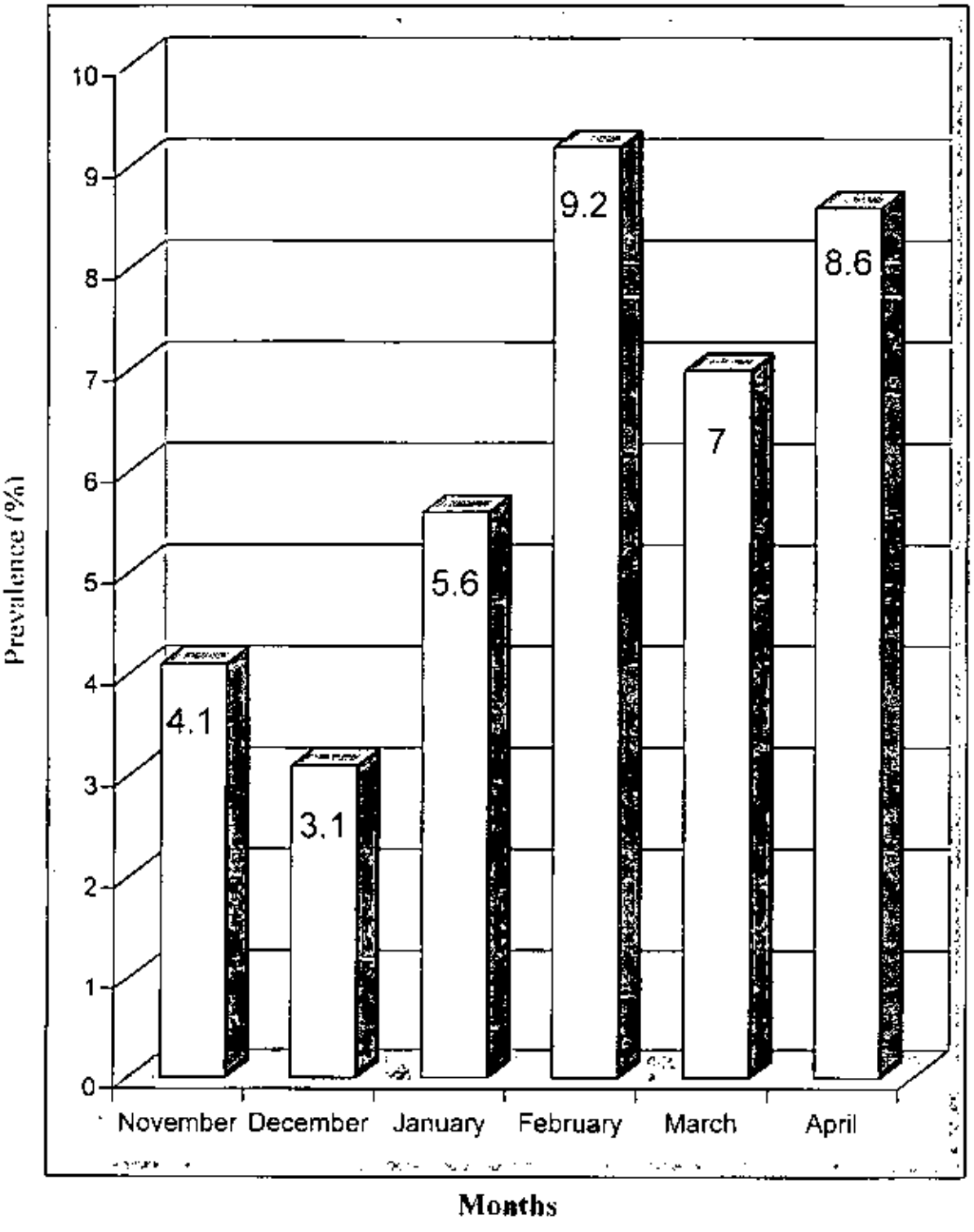
The result showed that single infection in males was 246 (15.9 %) higher than females 161 (10.4 %) . On the other hand mixed prevalence in males 103 (6.7 %) was higher than females 73 (4.7 %) (Table 10 and Fig. 9) .

Table (8) :Seasonal variations of intestinal parasites among primary schoolchildren in Sirt (N = 1548) :

Months	November	December	January	February	March	April	Total
Number examined	173	119	249	329	243	435	1548
Number infected	64	48	86	143	109	133	583
Percentage of infected	4.1 %	3.1 %	5.6	9.2 %	7.0 %	8.6 %	37.7%

* $\chi 2 = 20.813$; $P < 0.05$; $df = 5$; P - value = 0.001

Figure (7) : Prevalence of intestinal parasites within months in primary schoolchildren (N = 1548) :



Table(9):Overall prevalence of single and mixed infections of intestinal parasites in primary schoolchildren in Sirt (N=1548):

Types of Infection	Number infected children	Percentage (%)
Single Infection	407	26.3 %
Mixed Infection	176	11.4 %
Total	583	37.7 %

*** $\chi 2 = 1535.312$; $P < 0.05$; d.f. = 2 ; P - value = 0.00**

Figure (8) : Overall prevalence of single and mixed infections of intestinal parasites in primary schoolchildren (N = 1548):

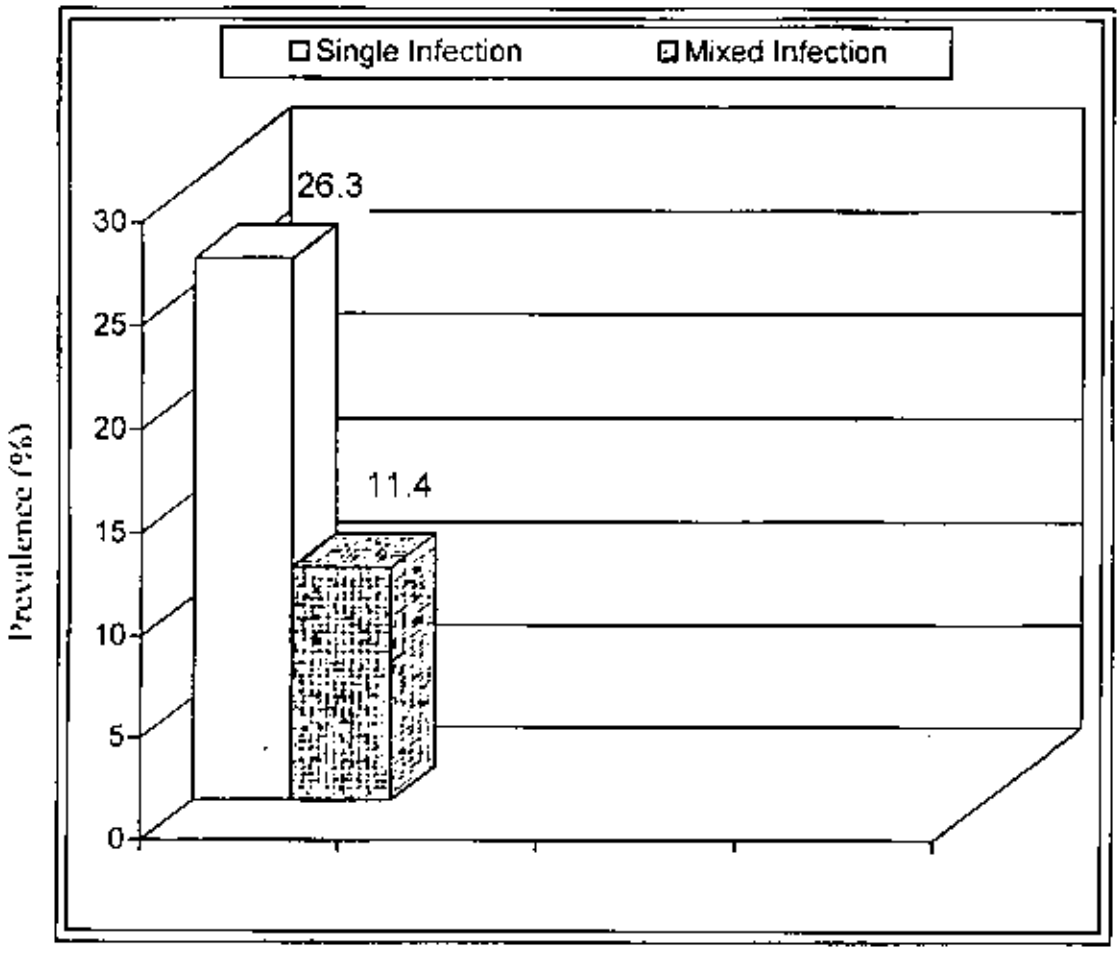
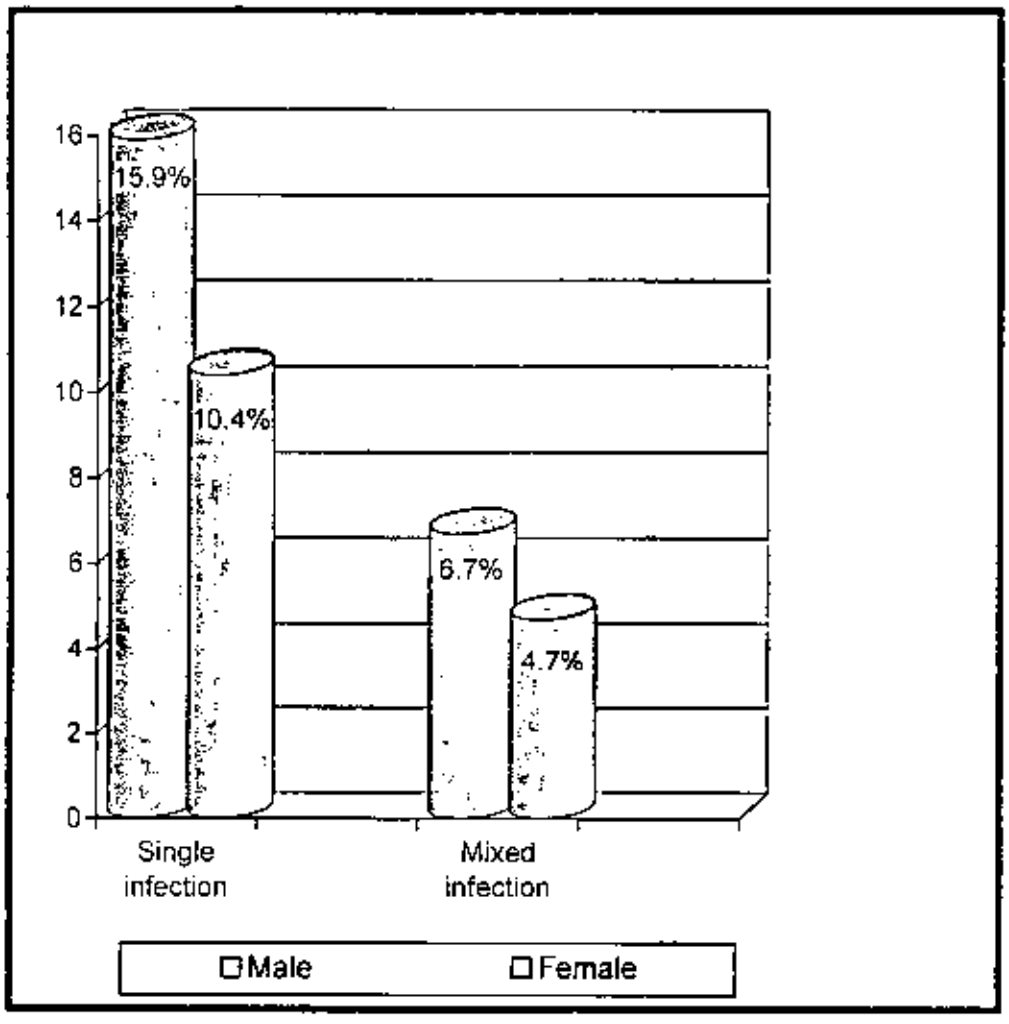


