



A retrospective study on the detection and prevalence of intestinal protozoan parasites at Shekhan General Hospital, Iraq

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Abstract

Globally, intestinal parasites cause of a considerable amount of illness and death. Parasites in the gut are a serious public health concern in poor countries. Infections with intestinal parasites are among the most prevalent diseases worldwide. Low-quality drinking water and unclean personal and environmental conditions are often associated with them. This study aimed to determine the prevalence of gastrointestinal parasites from patients who attended Shekhan General Hospital, Shekhan District, Duhok, Iraq. The study conducted a retrospective cross-sectional analysis from January to November 2023. Overall, 228 recorded stool samples for eleven months were included in this study, and direct wet stool examinations were done for all stool samples to record intestinal protozoan stages. 228 stool samples were reported for eleven months between January and November 2023. Of them, 90 (39.47%) were recorded positive for intestinal protozoan parasites. The highest infection rate was found in September (8.3%), while the lowest rate of intestinal parasites was in November (0.0%). Regarding gender, the infection rate with parasitic infection was higher in males (22.3%) than in females (17.1%). Regarding a total of 228 samples the most prevalent age group aged <10 years (6.7%), the moderate one was in ages between 10-30 years (8.8%), and the lowest was in ages >30 years (3.9%). Finally, this study recorded that the most common

gastrointestinal protozoan parasites were *Giardia lamblia* (21.1%) and *Entamoeba histolytica* (17.1%). Infections can be prevented and controlled by practicing epidemiological surveillance, keeping oneself clean, and improving environmental cleanliness.

Keywords: Gastrointestinal Parasites, Shekhan General Hospital, Parasites, Duhok, Parasite detection.

الكشف بأثر رجعي عن طفيليات الأوليات المعدية المعوية وانتشارها في مستشفى شيخان العام، منطقة شيخان، دهوك، العراق

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الخلاصة:

هدفت هذه الدراسة إلى معرفة مدى انتشار الطفيليات المعدية المعوية بين عينات البراز بين المرضى الذين حضروا مستشفى شيخان العام، منطقة شيخان، دهوك، العراق. أجرت الدراسة تحليلاً مقطوعياً بأثر رجعي من يناير إلى نوفمبر ٢٠٢٣. تم الكشف عن تفاصيل جميع الطفيليات المعوية المبلغ عنها داخل عينة البراز عن طريق الفحص المباشر للبراز، وتم الحصول على الانتشار من وحدة التسجيل في مستشفى شيخان العام. بشكل عام، تم تضمين ٢٢٨ عينة براز مسجلة لمدة أحد عشر شهراً في هذه الدراسة، وتم إجراء فحوصات البراز الرطب المباشرة لجميع عينات البراز لتسجيل الأوليات الأولية والخراجات المعوية لمدة أحد عشر شهراً. تم حساب الطفيليات الأولية المعدية المعوية المكتشفة ومعدل انتشارها باستخدام التكرار والنسب المئوية. أخيراً، تم تقديم جميع البيانات كجدول. تم الإبلاغ عن ٢٢٨ عينة براز لمدة أحد عشر شهراً بين يناير ونوفمبر ٢٠٢٣. من بينها، تم تسجيل ٩٠ (٣٩,٤٧٪) إيجابية للطفيليات الأولية المعوية. تم العثور على أعلى معدل إصابة في سبتمبر (٨,٣٪)، في حين كان أدنى معدل للطفيليات المعوية في نوفمبر (٠,٠٪). وفيما يتعلق بنوع الجنس، كان معدل الإصابة بالعدوى الطفيلية أعلى لدى الذكور (٢٢,٣ في المائة) منه لدى الإناث (١٧,١ في المائة). وفيما يتعلق بمجموعه ٢٢٨ عينة والفئة العمرية الأكثر انتشاراً بين >١٠ سنوات (٦,٧٪)، كانت العينة المعتدلة في الأعمار بين ١٠-٣٠ سنة (٨,٨٪)، وأقلها في الأعمار <٣٠ سنة (٣,٩٪). أخيراً، سجلت هذه الدراسة أن طفيليات الأوليات المعدية المعوية الأكثر شيوعاً هي *Giardia lamblia* (٢١,١٪) و *Entamoeba histolytica* (١٧,١٪). يمكن الوقاية من العدوى والسيطرة عليها من خلال ممارسة المراقبة الوبائية، والحفاظ على نظافة النفس، وتحسين النظافة البيئية.

