



Prevalence and Clinical Symptoms of Giardiasis among Children in Sebha City

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Abstract

The results of present study showed that 5 % (10 of 200) children were infected with *Giardia lamblia*. Boys had more (6.79%) than girls (3.06%) infection of this parasite and the difference was not statistically significant ($\chi^2= 1.30$, $P= 0.233$). No significant difference was found among different age groups of children. All the children infected with *Giardia* had two or three gastrointestinal symptoms. Abdominal pain was the most common symptoms among (100%) children infected with *G. lamblia*.

Key Words: *Giardia*, Libya, Children

Introduction

The intestinal protozoan *Giardia duodenalis* (synonym of *Giardia intestinalis* and *Giardia lamblia*) .It is a flagellate protozoan of small intestine, frequently found in diarrhoeal disease and it is broad worldly distributed, being detected in both developing and developed countries [1]. *G. lamblia* recognized as the most common intestinal pathogen, with an estimated number of 2.8×10^{10} infecting per year in humans [2].

It is the most commonly reported human intestinal parasite, with prevalence rates reaching 2 to 7% in the developed countries [1]. The prevalence rates may reach 20 to 60 % in some areas in the developing countries [3-5].

G. lamblia is usually pointed as one of the causes of childhood diarrhea [6-8]. It is also been associated with diarrheal illness among campers [9], swimmers [10] and those travelling abroad, usually to less developed countries [11]. The symptoms of giardiasis in humans are extremely variable. Some people may present asymptomatic form, other an acute or chronic diarrhea that can last for several

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months with malabsorption syndrome and weight loss [12]. *G. lamblia* also causes children's retarded growth and development [13-15].

G.lamblia spreads from person to person and from animals to humans through faeco-oral route. It has an incubation period of 3 to 25 days with median of 7 to 10 days [16]. The routine diagnosis of giardiasis in laboratories relies on the detection of cysts / Trophozoites or both in direct smear microscopy or microscopic examination smears made often some form of concentration methods. Antigen-capture enzyme linked immunosorbent assay (ELISA) to detect *G. lamblia* antigens in stool also proved to be useful in giardiasis diagnosis [17-19].

In Libya, a number of limited studies have been performed on giardiasis and showed its prevalence of 1.2 to 11.4 % [20-24]. Most of the results of these studies are hospital-based data.

In this cross sectional study, we decided to survey the prevalence of *Giardia lamblia* by stool examination (direct smear microscopy) among children. A structured questionnaire was used to record the gastrointestinal complains among *G. lamblia* carriage children.

Materials and Methods:

A total of 200 random stool samples were collected from 1 to 10 years old aged children attending Central Laboratory, Sebha city. As soon as stool samples collected, were processed for the detection of *Giardia* infection using direct smears microscopy in normal saline [25].

Microscopic examination of stool:

Each sample was processed and examined immediately after collection, by routine direct faecal smear microscopy using normal saline preparation to record the prevalence of *Giardia lamblia* among children residing in Sebha city.

Direct saline wet preparation:

The direct saline smear was prepared by mixing a small amount of feces with a drop of normal saline (0.85%). These mixtures provide a uniform suspension under 22 mm cover slip. The entire cover slip area was examined using low power (10X) and then high power objective (40X).

Results

Prevalence of giardiasis among random children from Sebha is presented in Table 1. In general, boys had more (6.79%) *Giardia* infection than girls (3.06%). There was no significant difference between boys and girls ($\chi^2=1.307$, $P= 0.233$). The prevalence rate of *Giardia lamblia* is compared with previous studied in Libya (Table 2).

Table 3 showed age-wise breakup of giardiasis among children. There was no significant difference in the prevalence rates of giardiasis among different age groups.

Clinical symptoms of 10 children infected with *G. lamblia* are shown in Table 4. Out of 10 children, 7 (70%) were symptomatic and 3 (30%) were asymptomatic. Of seven infected children with *Giardia*, had two or three gastrointestinal symptoms.