Table (10) : Relationship between Types of infection and Sex in primary schoolchildren in Sirt (N = 1548) :

Sex	Types of Infection			Total of infected
	Negative cases (965)	Positive cases		
		Single infection(407)	Mixed infection (176)	
Male	549	246	103	349
Female	416	161	73	234

* $\chi 2 = 6.747$; $P < 0.05$; d.f. = 2 ; P - value = 0.03

Figure (9) : Relation ship between Types of infection and Sex among primary schoolchildren in Sirt (N = 1548) :



4.1.5 Parasites and their combination in singe and mixed prevalence :

The names . combinations and numbers of protozoan intestinal parasites in single and mixed prevalence in schoolchildren (males and females) (Table 11a & b) . Two types of protozoa parasitic combinations were detected among the mixed prevalence . **(1)** The combination of two parasites and **(2)** The combination of three parasites . However the combination of two parasites was higher in *B. hominis* followed with *G.lamblia* and *E. histolytica / E. dispar* . The combination of three parasites of *E. histolytica / E. dispar* with two other protozoan parasites was found to be higher in both sexes . followed by *B. hominis* and *G.lamblia* .

There was no significant relationship between the prevalence of mixed infection in males and females in case of *E. histolytica / E. dispar* and *G. lamblia* (P = 0.242) and *B. hominis* and *I. belli* (P = 0.296) . Among single infection of protozoan parasites . the result revealed that *B. hominis* showed the highest prevalence in both sexes , followed by *E. histolytica / E. dispar* . *G. lamblia* and *E. coli* .

4.1.6 Prevalence and educated background of the parents of the . children :

The results revealed that the prevalence of infection was not associated with educational status of the parent's children . The parasitic infection appeared to vary with the educational status of the parents . Significant differences were exist between the overall prevalence and educated background of the parent's children (P = 0.028) . Children . whose parents were educated show high prevalence 15.8 % (245 out 1548) than those children their parents were uneducated 10.5 % (163 out

Table(11a): The names and numbers of single infections of parasites among male and female primary schoolchildren in Sirt (N = 1548) :

Types of parasites	Single infection		Total
	Male	Female	
E. histolytica / E.dispar	77	59	136
Entamoeba coli	11	7	18
Giardia lamblia	48	31	79
Blastocystis hominis	107	78	185
Endolimax nana	1	1	2
Iodamoeba butshlii	1	1	2

Table(11b): The names and numbers of mixed infections of parasites among male and female primary schoolchildren in Sirt (N = 1548) :

Types of parasites	Mixed infection		Total
	Male	Female	
E . histolytica/E.dispar + G . lamblia	14	10	24
E.histolytica/E.dispar +E.coli	0	2	2
E.histolytica/E.dispar +E.coli+ G . lamblia	4	2	6

E . histolytica/E.dispar + G . lamblia + Isospora	13	4	17
E . histolytica/E.dispar +B.Hominis+ Isospora	24	6	30
E.histolytica/E.dispar +Iodamoeba butshlii +Endo.nana	3	1	4
E.histolytica/E.dispar +Iodamoeba butshlii	3	1	4
E.histolytica/E.dispar +Iodamoeba butshlii + Isospora	2	0	2
E.histolytica/E.dispar + E.coli +E.nana	2	2	4
E.coli + G . lamblia	1	2	3
E.coli + B.Hominis	6	4	10
E.coli +B.Hominis+ Isospora	1	1	2
G . lamblia + B.Hominis	15	5	20
G.lamblia + Isospora	2	2	4
G.lamblia + E.nana	1	0	1
Endolimax nana + B.Hominis	10	3	13
Endolimax E.histolytica/E.dispar nana +	3	2	5
Endolimax nana+ Isospora	2	0	2
Endolimax nana +Iodamoeba butshlii	2	1	3
B.Hominis + Isospora	10	7	17

* $\chi 2 = 37.206$; $P > 0.05$; d.f. = 27 ; P – value = 0.09

1548) . However , schoolchildren had one educated parent has less prevalence rate 11.3 % (175 out 1548) than those their parents were educated . On the other hand, the results showed that the children had educated father and non-educated mother were more likely to be infected more than those children had educated mother and non-educated father (Table 12 and Fig. 10) .

The results showed that a significant relationship exist between the prevalence of intestinal parasitic infection and each of educated both parents of children (P = 0.000) and educated father . non-educated mother (P = 0.000) . Such relationship did not exist between the prevalence and educated mother and non-educated father (P = 0.533) .

Significant differences were detected in the prevalence between educated parents and non-educated parents (P = 0.006) and between educated parents and educated father , non-educated mother (P = 0.070) . No significant differences were exist between non-educated parents and each of educated father . non-educated mother (P = 0.394) and educated mother . non-educated father (P = 0.575) .

4.1.7 Family size and infection :

The relationship between the parasitic infection and family size of children shown in Table 13 . The results revealed that the infection with parasites did not associated with family size of schoolchildren . High infection rate (12.5 %) was detected among children their family size 4-6 followed by those 7 – 9 family size (12.3 %) and those > 10 family size (9.6 %) . On the other hand lower prevalence rate of parasitic infection was found among those children have <4 family size (3.2 %) . No

Table (12) : Prevalence of infected and non-infected primary schoolchildren according to educational background of their parents (N = 1548) :

Educational of parents	Number examined	Number infected	Percentage of infected
Educated mother and father	723	245	15.8 %
Non-Educated mother and father	385	163	10.5 %
Educated father - Non-Educated mother	399	157	10.1 %
Educated mother - Non-Educated father	41	18	1.2 %
Total	1548	583	37.7 %

* $\chi 2 = 9.138$; $P < 0.05$; $df = 3$; P-value = 0.028

Figure (10) : Prevalence of infected and non-infected primary schoolchildren according to educational background of their parents (N = 1548) :

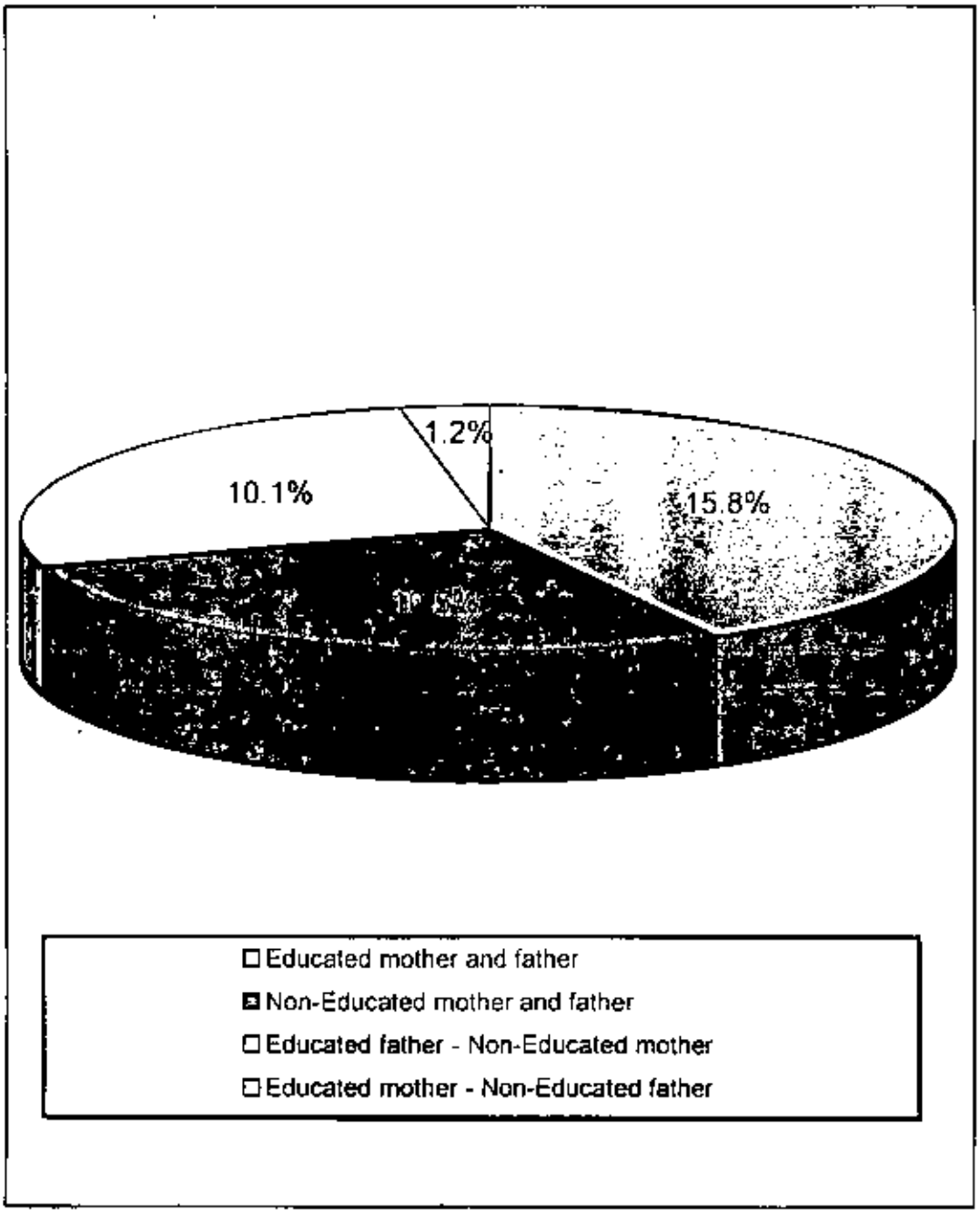


Table (13) : Prevalence of intestinal parasite according to family size of primary schoolchildren in Sirt (N = 1548) :

Family size	Number examined	Number infected	Percentage of infected
<4	157	50	3.2 %
4 - 6	539	193	12.5%
7 - 9	465	191	12.3 %
>10	387	149	9.6 %
Total	1548	583	37.7%

* $\chi 2 = 5.475$; $P > 0.05$; $df = 3$; P-value = 0.140

significant differences were exist between the prevalence of parasitic infection and family size of children (P = 0.140) .