الكلمات المفتاحية: داء الجيارديا، داء الأميبا، طفيليات الجهاز الهضمي، فحص البراز، الانتشار

Introduction

Intestinal helminths and protozoan parasites, as well as other parasitic infections, are major global public health concerns that are primarily responsible for illness and disease, especially in affluent nations. These parasites affect at least thirty percent of people on the planet. In the

world, for example, 3.5 billion people are impacted, and these infections are responsible for over 450 million illnesses. Gastrointestinal infections in affluent nations are more frequently caused by protozoan infections than helminth infections [1,2]

Globally, parasitic diseases are common; their frequency varies according to sanitation standards and is linked to several factors such as poverty, malnourishment, overcrowding, and tropical weather [1]. A major contributing factor to the spread of parasitic diseases is inadequate food hygiene, contaminated water, and poor personal hygiene [2,3]. The main parasitological diagnosis for screening of morphological stages of the intestinal parasite is an examination of stool for detection of the first screening of both trophozoites and cysts morphological stages of intestinal protozoan, including *Entamoeba histolytica*, non-pathogenic *Entamoeba*, and *Giardia lamblia*, and the oocyst of *Crptosporidium parvum*, [4, 5] the second for screening of eggs of some intestinal nematodes such as *Enterobius vermicularis*, *Ascaris lumbricoides*, and *Ancylostoma duodenale*, and the larval one of nematode like *Strongyloides stercoralis*, [6] and finally for searching of segments and eggs of cestodes [7].

Gastrointestinal parasitic infections are globally significant public health problems in poor nations, [8] as a result of several risk factors such as inadequate sanitation, personal hygiene, clean drinking water, crowding, and malnutrition [9]. Gastrointestinal parasites affect people of all ages, mainly children, who are most frequently impacted due to their unhygienic habits and weakened immune systems [10]. Absorption problems, loss of weight, anemia, learning challenges, mental retardation, and intellectual issues are all linked to intestinal parasites in children [11]. Millions of toddlers and school-age children are generally at high risk of contracting helminthic and protozoan parasites, requiring an effective medication and a preventive measurement [12]. The World Health Organization reported that more than three billion people are infected with gastrointestinal parasites throughout the world, and most of them are children [13].

Till now there is no such study that recorded the most frequent gastrointestinal parasites in Shekhan District, Duhok City, Iraq. Most of the patients who attended the General Shekhan Hospital are primarily from low-socioeconomic communities and are at risk of parasite diseases. Shekhan District is widely renowned for its hot and humid weather, presence of immigrant camps, crowding, contamination of drinking water, and environmental and personal hygiene; all these provide an optimal environment for the spread of parasitic

diseases. Till now, no document has determined the most gastrointestinal protozoan parasites in Shekhan. Therefore, this study aimed to know the prevalence of common intestinal parasites among stool samples at Shekhan General Hospital, Shekhan District, Duhok, Iraq.

1. Materials and Methods

1.1. Study Design and Data Collection

To determine the detection of gastrointestinal protozoan parasites and their prevalence during eleven months (January to November 2023), a retrospective cross-sectional study was conducted. Details for all reported intestinal parasites were detected within the stool sample by direct stool examination, and the prevalence rate of infection was obtained from the register unit at Shekhan General Hospital. 228 stool samples were included in this study from January to November 2023, and direct wet stool examinations were done for all stool samples to record intestinal protozoan trophozoites and cysts for eleven months.

2.2. Inclusion and Exclusion Criteria

All patients who underwent an 11-month examination for gastrointestinal parasites during the study period were included in the analysis; however, data that did not include sociodemographic information, the year the stool examination was conducted, or information about the species and stage of gastrointestinal parasites had been excluded.

1.2. Data Analysis

All recorded data were entered and analyzed in the Microsoft Office Excel worksheet 2010. The detected gastrointestinal protozoan and its prevalence rate were calculated using frequency and percentages. Finally, all data were presented as tables.

Results

During the period of study (January to November 2023). 228 stool samples were requested for gastrointestinal parasite examination at Shekhan General Hospital. Ninety (39.47%) of them were recorded positive for intestinal protozoan parasites. The highest infection rate was found in September (8.3%), while the lowest rate of intestinal parasites was in November (0.0%). Regarding gender, the infection rate with parasitic infection was higher in males (22.3%) than in females (17.1%), as shown in Table 1.

