

Investigation of Intestinal and Blood Parasites in People Returning to Turkey with a History of Traveling Abroad During the Pandemic

Pandemi Sürecinde Yurt Dışı Seyahat Öyküsü Olup Türkiye'ye Dönen İnsanlarda İntestinal ve Kan Parazitlerinin Araştırılması

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Cite this article as: Ekici A, Gürbüz E, Ünlü AH, Yıldız R, Aydemir S, Halidi AG, Ödemiş N, Karakuş S, Yürektürk Ş, Çiçek M, Yılmaz H. Investigation of Intestinal and Blood Parasites in People Returning to Turkey with a History of Traveling Abroad During the Pandemic. Türkiye Parazit Derg 2022;46(2):108-13.

ABSTRACT

Objective: To investigate intestinal and blood parasites in people who have a history of traveling abroad during the Coronavirus disease-2019 pandemic and returning to Turkey.

Methods: In this study, 104 patients with gastrointestinal system and/or fever complaints who had traveled abroad during the pandemic period and returned to Turkey were included. Parasitic agents were investigated by taking blood and stool samples from the patients. Additionally, urine samples were obtained from patients with hematuria or dysuria with the suspicion of schistosomiasis. A direct microscopic examination, the Crypto-Giardia immunochromatographic test, and ELISA methods were used in the examination of the stool samples. In order to detect *Plasmodium* species, blood samples were examined by preparing both the rapid diagnostic test and thick drop and thin smear preparations.

Results: One or more parasite species were detected in 38 (38.5%) of 104 patients included in the study. While intestinal parasites were detected in 16 (32%) of 50 patients who traveled to Iran and 16 (33.3%) of 48 patients who traveled to Northern Iraq, blood parasites were not found. *Schistosoma mansoni* was detected in all 5 of the patients with a history of traveling to Sudan. *Plasmodium falciparum* was detected in 1 patient who traveled to the African continent.

Conclusion: It is vital to take precautions to prevent parasitic diseases, such as malaria and schistosomiasis, during travels to African countries. During travels to neighboring countries of Turkey, such as Northern Iraq and Iran, hygiene should be paid attention to, so as to prevent contracting intestinal parasitic diseases. In addition, it was concluded that people who plan to travel abroad should have information about the endemic parasitic diseases of the country that they are going to.

Keywords: Intestinal and blood parasites, *Plasmodium falciparum*, Schistosomiasis, *Schistosoma mansoni*



Received/Geliş Tarihi: 22.06.2021 Accepted/Kabul Tarihi: 20.12.2021

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ÖZ

Amaç: Koronavirüs hastalığı-2019 pandemisi sürecinde yurt dışı seyahat öyküsü olup Türkiye'ye dönen insanlarda intestinal ve kan parazitlerinin araştırılmasıdır.

Yöntemler: Çalışmaya pandemi sürecinde yurt dışı seyahati olup Türkiye'ye dönen insanlardan gastrointestinal sistem ve/veya ateş şikayeti olan 104 hasta dahil edilmiştir. Hastalardan kan ve dışkı örnekleri alınarak parazitler etkenler araştırılmıştır. Ayrıca hematüri veya dizüri şikayeti olan hastalardan schistosomiasis şüphesiyle idrar örnekleri alınmıştır. Dışkı örneklerinin incelenmesinde direkt mikroskopik bakı, Crypto-Giardia immünokromatografik test ve ELISA yöntemleri kullanılmıştır. Kan örnekleri, *Plasmodium* türlerini saptamak amacıyla, hem hızlı tanı testi hem de kalın damla ve ince yayma preparatlar hazırlanarak incelenmiştir.

