

Epidemiological study of intestinal parasites among population of Erbil city, Kurdistan, Iraq.

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Abstract

The present epidemiological study, investigated the prevalence of intestinal parasites, among 25310 patients, examined during the period from January to December 2014. The investigation carried on many laboratories in hospitals and health centers distributed among localities in Erbil city. Out of 25310 patients examined, 2790 (11.02%), of which were infected with the intestinal parasite, approximately 139.5 patients per 100,000 person. Nine species of intestinal parasites were recorded in this study, and these identified as follow as: *Entamoeba histolytica* 61.2%, *Giardia lamblia* 26.6%, *Enterobius vermicularis* 10.0%, *Hymenolips nana* 1.2%, *Ascaris lumbricoides* 0.2%, *Taenia saginata* 0.03%, *Trichurs trichiura* 1.04%, hookworm 0.03% and *Strongeloides stercoralis* 0.03%. Out of total patients infected with intestinal parasites 87.35%, of which were Protozoa and 12.65% Helminthes. According to the sex of patient's involvement, we found that males (64.3%) significantly were highly infected than females (35.6%), and about infection of age groups we found that the age groups (1-10 years) and (11-20years) were highly infected than others which were (30.0%) and (30.4%) respectively. The present study indicated that the rate of patients infected in month of June (13.9%) were higher than other months and the lower rate were in months of January and February 8.3% and 9.5% respectively.

Keywords: Epidemiological study, intestinal parasites, Erbil-Kurdistan Iraq 2014.

Introduction

Parasitic infections, caused by intestinal helminthes and protozoan parasites, are the most prevalent infections in humans among developing countries. In developed countries, protozoan parasites more commonly cause gastrointestinal infections compared to helminthes, which they cause a significant morbidity and mortality in endemic countries (Rashidul, 2007p.387). Intestinal parasitism is a major public health problem that is often neglected, in the less developed countries, poor environmental and personal hygiene, poor nutrition, overcrowding and climatic conditions that favor the development and survival of these parasites, are some of the factors contributing to the high level of intestinal parasitic transmission (Kenneth et al.212 p.73). According to the World Health Organization estimate; globally there are 800-1000 million cases of Ascariasis, 700-900 million of Hook Worm infection, 500 millions of Trichuriasis, 200 million of Giardiasis and 500 million of *Entamoeba*

histolytica, the majority being children (Roma and Worku 1997 p.125). School children carry the heaviest burden of the associated morbidity (Nematian,2004 p.179.). Amebiasis due to infection with the intestinal protozoon *Entamoeba histolytica* and giardiasis due to *Giardia lamblia* are estimated to infect about 60 million and 200 million people worldwide respectively (Murry,2002 p.681). However, the burden of pathogenic intestinal protozoan infections in terms of Disability-Adjusted Life Years (DALYS), remain to be determined, which is a challenge due to the paucity of up-to epidemiological data, (Hotez,et al. 2009 p.1570). The global burden caused by soil transmitted helminthiasis infection with *Ascaris lumbricoides*, hookworm and *trichuris trichiura*) is estimated at 39 million person ((WHO, 2002 p.912). The first study of intestinal parasites in Erbil city, was done by (Kadir et al.1987 p.455), during the examination of 424 samples from children of many primary schools, and they found that 62.7% out of total examined were infected with several intestinal parasites, and these were as follow as: *G.lamblia* 35.5%, *H.nana* 28.3%, *A.lumbricoides* 14.5%, *E.histolytica* 18.6%, While the final study at the same area was done by (Ahmed,2006 p.124), during the examination of stools of food-handlers workers and primary school children, he recorded four intestinal parasites and these were, as follow as: *E.histolytica* (9.4%), *E.coli* (12.1%), *T. hominis* (0.3%) and *H. nana* (3.0%).

