

PREVALENCE OF INTESTINAL PARASITIC INFECTION AMONG PRIMARY SCHOOL CHILDREN IN SIRT-LIBYA

Hamed H. Kassem*; **Sedigh A. Nass**** and **Fatma A. El-Sanousi*****

* Faculty of Science, Benghazi University, Benghazi , Libya.

** Faculty of Science, Tripoli University, Tripoli, , Libya.

*** Faculty of Science, Sirt University, Sirt, Libya.

ABSTRACT

*This study was carried out to determine the prevalence of intestinal parasitic infection in primary school children in eight primary schools in Sirt city, Libya. One thousand, five hundred and forty eight feacal samples (905 males and 643 females) were examined using direct smear method and formol-ether concentration technique to determine the prevalence of intestinal parasites. Out of the number examined, 583 (37.7 %), comprising 353 (39%) males and 230 (35.8%) females were infected. Seven intestinal protozoan parasites were found. No helminth intestinal parasites were detected. The most common protozoan parasite was *B. hominis* with the highest prevalence at 17.9 %, followed by *E. histolytica* / *E. dispar* (14.8%), *G. lamblia* (9.9%), *I. belli* (4.8 %), *I. butschlii* (0.97%), *E. coli* (2.9 %) and *E. nana* (2.2 %). Sex-wise prevalence showed 19.1% and 16.2 % in males and females respectively. Overall prevalence of *E. histolytica* / *E. dispar* was 9.2 % 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 parasite ($P = 0.236$). Single infection was detected in 69.81 % and 30.19 % mixed infection of positive cases.*

There was a significant difference between single and mixed infection ($P= 0.000$).The parasitic infection appeared to vary with the educational status of children parents. Also, associated with family size of children. The children who have body weight (15 – 25 kg) showed high prevalence (17.6 %), followed by body weight (26 - 35 kg) (13.8 %). However, low prevalence (1.5 %) at body weight >

46 kg. The results revealed that the prevalence decrease with family salary income increase.

Key words: Prevalence, intestinal parasites, primary school children, Sirt, Libya.

INTRODUCTION

Intestinal parasitic infections are the major diseases of public health problems in many countries. Although many advanced studies have been done in this field. 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, low literacy rate, poor hygiene and sanitation, lack of public water supply, lower socio-economical groups, an inadequate environment condition and over-crowding prevail.

Children are more susceptible to parasitic 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 (Fabiana and Carolina, 2002). 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). Few studies have been done on the prevalence of intestinal parasitic infection in Libya (Dar *et al.*, 1979; El-Boulaqi *et al.*, 1980; Bugharara *et al.*, 1999 and Raof, 2002). There are still several localities in the country for which parasitic infection 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 present study aimed to estimate prevalence and types of intestinal parasitic infections in primary schoolchildren of Sirt city, and investigate the relationships between parasitic infection and demographic, behavioral, socio-economic and environmental factors associated with the parasitic infection.

MATERIALS AND METHODS

Area of study : Sirt city is located on the Mediterranean coast. It's a far of 480 Km east of the Libya's capital "Tripoli" (It is occupying an area of approximately 69 Km² with an average of population 140.000. Sirt has Mediterranean climate with moderate winter and hot summer, the relative

humidity ranges from 67 to 71%. The average monthly temperature during the winter ranging from 10 to 17°C, and may reach 25 to 40°C in the summer. The average annual rainfall exceeds 253 mm.

Collection of stool samples: A cross-sectional descriptive study was conducted among school children studying at public school in Sirt city, from June 2005 to May 2006. 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.

School visits and distributed package: Each child was given a sealed plastic bag containing a covering letter, a questionnaire, which contain the possible risk factors and a 20-ml disposable screw-capped universal container and applicator sticks. Children were asked by their class mistress to deliver the bags to their parents and was asked to provide a stool sample on the next day. At the second visit, the containers were collected. From each student, about 2g of fresh stool was collected. A portion from each of the stool samples was processed with a direct microscopic technique. The remaining part of the samples were preserved in 10% formalin solution. Stool examinations were performed using the formol-ether concentration technique according to Zeibig (1997) and Markell *et al.* (1999). The findings were analyzed statistically using the Chi-square test.