Bulgular: Çalışmaya dahil edilen 104 hastanın 38'inde (%38,5) bir ya da birden fazla parazit türü saptanmıştır. İran'a seyahat eden 50 hastanın 16'sında (%32), Kuzey Irak'a seyahat eden 48 hastanın 16'sında (%33,3) intestinal parazitler saptanırken, kan parazitlerine rastlanmamıştır. Sudan'a seyahat öyküsü olan 5 hastanın tümünde *Schistosoma mansoni* saptanmıştır. Afrika kıtası seyahati olan bir hastada ise *Plasmodium falciparum* saptanmıştır.

Sonuç: Afrika ülkelerine seyahatlerde sıtma ve schistosomiasis gibi parazitler hastalıklardan korunmak için önlemlerin alınması hayati önem taşımaktadır. Kuzey Irak ve İran gibi Türkiye'ye komşu ülkelere seyahatlerde ise intestinal parazitler hastalıklardan korunmak için hijyene dikkat edilmesi gerekmektedir. Ayrıca yurt dışı seyahati planlayan kişilerin, gideceği ülkenin endemik parazitler hastalıkları hakkında bilgi sahibi olması gerektiği kanaatine varılmıştır.

Anahtar Kelimeler: İntestinal ve kan parazitleri, *Plasmodium falciparum*, Schistosomiasis, *Schistosoma mansoni*

INTRODUCTION

Due to the increase in the welfare level and the ease of travel opportunities, international travel continues to increase day by day in Turkey, as well as in the rest of the world. Many people travel from Africa to Asia, and from Latin America to Oceania for various reasons. These include business, education, research, eco-tourism, adventure, touristic trips, visiting relatives, medical reasons, religious travels, natural or humanitarian disasters (1).

One of the most current problems caused by these travels is the ongoing Coronavirus disease-2019 (COVID-19) pandemic (2). In the globalizing world, this human mobility, which occurs for various reasons, causes the spread of different infections between continents and changes in the epidemiology of diseases. People can face serious health problems when traveling, especially if they choose regions where certain infections are endemic. The parasitic infections that pose a risk to travelers to these endemic areas include malaria, leishmaniasis, schistosomiasis, filariasis, foodborne trematode infections, soilborne helminth infections, and tourist diarrhea. In a booklet published by the American National Center for Disease Control in 2016, it was stated that 25 out of 75 infectious diseases are due to parasites and 8 are viral/bacterial infections transmitted by vectors. Such diseases can cause significant morbidity and mortality in cases where necessary precautions are not taken during travel and preventive drugs are not used. When travelers return to their countries, they can carry these pathogens that they were infected with and cause the spread of infectious diseases all over the world (3-5). In 1-month trips to developing countries, which constitute almost half of international travel worldwide, it was reported that approximately 50% of the travelers felt sick during or after the trip, 10% consulted a doctor while abroad or when they returned to their country, 7% felt the need to rest, 2% were too ill to go to work after the trip, less than 1% were hospitalized while abroad, and 0.001% died during the trip. Parasitic infections constitute approximately one-fifth of these. When infections transmitted by vectors are added to the lesions and irritations caused by external parasites, it becomes clear how important parasitic diseases are. Parasitic infections transmitted by water and food can be carried to their living spaces by people returning to their countries. Care should be taken in terms of infections such as giardiasis, cryptosporidiosis, which may lead to epidemics. On the other hand, the serious health problems that may arise due to the fact that the sick person who goes to the regions where the disease

does not exist, but where the appropriate vector is present, is the reservoir of the disease, shows how important it is (1).

With this study, it was aimed to investigate intestinal and blood parasites in people who had a history of traveling abroad during the pandemic period and returning to Turkey, and to minimize mortality-morbidity by taking precautions against parasitic diseases that travelers may encounter at their destination.

METHODS

The study included 104 patients who applied to the University of Health Sciences Turkey, Van Training and Research Hospital with gastrointestinal system and/or fever complaints, hematuria, or dysuria and had a history of traveling abroad during the COVID-19 pandemic and returning to Turkey. Parasitic agents were investigated by taking blood and stool samples from those with gastrointestinal system and/or fever complaints, and urine samples from those with hematuria or dysuria.