4.1.8 Nationality and infection :

The prevalence of infection in Libyan children was found to be 35.3 % with a corresponding 2.4% for non-Libyan (Table 14 and Fig. 11). Differences in infection between Libyan and non-Libyan children were statistically insignificant (P = 0.368) .

4.1.9 Children body weight and infection :

The relationship between infection of intestinal protozoan parasites and children body weight is presented in Table 15 . Those schoolchildren have body weight (15 – 25 kg) showed higher prevalence of infection 17.6 % (272 out 1548) followed by children body weight 13.8 % (26 – 35 kg) . children body weight 4.8 % (36 – 45 kg) . However , schoolchildren had > 46 kg body weight showed low prevalence rate at 1.5 % . There was a significant relationship between the prevalence of parasitic infection and body weight (P = 0.021) .

4.1.10 Socio-economic status and infection :

The relationship between the prevalence and socio-economic status (family income per month) of children parents is presented in Table 16 . The results revealed that high prevalence (31.6 %) was detected in those children the salary income of their parents between 151 – 300 diner / month . However , the prevalence decrease with family salary income increase , the low prevalence (0.3 %) was detected among those children whose parents have salary income > 501 diner / month .

Table (14) : Prevalence of intestinal parasites according to nationality of primary schoolchildren in Sirt (N = 1548) :

Nationality	Number examined	Number infected	Percentage of infection
Libyan	1463	564	35.3
Non-Libyan	85	37	2.4
Total	1548	583	37.7

*** $\chi 2 = 1.319$; $P > 0.05$; $df = 1$; P-value = 0.251**

Figure (11) : Prevalence of intestinal parasites according to nationality of children (N = 1548) :

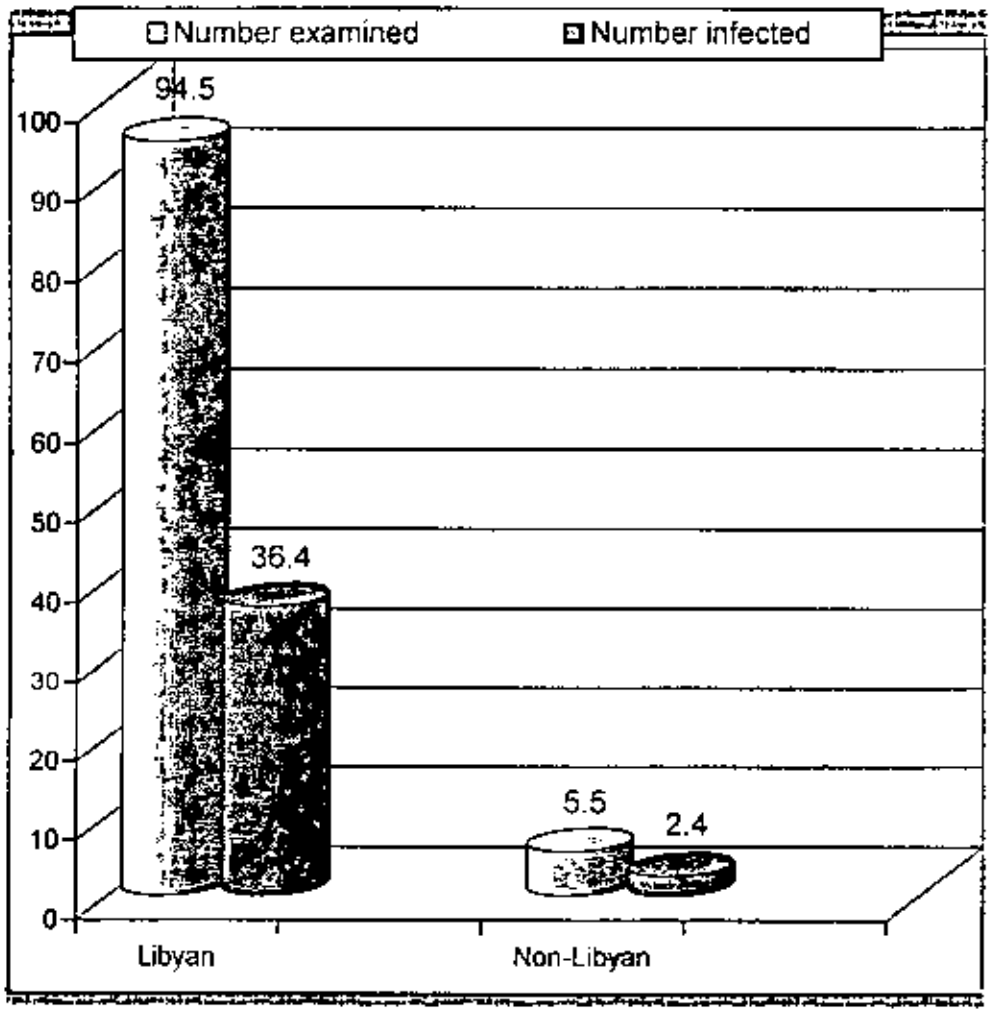


Table (15) : Prevalence of intestinal parasites according to body weight of primary schoolchildren (N =1548):

Weight	Number examined	Number infected	Percentage Of infected
15 -25	651	272	17.6 %
26 -35	612	214	13.8 %
36 - 45	204	74	4.8%
> 46	81	23	1.5 %
Total	1548	583	37.7 %

* $\chi 2 = 9.729$; $P < 0.05$; $df = 3$; P-value = 0.021

Table (16): Prevalence of intestinal parasites according to socio-economic status (salary income) (N = 1548) :

Salary income	Number examined	Number infected	Percentage Of infected
< 150	123	45	2.9 %
151 - 300	1267	489	31.6 %
301 - 500	131	45	2.9 %
> 501	27	4	0.3 %
Total	1548	583	37.7 %

* $\chi 2 = 7.145$; $P > 0.05$; $df = 3$; P-value = 0.067

4.1.11 Prevalence and district :

Prevalence of infection within the various study districts is shown in Table 17 . Elfath district displayed the highest infection (12 %) followed by Khaleeg Sirt (11 %) , whereas Elrebat Alamammi (6.8 %) and Sirt Al-Markaz (7.8 %) had the lowest infection rates . Differences in prevalence of infection within the different districts (P = 0.000) was highly significant .

4.1.12 Prevalence of parasitic infection in primary schoolchildren according to schools :

Prevalence of infection and schools is shown in Table 18 and Fig. 12 . Talaia Elnaser (6.2 %) had the highest number of infected children followed by Shohada Tagrift (5.7 %) . Ebenkaldon (5.6 %) . Shohada yaniyr (5.3 %) Sania yousif (4.6 %) and Elmajd (4.0 %) with Elfath showing lower prevalence (2.3 %) . Differences in prevalence of infection and schools was significant (P = 0.000) .

Table (17) : Prevalence of intestinal parasites among primary schoolchildren in Sirt according to district authority (N = 1548) :

District authority	Number examined	Number infected	(%) infected
Khaleeg Sirt	348	170	11.0 %
Sirt Al-markaz	353	123	7.9%
Elfath	412	185	12.0 %
Elrebat Alamammi	435	105	6.8%
Total	1548	583	37.7%

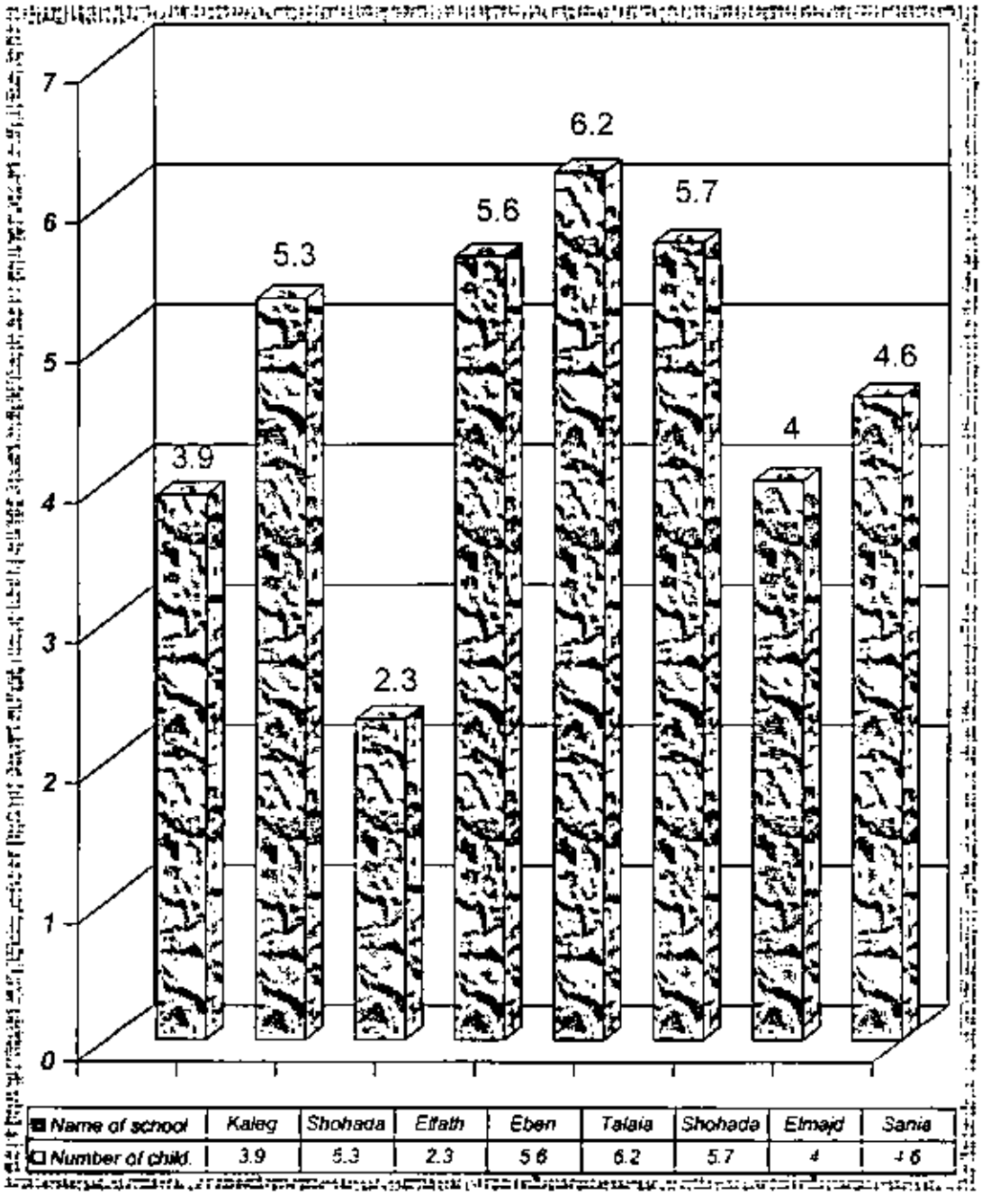
*$\chi 2 = 22.357$; $P < 0.05$: df = 4 : P-value = 0.000