The aim of current study is to determine the prevalence of intestinal parasitic infections among ages (pre-school children, schoolchildren, and adults), among population of Erbil city during the period of one year study. On the other hand the present study conducted to know the effect of months of a year on the parasitic infection among people, and also to getting true incidence of intestinal parasitic infection among Erbil community, and to record a new prevalence of human intestinal infection during 2014. and also to getting new study about types of intestinal parasitic infection compared to the last study. The current study is the first of its kind that include examination of 25310 patients distributed from more than twenty healthy centers in governorate hospitals in Erbil city during period of one year.

Table: 1 Shows the intestinal parasites recorded among patients examined in laboratories of many hospitals and health centers in Erbil City according to their sex.

Month of the study	No. of patient examined	No. of patient infected (%)	Males* (%)	Females* (%)
January	1976	165 (8.35)	122 (73.93)	43(26.06)
February	2659	253 (9.51)	183 (72.33)	70(27.66)
March	1719	188 (10.93)	143 (76.06)	45(23.93)
April	2022	204 (10.08)	150 (73.52)	54(26.47)
May	2065	181 (8.76)	127 (70.16)	54(29.83)
June	2023	282 (13.93)	160 (56.73)	122(43.26)
July	2372	286 (12.05)	191(66.78)	95(33.21)
August	2081	266 (12.78)	149 (56.01)	117(43.98)
September	2138	249 (11.64)	171 (68.67)	78(31.32)
October	1797	197 (10.96)	119 (60.40)	78(39.59)
November	2025	229 (11.30)	161 (70.30)	68(29.69)
December	2433	289 (11.87)	149 (51.55)	40(48.45)
Total	25310	2789 (11.01)	1794 (64.32)	995 (35.67)

. (*significant differences $p < 0.05$ between males and females patients.)

Table 2: Shows the species of intestinal parasites recorded in patients according to the months of year, examined in laboratory of many hospitals and health centers in Erbil city.

Months of the study	species of intestinal parasites recorded				
	<i>E.histolytica</i> (%)	<i>G.lambliia</i> (%)	<i>E.vermiculars</i> (%)	<i>H.nana</i> (%)	Others (%)
January T= 165	103 (62.42)	38 (23.03)	22 (13.33)	Nil	<i>A.lambricoide</i> 2(1.2)
February T= 253	168 (66.40)	63 (24.90)	19 (7.50)	2 (0.79)	<i>A.lambricoides</i> 1(0.3)
March T= 188	103 (54.78)	57 (30.31)	25 (2.65)	1(0.53)	<i>A.lambricoides</i> 2(1.0)
April T=204	145 (71.07)	70 (34.31)	12 (5.88)	Nil	<i>A.lambricoides</i> 1(0.4)
May T=181	111(61.32)	57 (31.49)	13 (7.18)	Nil	Nil
June T=282	171 (60.63)	82 (29.07)	28 (9.92)	Nil	Hookworm 1(0.3)
July T= 286	162 (56.64)	89 (31.11)	32 (4.19)	Nil	<i>T.trichiura</i> 3(1.0)
August T= 266	139 (52.25)	74 (27.81)	37 (13.90)	14(5.2)	Nil
September T= 249	155 (62.24)	68 (27.30)	32(13.86)	4 (1.6)	<i>T.saginata</i> 1(0.4)
October T= 197	123 (62.43)	38 (19.28)	26(13.19)	6 (3.0)	Nil
November T=229	152 (66.37)	58 (25.32)	31 (13.53)	2 (0.8)	Nil
December T= 289	178(61.59)	86 (29.75)	20(6.92)	5 (1.7)	Nil
Total=2789	1708 (61.24)	742 (26.60)	297 (10.00)	34(1.2)	8(0.8)

Protozoa infection = 87.35%, Helminthes infection = 12.65% T=Total of infection.

Table:3 Shows the Prevalence of intestinal parasites among 2789 infected patients according to their age groups.