A direct microscopic examination, Crypto-Giardia immunochromatographic test, and ELISA methods were used in the examination of stool samples. The urine samples taken were analyzed using the precipitation method. In order to detect *Plasmodium* species, the blood samples were analyzed by preparing both a rapid diagnostic test, and thick drop and thin smear preparations. The epidemiological history and clinical symptoms of the patients were recorded from the hospital automation system.

Microscopic Examination of the Stool Samples

The native-Lugol, brine flotation, and formol-ether precipitation methods were used to analyze the stool samples taken from all of the individuals included in the study. The prepared preparations were examined under the light microscope with a 10 magnification to detect the presence of helminth eggs and a 40 magnification to detect protozoan trophozoites and cysts.

Microscopic Examination of the Urine Samples

Urine samples were collected from patients with hematuria or dysuria for a period of 3 days, in the afternoon of each day. The patients were instructed to take the sample towards the end of urination. The collected urine samples were centrifuged at 1500 rpm for 5 min. The resulting debris was examined under a light microscope with 10 and 40 lenses.

Crypto-Giardia Immunochromatographic Assay

The Certest Crypto-Giardia (Biotec, Barcelona, Spain) cassette test was used to detect patients who were positive for *Cryptosporidium* spp. and/or *Giardia intestinalis*. Cassette tests were performed in accordance with the manufacturer's instructions for use.

ELISA *E. histolytica* Adhesin Test

The commercial ELISA kit (*E. histolytica* II Test Kit; Wampole TechLab, Blacksburg, VA, USA) was used to detect *Entamoeba histolytica* adhesin antigen in stool. The ELISA test was performed in accordance with the manufacturer's instructions for use.

Microscopic Examination of the Blood Samples

Thick drop and thin smear preparations were prepared from the samples taken from the peripheral blood of the patients. The prepared preparations were stained with Giemsa dye. Blood parasites were investigated with a 100-lens objective under the light microscope.

Malaria Rapid Diagnostic Test

A rapid diagnostic test (OptiMAL, DiaMed GmbH, Cressier FR, Switzerland) was used to detect antigens of *Plasmodium* species from the peripheral blood samples that were taken from the patients. The test was performed in accordance with the manufacturer's instructions for use.

Statistical Analysis

No statistical analysis was required in the study.

Ethical considerations: Approval of the ethics committee with decision number 16 was obtained on 20.08.2020 from the University of Health Sciences Turkey, Van Training and Research Hospital Ethics Committee. Informed consents were obtained from patients.

RESULTS

A total of 104 patients, including 50 patients who traveled to Iran, 48 patients who traveled to Northern Iraq, 5 patients who traveled to Sudan, and 1 patient who traveled to the African continent, were included in the study. It was determined that all of the patients with a travel history to Iran and Northern Iraq applied to the hospital with gastrointestinal complaints. Severe watery diarrhea was detected in some patients, and bloody diarrhea was detected in 1 patient. Fatigue, weakness, fluctuating fever and sweating, pain during urination, and severe abdominal and kidney pain were determined in 5 patients who traveled to Sudan, and fever was found in the 1 patient who traveled to the African continent.

One or more parasite species was detected in 38 (36.5%) patients. Intestinal parasites were detected in 16 (32%) of 50 patients who traveled to Iran and 16 (33.3%) of 48 patients who traveled to Northern Iraq, while blood parasites were not detected. *Schistosoma mansoni* was detected in all 5 of the patients who traveled to Sudan (Figure 1). *Plasmodium falciparum* was detected in the 1 patient who traveled to the African continent (Table 1).

DISCUSSION

Natural disasters have affected human life through chain events throughout history, and have deeply affected and changed areas

such as socio-cultural, economic, and public health. Epidemics, mass migration events, and interactions, which have a significant impact on these events, shape the history of humanity. It has been observed that migration events that occur for different reasons are a reservoir for infectious diseases. Infectious diseases, which have emerged in various forms throughout history, have affected not only societies, but the whole world and have caused great destruction. The spread of epidemics to the global area through migration has now become faster and easier, and has greatly affected societies and human history. The ongoing COVID-19 pandemic, similar to the breaking points in the past, affects the whole world and takes its place in history as the largest pandemic of the century World Health Organization (WHO) (6,7).