Table 1: Prevalence of *Giardia lamblia* among boys and girls.

| No. Examined | | No. positive | | Percentage (%) | |
|--------------|-------|--------------|-------|----------------|-------|
| Boys | Girls | Boys | Girls | Boys | Girls |
| 103 | 97 | 7 | 3 | 6.79 | 3.06* |

($\chi^2=1.307$, P=0.233) *

Table 2: Prevalence of *Giardia lamblia* in Libya

| Category/ Locality | <i>Giardia lamblia</i> (%) | References |
|---|----------------------------|------------------------|
| School children in Benghazi. | 11.4 | Dar et al [20] |
| Outpatients in Tripoli. | 8.7 | Bolbol et al [26] |
| Expatriates in Benghazi. | 7.8 | El-Buni et al [27] |
| Children attending Hospital in Benghazi. | 6.2 | El-Buni and Khan [28] |
| Children with gastroenteritis in Children Hospital in Benghazi. | 5.85 | Bugarara et al [29] |
| Children with diarrhea in Children Hospital Benghazi. | 3.77 | Al-Tawaty et al [30] |
| Outpatients in Sebha. | 1.62 | Al-Fellani et al [31] |
| Children with diarrhea in Zileten. | 1.2 | Ali et al [21] |
| Libyan patients in Sirte. | 7.2 | Salem et al [32] |
| Primary school children in Derna | 12.7 | Sadaga and Kassem [22] |
| Children and neonates in Sirte Hospital | 10.29 | Kassem et al [33] |
| Out patients in Sebha | 1.28 | Saleh [34] |
| School aged children in Tripoli | 2.0 | Ben Mousa et al [35] |
| Random population of Wadi Al-Shati | 1.76 | Gelani et al [23] |
| Children living in different rural areas of Wadi Al-Shati. | 3.1 | Saada et al [36] |
| Random children in Sebha | 5.0 | Present study (2016) |

Table 3: Prevalence of *Giardia lamblia* among children according to age groups

| Age (Years) | No. Examined | No. Positive | Percentage |
|-------------|--------------|--------------|------------|
| ≤ 2 | 35 | 2 | 5.71* |
| 3-6 | 51 | 4 | 7.84 |
| 7-10 | 114 | 4 | 3.50 |

($\chi^2=1.288$, P=0.525) *

Table 4: Clinical Symptoms among children infected with *Giardia lamblia*

| Clinical symptoms | No. of samples | Percentage (%) |
|---|----------------|----------------|
| Abdominal pain with Diarrhea | 2 | 28.57 |
| Abdominal pain with Steatorrhea | 2 | 28.57 |
| Abdominal pain with Diarrhea and vomiting | 2 | 28.57 |
| Abdominal pain with Vomiting and Anorexia | 1 | 14.28 |

Discussion

Giardia lamblia is a vulnerable infection and has been associated with diarrhea and malabsorption, especially among children with growing prevalence in different regions of the world [15]. Giardiasis is considered as one of the main health problems in the developing countries [37]. Stool examination has been used as "gold standard" method from long time in the diagnosis of giardiasis.

A cross sectional study was carried out on random children attending diagnostic laboratory in Sebha city. Over all the prevalence of giardiasis was low (5.0%, 10 of 200). This result almost agrees with other studies, who reported lower prevalence of *G. lamblia* in some parts of Libya, as it was 3.77% in children in Benghazi [30], 1.2% in children with diarrhea in Ziletan [21], 2.0% in school aged children in Tripoli [35]. Moreover, a lower prevalence rate of giardiasis (1.76% and 3.1%) has also been reported in random population and children of Wadi Al-Shati province, [23, 36] respectively. However, Dar *et al* [20] and Sadaga and Kassem [22] reported that *G. lamblia* was the most common among children in Northern, Libya (11.4% in Benghazi and 12.7% in Derna city respectively). Moreover, other studies also reported a higher prevalence of giardiasis, as it was 8.7% in outpatients in Tripoli [26], 7.8% in