Age groups of patients infected	No. of Males Infected (%)	No. of Females Infected (%)	Total Infected (%)
(1 to 10 years)	512 (69.94)	220 (22.28)	732 (30.05)
(11 to 20 years)	510 (69.57)	223 (22.59)	733 (30.42)
(21 to 30 years)	320 (59.59)	217 (40.40)	537(19.25)
(31 to 40 years)	210 (66.07)	108 (33.96)	318 (11.40)
(41 to 50 years)	134 (52.34)	122 (47.56)	256 (9.17)
(More than 51 years)	108 (50.70)	105 (49.29)	213(7.35)
Total examined (25310)	1794 (64.32)	995 (35.67)	2789 (11.01)

Materials and Methods

The present study carried out in parasitic laboratories of health centers and hospitals of Erbil city during the period of 12 months in a year. The human fecal samples (n=25310) were obtained from patients visiting laboratory of parasites among health centers and parasitology section of Erbil city hospitals, the period started in January to end of December in 2014. The spacemen bottles collected from the patients were labeled with host name, age and sex. The collected samples were mostly examined freshly, but sometimes in case of examination of infection with *E.vermicularis* (pin worm) they use Scotch tape or a pinworm paddle used for obtain eggs, because female worms deposit eggs in the perianal area, particularly at night. The eggs of this parasite may be found in the stool but its few, so the good finding of eggs is by using Scotch tape.

Preparation of temporary mounts of fecal samples

The preserved stool sample was mixed with an applicator and a small drop of it was placed on the slide and one drop of iodine solution was added to the fecal material to stain the parasite. Thoroughly mixed, covered with cover slip and examined under the microscope. The temporary mounts of fresh fecal samples were made by two ways: if stool was loose, a drop of stool was placed on the slide covered with cover slip and observed under the microscope. If stool was solid or semi-solid then a drop of normal saline was placed on the slide, 1 mg of stool sample was mixed on the slide and then covered with the cover slip for examination under the microscope (Cable, 1985 p242). The results are expressed in percentages and the values between different groups are compared by Chi Square test.

Results and discussion

Epidemiological studies on the prevalence with infection of intestinal parasites in different localities have as a primary objective to identify high-risk communities and formulate appropriate interventions, in a community so the study of intestinal parasitic infections of humans are important threats to healthy living in developing countries. The environment and the socio-cultural habits of the people could be attributable for the high prevalence of intestinal parasitic infections in the developing countries (Coulibaly, 2012 p.135). In line with this view, the present study attempted to assess the prevalence of different intestinal parasitic infections among population of Erbil city the Capital of Kurdistan-Iraq during 2014. The present study is the first of its kind that included 25310 patients, distributed in more than twenty health centers and hospitals, to investigation, for presence of intestinal parasites, during the period of one year. Out of total patients examined, we found 11.09%, of which were infected with intestinal parasites approximately 193.5 patients per 100,000 person (Table: 1). The Protozoa and Helminthes infection were 86.24% and 13.75% respectively (table: 2). Previous study was recorded so many different percentages of infections (Molan and Farag, 1989 p.107) they found that the rate of infection was higher (62.7%) in low socio-economic than in high socio-economic in the same area. While the last study which was done at the same area by (Ahmed, 2006 p.124) he found that (40.1%) of children were infected with the intestinal parasites. The low total infection (11.09%) which recorded in current study compared to the previously may be due to many factors, first's the examination of small samples size, and the second factor is due to the age of patients examined in the studies. Our study included patients of all ages in population of Erbil city, not only schoolchildren as previous studies, or only one age group. On the another hand the low rate of infection in current study may be due to increasing of level of economic status of people, increasing of the level of family health education, and may due to utilizing healthy water source, all these factors plays a good role in the decreasing of intestinal parasitic infection in any area of

community (Mbanugo and Onyebuchi, 2002 p. 27 and Parameshwarappa, 2012 p.4662).