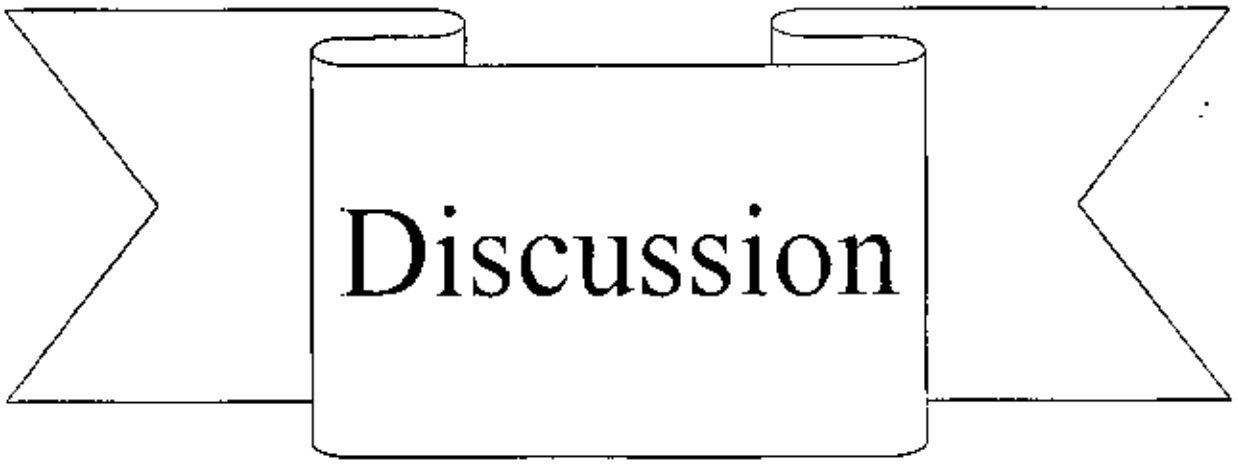
Table (18) : Prevalence of intestinal parasites in primary schoolchildren according to schools (N = 1548) :

Name of school	Khaleeg Eltahadi	Shohada yaniyr	Elfath	Eben Kaldon	Talaia Elnaser	Shohada Tagrift	Elmajd	Sania yousif	Total
Number Infected	60	82	36	87	96	89	62	71	583
Percentage of infected	3.9%	5.3%	2.3%	5.6%	6.2%	5.7%	4.0%	4.6%	37.7%

* $\chi 2 = 37.561$; $P < 0.05$; $df = 7$; P - value = 0.000

Figure (12) : Prevalence of intestinal parasites in primary schoolchildren from Sirt according to schools (N = 1548) :




Discussion

5. DISCUSSION

Intestinal parasitic infections are among the major diseases of public health problem in many countries . Apart from causing mortality and morbidity , infection with intestinal parasites has been associated with stunting of linear growth , physical weakness and low educational achievement in schoolchildren . Furthermore , chronic intestinal parasitic infections have become the subject of speculation and investigation in relation to the spreading and severity of other infections diseases . However , the role of intestinal parasites in causing morbidity and mortality as well as in the pathogenecity differs from species to species . The distribution and prevalence of various species of intestinal parasites also differs from region to region because of several environmental , social and geographical factors . Hence , study on the prevalence of various intestinal parasitic infections is a prerequisite not only for formation of appropriate control strategies but also to predict risk for communities under consideration .

Few studies had been conducted on the distribution and prevalence of intestinal parasites in Libya , there are still several localities for which epidemiological information on parasitic infections is not available . Therefore , the objective of the present study was to assess the prevalence of intestinal parasitic infections among schoolchildren in primary schools found in Sirt city .

5.1. Prevalence :

The overall prevalence of intestinal protozoan parasites seen in this study was 37.7 % . This is different to previous prevalence reported for other few studies carried out among children in the country .

However , El-Boulaqi *et al.*(1980) reported that the prevalence of parasitic infection among primary schoolchildren from five schools in Benghazi was 75.6%. Raof (2002) put the overall prevalence of intestinal protozoan parasites of primary schoolchildren at 56.78 % . Sadaga (2006) reported that the prevalence of intestinal parasites among primary schoolchildren in Derna district was 31 % . Intestinal parasitic infection have been reported in hospilized children in the country from Benghazi , 12.2% (Al-Tawty *et al.*, 1998) . 12.88 % (El-Buni and Khan , 1998) and 31.9 % (Bugharara *et al.*, 1999). Study conducted by Ibrahem (2003) among children and neonatus in Sirt city put the overall prevalence at 56% .

The overall prevalence reported in the present study similar and differ from other infection rates reported among children from Al-Baha region in Saudi Arabia (Al-Eissa *et al.*, 1995) , Egypt (Mahfouz *et al.*, 1997) , Nigeria (Ighogboja and Ikeh , 1997) , Uganda (Kabatereine *et al.*, 1997) , southern Sudan (Magambo *et al.*, 1998) . Egypt (Curtale *et al.*, 1998) , Palestine , Gaza city (Yassin *et al.*, 1999 and Agha Rodina and Teodorescu , 2002) , Morocco (El-Idrissi *et al.*, 1999) , Philippines (Lee *et al.*, 2000 a) , Riyadh , Saudi Arabia (Al-Shammari *et al.*, 2001) , Bangladesh (Hosain *et al.*, 2003) , Turkey (Ulukanligil and Seyrek , 2003) . Ethiopia (Legesse and Erko , 2004) , Uganda (Mote *et al.*, 2005) and Oman (Patel and Khandekar , 2006) .

The environmental factors , such as worm climate , the moisture and relative humidity in addition to nature of soil and nature of water play an important role in the transmission of parasitic infection . The present study revealed that only protozoan parasites were detected and the absence of helminthic infection the same results was reported by Ibrahem

(2003) in a study of intestinal parasites among children and neonatus admitted Ibn-Sina Hospital in Sirt city , this may due to less use of human waste as a fertilizer in agriculture and low moisture soil in Sirt area . It was reported that the use of raw sewage and wastewater for agricultural purposes leading to high risks of parasitic infection has caused epidemic of hookworms and ascariasis in Nigeria (Akogun and Badaki , 1998) and in Morocco (Habbari *et al.*, 1999) .

The fecal specimens examination of children revealed that prevalence of seven protozoan parasite species were detected . Dar *et al.* (1979) found 10 species of intestinal parasites protozoan and helminthes among schoolchildren in Benghazi , El-Boulaqi *et al.* (1980) reported 5 protozoan and 5 helminth parasites among schoolchildren in Benghazi , and eight protozoan parasites were detected in schoolchildren by Raof (2002). eight intestinal parasites (5 protozoa and 3 helminths) were detected among primary schoolchildren in Derna district , Libya (Sadaga , 2006) , Ibrahem (2003) reported that 13 protozoan parasites among children and neonatus in Sirt city , El-Buni and Khan (1998) reported 4 protozoan intestinal parasites , Bugharara *et al.* (1999) found 4 protozoan parasites among children admitted in Al-Fateh children's hospital in Benghazi . According to previous studies 5 protozoan and 4 helminth parasites from Bendel state in Nigeria (Obiamiwe and Nmorsi , 1991) , Saygi *et al.* (1995) in Turkey reported two protozoan and one helminth parasites and 8 protozoan and 7 helminth parasites were reported from rural area in Tanzania (Gomez-Morales *et al.*, 1995) .

B. hominis was the most highly encountered parasite in this study with a prevalence of 17.9 % . This is consistent with the high infection rates , which have been reported for this parasite from children all over

the world , 25 % (Nimri , 1993) , 2.6 % (Kappus *et al.*, 1994) , 20.3 % (Nimri and Batchoun , 1994) , from Benghazi at 46.15 % (Raof , 2002) , from Sirt at 12.57 % (Ibrahem , 2003) , 45.2 % (Saksirisampant *et al.*, 2003) , 53.8 % (Graczyk *et al.*, 2005) and 26.5 % (Nascimento and Moitinho Mda , 2005) .

B. hominis commonly seen in stool of healthy and symptomatic individual (Sheehan , 1986) . Nimri and Batchoun (1994) reported that contaminated drinking water is suspected to be the source of infection with *B. hominis* . This parasite is thought to be conducted through travel since it has been reported in westerners traveling to the tropics (Sheehan *et al.*, 1986 ; Shlim *et al.*, 1995 ; Stenzel and Boreham , 1996) .

Infections due to intestinal protozoan parasites are common throughout the tropical and subtropical countries , posing serious public health problems in developing countries (WHO , 1986 ; Erko and Tedla , 1993 ; Legesse and Erko , 2004 and Mote *et al.*, 2005) . The high frequency of the protozoan infection may be due to the simple life cycles of these parasites and the simple way of transmission , specially in the presence of poor sanitary facilities , absence of clean water supply and take-away food from unhygienic places (Neva and Brown , 1994) .

B . hominis the causative parasite of Zierdt disease is common inhabitant of the human bowel and is now increasingly recognized a potential cause of diarrhea , infection is thought to be aquired through the fecal-oral route (Libre *et al.*, 1989 and Ok *et al.*, 1999) . On the other hand the pathogenicity of *B. hominis* is a controversial issue , some authors consider it to be a pathogen as reported (Libre *et al.*, 1989 ; Lee , 1991 and Ok *et al.*, 1997 , 1999) . Whereas others concluded that it is a

harmless commensal (Sun *et al.*, 1989 ; Boreham and Stwnzel , 1993 and Boreham *et al.*, 1992) .