expatriates in Benghazi [27], 6.24% in children attending hospital in Benghazi [28], 5.85% children with gastroenteritis in Benghazi [29], 7.2% among Libyan patients in Sirte [32] and 10.29 % in children and neonates admitted in Ibn-Sina Hospital, Sirte [33]. The results of present study are also similar to Nematian *et al* [38], Boontanom *et al* [39], and Tellevik *et al* [40], who reported a low prevalence of giardiasis 2.8 % in a large population based survey of school children in Iran , 5.8% in preschool children in Thailand and 4.6% in young children in Tanzania respectively. However, a higher prevalence of *Giardia* infection has been reported in other parts of the world as it was 30.96% in Pakistan [41], 34.2% in Algeria [42], 22.2% in Malaysia [43], 62% in Turkey [5] and 90.9% in Egypt [44].

The present study showed a lower prevalence of giardiasis than some other Arab Republic regions, and parts of the world, as it was 53% in Yemen [45], 35% in Egypt [46], 48.21% in Bahrain [47], % 10.9% in Saudi Arabia [48], 36% in Jordan [37], 37.14% in Tunisia [49], 8% in Gaza Strip [50], 10.9% in Iran [51], 16.5% in Turkey [52], 38.5% in Iraq [53], 14% in Syria [37], and 12.3% in Sudan [54].

In general, in the present study, boys had a higher prevalence of giardiasis than girls and difference between genders was not significant ($p= 0.23$). This may be due to frequent outdoor

activities of boys and have more exposure to the source of *Giardia* infection compared to girls. Similarly several other studies have found boys were more prone to be infected than girls [47, 55-57]. The results of present study differ from other studies in Libya [23, 31, 36, 58], who reported more prevalence of *G. lamblia* in females than males and difference in the positive rates was not statistically significant.

Mobayed *et al* [59] and Almerie *et al* [15] also reported that girls are more infected with *G. lamblia* than boys in an epidemiological survey of giardiasis in Bahrain and Syria respectively among school children, and did not find significant difference between them. While most of the other studies reported no difference in the prevalence of giardiasis between genders [60-64].

Many studies found that the prevalence of giardiasis rises during childhood, and only begins to decline during early adolescence [55, 65], presumably as protective immunity is acquired.

In the present study, 5 to 6 years old aged children have more infection of *G. lamblia* than other aged groups. This is perhaps because at this age children fully independent in toilet use

and are more involved in different outdoor activities which might lead to *Giardia* transmission [66]. However, Ahmed [57] reported highest prevalence (1.81%) of *G. lamblia* in 7 to 12 years old children in Sebha, Libya. However, a higher prevalence of giardiasis (24.9 % and 5.8%) has been reported among children age 4 to 12 years in Yemen [67], and 6 to 15 years in Portugal [63] respectively.

Clinical features of giardiasis may range from diarrhea to constipation, nausea, abdominal pain, and flatulence. However, many patients infected with *G. lamblia* do not present symptoms. These asymptomatic individuals are important reservoirs for the spread of infection, and are less likely to seek treatment due to the absence of the clinical symptoms [68].

The present study, indeed, found the most common complain among children infected only with *G. lamblia* was abdominal pain. This finding was consistent with the finding of Moolasart [69], Minvielle *et al* [70], Younas *et al* [41], and Selim *et al* [18], who observed abdominal pain was most common symptom among giardiasis patients in Thailand, Egypt, Argentina and Pakistan respectively.