The earliest reports concerning the intestinal parasitic infection among Iraqi population was by (Senkgi et al. 1939 p.33), they found that the potential pathogenic parasites was 55.6%, of which 22.9% was *E.histolytica*, 13.6% *A.lumbricoides*, 8.5% *G.lambliia*, and 0.5% *T.hominis*. While in Erbil city the first study of prevalence of intestinal parasites was done by (Kadir,et al. 1987 p.455), they recorded 4.1% *E.histolytica*, 4.3% *H.nana*, and 10.9% *G.lambliia*, with total infection of intestinal parasites. The second study was by (Molan, and Farag,1989 p.107), they recorded 62.7% of intestinal parasitic infection among two districts of different socio-economic in Erbil city, and they recorded high rate of infection (77.5%) in low socio-economic, compared to high socio-economic district. The last study about this subject was by (Ahmed, 2006 p.124), during the survey among food handlers and primary school children in Erbil city, he found that 24.5% of which were infected with protozoa parasites and 22.1% with helminthes, and he recorded five species of intestinal parasites, *E.histolytica* 12.9%, *G.lambliia* 8.0%, *E.coli* 3.2%, and each of *I.buotshlii* and *T.hominis* were 0.17%.

In the present study the patients that infected with *Entamoeba histolytica* were 59.07% higher than other intestinal parasites. Previously various rate of infection with *Entamoeba histolytica*, were recorded in many studies in Iraq, and other countries of the world. The low rate of infection were recorded in Iraq by (Bailey,and Khamis, 1958 p.152) in Baghdad city; (Shihab,and Sultan,1985 p.56, Salih, 1991p.92 and Farag, 2000 p.7) in Erbil city; (Shihab,and Sultan,1985 p.119 and Al-Shirifi, 2000 p.180) in Kirkuk city and (Hussein, 2003 p.99) in Sulaimania city. In our study the high rate of infection recorded with *Entamoeba histolytica* 59.07%, is agreement with previous study (Abdullha,1999 p.397) and (Hamad and Ramzy, 212 p.57) in Erbil city, and (Al-Saeed, et al. 20001 p.13) and(Al-Noffoly, 2004 p.140) in Mosul city. The high rate of infection with this parasite is due to many interacted factors like sanitary service, low education of mothers, improper water supply, because *E. histolytica* can be transmitted orally by drinking water and it is one of the environmental contaminants of the water supply (Omer,et al., 1991 p.195). Also absence of regular hygiene toilets, and malnutrition which significantly increases susceptibility to *Entamoeba histolytica* in children (Duggal, et al., 2011 p.1191). In addition to environmental, social and economic factors are also playing a role in this matter (Al-Shammari, et al., p.2001 p. 184).

Another intestinal protozoa parasite that recorded in this study was *Giardia lamblia* with the rate of infection (27.16%). This protozoa intestinal parasite is a lumen dweller and essentially is a non-invasive parasite of the duodenum and jejunum. The trophozoites colonize the duodenum by attaching to the mucosal surface near the base of the villi. This parasite can be asymptomatic in few and in some can manifest as diarrhea, mal-absorption of fat and carbohydrates and shortening or atrophy of villi (Parijia, 2004 p.408). This rate of infection that recorded in our study with this parasite was higher than that recorded previously in the same area for example

(Ahmed, 2006 p.124 and Farag 2000 p.7) in Erbil city, and (Hussein, 2003 p.99) in Sulaimania city. While the high rate of infection with this parasite was recorded previously by (Molan and Farag, 1989 p.107; Abdullah, et al. 1999 p. 397. and Salih, 1998, p.117) in Erbil city. The results of infection with protozoa parasite generally may be due as mentioned above to many factors, level of sanitation, personal hygiene, age of the host and better environmental conditions among studied groups.