The prevalence rate of *E. histolytica / E. dispar* in the present study was (14.8%) . The high prevalence rate of *E. histolytica / E. dispar* in the present study was in agreement with those studies in Benghazi (El-Boulaqi , 1980) , in Egypt (Mohamed *et al.*, 1985 ; Mohamed *et al.*, 1988 and Hassan , 1994) , in Ethiopia (Legesse and Erko , 2004) and in Palestine (Al-Zain and Sharma , 1999) .

The prevalence rate of *E. histolytica / E. dispar* in the present study was relatively high as compared to the results reported among schoolchildren from Benghazi . as 2.4 % (Dar *et al.*, 1979) and 3.25 % (Raof , 2002) . From Derna district as 6.6 % (Sadaga , 2006) , and from other parts of the world , 1.2 % students educational center in Sivas , Turkey (Saygi *et al.*, 1995) , 1 % among children in Roxas city , Philippines (Bong-Jin *et al.*, 2003) low prevalence rate also reported in Benin city , Nigeria (Obiamiwe , 1977) , Egypt (Mandour , 1978) , in Bendel state , Nigeria (Obiamiwe and Nmorai , 1991) and in Serbia (Nikolic *et al.*, 1995) .

E. histolytica / E. dispar is the causative agent of amoebiasis , responsible for up to 100,000 deaths per/year and estimated that 40-50 million individuals have amoebic colitis and liver abscess (WHO , 1981 : 1987 : 1993 and Clark , 1998) . Amoebiasis is a potentially fatal disease in human . it infects individuals of all ages but had a major impact in adults (Farthing *et al.*, 1996) .

The prevalence rate of *G. lamblia* reported in the present study was 9.9 % , lower than previous result in Benghazi as 44.4 % among children of closed communities (Dar and Friend , 1979) , 17.52 % among primary schoolchildren in Benghazi (Raof , 2002) and 12.7 % among primary schoolchildren from Derna district (Sadaga , 2006) . This parasite was the most frequent seen in stool of children from Riyadh , Saudi Arabia (28.57%) (Ahmed and El-Hady , 1989) ; Abha 10.9 % (Ahmed *et al.*, 1990 and Omer *et al.*, 1991) ; northern Jordan 36 % (Nimri , 1994) ; Benghazi 6.24 % (El-Buni and Khan , 1998) ; 5.85 % (Bugharara *et al.*, 1999) ; USA (1.5-20 %) (Markell *et al.*, 1999) ; Palestinian , Gaza city 62.2 % (Yassin *et al.*, 1999) ; Gaza , Palestine 64.0 % (Al-Wahaidi , 1997) and 62.0 % (Shubair *et al.*, 2000) .

The mode of transmission of *G. lamblia* may be direct by ingestion of faeces or indirect through drinking of contaminated water or ingesting of contaminated food (Neva and Brown , 1994) . *G. lamblia* may cause acute or chronic diarrhea , steatorrhoea , malabsorption of fat and weight loss (Benenson , 1990) . Ahmed (1991) and Ahmed *et al.* (1990) reported that there was a significant association between infection with *G. lamblia* and low haemoglobin level . Giardiasis consider one of the major causes of traveler's diarrhea (Markell *et al.*, 1999) . WHO (1987 and 1993) estimated that 200 million individuals infected with giardiasis .

The prevalence rate of *I. belli* in the present study was 4.8 % . Previous studies reported the prevalence rates among children at 0.5 % in Argentine (Borda *et al.*, 1996) , 0.26 % in Kimberley (Meloni *et al.*, 1993) , < 1 % in the Niger Delta (Arene and Akabogu , 1996) , 3.14 % in Sirt city (Ibrahem , 2003) . *I. belli* is a parasite of the columnar epithelial cells of small intestine , may cause diarrhea associated with abdominal

pain (Neva and Brown , 1994) . Diarrhoea-related to this parasite in HIV patients is common in Africa (13 %) (Farthing *et al.*, 1996) .

Non-pathogenic protozoan parasites reported in the present study were *E. coli* , *E. nana* , and *I. butschlli* .The study of non-pathogenic intestinal parasites are important as epidemiological indicator of the level of fecal contamination (Hammouda *et al.*, 1986) . The prevalence of *E. coli* (2.9 %) was relatively low when compared to previous reports 9.65% among schoolchildren from Benghazi (Raof , 2002) ; chile 45 % (Biolley *et al.*, 1990) ; Argentine 27 % (Borda *et al.*, 1996) ; Southern Sudan 37.8% (Magambo *et al.*, 1998) ; Northern Thailand 25.8 % (Wailkagui *et al.*, 2002) and Nigerian 53.3 % (Adekunle and Lola , 2002) . However , high prevalence rate was reported at 15.14% among children and neonatus admitted Hospital in Sirt city (Ibrahem , 2003) .

E. nana and *I. butschlli* were detected at low prevalences 2.2 % and 1.0 % respectively , the former parasite was reported among schoolchildren at 2.5 % in Northern Thailan (Wailkagul *et al.*, 2002) and 33.33 % in chile (Biolley *et al.*, 1990) and 64.3 % in Zambia (Graczyk *et al.*, 2005) . The second was reported as 1 % in Philippines (Bong-Jin *et al.*, 2003) 3.2 % in Kampongcham , Korea (Lee *et al.*, 2002) and 0.1 % in Northern Thailand (Wailkagul *et al.*, 2002) .

5.1.1 Prevalence and sex :

The overall prevalence of intestinal protozoan parasites among males and females reported in the present study was 22.8 % and 14.9 % respectively . No significant differences was exist between prevalence and sex . Which agreed the results reported by Dar *et al.* (1979) ; El-Boulaqi *et al.* (1980) ; Robertson *et al.* (1989) and Raof (2002) as well as

from other parts of the world (Coskun , 1991 ; Al-Eissa *et al.*, 1995 ; Devera *et al.*, 1997 ; Rivero-Rodriguez *et al.*, 2000 ; Yong *et al.*, 2000 ; Quadros *et al.*, 2004 and Champetier de Ribes *et al.*, 2005) . The present study shown that infection in males was slightly higher than females , this may due to males have fewer restrictions than females whose leisure house are strictly controlled (Akogun and Badaki , 1998 ; Agha Rodina and Teodorescu , 2002 and Ibrahem , 2003 ; Suwansaksri *et al.*, 2005) .

5.1.2 Prevalence and age :

The present study showed all age groups were infected . This suggests children of all ages are susceptible to parasitic infection . The minimum prevalence of parasites was discernible in old age group , this may due to the develop of immunity to infection . The absence of the difference in the prevalence between age groups was reported previously (Dar *et al.*, 1979 ; Rajaá *et al.*, 2000 and Raof , 2002 and Ijagbon and Olagunju , 2006) other previous studies (Alakija , 1986 ; Yong *et al.*, 2000 and Shubair *et al.*, 2000) . On the other hand similar results in age and prevalence of intestinal parasites was found statistically significant (El-Boulaqi *et al.*, 1980 ; Robertson *et al.*, 1989 and Devera *et al.*, 1998 and Basam and Adnan , 2005) . Infection in early ages of children has been reported by Golinska *et al.* (1997) and Mahfouz *et al.*, 1997) .

5.1.3 Prevalence and seasons :

The present study revealed that high prevalence in February and April and minimum prevalence in November and December . There was a significant relationship between the prevalence in different months during the study (P = 0.001) . Obiamiwe (1977) reported that the intestinal parasitic infection had peaks in summer which coincided with the

housefly season . suggesting contaminative transmission by filth flies as well as by contaminated water and food .

5.1.4 Prevalence of single and mixed infection :

The present study revealed that 26.3 % and 11.4 % of infection were single and mixed infection respectively . Mixed infection of intestinal protozoan parasites appear to be a characteristic of parasitic infections . Single and mixed prevalence has been reported by various workers (Dar *et al.*, 1979 ; Omar *et al.*, 1991 ; Lee *et al.*, 2000a ; Erosie *et al.*, 2002 ; Waikagul *et al.*, 2002 ; Dada and Erinle , 2004 and Okyay *et al.*, 2004) . Single and mixed infection were higher in males than females . this may explained that the males are more exposure to infection than females . The combination *E. histolytica / E. dispar* with other two parasites was higher in both sexes than other parasites followed with *B. hominis* and *G. lamblia* , the same association was detected in other parts of the world , Saudi Arabia (Al-Fayez and Khogheer , 1989) in Abha (Omar *et al.*, 1991) ; northern Jordan (Nimri , 1993) ; Venezuela (Devera *et al.*, 1997).

5.1.5 Prevalence and educated background of the children parents :

In the present study prevalence of infection in educated children parents was higher than those who their parents were uneducated , while those children had one educated parent showed less prevalence than those who their parents were educated . This finding may explained by educated parents were a ware of the precaution of infection . The influence of educational background of the parents on the infection rates was reported by Dar *et al.* (1979) , Raof (2002) and Ibrahem (2003) .Omar *et al.* (1991) and Nematian *et al.* (2004) reported that low level of education effect on the parasitic infection . The relation between a child's health and the mother's education is well known . Health indicators of

children whose mother's education level is lower are always worse (Ozer and Aksoy , 1999) . The important of parent's education and its level seems to help in decreasing the prevalence of parasitic infection and play an important role in protection of the resident . Because education of parents make them and their children a ware from the sources of infection (Basam and Adnan , 2005) .

5.1.6 Family size and infection :

The present result revealed that the infection with parasites did not associated with family size of schoolchildren (P = 0.140) . Previous studies revealed that the infection increase with the family size increased and bed rooms in a house decreased (Chacin-Bonilla *et al.*,1993 ; Nimri , 1993 ; Rajeswari *et al.*, 1994 ; Solorzano-Santos *et al.*, 2000 Taamasri *et al.*, 2000 ; Basam and Adnan , 2005 and Sadaga , 2006) .