References

1. **Thompson RC, Reynoldson JA and Mendis AH (1993).** *Giardia* and giardiasis . *Advanc. Parasitol.* 32: 71-160.
2. **Ali S and Hill DR (2003).** *Giardia intestinalis.* *Curr.Opin. Infect. Dis.* 16: 453-460.
3. **Danciger M and Lopez M (1975).** Number of *Giardia* in the feces of infected children. *Amer. J. Trop. Med. Hyg.* 24: 237-242.
4. **Prado MS, Cairncross S, Strina A, Barreto MI, Oliveira-Assis AM and Rego S (2005).** Asymptomatic giardiasis and growth in young children; a longitudinal study in Salvador, Brazil. *Parasitol.* 131: 51-56.
5. **Kirkoyun UH, Akqul O, Pursia S and Oner YA (2014).** Twenty five years of intestinal parasites prevalence in Istanbul University, Istanbul Faculty of Medicine: a retrospective study. *TurkiyeParazitel. Derg.* 38: 97-101.
6. **Linnana E, Roberts R and Looker N (2001).** Nappies and Transmission of *Giardia lamblia* between children. *Lancet.* 358: 507.
7. **Laupland KB and Church DI (2005).** Population-based laboratory Surveillance for *Giardia spp.* and *Cryptosporidium spp.* Infection in a large Canadian health region. *BMC Infect. Dis.* 5:72.

8. **Nkrumah B and Nquah SB (2011).** *Giardia lamblia*: a major parasitic cause of childhood diarrhea in patients attending a district hospital in Ghana. *Parasit. Vectors.* 22:163.
9. **Holtan N. (1988).** Giardiasis: a crimp in the life-style of campers, Traverlrs, and others. *Postgrad. Med.* 83: 54-56.
10. **Porter JD, Ragazzoni HP, Buchanon JD, Waskin HA, Juranek DD and Parkin WE (1988).** *Giardia* transmission in a swimming pool. *Am. J. Pub. Health.* 78: 659-662.
11. **Gray SF, Gunnell DJ and Peters TJ (1994).** Risk factors for giardiasis: a case-control study in Avon and Somerset. *Epidemiol infect.* 113: 95-102.
12. **Goldin AJ, Werner APT and Aguilera X (1990).** Efficient diagnosis of giardiasis among nursery and primary school children in Santiago, Chile by capture ELISA for the detection of faecal *Giardia* antigen. *Am. J. Trop. Med. Hyg.* 42: 538-545.
13. **Oberhelman, RA, Guerrero ES, Fernandez ML, Sillio M, Mercado D and Comiskey N (1998).** Correlation between intestinal parasitosis, physical growth, and psychomotor development among infants and children from rural Nicaragua. *Am. J. Trop. Mde. Hyg.* 58: 470-475.
14. **Muniz-Junqueira MI and Queiroz EF (2002).** Relationship between protein-energy malnutrition, vitamin A, and parasitoses in living in Brasilia. *Rev. Soc. Bras Med. Trop.* 35: 133-141.
15. **Almerie MQ, Azzouz MS, Abdessamad MA, Mouchli MA, Sakbani MW, Alsibai MS, Alkafri A and Ismail MT (2008).** Prevalence and risk factors for giardiasis among primary school children in Damascus, Syria. *Saudi. Med. J.* 2: 234-240.