In recent study the percentage of infections that recorded with intestinal Helminthes were 13.75% of which *E.vermicularis* were 10.34%, followed by *H.nana* 34(1.18%), *A.lambricoides* 6(0.21%), *T.trichiura* 0.13%, *A.dudenale* , *S.stercoralis* and *T.saginata* each of which were 0.03%.The rate of infection with pin worm (*E.vermicularis*) that recorded In this study 10.3%, was higher than that recorded previously in the same area 1.7% by (Farag, 2000 p.7) during the examination of stool specimens from 115 kindergartens in Erbil city. or that recorded in Mosul city by (Al-Daoudy, 1998 p.117) This nematode is very common intestinal parasites that can infect man especially in pre-school children, and primary school.The nematode *A.lambricoides* that recorded in recent study with the percentage 0.34% was, lower than previously recorded in Iraq (13.6%.) for the first time by (Senekji, 1940 p. 349) among Iraqi population. And was lower than recorded in Erbil city by (Molan, and Farag,1989 p.107) in patients of school children with percentage 19.7%. The result of infection with this nematode was approximately closely to that was recorded by (Ahmed, 2006 p.124) at the same area. The nematode *T.trichiura* is a worldwide distribution and has been reported from Iraq by (Molan, and Farag,1989 p107). In this study we found three cases of patients were infected with this parasite (0.13%). The thread worm *S.stercoralis* which is known as cochin-china diarrhea, was found in one case with percentage (0.03%), this parasite is an infection of the tropical and subtropical areas with poor sanitation, the rate of infection with this parasite was lower than that recorded in Kirkuk b (Kadir, and Salman, 1999 p. 94) he found 1.46% of total patients were infected with this parasites. One patient was infected with *Ancylostoma doudenale* (0.03%) *and this parasite was previously recorded by (Kadir, and Salman,1999 p.94) in Kirkuk city.

In recent study we found two type of intestinal cestodes *H.nana* 34 (1.21) and *Teania.saginata* 1 (0.03% The beef tapeworm was reported in Iraq 1956 by (Bailey,1956 p.295) in Baghdad city, and the dwarf tapeworm *Hymenolips nana* by (Bailey, and Khamis,1958 p.) in Baghdad city. the area of our study (Erbil city) this two cestodes *H.nana* was reported by (Kadir, et al. 1987 p.455) and *T.saginata* by (Al-Barzanjey, 1992 p.113). In the present study we found 1.21% of patients were infected with *H.nana* which was lower than that recorded previously by (Ahmed, 2006 p.124).and (Farag, 2000 p.7) at the same area and, (Al-Shirifi, 2000 p.180) in Kirkuk, and (Al-Daoudy, 1998 p.117) in Mosul city. According to the sex of patient's infection the result of current study showed that males were highly infected than females,(significant differences $p < 0.05$) (table:1) This finding was in agreement with previous study (Salih, 1991 p.,92) in Erbil ; (Salih, 1998 p.15) in Mosul ; (Al-Shirifi, 2000 p.180) in Kirkuk and (Al-Saeed, et al. 2001 p.13) in Dohuk city. Most previous study mentioned that the high rate of infection in males may due to the male's

activities out of the house and they are more contact with environmental conditions and direct contacts with the source of the infection than females. Our finding was disagree with some previous study which they found that females were more infected than males, for example (Hussein, 2003 p.99) in Sulaimania city ; (Ahmed,2006 .124) in Erbil and (Alver, 2005 p. 193) in Turkey. About the age groups infection, we found two age groups were higher than others, 1-10 years (30.0%) and 11-20 years 30.4% (.table:3), this results is agreement with some of previous study was done in the same area ((Ahmed,2006 .124) he found that 10-19 years was higher rate of infection (36.9%) than others. The high rate of infection among peoples of this age group may due to high exposure of these ages to the sources of infection and infective stages of the parasites in the environment

Conclusions:

The present study indicated that the intestinal parasitic disease is still endemic in Erbil city the capital of Kurdistan region. The results of current study recorded highly rate of infections with protozoa intestinal parasites (87.3%), of which *E.histolytica* infection were (61.2%) and *Giardia lamblia* (26.6%). While less rate of infection were with helminthes as (12.6%). The age groups (1ys.-10ys.) and (11ys.-20ys.) were highly infected, and males were more infected than females.