RESULTS

Prevalence: The results showed 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 males and 230 females) giving an overall prevalence of 37.7%. The results revealed that no helminth intestinal parasites were detected, and only seven intestinal protozoan parasites were recorded. The most common protozoan parasite was *B. hominis* with the highest overall prevalence of 17.9% followed by *E. histolytica / E. dispar* 14.8%, *G. lamblia* 9.9%, *I. belli* 4.8%, *E. coli* 2.9% and *E. nana* 2.2%, whereas *I. butschlii* recorded of low prevalence rate, 0.97% (Table 1).

Prevalence and sex: Infection was detected in both sexes. Out of the total positive cases, males constituted 353 (39%) and females 230 (35.8%) (Table 2). *B. hominis* showed the highest prevalence among both sexes. Among males was 19.1% and females was 6.7% when tabulated sex-wise, the percentage of prevalence was 19.1% and 16.2% 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). *E. histolytica / E. dispar* was detected

in 9.2 % of males out of 1548, whereas among females was 5.6 %. Sex-wise prevalence of this parasite was 15.7% (142 out of 905) and 13.5 %, (87 out of 643) for males and females, respectively. There was a significant relationship between overall prevalence and each of males and females ($P = 0.000$), the same finding was noted between both sexes ($P=0.000$) as shown in Table 3.

Prevalence of single and mixed infection: The stools of 69.81 % (407 out of 583) of infected children showed a single infection and 30.19 % (176 out of 583) contained more than one parasite (mixed infection) in different combinations. The data revealed that there was a significant differences between single and mixed infection ($P=0.000$) as shown in Table 4.

Prevalence and age: The results revealed that the prevalence decrease with increase of age. Age had no influence on the prevalence of intestinal parasites ($P = 0.236$). *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* as shown in Table 5.

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 ($P = 0.028$) as shown in Table 6.

Family size and infection: The results revealed that the infection with parasites associated with family size of school children. High infection rate (41.3 %) was detected among children their family size >10 followed by those 7 – 9 family size (39.8 %) and those 4-6 family size (35.3 %). On the other hand, lower prevalence rate of parasitic infection was found among those children have < 4 family size (30.57 %). No significant differences were exist between the prevalence of parasitic infection and family size of children ($P = 0.140$) as shown in Table 7.

Children body weight and infection: The results showed that there was a significant relationship between the prevalence of parasitic infection and body weight ($P = 0.021$) (Table 8).

Socio-economic status and infection: According to the relationship between the prevalence and socio-economic status (family income per month) of children parents, the results revealed that high prevalence (40.7 %) was detected in those children the salary income of their parents <150 Libyan diner / month. However, the prevalence decrease with family salary income increase, the low prevalence (14.8 %) was detected among those children whose parents have salary income > 501 diner/month (Table 9).

Table 1: Prevalence (%) of intestinal parasites in primary school children from Sirt:

Types of parasites	Out of total examined (N = 1548) (%)	Out of positive cases (N =583) (%)
<i>Blastocystis hominis</i>	277 (17.9%)	277 (47.5%)
<i>Entamoeba histolytica / E.dispar</i>	229 (14.8 %)	229 (39.3%)
<i>Giardia lamblia</i>	154 (9.9%)	154 (26.4%)
<i>Isospora belli</i>	74 (4.8 %)	74 (12.7 %)
<i>Entamoeba coli</i>	45 (2.9 %)	45 (7.7 %)
<i>Endolimax nana</i>	34 (2.2 %)	34 (5.8 %)
<i>Iodamoeba butschlii</i>	15 (0.97 %)	15 (2.6 %)

Table 2. Prevalence of intestinal protozoan parasites infection among males and females children from Sirt

Infections	Males (905)	Females (643)	Total
Negative	552 (61%)	413 (64.2%)	965 (62.3%)
Positive	353 (39%)	230 (35.8%)	583 (37.7%)
Total	905 (58.5%)	643 (41.5%)	1548

Table 3. Prevalence of intestinal parasites in males and females in primary school children from Sirt:

Types of parasites	Sex (N=1548)		Total
	Males (905)	Females(643)	
<i>E. histolytica / E.dispar</i>	142 (15.70%)	87 (13.50%)	229 (14.80%)
<i>Entamoeba coli</i>	25 (2.80%)	20 (3.10%)	45 (2.91%)
<i>Endolimax nana</i>	24 (2.70%)	10 (1.60%)	34 (2.20%)
<i>Iodamoeba butschlii</i>	11 (1.20%)	4 (0.62%)	15 (0.97%)
<i>Giardia lamblia</i>	98 (10.80%)	56 (8.71%)	154 (9.95%)
<i>Blastocystis hominis</i>	173 (19.11%)	104 (16.17%)	277 (17.89%)
<i>Isospora belli</i>	54 (5.96 %)	20(3.11%)	74 (4.8%)

Table 4. Overall prevalence of single and mixed infections of intestinal parasites in primary school children in Sirt:

Types of Infection	Number infected children	Percentage (%)
Single Infection	407	69.81 %
Mixed Infection	176	30.19 %
Total	583	100 %

Table 5. Prevalence of intestinal parasites in different age groups of primary school children from Sirt :

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

Table 6. Prevalence of intestinal parasitic infection according to educational background of their parents

Educational of parents	Number examined	Number Infected	Percentage of infected
Educated mother and father	723	240	33.2%
Non-Educated mother and father	385	170	44.2%
Educated father - Non-Educated mother	399	157	39.3 %
Educated mother - Non-Educated father	41	16	39%

Table 7. Prevalence of intestinal parasite according to family size of primary school children in Sirt:

Family size	Number examined	Number infected	(%)
< 4	157	48	30.6 %
4 – 6	539	190	35.3 %
7 – 9	465	185	39.8%
>10	387	160	41.3 %
Total	1548	583	37.7%

Table 8. Prevalence of intestinal parasites according to body weight of primary school children:

Body weight (g)	Number examined	Number infected	Percentage Of infected
15 -25	651	272	41.8 %
26 -35	612	218	35.6 %
36 – 45	204	70	34.3%
> 46	81	23	28.4%
Total	1548	583	37.7 %

Table (9): Prevalence of intestinal parasites according to socio-economic status (salary income) :

Salary income Libyan diner*	Number examined	Number Infected	Percentage Of infected
< 150	123	50	40.7
151 – 300	1267	480	37.9 %
301 – 500	131	45	34.4 %
> 501	27	4	14.8 %
Total	1548	583	37.7%

Libyan diner equal to dollar*

DISCUSSION

The prevalence of parasitic infection in the present study was higher (37.7 %) compared to previous studies in Libya, 12.2% (Al-Tawaty *et al.*, 1998), 12.88 % (El-Buni and Khan, 1998) and 31.9 % (Bugharara *et al.*, 1999) and 31 % (Sadaga and Kassem, 2007), and other countries, Saudi Arabia, 10.94% (Ahmed and El Hady, 1989) and Turkey, 31.8% (Okayay *et al.*, 2004), West Bank- Palestine, 22.2% (Hussein, 2011), Nigeria 25.5% (Uhuo *et al.*, 2011) and 34.2% Ethiopia (Gelaw *et al.*, 2013). In contrast, it was notably high studies conducted in Libya, 75.6% (El-Boulaqi *et al.*, 1980), 56.78 % (Raof, 2002), 56% (Ibrahem, 2003), Thailand, 68.1% (Waikagul *et al.*, 2002), Nigeria , 60% (Enekwechi and Azubike, 1994) and Nepal, 71.2% (Rai *et al.*, 2004).