16. **Ortega YR and Adam RD (1997).** *Giardia*: overview and update. *Clin. Infect. Dis.* 25: 545-549.
17. **Rocha MO, deMello RT, Guimaraes TMPD, de Toledo VPCP, Moreira MCGG and da Costa CA (1999).** Detection of *Giardia lamblia* copro-antigen by using a commercially available immunozymatic assay, in Belo Horizonte, Brazil. *Rev. Inst. Med. Trop. S. Paulo.* 41: 151-154.
18. **Selim S, Nassef N, Sharaf S, Badra G and Abdel Atty D (2009).** Copro-antigen detection verses direct methods for the diagnosis of *Giardia lamblia* in patients from the National Liver Institute. *J. Egypt. Soc. Parasitol.* 39: 575-583.
19. **Argaiya MA, Syed AMA, Atef E, Shaida FH, Mahmoud AA and Abdulhafeez K (2012).** Comparison of faecal microscopy and immunoassay for the diagnosis of giardiasis. *Sebha Med. J.* 10: 64-72.
20. **Dar FK, El-Kouly SI, Hoda A, El-Boulaq I, Munir R and El-Maghrebi S (1979).** Intestinal parasites in Benghazi school children. *Garyounis Med. J.* 2: 3-7.
21. **Ali MB, Ghenghesh KS, Aissa RB, Abohelfaia A and Dufani M (2005).** Etiology of childhood diarrhea in Zlieten, Libya. *Saudi. Med. J.* 26: 1759-1765.
22. **Sadaga GA and Kassem HH (2007).** Prevalence of intestinal parasites among primary school children in Derna District, Libya. *J. Egypt. Soc. Parasitol.* 37: 205-214.
23. **Gelani SS, Abdulhafeez K, Abdul Gader A, Awatif MA, Al-Shebani M and Yosef, K (2009).** A study of prevalence of human intestinal parasites in Wadi-Al-Shati region. *Sebha. Med. J.* 2: 3-7.
- 24- **Mergani MH, Mohammed MS, Nawed K, Meraj B and Khan AH (2014).** Detection of intestinal protozoa by using different methods. *Dental and Medical Research.* 2(2): 28-32.
- 25- **Chessbrough, M. (2004).** District Laboratory Practice in Tropical Countries.2. Ed. Cambridge University press.191-199.
- 26- **Bolbol AS, Warsi MM, El-Nageh and Mabrouk. (1981).** The incidence of intestinal parasites in the Tripoli area of Libya. *Sina. Med. Assoc. J.* 1: 13-15.
- 27- **El-Buni AA, Khan AH, Griew AE and Waliaden Q (1998).** Prevalence of intestinal parasites among expatriates in Benghazi, Libya. *Jamahiriyah Med. Sci. Congress,* Benghazi, 1-4 Nov, Benghazi, Libya.
- 28- **El-Buni AA and Khan AH (1998).** Intestinal Protozoan infections in Benghazi. *Sebha Med. J.* 1: 106-108.
- 29- **Bugharara SI, Ali MY, Khan AH and Nadia IE (1999).** Incidence of *Cryptosporidium* in patients with diarrhea. *Riv. Di.Parasit.* 16: 169-172.
- 30- **Al-Tawaty AH, Khan AH, Nadia IE and El-Buni AA (2002).** Screening of *Cryptosporidium* oocysts in clinically immunocompetent children. *Garyounis Med. J.* 19: 26-33.
- 31- **Al-Fellani MA, Abdulrahman OM, Khan AH and Abousaif, AA (2005).** Prevalence of intestinal