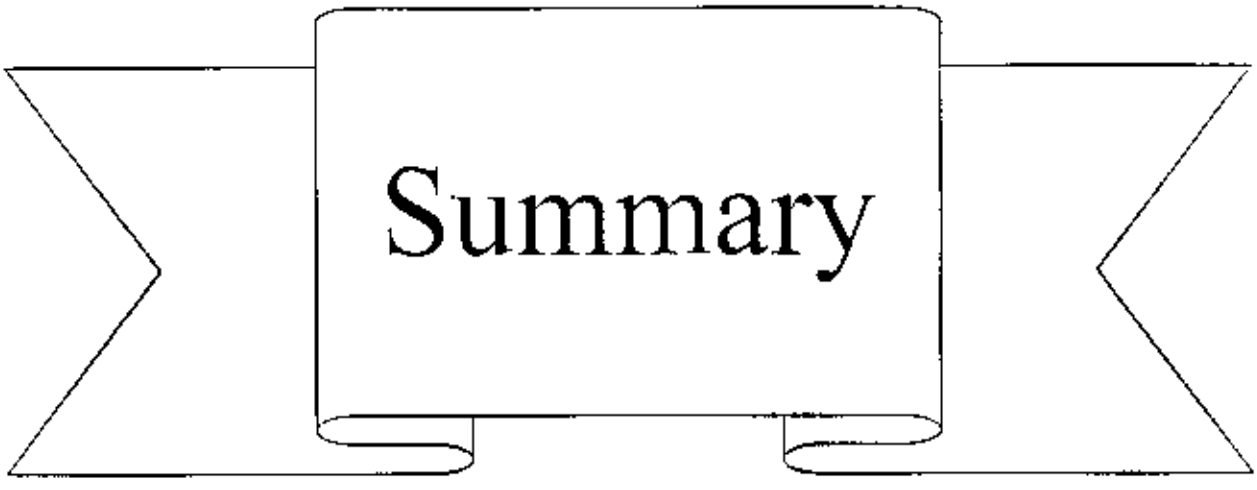
5.1.7 Nationlity and infection :

Differences in infection between Libyan and non-Libyan children were statistically insignificant (P = 0.368) . This may due to the small sample of non-Libyan . This agreed with results reported in Sirt city (Ibrahem , 2003) . However , the nationality was associated with the intestinal parasitic infection in Saudi and non-Saudi children (Al-Shammari *et al.*, 2001) and Yemeni children (Omar *et al.*, 1991) .

5.1.8 Socio-economic status and infection :

The present study revealed that high infection (31.6 %) in children from low socio-economic status than those from high socio-economic status . this agreed with observation reported by (El- Boulaqi *et al.*, 1980; Rajeswari *et al.*, 1994 ; Nimri , 1994 ; Yassin *et al.*, 1999 ; Ibrahem, 2003 and Sadaga , 2006) . Zakai (2004) reported that increased family income

has no significant role in the health status of children . Poor socio-economic of families appear to powerful determinate of infection (Nematian *et al.*, 2004) .


Summary

6. SUMMARY

Protozoan intestinal parasitic infections are among the most common infection in the world , being responsible for considerable morbidity and mortality . Intestinal parasitic infections are highly prevalent in developing countries, mainly due to deficiency of sanitary facilities . unsafe human waste disposal systems . inadequacy and lack of safe water supply . and low socio-economic status . In general the prevalence of parasitic diseases is an indication of environmental conditions .

This study is the first as a community based study for the estimation the prevalence of intestinal parasites among schoolchildren of Sirt- Libya. The aim of this study was to assess the prevalence and types of intestinal parasites among primary schoolchildren found in eight primary schools in different district authorities of Sirt city . Then made a detailed comparison on the distribution pattern of these parasites among these children and determine the effect of risk factors on the prevalence of parasitic infection .

One thousand , five hundred and forty eight stool specimens of primary schoolchildren (905 males and 643 females) from Sirt city were examined during the period from November to April 2004 . to determine the prevalence of protozoan intestinal parasites .

The stool specimens was examined by two corprological techniques: (1) direct smear examination using normal saline and iodine solution . (2) sedimentation method (Formalin-Ethyl Acetate method) to detect all cysts an trophozoites of protozoa and helminthes eggs and larvae that are frequently discharged in human faeces .

Parasitic infection was identified in 583 (353 males and 230 females) giving an overall prevalence of 37.7 % .

Seven intestinal protozoan parasites were found in the namely *E. histolytica / E. dispar*, *E. coli* , *E. nana* , *I. butschlii* , *G. lamblia* , *B. hominis* and *I. belli*. No helminth intestinal parasites were detected .

The most common pathogenic protozoan parasite was *B. hominis* with the highest prevalence at 17.9 % followed by *E. histolytica / E.dispar* (14.8%) . *G. lamblia* (9.9 %) and *I. belli* (4.8 %) . Among non-pathogenic protozoan parasites , highest prevalence was detected for *E. coli* (2.9 %) followed by *E. nana* (2.2 %) and *I. butschlii* (4.8 %) . The apparent differences in overall prevalence were statistically significant for each parasite (P = 0.000) . No such differences were noted in *B. hominis* (P = 0.246) .

Both sexes were infected with intestinal protozoan parasites the overall prevalence was 35.7 % in males and 26.7 % in females . *B. hominis* had the highest prevalence in both sexes with 11.2 % in males and 6.7 % in females . Sex-wise prevalence showed 19.1 % and 16.2 % in males and females respectively . Overall prevalence of *E. histolytica / E.dispar* was 9.2 % in males and 5.6 % in females , while sex-wise showed 15.7 % and 13.5 % in males and females respectively . *G. lamblia* was detected in 6.3 % of males and 3.6 % of females , sex-wise was 10.8 % for males and 8.7 % for females . Significant relationship was exist between overall prevalence and sexes for *B. hominis* . *E. histolytica/ E. dispar* . and *G. lamblia* (P = 0.000) .

Age had no effect on the prevalence of intestinal parasites (P = 0.236) *B. hominis* showed high prevalence in all age groups followed by *E. histolytica /E. dispar* , *G. lamblia* and *I. belli* low prevalence was detected in *I. butschlii* .

The general prevalence was higher in February (9.2 %) followed by April (8.6 %) and March (7.0 %) , the minimum prevalence in November (4.1 %) and December (3.1 %) . There was a significant relationship between the prevalence of intestinal parasites and months (X^2 = 20.813 ; P > 0.05 ; df = 5 ; p-value = 0.001) .

Single infection was detected in 26.3 % and 11.4 % in mixed infection . There was a significant differences between single and mixed infection (P = 0.000) .

The parasitic infection appeared to vary with the educational status of children parents . Significant differences were exist between the overall prevalence and educated background of the parent's children (P = 0.028) children , whose parents were educated show higher prevalence 15.8 % than those children had one educated parent (11.3 %) . Significant differences were detected in the prevalence between educated parents and non-educated parents (P = 0.006) .

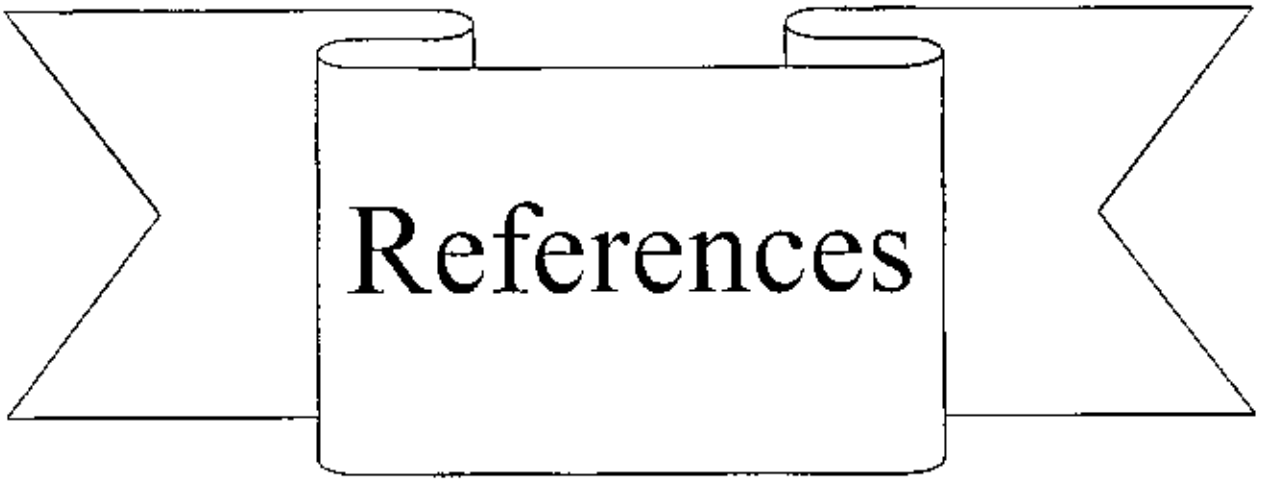
The results revealed that the infection with parasitic infection did not associated with family size of schoolchildren . High infection rate (12.5 %) was found among children their family size 4 – 6 followed by 7 – 9 family size (12 %) and those > 10 family size (9.6 %) . No significant differences were exist between the prevalence of parasitic infection and family size of children (P = 0.140) .

The prevalence of infection in Libyan children was 35.3 % and non-Libyan was 2.4 % . Differences in infection between Libyan and non-Libyan children were statistically insignificant (P = 0.368) .

The schoolchildren who have body weight (15 – 25 kg) showed high prevalence of infection (17.6 %) followed by children body weight (26 - 35 kg) at 13.8 % and children body weight (36 – 46 kg) at 4.8 % . However . low prevalence rate (1.5 %) was detected among those children with their body weight > 46 kg .

The results revealed that the prevalence decrease with family salary income increase . High prevalence (31.6 %) was detected among those children with family income of their parent between 151 – 300 dinars . While it was 0.3 % among those children whose parents have salary income > 501 dinars/month .

Differences in prevalence of infection within the different districts was highly significant (P = 0.000) , the same trend was detected between prevalence and schools (P = 0.000) .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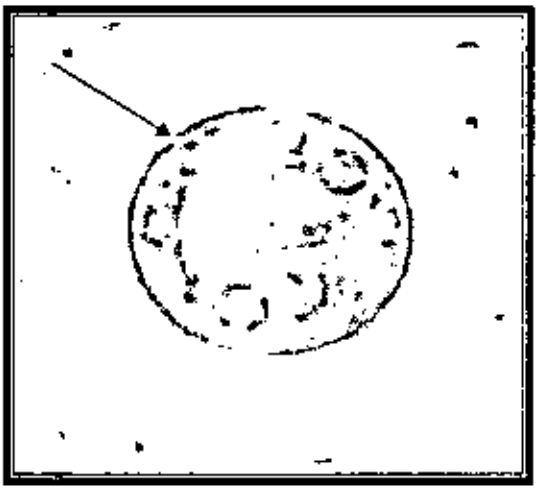
Plates

(A)