Infectious diseases caused by immigration for various reasons are a public health problem for both immigrants and those living in the countries of immigration. Infected people traveling from endemic areas to non-endemic areas carry the disease to the areas they visit if the vector and environmental conditions are suitable. Moreover, healthy individuals traveling to endemic areas may be at greater risk of infection than those living there. Infectious diseases especially occur in areas with poor sanitation or overcrowded populations. Especially in such places, it has been seen that infectious diseases spread rapidly, are carried to other places by travelers, and even death can result if precautions are not taken (2). Like many parasitic infectious agents, *G. intestinalis* can be transmitted by asymptomatic people. Those who are asymptomatic returning from travel may pose a serious threat to public health. In addition, the fact that malaria, which can be carried by people returning from travel, remains current as a threat to public health, can be given as a different example (3). Medical parasitologists face problems in controlling the spread of disease rather than treating it (8). People infected with parasites, such as *G. intestinalis* and *Cryptosporidium* spp., which are common in Turkey and neighboring countries, can easily spread the infection to the environment. It should become known that if these infections become endemic, especially in the regions where the Southeastern Anatolia Project (GAP) is conducted, it will be very difficult to control and this will come at great cost (9). Migration poses a great threat to the emergence and spread of infectious diseases, especially for infectious diseases with diarrhea (2).

Travel health should be constantly monitored in terms of source countries and infectious diseases, as it is constantly changing. In Europe in 2011, 482 (8.1%) of 5.965 patients admitted to clinics after travel had malaria, 221 (3.7%) had giardiasis, 131 (2.2%) had schistosomiasis, and 154 cutaneous larva migrans was found in 2.6%, and cutaneous leishmaniasis was found in 46 (0.8%) (1). The African continent is a very important region in terms of travel-related parasitic diseases. In addition, the African continent is a region where many parasitic diseases, especially the *P. falciparum* detected in this study, are epidemic or endemic. Most of the malaria cases seen in Turkey and other developed countries originate from the African continent. Apart from malaria, schistosomiasis, trypanosomiasis, onchocerciasis, lymphatic filariasis, and leishmaniasis, which are endemic to the African continent, are other parasitic diseases that can be transmitted to people traveling to the African continent. Moreover, 3.2 billion people in 106 countries around the world are at risk of contracting malaria. According to WHO data, 214 million cases of malaria were detected in 2015 and 438 thousand people died

due to this disease. In a study conducted with people who had a history of traveling to the African continent, 27.9% of 24,920 people were found to have fever, and 21% of these patients were diagnosed with malaria (10). If necessary precautions are not taken and appropriate prophylactic drugs are not applied during travels to Africa, significant morbidity and mortality could be seen (4). In this study, *Plasmodium falciparum* was detected in 1 patient who traveled to the African continent. In order to protect against vector-borne parasitic infections, first of all, those who are going to travel to endemic areas should be informed about these infections. It was concluded that protective measures should be taken, especially against vector bites; areas that could be exposed to vectors should be minimized by wearing light-colored and long-sleeved clothing, long pants, boots, and hats; and exposed areas should be protected with repellent.

Another disease that causes significant travel-related health problems is schistosomiasis. According to WHO data, schistosomiasis affects more than 250 million people worldwide and brings a global burden of 1.4 million dollars annually. Sudan is one of the places with the highest prevalence of schistosomiasis in the world. In different studies, the prevalence of schistosomiasis in Sudan was reported to be 40% (11,12). Apart from schistosomiasis, Oriental boil, leishmaniasis, African sleeping sickness, yellow fever, and malaria, which are endemic in the continent, are also common parasitic infections in Sudan.