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References

- 1- Abdullah, S.M.A.; Darogha, S.N .and Shekhani, K.A.(1999).A study on the causative agents of diarrhia in regular patients of maternity and pediatric hospital in Erbil. J. Dohuk univ. (Sci). Special issue, 2(3): 397-407(In Arabic).
- 2- Ahmed, Q.M.(2006). Prevalence of intestinal parasites among food-handlers and primary school children in Erbil province, within initial cultivation of *Entamoeba histolytica* Schaudinn,1903. M.Sc. thesis, Salahaddin Univ. pp.124
- 3- Al-Barzanjey Bailey, V.M. (1956). A cursory examination and comparison of stool examination, methods. Bull. End. Dis. 1: 295-297.
- 4- Al-Doody, A.A.K. (1998). Epidemiology of intestinal parasites among pupils of a number of primary schools and food handlers in Nineveh governorate. MSc. Thesis, Mosul Univ., 117pp. (In Arabic).
- 5- Al-Naffoly,D.M.Y.(2004). Different staining techniques to detect *Entamoeba histolytica* and tracing the histology changes of induced amoebiasis in mice. M.Sc.Thesis. Mosul, Univ.pp.140.
- 6- Al-Saeed,A.I.; Saeed,A.Y. and Mohammed,J.B.(2001). Prevalence of gastro-intestinal parasites among population in Dohuk-Kurdistan Region-Iraq.Zanco,J.,5:13-14.
- 7- Al-Shammari S, Khoja T, El-Khwasky F and Gad A.(2001). Intestinal parasitic diseases in Riyadh, Saudi Arabia: prevalence, socio-demographic and environmental associates. Trop. Med. Int. Health 6(3):184-189.
- 8- Al-Shirifi, H.M.H. (2000). Prevalence of intestinal parasites among pupils of primary schools and food handlers in Al-Taamem province-Iraq. M.Sc. Thesis, Mosul Univ., 180pp. (In Arabic).
- 9- Alver,O.; Ozakin,C.; Yalmaz,E.; Akcaglar,S., and Tore,O.(2005). Evaluation of the distribution of intestinal parasites in the Uludag University Medical Faculty during a period of eight years. Acta. Parasitol.Turcica.,29(3):193-199
- 10-Bailey,V.M. and Khamis, F. (1958). An intestinal parasite survey in a rural district of Baghdad. Bull. End. Dis., 2: 152.
- 11-Cable, R.M. (1985). An illustrated laboratory manual of parasitology. 5th ed. Surjeet Publication Delhi. 242-246.
- 12-Coulibaly,J.T.; Furst, T.; Silue, K.D.; Knopp, S. Hauri, D.; Quattara, M.; Utzinger,J. and Goran,K.N.(2012).Intestinal parasitic infections in schoolchildren in different settings of Cote dlvoier: effect of diagnostic approach and imolications for control. J. parasites & vector, 5: 135.
- 13-Duggal P, Guo X, Haque R, Peterson KM, Ricklefs S, Mondal D, Alam F, Noor Z, Verkerke HP, Marie C, Leduc CA, Streamson C, Chua Jr, Myers MG, Rudolph Jr, Leibel L, Haupt E, Gilchrist CA, Sher A, Porcella SF and Petri WA. (2011). A mutation in the leptin receptor is associated with *Entamoeba histolytica* infection in children. J. Clin. Invest. 121(3):1191-1198.
- 14- Farag, A.m. (2000). Prevalence of intestinal parasites in some of Kindergartens in the center of Erbil-Northern Iraq. J. Dohuk Univ., 3(1): 7-12. (In Arabic).