Table 1: The gender distribution of samples per month and prevalence of intestinal parasites in this study:

Months	Total examined stool samples	Positive cases and their percentage		
		Total Positive No.	Males	Females
January	9	3(1.3%)	2(0.9%)	1(0.4%)
February	10	4(1.8%)	2(0.9%)	2(0.9%)
March	18	13(5.7%)	8(3.5%)	5(2.2%)
April	11	3(1.3%)	0(0.0%)	3(1.3%)
May	18	8(3.5%)	4(1.7%)	4(1.7%)
Jun	29	7(3.0%)	6(2.6%)	1(0.4%)
July	33	12(5.2%)	7(3.0%)	5(2.2%)
August	26	9(3.9%)	6(2.6%)	3(1.3%)
September	35	19(8.3%)	10(4.4%)	9(3.9%)
October	36	12(5.2%)	6(2.6%)	6(2.6%)
November	3	0(0.0%)	0(0.0%)	0(0.0%)
Total	228	90(39.4%)	51(22.3%)	39(17.1%)

Regarding

a total of 228 stool samples, the most prevalent age group aged <10 years (6.7%), the moderate one was in ages between 0-30 years (8.8%) and the lowest was in ages >30 (3.9%) as shown in Table 2.

Table 2: The distribution of intestinal parasites according to gender and age groups:

Age Groups	Total No. examined Stool sample	Positive Stool Samples		
		Total Positive No.	Males	Females
<10	115	61(26.7%)	37(16.2%)	24(10.5%)
10 - 30	75	20(8.8%)	13(5.7%)	7(3.1%)
>30	38	9(3.9%)	1(0.4%)	8(3.5%)
Total	228	90(39.4%)	51 (22.3%)	39 (17.1)

The most common intestinal parasites detected in this study were *G. lamblia*, *E. histolytica*, and *E. coli* (21.1%, 17.1%, and 1.3%) respectively, as shown in Table3.

Total No.	Positive Cases	%	<i>E. coli</i>	<i>E. histolytica</i>	<i>G. lamblia</i>
228	90	39.5%	3(1.3%)	39(17.1%)	48(21.1%)

Table 3: The detected intestinal protozoan parasites in this study and their rate:

3. Discussion

Infections with gastrointestinal parasites are a serious public health concern and are thought to be a primary cause of many infections. Gastrointestinal parasitic infections are linked to inadequate sanitation and unhygienic practices [14]. There is no such study that determines the reported gastrointestinal parasites and their prevalence rate in Shekhan District, Duhok, Iraq.

This retrospective study highlights that the infection rate with gastrointestinal parasitic disease was (39.4%). The prevalence rate with intestinal parasites according to the month was higher in September (8.3%), and a lower infection rate was recorded in November (0.0%). This finding is within the line of Mohammed et al., [15] and Konadu et al. [16], who reported as this study reported. The autumn season is wet and rainy, which makes sanitation extremely

unsafe and increases the risk of gastrointestinal parasite contamination in food and drink due to improper stool waste disposal [17].

Regarding gender, the infection rate with parasitic infection was higher in males (22.3%) than in females (17.1%). This result is in line with a study done in Duhok City, Iraq, by which a higher rate was recorded in males than in females [18]. The same rate was reported in males by Taher and Ali [19]. This finding disagrees with a study done in Saudi Arabia between the period of 2019 to 2023, which found that the higher infection rate in females can be explained by the fact that females are more likely than males to contract parasite infections during the infectious stages because of household responsibilities and lifestyle choices [20]. While, this result disagrees with the study result recorded by Getnet *et al.* [21], which found the highest rate in males than in females among schoolchildren at Amber Primary School, Ethiopia.

This study found that the most common was in the age group <10 years (6.7%), and the lowest was in ages >30 years (3.9%). This high rate in these ages was reported in Kirkuk City, Iraq, by Mohammed *et al.* [8]; also, a similar rate was reported by other researchers such as Ismael *et al.* [18], Taher and Ali [19], Kumar *et al.* [22]. This age group is more susceptible to infection because they spend most of their time outside the home and in contact with the contaminated environment.