Although schistosomiasis infection is not endemic to Turkey, cases originating from abroad have been reported at different times (13). In Turkey, a Nigerian student in 2004 (9), a Ghanaian patient in 2008 (14), a Nigerian student in 2010 (15), A case of *Schistosoma haematobium* was reported in a patient who had a

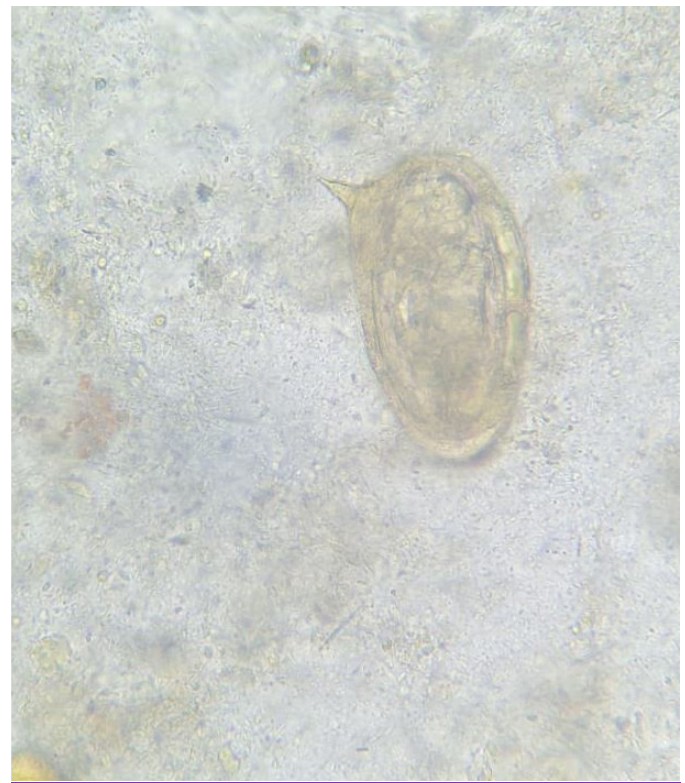


Figure 1. *S. mansoni* eggs (x40) detected in a patients

Table 1. Intestinal and blood parasites detected in people with a history of traveling abroad and returning to Turkey during the COVID-19 pandemic

Country travelled to (number of patients)	Species of parasites detected	Number of patients with parasites	Total number of patients with parasites (%)
Iran (50)	<i>G. intestinalis</i>	3	16 (32)
	<i>Cryptosporidium</i> spp.	3	
	<i>Blastocystis hominis</i>	2	
	<i>Entamoeba coli</i>	3	
	<i>Endolimax nana</i>	1	
	<i>Iodamoeba butschlii</i>	1	
	<i>Taenia saginata</i>	1	
	<i>Ascaris lumbricoides</i>	1	
	<i>Hymenolepis nana</i>	1	
Northern Iraq (48)	<i>B. hominis</i>	3	16 (33.3)
	<i>G. intestinalis</i>	5	
	<i>E. histolytica</i>	1	
	<i>E. coli</i>	1	
	<i>I. butschlii</i>	1	
	<i>H. nana</i>	1	
	<i>T. saginata</i>	1	
	<i>A. lumbricoides</i>	3	
Sudan (5)	<i>S. mansoni</i>	5	5 (100)
Africa (1)	<i>P. falciparum</i>	1	1 (100)
Total (104)			38 (36.5)

history of travel to the countries of 2011 in Cameroon, Guinea and Mali (16). In this study, a case of schistosomiasis was detected in 5 people who stayed in Sudan for 6 months and went into the water with bare feet at the riverside as a group during their stay. It was concluded that, in the prevention of schistosomiasis, those who will travel to endemic areas should be informed about this disease and that fresh water such as lakes, streams, and rivers should be avoided, and that necessary precautions should be taken if contact with them is necessary.