- 15-Hotez,P.J.; Fenwick,A.; Savioli,L.; Molyneux,D.H.; (2009). Rescuing the bottom billion through control of neglected tropical disease. *Lancet*,373: 1570-1575.
- 16-Hamad,N.R. and Ramzy,I.A..(2012). Epidemiology of *Entamoeba histolytica* among children in Erbil, Province, Kurdistan Region-Iraq. *Journal of Research in Biology*. 1: 57-62.
- 17-Hussein, R.H. (2003). Epidemiology study of intestinal parasites among population in Sulaimani district. M.Sc. Thesis, Sulaimani Univ. 99pp.
- 18- Jassan,B.A.; Al-Dujaily,AA. And Hussein,MMS.(1986). Prevalence of intestinal parasites in schoolchildren of Kirkuk city, Iraq. *J.Bio.Sci.Res.*,17(2):119-125.
- 19-Kadir, M.A. and Salman,Y.G.(1999). Prevalence of intestinal parasites among primary school children in Al-Taameem Province, Iraq. *Annals of college of Medicine, Mosul*, 25:94-98.
- 20-Kadir, M.A.; Kader, A.A. and Faraj, K.K. (1987). Survey study of intestinal parasites among different population of Erbil city, *J. Fac. Med. Bagh.*, 29(4): 455-458.
- 21-Kenneth, N. O; Nsima, I. u.; Dominic C. O.; Okpok, E. O.; Evelyn U. E. and Anietie, J.U.(2012) The impact of intestinal parasitic infection on the nutritional status of rural and urban school-Aged children in Nigeria. *International journal of MCH and AIDS*, (1)73-82.
- 22-Mbanugo JI, and Onyebuchi CJ.(2002). Prevalence of intestinal parasites in Ezinifite community, Aguata Local Government Area of Anambra State. *Nigerian J. Parasitol*. 23:27–34.
- 23-Molan, A.L. and Farag,A.M.. (1989). Prevalence of intestinal parasites in school children of Erbil – Northern Iraq. *Saud. Med. J.*, 10(2) :107-110.
- 24-Murry, PR.; Rosenthal, KS. Kobayashi, GS. And Pfalle, HA. (2002). *Medical microbiology*. 4th ed.London: Mosby; 681-761.
- 25-Nematian, J.; Nematian, E.; Gholamrezanezhad,A. and Asgari, AA (2004). Prevalence of intestinal parasitic infection and their relation with socio-economic factors and hygiene habits in Tehran primary school students. *Acta Tropica*. 92(3):179-186.
- 26- Omer, M.S; Abu-Zeid,H.A. and Mahfuoze,A.A. (1991). Intestinal parasitic infections in school children of Abah(Asir), Saudia Arabia. *Acta Trop*. 48: 195-202.
- 27-Parijia, S.Ch.(2004).Textbook of medical parasitology protozoology and helminthology(Text and Color Atlas)2nd.edn.,New Delhi:408pp.
- 28-Parameshwarappa,K.D; Chandrakanth,C. and Sunil,B. (2012).The prevalence of intestinal parasitic infestation and the evaluation of different concentration techniques of the stool examination. *J. Clinical and Diagnostic Research*, 4662: 2392.
- 29-Rashidul, H. (2007). Human Intestinal Parasites. *J Health Popul Nutr. Dec*; 25(4): 387–391.

- 30-Roma B, Worku S.(1997). Magnitude of *Schistogoma mansoni* and intestinal helminthic infections among school children in wondogenet zuria, Southern Ethiopia. *Ethiop J Health Dev.* ;11:125–129.
- 31-Salih, I.J. (1998). Epidemiology of giardiasis in Erbil. *Community Health Dept., Technical Institute in Erbil. Zanco*, 10(2):15-18.
- 32-Salih, I.J. (1991). Parasitic infection in Erbil. *Salahaddin univ.,Erbil.Zanco*, 4(3):92-101.
- 33--Senekji, H.A.; Boswell, C. and Beattie, C.P.(1939). The incidence of intestinal parasites in Iraq. *Trans. R.Soc.Trop.Med. Hyg.*,33: 349.
- 34- Shihab,K. and Sultan,M.(1985). Parasitic disease among Egyptian foodhandler workers in Baghdad city.*Bull. End.Dis.*,26:56-70.
- 35-World Health Organization (WHO), (2002). Prevention and control of schistosomiasis and soil-transmitted helminthiasis; first report of the joint WHO expert committee. *WHO tech. Rep. Ser.* 912: 1-57.