- parasites in Sebha, Libya. *Garyounis Med. J.* 22: 56-60.
- 32- **Salem RAA, Abdullah ME and Abdulgader AE (2007)**. Intestinal protozoa in Libyan patients in Sirte. *Jamahiriya Med. J.* 6: 59-61.
- 33- **Kassem HH, Zaed HA and Sadaga GA (2007)**. Intestinal Parasitic infection among children and neonates admitted to Ibn-Sina Hospital, Sirte. *J. Egypt. Soc. Parasitol.* 37: 371-380.
- 34- **Saleh MM (2007)**. Prevalence of human intestinal parasites in Sebha city. M. Sc. Thesis, Sebha University, Sebha, Libya.
- 35- **Ben Mousa NA, Sehari A and Hawas A (2007)**. Intestinal parasitic infections among school children in Tripoli, Libya. *J. Egypt. Soc. Parasitol.* 7: 1011-1016.
- 36- **Saada AA, Mohammed MC, Daw A and Khan AH (2013)**. Prevalence of giardiasis among children from Wadi Al-shati, Libya. *Sebha Med. J.* 12(2): 90-95.
- 37- **Nimri LE (1994)**. Prevalence of giardiasis among primary school children. *Child. Care. Health. Dev.* 20: 231-237.
- 38- **Nematian J, Gholamnezanezad A and Nematian A (2008)**. Giardiasis and other intestinal parasitic infections in relation to anthropometric indicators of malnutrition. *Ann. Trop. Med. Parasitol.* 102: 209-214.
- 39- **Bootanom P, Mungthin M, Tan-ariya P, Naaglor T and Leelayoova S (2011)**. Epidemiology of giardiasis and genotypic characterization of *Giardia duodenalis* in preschool children of a rural community, Central Thailand. *Trop. BioMed.* 28: 32-39.
- 40- **Tellevik MG, Moyo SJ, Blomberg B, Hjollo T, Maselle SY, Langeland N and Nanevik K (2015)**. Prevalence of *Cryptosporidium parvum/hominis*, *Entamoebahistolytica*, and *Giardia lamblia* among young children with and without diarrhea in Dare Salam, Tanzania. *PLoS Negl. Trop. Dis.* 9: 1-16.
- 41- **Younas M, Shah S and Talaat A (2008)**. Frequency of *Giardia lamblia* infection in children with recurrent abdominal pain. *J.P.M.A.* 58: 171-176.
- 42- **Lalle M, Bruschi F, Castagna B, Campa M, Pozio E and Cassio SM (2009)**. High polymorphism among *Giardia duodenalis* isolates from Shrawi children. *Trans. R. Soc. Trop. Med. Hyg.* 103: 834-838.
- 43- **Hesham MA, Mohamed TA, Rohana J, Abdulhamid A, Tengku SA, Norhayati M, Mohmeed AKM., Yvonne ALL, Rohela M and Johari S (2013)**. Burden of *Giardia lamblia* infection and its adverse effects on growth of school children in rural Malaysia. *PLoS Negl.Trop.Dis.* 7: 1-12.
- 44- **Hussain EM, Zaki WM, Ahmed SA, AlMatary AM, Nemr NI and Hussain AM (2016)**. Predominance of *Giardia lamblia* assemblage A among iron deficiency anemia pre-school Egyptian children. *Parasitol. Res.* 115(4):1537-1545
- 45- **Farag H (1985)**. Intestinal parasitosis in the population of Yemen Arab Republic. *Tropical. Geographical. Med.* 37:29-31.
- 46- **Shukry S, Zaki AM, Dupont HL, Shoukry IEL, Tagi M and Hamed Z (1986)**. Detection of enteropathogens in fatal and potentially fatal diarrhea in Cairo, Egypt. *J. Clin. Microbiol.* 24: 959-962.
- 47- **Abdulrahman OM and William, BG (1990)**. Change in Parasitic infection among school children in Bahrain. 1980- 1986: A Preliminary study. *Saudi Med. J.* 11: 113-115.
- 48- **Omar MS, Abu-Zeid HA and Mahfouz AA (1991)**. Intestinal parasitic infections in school children of Abha (Asir), Saudi Arabia. *Acta. Trop.* 48: 195-202.
- 49- **Gharbi T, Chaker E, Boughedi J, el Mabrouk S and Ben Rayana MC (1999)**. Study of anemia in giardiasis in Tunisian preschool children. *Tunis Med.* 11: 61-558
- 50- **Astal Z (2004)**. Epidemiological survey of the prevalence of parasites among children in Khan Younis governorate, Palestine. *Parasitol. Res.* 94: 449-451.
- 51- **Sayyari AA, Iman ZF, Bagheri YSA, Karami H and Yaghobi M (2005)**. Prevalence of intestinal parasitic infections in the Islamic Republic of Iran. *East Mediterr. Health J.* 11: 377-383.
- 52- **Celiksoz A, Guler N, Guler G, Oztop AY and Degerli S (2005)**. Prevalence of intestinal parasites in three socioeconomically-different regions of Sivas, Turkey. *J. Health Popul. Nutr.* 23: 184-191.
- 53- **Al-Saeed AT and Issa SH. (2006)**. Frequency of *Giardia lamblia* among children in Dhouk, Northern Iraq. *East.Mediterr. Health J.* 12: 555-561.