According to the present study, the most frequently detected gastrointestinal parasites were *G. lamblia* and *E. histolytica*. This result agrees with Taher and Ali, who found that the most intestinal parasites were *G. lamblia* and *E. histolytica* [19]; also, a similar report was obtained by Duguma and Tekalign [23] and a retrospective study was done in Ghana for five years, which agrees with the result within this study [16, 24]. It is suggested that these two parasites were more frequent in this study because these parasites are transmitted by ingestion of contaminated food and grasses and drinking contaminated water [25, 26, 27].

In contrast to the current study's findings, a retrospective survey of intestinal parasites by Kurup & Gurdir [28] found a total incidence of 26.1% within four years. The most common protozoan infection was *Giardia intestinalis*, which was found to have a prevalence rate of 21.1% in this study. This is lower than findings from various types of literature that reported giardia prevalence of 2 to 3 percent in wealthy nations but up to 30 percent in the majority of underdeveloped countries [29].

Our findings for the prevalence of amebiasis were 17.1%, whereas a study conducted in Iraq found a prevalence of 3.78 percent [30]. The current study's findings are significantly lower than those of another similar study conducted at the University Hospital of Parma, which found an intestinal parasite prevalence of 16.6% [31] between 2006 and 2010. Intestinal parasite prevalence rates of 17.6%, 13.9%, 9.03, and 8.9% were reported in four Indian tertiary care facilities; our results were greater than those of other studies [32, 33]. Additionally, a study in north-central Iran between 2012 and 2016 found an intestinal parasite prevalence of 18.0%, which was less than what our study found [34].

Conclusion

Due to the lack of research on the prevalence of gastrointestinal parasites in Shekhan General Hospital, Duhok, Iraq, this investigation provided several interesting findings. This study revealed a low number of stool samples examined daily during the eleven months, and the rate of parasitic infection was 39.4%. The most frequent gastrointestinal parasites in this study were *G. lamblia* and *E. histolytica*. Also, our study highlights that the male sex, young people, and the humid season all impact positively on the prevalence rate of parasitic infection.

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Contribution Study Concept and Design

Shameeran Salman Ismael, Iman Salim Sulaiman, and Hayam Nori Awad

Analysis and interpretation of data

Shameeran Salman Ismael

Ethics

The study proposal was approved by the ethics and scientific committee of the Shekhan Technical College of Health/Duhok Polytechnic University and Shekhan General Hospital.

Conflict of Interest

The authors declare that they have no conflict of interest.

Data Availability

The data that support the findings of this study are available on request from the corresponding author.

References

- [1] Shobha, M., Bithika, D., & Bhavesh, S. The prevalence of intestinal parasitic infections in the urban slums of a city in Western India. *Journal of Infection and Public Health*, 2023; 6(2), 142–149. <https://doi.org/10.1016/j.jiph.2012.11.004>
- [2] Ahmed, M. Intestinal Parasitic Infections in 2023. *Gastroenterology research*, 2023;16(3):127-140. doi:10.14740/gr1622
- [3] Meena, S., Meena, J. K., Kumar, D., & Mathur, P. Spectrum and Trends of Intestinal Parasitic Infections at a Tertiary Care Hospital during Pandemic Times: A Laboratory-Based Retrospective Study. *Journal of Laboratory Physicians*,2023; 15(4), 503–509. <https://doi.org/10.1055/s-0043-1768169>
- [4] McHardy, I. H., Wu, M., Shimizu-Cohen, R., Couturier, M. R., & Humphries, R. M. Detection of intestinal protozoa in the clinical laboratory. *Journal of Clinical Microbiology*, 2014; 52(3), 712–720. <https://doi.org/10.1128/JCM.02877-13>
- [5] Fletcher, S. M., Stark, D., Harkness, J., & Ellis, J. Enteric protozoa in the developed world: a public health perspective. *Clinical Microbiology Reviews*, 2012; 25(3), 420–449. <https://doi.org/10.1128/CMR.05038-11>
- [6] Roeber, F., Jex, A. R., & Gasser, R. B. Advances in the diagnosis of key gastrointestinal nematode infections of livestock, with an emphasis on small ruminants. *Biotechnology advances*, 2013; 31(8), 1135–1152. <https://doi.org/10.1016/j.biotechadv.2013.01.008>
- [7] Ndao, M. Diagnosis of parasitic diseases: old and new approaches. *Interdisciplinary perspectives on infectious diseases*, 2009, 278246. <https://doi.org/10.1155/2009/278246>
- [8] Negussu, N., Mengistu, B., Kebede, B., Deribe, K., Ejigu, E., Tadesse, G., Mekete, K., & Sileshi, M. Ethiopia Schistosomiasis and Soil-Transmitted Helminthes Control Programme: Progress and Prospects. *Ethiopian Medical Journal*, 2017; 55(1), 75–80. PMID: 28878432; PMCID: PMC5582635.