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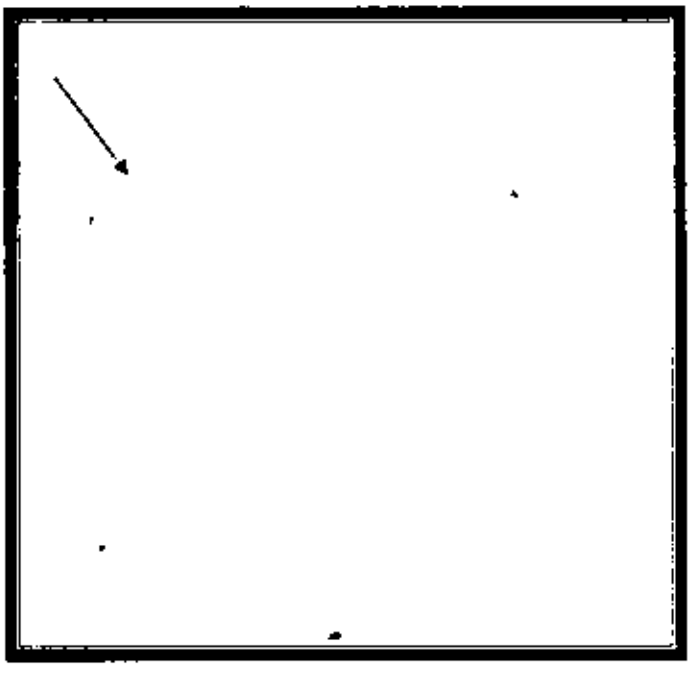

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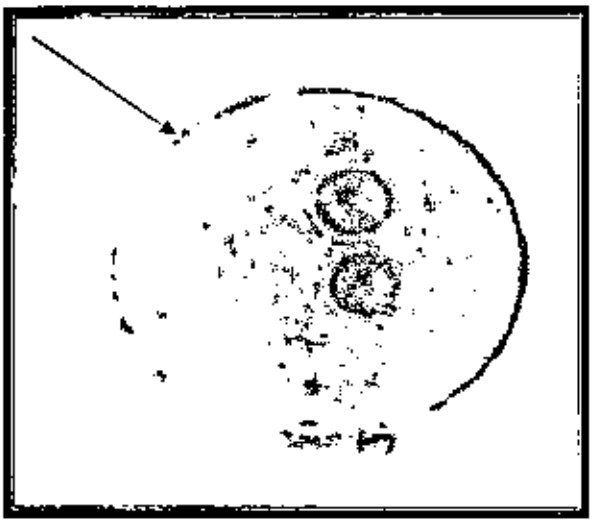

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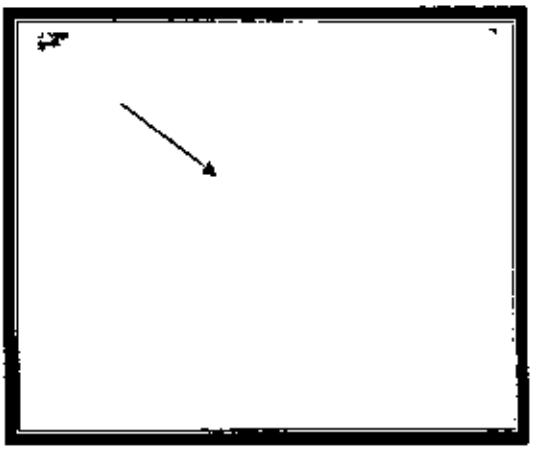

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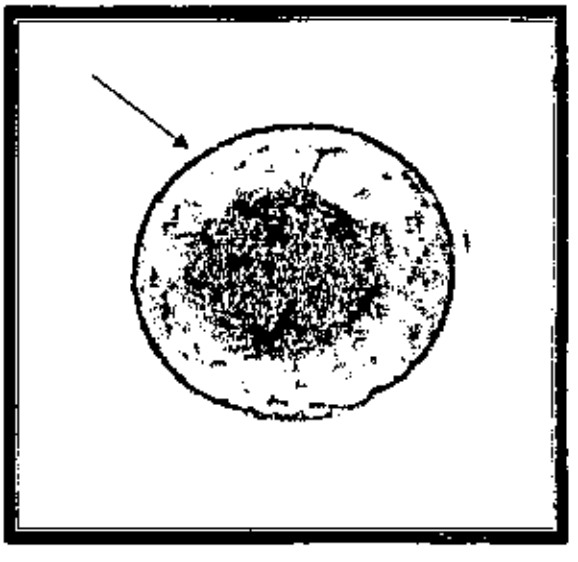

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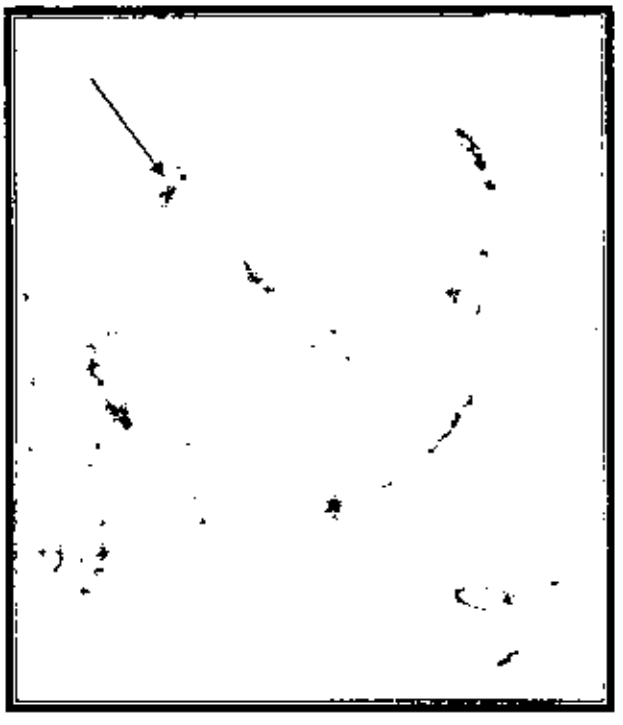

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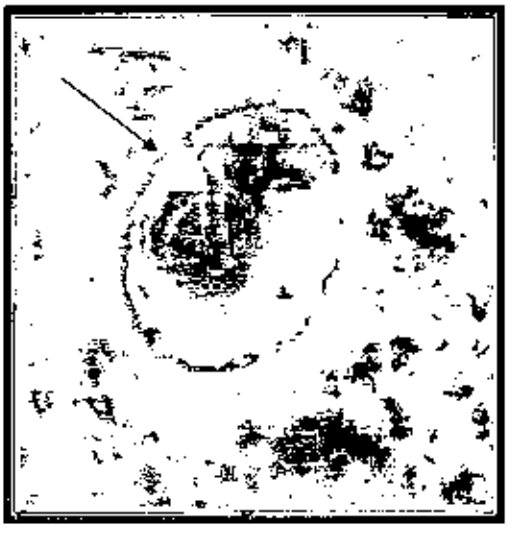

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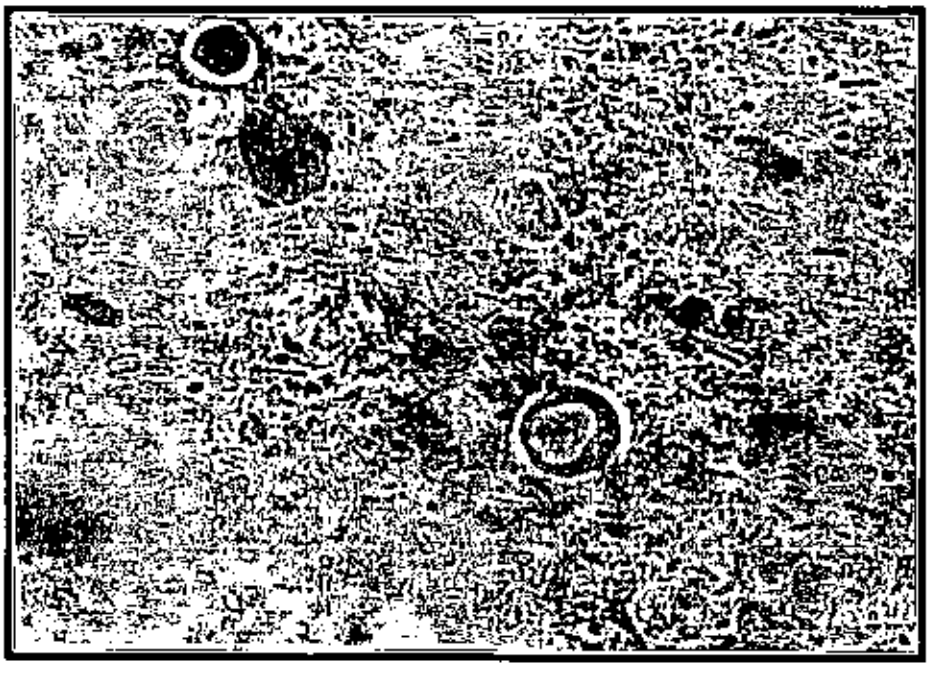

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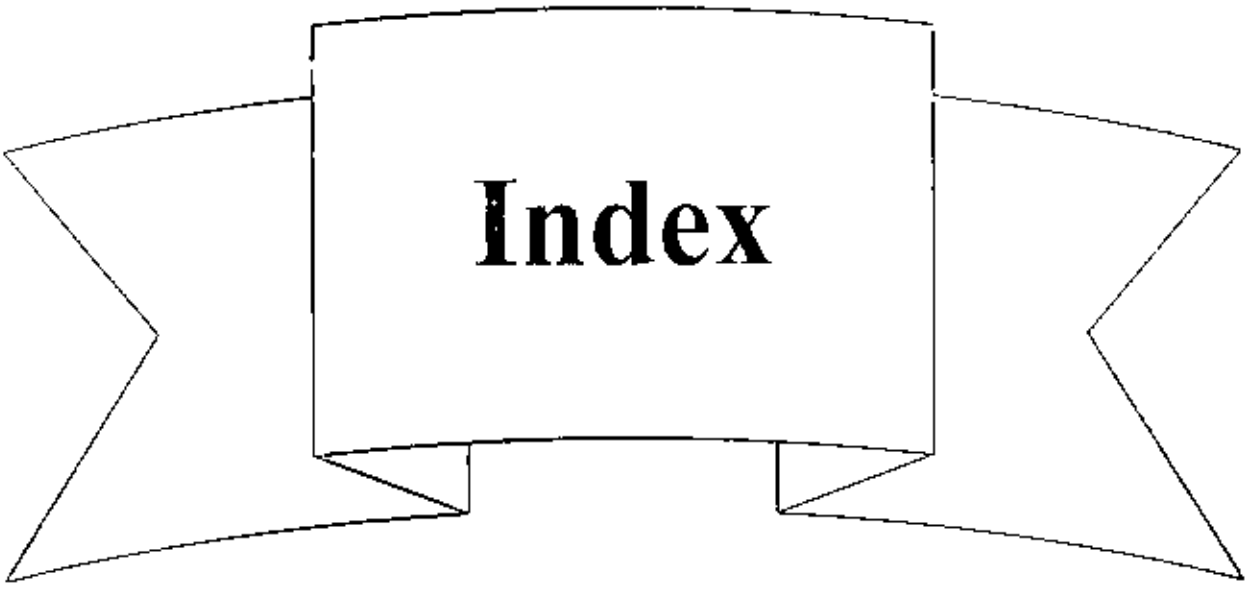
Index

INDEX

Questionnaire:

Data collected using the questionnaire:

Personal Data:

1- Name of child ..... . 2- Age of child ..... .