- 54- **Mohamed MM, Ahmed AI and Salah ET (2009).** Frequency of intestinal parasitic infections among displaced children in Kassala Town. *KhartoumMed. J.* 1: 175-177.
- 55- **Mahmud MA, Chappell C, Hossain MM, Habib M and Dupont HL (1995).** Risk factors for development of first symptomatic *Giardia* infection among infants of a birth cohort in rural. Egypt. *Am. J. Trop. Med. Hyg.* 53: 84-88.
- 56- **Greig JD, Michel P, Wilson JB, Lammerding AM, Majowicz SE and Stratton J (2001).** A descriptive analysis of giardiasis cases reported in Ontario, *Can. J. Public. Health.* 92: 361-365.
- 57- **Ahmad AA (2006).** Analytical study for the epidemiology of *Giardia lamblia* parasites in Sebha City, Libya. *Sebha University J.* 1: 43-55.
- 58- **Ben Mousa NA and Ibrahim R (2007).** Long term formalin preserved stool specimen for detection of intestinal parasites from school aged children in Tripoli, Libya. *J. Egypt. Soc. Parasitol.* 37: 1049-1054.
- 59- **Mobayed M, Kamal F and El-Gashy B (1980).** A Study of the needs of children in Bahrain. *Bahrain: UNICEF/ High Council for Youth and Sport*, 195.
- 60- **Norhayati M, Penggabean M, Oothuman P and Fatmah MS (1998).** Prevalence and some risk factors of *Giardia duodenalis* infection in a rural community in Malaysia. *Southeast Asian. J. Trop. Med. Public. Health.* 29: 735-738.
- 61- **Cheng-Ng R, Castellano-Canizales JA, Diaz-Suarez O and Villalobos-Perozo RE (2002).** Prevalence of giardiasis in day care centers in San Francisco municipality, State of Zulia, Venezuela. *Invest. Clin.* 43: 231-237.
- 62- **Ngui R, Ishak S, Chuen CS, Mahmud R and Lim, YAL (2011).** Prevalence and risk factors of intestinal parasitism in rural and remote west Malaysia. *PLoS. Neg.Trop. Dis.* 5: e974.Doi10.1371/ Journal Pntd. 0000974.
- 63- **Julio C, Vilares A, Oleastro M, Ferreira I, Gomes S, Monteiro L, Nunes B, Tenrerio R and Angleo H (2012).** Prevalence and risk factors of *Giardia duodenalis* infection among children: a case study in Portugal. *Parasites and Vectors.* 5: 1-8.
- 64- **Sah RB, Paudel IS, Baral R, Poudel P, Jha N and Pokhanel PK (2013).** A study of prevalence of intestinal protozoa parasites and associated risk factors among school children of Itahari Eastern region of Nepal. *J. C.M.C.* 3: 32-36.
- 65- **Tellez A, Morales W, Rivera T, Meyer E, Leiva B and Linder E (1997).** Prevalence of intestinal parasites in the human population of Leon, Nicaragua. *Acta. Trop.* 66: 119-125.
- 66- **Mercado R, Otto JP and Perez M (1999).** Seasonal variation of intestinal protozoa infection in outpatients of the North section Chile. *Bol. Chil. Parasitol.* 54: 4-41.
- 67- **Azazy AA, Al-Mahbashi TY and Al-Mekhlafi HM (2002).** Prevalence of intestinal and blood parasites among school children in Sana'a and Al-Mahweet provinces, Yemen. *Yemen Medical J* 4: 50-55.
- 68- **Cerezo Pancorbo JM, Gracia Munoz MT and Sanchez Badia JL (1985).** Giardiasis: treatment of carriers. *Lancet.* 2: 951.
- 69- **Moolasart P (1999).** *Giardia lamblia* in Aids patients with diarrhea. *J Me. Assoc Thai.* 82: 654-659.
- 70- **Minvielle MC, Pezzani BC, Cordoba MA, Deluca MM, Apezteguia MC and Bassualdo JA (2004).** Epidemiological survey of *Giardia* spp. and *Blastocystis hominis* in an Argentinian rural community. *Parasitol.* 3: 121-127.