- [9] Alum, A., Rubino, J. R., & Ijaz, M. K. The global war against intestinal parasites--should we use a holistic approach?. *International journal of infectious diseases: IJID: official publication of the International Society for Infectious Diseases*, 2010; 14(9), e732–e738. <https://doi.org/10.1016/j.ijid.2009.11.036>
- [10] Steketee R. W. Pregnancy, nutrition and parasitic diseases. *The Journal of nutrition*, 2003; 133(5 Suppl 2), 1661S–1667S. <https://doi.org/10.1093/jn/133.5.1661S>
- [11] El-Sherbini, G. T., & Abosdera, M. M. Risk factors associated with intestinal parasitic infections among children. *Journal of the Egyptian Society of Parasitology*, 2013; 43(1), 287–294. <https://doi.org/10.12816/0006385>
- [12] Hotez, P. J., Alvarado, M., Basáñez, M. G., Bolliger, I., Bourne, R., Boussinesq, M., Brooker, S. J., Brown, A. S., Buckle, G., Budke, C. M., Carabin, H., Coffeng, L. E., Fèvre, E. M., Fürst, T., Halasa, Y. A., Jasrasaria, R., Johns, N. E., Keiser, J., King, C. H., Lozano, R., & Naghavi, M. The global burden of disease study 2010: interpretation and implications for the neglected tropical diseases. *PLoS neglected tropical diseases*, 2014; 8(7), e2865. <https://doi.org/10.1371/journal.pntd.0002865>
- [13] Brooker S. Estimating the global distribution and disease burden of intestinal nematode infections: adding up the numbers--a review. *International Journal for Parasitology*, 2010; 40(10), 1137–1144. <https://doi.org/10.1016/j.ijpara.2010.04.004>
- [14] Hassen Amer, O., Ashankyty, I. M., & Haouas, N. A. Prevalence of intestinal parasite infections among patients in local public hospitals of Hail, Northwestern Saudi Arabia. *Asian Pacific Journal of Tropical Medicine*, 2016; 9(1), 44–48. <https://doi.org/10.1016/j.apjtm.2015.12.009>
- [15] Mohammed, B.A., Rasheed, Z.K., Jihad, L.J., & Abass, K.S. Frequency of *Giardia lamblia* among Iraqi children in Kirkuk Governorate. *Systemic Reviews in Pharmacy*, 2020; 11(12), 1909-1911
- [16] Konadu, E., Gbedema, S.Y., Boakye, Y.D., Osei-Mensah, B., Badu-Boateng, E. Burden of gastrointestinal parasitic infections: A 5-year retrospective study at a tertiary hospital in Ghana. *International Journal of Advanced Research in Biological Sciences*. 2023; 10(4), 238-246.