Food- and soil-borne parasitic infections still remain a major public health problem in many developing countries. Food- and soil-borne parasitic infections are an important public health problem in Iraq. The prevalence of parasitic infections is high in Iraq due to poor sanitation, poor environmental conditions, and low socioeconomic conditions (17). There have been many studies on parasitic diseases in Iraq. In a study by AL-Kubaisy et al. (17), on children with diarrhea, it was determined that 45.54% of the children had *G. intestinalis*, 23.44% had *E. histolytica*, 12.7% had *E. vermicularis*, 9.82% had *H. nana*, 5.4% had *T. trichiura*, and 2.2% had *A. lumbricoides*. In a study by Al-Saqr et al. (18), it was emphasized that *E. histolytica/dispar*, *E. vermicularis*, and *G. intestinalis* were the most common parasites. Latif et al. (19) conducted a study on parasites in human feces, animal feces, and vegetables. In their study, they reported that parasitic agents, especially *E. histolytica/dispar*, *G. intestinalis*, and *Cryptosporidium* spp., were an important public health problem in Baghdad. In a study conducted by Duda et al. (20), intestinal parasites were detected in 17% of Polish soldiers returning from Iraq. In this study, one or more intestinal parasites was detected in 33.3% of the patients who traveled to Northern Iraq. These results were similar to those of other studies conducted in Northern Iraq (17-19). This result, which was determined at a high rate, showed that intestinal parasitic diseases are still an important public health problem in Northern Iraq. Therefore, in order to reduce the risk of catching food-borne infections, individuals who are going to travel to countries with high food- and soil-borne parasite contamination should be informed. In order to be protected from foodborne infections, they must be sure of their cleanliness before consuming water and aquatic plants. In addition, it was concluded that those who like to try new foods should be careful about consuming raw, pickled, or undercooked seafood in the countries that they visit.

Iran has favorable conditions for intestinal parasites due to its geographical location, climate, and biological and cultural characteristics. Although sanitation conditions have steadily improved over the past 3 decades in Iran, intestinal parasitic infections are quite common, especially in rural areas and small towns (21). Studies in different regions of Iran have shown that intestinal helminth infections have a low prevalence, but intestinal protozoan infections still have a high prevalence (22). In studies examining human fecal samples, intestinal parasites were detected in 56% in Chaharmahal and Bakhtiari Province (23), 37.5% in Boyer-Ahmad (24), 32.7% in Tehran (25), 32.2% in Nahavand (21) and 29.3% in Kerman Province. The rate of 32% found in this study was similar to the results of studies conducted in Iran.

CONCLUSION

As a result, there is a risk of the transmission of parasitic diseases, such as schistosomiasis and malaria, when traveling to Sudan

and African countries, and intestinal parasitic diseases when traveling to neighboring countries, such as Northern Iraq and Iran. Against these risks, before traveling, the risks of infection in the destination country, the prevalence of infections, and the age, gender, and immunity status of the traveler, and the travel plan and duration should be reviewed. It is of vital importance to receive health consultancy services before traveling and to benefit from appropriate health services, such as vaccinations and prophylaxis before travel, as it will reduce the risk of disease during and after travel. In addition, if these personal precautions are taken, the risk of carrying pathogens and causing the global spread of infectious diseases will be minimized when returning to their countries.

*Ethics

Ethics Committee Approval: Approval of the ethics committee with decision number 16 was obtained on 20.08.2020 from the University of Health Sciences Turkey, Van Training and Research Hospital Ethics Committee.

Informed Consent: Informed consents were obtained from patients.

Peer-review: Internally peer-reviewed.

* Authorship Contributions

Concept: A.E., E.G., A.H.Ü., H.Y., Design: A.E., R.Y., N.Ö., M.Ç., Data Collection or Processing: A.E., S.A., S.K., Analysis or Interpretation: A.E., Ş.Y., Literature Search: A.E., M.Ç., Writing: A.E., E.G., A.G.H., H.Y.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support.

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