Only protozoan parasites were detected and no helminthic infection ,the same results was reported by Ibrahem (2003), 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 helminth infection in Nigeria (Akogun and Badaki, 1998) and Morocco (Habbari *etal.*,1999. *Bastocystis hominis* was the most highly encountered parasite in this study with a prevalence of 17.9 % . This is consistent with previous studies (Raof, 2002, Ibrahem, 2003 and Nascimento and Moitinho, 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, especially in the presence of poor sanitary facilities , absence of clean water supply (Neva and Brown, 1994). The prevalence rate of *E. histolytica* / *E. dispar* in the present study was (14.8%) .This is in agreement with those studies in Libya (El-Boulaqi *et al.*, 1980), in Egypt (Hassan, 1994) and in Ethiopia (Legesse and Erko, 2004). However, this

prevalence was relatively high as compared to the previous results among school children, 2.4 % (Dar *et al.*, 1979), 3.25 % (Raof, 2002). 6.6 % (Sadaga and Kassem, 2007).

The prevalence of *G. lamblia* was 9.9 %, lower than previous result in Benghazi among children as 44.4 % (Dar and Friend, 1979) and 17.52 % Raof, 2002) and from Riyadh, Saudi Arabia (28.57%) (Ahmed and El-Hady (1989) ; Northern Jordan 36 % (Nimri, 1993), but higher than that reported in Benghazi 6.24 % (El-Buni and Khan, 1998); 5.85 % (Bugharara *et al.*, 1999). The prevalence of *I. belli* was 4.8 %. Previous studies reported the prevalence among children at 0.5 % in Argentine (Borda *et al.*, 1996), 0.26 % in Kimberley (Meloni *et al.*, 1993), 3.14 % in Sirt city (Ibrahim, 2003) .The prevalence of *E. coli* (2.9 %) was relatively low when compared to previous reports Libya, 9.65% (Raof , 2002) ; Argentine 27 % (Borda *et al.*, 1996) and Northern Thailand 25.8 % (Wailkagul *et al.*, 2002). *E. nana* and *I. butschilli* were detected at low prevalence 2.2 % and 1.0 % respectively, the former parasite was reported among schoolchildren at 2.5 % in Northern Thailand (Wailkagul *et al.*, 2002) and 64.3 % in Zambia (Graczyk *et al.*, 2005) . The second was reported as 1 % in Philippines (Bong-Jin *et al.*, 2003).

The infection among males and females was 39 % and 35.8 %, respectively. No significant differences were exist between prevalence and sex. Which agreed the results reported by Dar *et al.* (1979); El-Boulaqi *et al.* (1980) and Raof (2002) as well as from other parts of the world (Rivero-Rodriguez *et al.*, 2000; Yong *et al.*, 2000; Quadros *et al.*, 2004 and Champetier de Ribes *et al.*, 2005).

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 Ijagbone and Olagunju , 2006). On the other hand similar results in age and prevalence of intestinal parasites was found statistically significant (El-Boulaqi *et al.*, 1980 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). The present study revealed that 69.81 % and 30.19 % 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; Erosie *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) northern Jordan (Nimri, 1993); Venezuela (Devera *et al.*, 1997).

In the present study prevalence of infection in educated children parents was lower than those who their parents were uneducated, while those children had one educated parent showed less prevalence than those who their parents were uneducated. 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). 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 aware from the sources of infection (Basam and Adnan, 2005). The present result revealed that the infection with parasites associated with family size of school children ($P = 0.140$). Previous studies revealed that the infection increase with the family size increased and bed rooms in a house decreased (Chacin-Bonilla *et al.*, 1993; Rajeswari *et al.*, 1994; Solorzano-Santo *et al.*, 2000; Basam and Adnan, 2005 and Sadaga and Kassem, 2007).

The present study revealed that high infection (40.7 %) in children from low socio-economic status than those from high socio-economic status, this agreed with observation reported by (Rajeswari *et al.*, 1994; Yassin *et al.*, 1999; Ibrahem, 2003 and Sadaga and Kassem, 2007). 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).

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معدل انتشار الأصابة بالطفيليات المعوية فى أطفال المدارس الابتدائية بمدينة سرت – ليبيا

حامد أحمد قاسم* ، الصديق أحمد النعاس**، فاطمه أحمد السنوسى***
* كلية العلوم ، جامعة بنغازى، بنغازى، ليبيا ، ** كلية العلوم ، جامعة طرابلس، طرابلس، ليبيا ،
*** كلية العلوم ، جامعة سرت، سرت، ليبيا.