- [17] Osei, F. B., & Stein, A. Spatio-temporal analysis of small-area intestinal parasites infections in Ghana. *Scientific reports*, 2017; 7(1), 12217. <https://doi.org/10.1038/s41598-017-12397-1>
- [18] Ismael, S., Abdullah, B.H., Sadiq, A.J., Ajaj, J.S., Ali, N.S., Omer, D.M., & Nori, N.Y. Prevalence of Intestinal Protozoan Parasites among Children attending the Hevi Pediatric Hospital in Duhok Province, Kurdistan Region, Iraq. *Archives of Razi Institute*, 2024; 79(3), 507-12.
- [19] Taher, H.M., & Ali, Y.S. Prevalence of Intestinal Parasitic Infections among children in Kirkuk City, Iraq. *Bionatura*, 2023; 8(CSS 1). 10.21931/RB/CSS/2023.08.01.18.
- [20] Abdalal, S. A., Niyazi, H. A., Alsulami, S. M., Azhari, A. A., Niyazi, H. A., Mokhtar, J. A., Attallah, D. M., Al Braikan, F. A., & Aldarmasi, M. A. Prevalence and Predictors of Intestinal Parasitic Infections at King Abdulaziz University Hospital, Jeddah, Saudi Arabia, from 2019 to 2023: A Retrospective Study. *Infection and drug resistance*, 2024; 17, 2793–2801. <https://doi.org/10.2147/IDR.S457522>
- [21] Getnet, T., Alemayehu, T., Demeke, T., Toru, M., & Aschale, Y. Assessment of prevalence and associated factors of intestinal parasite infections among school children at Amber Primary School, Northwest Ethiopia. *SAGE open medicine*, 2022; 10, 20503121221128134. <https://doi.org/10.1177/20503121221128134>
- [22] Kumar, H., Jain, K., & Jain, R. A study of prevalence of intestinal worm infestation and efficacy of anthelmintic drugs. *Medical Journal, Armed Forces India*, 2014; 70(2), 144–148. <https://doi.org/10.1016/j.mjafi.2013.12.009>
- [23] Duguma, T., & Tekalign, E. A Five-Year Retrospective Investigation of the Prevalence of Intestinal Parasites at Mizan-Tepi University Teaching Hospital, Southwest Ethiopia. *Iranian Journal of Parasitology*, 2023; 18(1), 76–84. <https://doi.org/10.18502/ijpa.v18i1.12382>
- [24] Haji, H.M., Bamarni, S.S.I. Prevalence of Entamoeba histolytica and Giardia lamblia in children in Duhok Province, Kurdistan Region, Iraq. *Journal of Duhok University*. 2023;26(1),274-80.

- [25] Sengupta, P., & Chakraborty, A. Infection of the gastrointestinal tract: Giardiasis and amoebiasis. *Viral, Parasitic, Bacterial, and Fungal Infections, Academic Press*, 2023; 365-373. 10.1016/B978-0-323-85730-7.00013-8.
- [26] Barwari, W.J., & Ismael, S.S. Detection of Pathogenic Strains of Entamoeba Histolytica in Children Using ELISA Technique in Duhok. *Journal of Duhok University*, 2011; 8(2),109-19.
- [27] Aguilar-Marcelino, L., Bautista-Garfias, C.R., Zaheer, T., Maqsood, A., Bamarni, S.S., Abdullah, B.H., Faruk, A.Z., Salman, M., Akhtar, T., Silva, F.E., & Hussain, R. Potential of Anisakiasis in Foodborne Zoonosis. *Pakistan Veterinary Journal*, 2022; 42(4), 434-444. <http://dx.doi.org/10.29261/pakvetj/2022.080>
- [28] Kurup, R., Gurdir, SH. Intestinal parasites in St Lucia: a retrospective, laboratory-based study. *Journal of Rural and Tropical Public Health*, 2010; 24-30.
- [29] Feng, Y., Xiao L. Zoonotic potential and molecular epidemiology of *Giardia* species and giardiasis. *Clinical microbiology reviews*, 2011;24(1):110-140. doi:10.1128/CMR.00033-10
- [30] Al Saqur, I.M., Al-Warid, H.S., Albahadely, H.S. The prevalence of Giardia lamblia and Entamoeba histolytica/dispar among Iraqi provinces. *Karbala International Journal of Modern Science*, 2017;3(2):93-6. <https://doi.org/10.1016/j.kijoms.2017.04.001>
- [31] Calderaro, A., Montecchini, S., Rossi, S., et al. Intestinal parasitoses in a tertiary-care hospital located in a non-endemic setting during 2006-2010. *BMC infectious diseases*, 2014;14:264. doi:10.1186/1471-2334-14-264
- [32] Sangani, S., Jaiswal, N., Charlies, J., Rukadikar, A., Deshkar, D., Tadv, J., Kishori, R. Prevalence of Intestinal Parasites in a Tertiary Care Hospital in Rural Areas of Dahod. *European Journal of Molecular & Clinical Medicine (EJMCM)*, 2020;7(11):2020.
- [33] Sahai, S., Jamali, S. Changing trend in prevalence of intestinal parasites in patients attending a tertiary care hospital in Lucknow. *Indian Journal of Basic and Applied Medical Research*, 2014;4:560-7.
- [34] Karimazar, M., Rezaeian, S., Ebrahimipour, M., Ranjbarpour, A., Madanipour, H., Javan, S., Najjari, M. Prevalence and time-trend analysis of intestinal parasitic infections in north-central Iran, 2012-2016. *Tropical biomedicine*, 2019;36(1):103-113.