3- Sex / Male( ). Female( ) .

4- Height of child ..... . 5- Body weight of child ..... .

6- Nationality ..... . 7- Address ..... .

Socioeconomic status such as:

1- Family size ..... . 2- Family income per month ..... .

3- Occupation ..... . 4-Educated background of parents.

Dietary Data:

The daily consumption of various food .....

.....

.....

Have you any health habits Yes ..... No .....

Have you any domesticated animals Yes ..... No.....

Social Conditions:

A- Upper strata ( ). B- Middle strata ( ). C- Lower strata ( ).

Diagnosis :

1-Clinical diagnostics

.....

.....

.....

.....

.....

Laboratory diagnostic:-

Macroscopic Examination :

1- Cross and physical examinations :

A- Consistency degree of moisture:

a- Formed( ) b- Semi-formed ( ) c- Liquid ( ) d- Loose ( )

e- Hard ( ).

B- Colour :

a-Black b- Brown c- Yellow d- yellowish-brown

e- Bright-red f- Green g- Clay coloured .

C- Mucous +ve -ve **D- Blood** +ve -ve

E- Adult parasite +ve -ve

2- Chemical Examination :

a- Reaction PH **b- Occult Blood** +ve -ve

Microscopic Examination :

1- Non parasitic cell:

1- Pus cell	+ve	-ve	7- Crystals	+ve	-ve
2- Epithelial cells	+ve	-ve	8- Calcium oxalate	+ve	-ve
3- Erythrocytes (R.B.Cs)	+ve	-ve	9- Fat	+ve	-ve
4- Macrophages cells	+ve	-ve	10- Starch	+ve	-ve
5- Mucosis	+ve	-ve			
6-Vegatable matter	+ve	-ve			

B- parasites :

1- Direct smear

Positive	Trophozoite	Cyst	Helminthes			Negative
			Adult	Eggs	Larva	

2- Centrifugation:

Sedimentation method

Positive	Trophozoite	Cyst	Helminthes			Negative
			Adult	Eggs	Larva	

الخلاصـــــة باللغة العربية

الخـــلاصـــة

لا تزال العديد من المجتمعات في العالم تعاني من الإصابة بالطفيليات المعوية نظرا لتأثيرها على الحالة الصحية العامة خصوصا فيما يتعلق بصحة الأطفال وما يترتب عليها من أعاقة النمو وسوء التغذية. ولهذا كان من الواجب دراسة مدى تواجد الطفيليات وانتشارها في المجتمع . عليه فإن الدراسة الحالية تستهدف تحديد مدى انتشار الطفيليات المعوية الممرضة والغير الممرضة بين تلاميذ المدارس الابتدائية الموزعين خلال مؤتمرات شعبية مختلفة في مدينة سرت.

تم فحص ما مجموعة 1548 عينة براز من تلاميذ المدارس الابتدائية (905 ذكور ، 643 إناث) الموزعين في مؤتمرات مختلفة في مدينة سرت ، ذلك في الفترة من نوفمبر 2003 ف إلي أبريل 2004 ف ، لتحديد معدل انتشار الطفيليات المعوية بين هؤلاء التلاميذ .

اعتمدت الطرق المستخدمة في هذه الدراسة للكشف عن تواجد الطفيليات المعوية في عينات البراز بين تلاميذ المدارس الابتدائية على :

أ . الفحص المباشر لمسحة من البراز باستخدام المحلول الملحي الفسيولوجي و محلول الأيودين .

ب – استخدام تقنية الترسيب (Formalin Ethyl Acetate) Sedimentation .

دلت نتائج فحص 1548 عينة عن وجود سبعة أنواع في 583 (37.7 %) وهي :

E. histolytica / E.dispar ، *E. coli* ، *G. lamblia* ، *B. hominis* ، *E. nana* ، *I. butshlli* ، *I. belli* .

يعتبر كلا من الطفيليات الآتية : *E. histolytica / E.dispar* ، *G. lamblia* ، *I. belli* ، *B. hominis* من الأوليات الطفيلية الممرضة ، أما *E.dispar* وباقي الأوليات الطفيلية المعوية الثلاثة الأخرى غير ممرضة .

كما أظهرت النتائج عدم وجود ديدان معوية . طفيلي *B. hominis* سجل أعلى معدل انتشار (17.9 %) مقارنة مع الأوليات الطفيلية المعوية الأخرى ثم الطفيليات *E.histolytica /*

E.dispar (14.8%) ، *G. lamblia* (9.9 %) وأخيرا طفيلي *I. belli* (4.8 %) . أما الأوليات الطفيلية المعوية الغير ممرضة ، وقد كانت *E. coli* (2.9 %) ، *E. nana* (2.2 %) و *I. butschlii* (1.0 %) . وكانت هناك إختلافات معنوية بين المعدل العام للطفيليات وكل طفيلي (P = 0.000) عدا *B. hominis* (P = 0.246) .

أظهر معدل الانتشار للأوليات الطفيلية المعوية في الجنسين (905 ذكور و 643 إناث) لكل من الأطوار الخضرية و / أو المتكيسة للأوليات الطفيلية المعوية في عينات البراز للتلاميذ . أظهرت وجود معدلات عالية من طفيلي *G. lamblia* , *E. histolytica / E.dispar* . ويليها إنتشار متوسط للطفيليات *E. coli* , *I. belli* في الذكور والإناث ، في حين أن معدل انتشار باقي الأوليات الطفيلية الأخرى منخفض في الجنسين . ولم يكن هناك إختلافات معنوية في التلاميذ بين الجنسين (P = 0.368) .

لقد كان انتشار الأطوار الخضرية و / أو المتكيسة للأوليات الطفيلية المعوية في المجموعات العمرية المختلفة للتلاميذ عاليا في الفئة العمرية 6 – 7 سنوات ، يليها التلاميذ من الفئة العمرية 8 – 9 سنوات ، ثم الفئة العمرية 10- 11 سنوات ، أما التلاميذ من الفئة العمرية أكثر من 11 سنة قد سجلت أدنى معدل انتشار للأوليات الطفيلية المعوية . هناك عدم وجود فروق معنوية في نسبة إنتشار الأوليات الطفيلية المعوية بين المجموعات العمرية المختلفة (P = 0.236) .

أما فيما يتعلق بنسبة الإنتشار في كل شهر أثناء الدراسة فقد كانت في أعلى معدلاتها خلال شهر نوفمبر ، فبراير ، أبريل ، مارس . ويليها بنسبة أقل خلال شهر يناير . كان هناك إختلافات معنوية تبعاً لإختلاف شهور السنة ($X^2 = 20.813$; $P > 0.05$; $df = 5$ p-value = 0.001) .

أظهرت النتائج أن 26.3 % (407 / 1548) من الحالات المفحوصة كانت مصابة بالأوليات الطفيلية المعوية في حالة إصابة مفردة (إصابة بطفيلي واحد) ، 11.4 % (176 / 1548) تلميذ مصاب بأكثر من طفيلي. وكان هناك إختلافات معنوية بين الإصابات الفردية والمختلطة (P = 0.03) .

إن أعلى معدل انتشار للأوليات الطفيلية كان لدى التلاميذ من أبوين متعلمين ، وأن أقل معدل انتشار سجل في التلاميذ من الأبوين الغير متعلمين ، حيث لا توجد اختلافات معنوية بين المعدل العام والمستوى التعليمي للأبوين (P = 0.06) . وكانت أعلى نسبة انتشار سجلت بين التلاميذ من العائلات ذات الدخل المادي الأدنى وأقل نسبة بين التلاميذ من العائلات ذات الدخل المادي العالي . كما تبين أن الدراسة لم تسجل أي اختلافات معنوية في نسبة انتشار الطفيليات بين التلاميذ وعدد أفراد الأسرة (P = 0.140) .

كانت نسبة انتشار الأوليات الطفيلية 35.3 % بين التلاميذ الليبيين ، 2.4 % بين التلاميذ غير الليبيين ، ولم تسجل الدراسة أي اختلافات معنوية في معدل الاصابة بين التلاميذ الليبيين وغير الليبيين (P = 0.251) .

أظهر إنتشار الأوليات الطفيلية المعوية في أعلى معدلات بين التلاميذ ذات الأوزان ذوي 15 – 25 كيلوجرام ، يليه 26 – 35 كيلوجرام ، في حين أن أقل إنتشار سجل بين التلاميذ ذوي الأوزان 36 – 45 وأكثر من 46 كيلوجرام . وقد كان هناك وجود اختلافات معنوية بين نسبة إنتشار الأوليات الطفيلية المعوية وأوزان التلاميذ .

سجلت أعلى معدلات انتشار للأوليات المعوية الطفيلية بين التلاميذ الموزعين في مؤتمرات الفاتح وخليج سرت وأقل إنتشار في مؤتمر سرت المركز ومؤتمر الرباط ، مع وجود اختلافات معنوية بين نسبة انتشار الطفيليات المعوية وعدد المؤتمرات (P = 0.000) .

لقد توصلت نتائج هذه الدراسة ضمن إطار التأثيرات المتداخلة الشاملة للعوامل المؤثرة على مدى انتشار الطفيليات المعوية واستنتج أنه من الضروري القيام بمثل هذه الدراسة على فترات مناسبة ، وتحسين الظروف الصحية للبيئة المحيطة ، والتأكيد على الحاجة لخلق مجتمع ذو ثقافة صحية عالية لتجنب الإصابة بالطفيليات والعوامل الممرضة الأخرى .

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قســـــم الأحيـــــــاء

عنـــوان البحـــث

((دراســة معــدل انتشــار الطفيليــات المعــوية فــي أطفــال المــدارس الابتــدائية فــي مدينــة ســرت -ليبيــا))

مقدمـــة مـــن الطـــالب

فاطمـــة عبـــد الله السنـــوسي عمـــر

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(مشـــرف الرســـالـــة)

الدكتور / فهيمـــة حامـــد عمـــام 06/12/5
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(ممتحـــن خارجـــي)

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دراسة معدل انتشار الطفيليات المعوية في أطفال المدارس الابتدائية في مدينة سرت – ليبيا

أطروحة مقدمة كجزء من متطلبات الأجازة العليا (الماجستير) في العلوم

مقدمة من الطالبة

فاطمة عبد الله الســـــــــنوسي عمر

أشراف

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