الدراسة تستهدف تحديد مدى انتشار الطفيليات المعوية بين تلاميذ ثمانية مدارس ابتدائية في مدينة سرت، ليبيا . تم فحص ١٥٤٨ عينة براز من تلاميذ المدارس الابتدائية (٩٠٥ ذكور ، ٦٤٣ إناث) خلال الفترة من يونيو 2005 إلى مايو 2006 ، لتحديد معدل انتشار الطفيليات المعوية بين هؤلاء التلاميذ. اعتمدت الطرق المستخدمة في هذه الدراسة للكشف عن تواجد الطفيليات المعوية في عينات البراز على الفحص المباشر لمسحة من البراز باستخدام المحلول الملحي الفسيولوجي و محلول الأيودين واستخدام تقنية الترسيب (Formalin Ethyl Acetate)

Sedimentation. دلت نتائج فحص ١٥٤٨ عينة عن إصابة ٥٨٣ (٣٧.٧%) تلميذ بالطفيليات المعوية تشمل ٣٥٣ (٣٩%) ذكور و ٢٣٠ (٣٥.٨%) إناث وأظهرت النتائج عدم وجود إصابات بالديدان المعوية بينما سجلت الدراسة الأصابة سبعة أنواع أنواع من الأوليات الطفيلية هي: *E. histolytica / E. dispar*, *E. coli*, *G. lamblia*, *B. hominis*, *E. nana*, *I. butshlli*, *I. belli* سجل أعلى معدل انتشار (١٧.٩%) مقارنة مع الأوليات الطفيلية المعوية الأخرى ثم الطفيليات *E. histolytica / E. dispar* (14.8%) ، *G. lamblia* (٩.٩%) ، *I. belli* (٤.٨%) ، *E. coli* (٢.٩%) ، *E. nana* (٢.٢%) و *I. butschlii* (٠.٩٧%).

أظهرت النتائج معدل الانتشار للأوليات الطفيلية المعوية في الجنسين كانت ١٩.١% و ١٦.٢% في الذكور والإناث على التوالي. أظهرت النتائج معدل الأصابة بطفيل *E. histolytica / E. dispar* ٩.٢% في الذكور و ٥.٦% في الإناث والمعدل بالنسبة للجنسين كان ١٥.٧% و ١٣.٥% في الذكور والإناث على التوالي وطفيل *G. lamblia* سجل في ٦.٣% من الذكور و ٣.٦% في الإناث والمعدل بالنسبة للجنسين كانت ١٠.٨% للذكور و ٨.٧% للإناث. أظهرت النتائج عدم وجود فروق معنوية في نسبة إنتشار الأوليات الطفيلية المعوية بين المجموعات العمرية المختلفة (P = 0.236) ، أظهرت النتائج أن ٦٩.٩% من الحالات الموجه كانت مصابة بالأوليات الطفيلية المعوية في حالة إصابة مفردة، ٣٠.١% تلميذ مصاب بأكثر من طفيل. أظهرت النتائج وجود إختلافات معنوية بين الإصابات الفردية والمختلطة (P = 0.00).

إن أعلى معدل انتشار للأوليات الطفيلية كان لدى التلاميذ من أبوين الغير متعلمين ، وأن أقل معدل انتشار سجل في التلاميذ من الأبوين متعلمين ، حيث لا توجد إختلافات 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 إختلافات معنوية في نسبة انتشار الطفيليات بين التلاميذ وعدد أفراد الأسرة (P = 0.140). أظهر إنتشار الأوليات الطفيلية المعوية في أعلى معدلات بين التلاميذ ذات الأوزان ذوي ١٥ – ٢٥ كيلوجرام ، يليه ٢٦ – ٣٥ كيلوجرام ، في حين أن أقل إنتشار سجل بين التلاميذ ذوي الأوزان ٣٦ – ٤٥ وأكثر من ٤٦ كيلوجرام. وقد كان هناك وجود إختلافات معنوية بين نسبة إنتشار الأوليات الطفيلية المعوية وأوزان التلاميذ. أشارت النتائج أن معدل الأصابة تقل بزيادة الدخل الشهري للأسره.