

Diagnosics of intestinal parasites by light microscopy among the population of children between the ages of 4-12 in eastern Turkey

Babat, S.O.¹, Sirekbasan, S.^{2*}, Macin, S.³, Kariptas, E.⁴ and Polat, E.²

¹Cizre Vocational High School, Child Development Program, Sirtak University, Sirtak, Turkey

²Department of Medical Microbiology, Cerrahpasa Medical Faculty, Istanbul University, Istanbul, Turkey

³Department of Medical Microbiology, Medical Faculty, Selcuk University, Konya, Turkey

⁴Department of Medical Microbiology, Medical Faculty, Ahi Evran University, Kkrsehir, Turkey

*Corresponding author e-mail: serhatsirekbasan@gmail.com

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Abstract. Intestinal parasitic infections are among important health problems in developing countries. In societies living in low socioeconomic conditions, it has been neglected and mostly affects children. It is important to determine the prevalence and type of intestinal parasites in order to determine the intervention strategies for these infections. Therefore, the aim of this study is to evaluate intestinal parasite prevalence and IgE levels and the factors associated with the region in which the children population live, in Sirtak province, in the eastern of Turkey. A total of 357 symptomatic children aged 4 to 12 years, who were admitted to the Paediatric Polyclinic of Sirtak State Hospital, were examined prospectively. The collected stool samples were examined with direct wet-mount and concentration method under light microscope. In addition, total serum IgE levels were compared among 223 children with parasitic disease and 134 children without parasitic disease. One or more intestinal parasites were detected in 223 out of the 357 children participating in the study. The ratio of single, double, and triple parasitic infections in children was 32.5 %, 22.4 % and 7.6 %, respectively. The most common parasites determined in the study were *Taenia* spp. (39.9%), *Enterobius vermicularis* (38.6%) and *Giardia intestinalis*. (30 %). The difference between IgE levels determined in both groups was not regarded to be statistically significant. This study indicated that that intestinal polyparasitism is very common in children living in the province of Sirtak, which is located in the east of Turkey, neighbouring Iraq and Syria in the South. For this reason, sustainable control measures are urgently needed to improve personal hygiene and sanitation, to provide a healthy infrastructure and to improve the quality of existing water resources.

INTRODUCTION

Intestinal parasitic infections are commonly seen in children between the ages of 5-15, especially in rural areas of developing countries (WHO 2002). The common parasites causing these infections are as follows: *Ascaris lumbricoides*, *Trichuris trichiura*, *Strongyloides stercoralis*, hookworms (*Ancylostoma duodenale*/*Necator americanus*), *Taenia* species, *Hymenolepis nana*, *Enterobius vermi-*

cularis, *Entamoeba histolytica* and *Giardia* species (Al-Mekhlafi *et al.*, 2016).

Epidemiological studies in different countries show that the social and economic status of individuals plays an important role in the prevalence of intestinal parasites (Al-Delaimy *et al.*, 2014; Gamboa *et al.*, 1998; Phiri *et al.*, 2000; Mahmoudvand *et al.*, 2018). Over the past decade, the conflicts in the Middle East have caused many people living in Syria and Iraq to have to immigrate to other countries. One of the main points of

entry from the Middle East to Turkey is the Habur border crossing. It is thought that the immigrants who have fled from the Middle East and have taken refuge in our country and whose numbers exceed 3 million may have contributed to the increase in incidence and diversity of parasitic infections in this region.

It is important to determine the prevalence and type of intestinal parasites in the fight against these infections, which are neglected in societies living in low socioeconomic conditions and which are mostly affecting children. In this study, we aimed to investigate the prevalence of intestinal parasitic infections in children between 4-12 years of age and the IgE levels and the factors associated with the region they live in.

MATERIALS AND METHODS

Ethics Statement

This study was carried out in accordance with the guidelines set forth in the Helsinki Declaration. The Protocol of the study was approved by the Clinical Researches Ethics Committee of the Istanbul University Cerrahpasa Medical Faculty, (no: 83045809/604). Before the study, the parents of the children were interviewed and informed about the purpose and protocol of the study and their approval was obtained.

Study Population

Three hundred and fifty-seven symptomatic children, between 4-12 years of age, who were admitted to the Sırnak State Hospital Paediatric Polyclinic, between June 2014 and January 2015, were evaluated as prospectively.

Sample Collection

Three stool samples and 2 cellophane-tape slide samples were taken from each child at 2 days intervals for the determination of intestinal parasites. The stool samples placed in 10% formalin and the slide samples with cellophane-tape were transferred to the Department of Medical Microbiology of Istanbul University Cerrahpasa Faculty

of Medicine. Furthermore, the total serum IgE levels in blood samples were measured.

Stool examination for parasites

Stool samples were examined by light microscopy at 10x and 40x magnification with 0.9% NaCl and D'Antoni's iodine solution as soon as possible. In addition, all samples were concentrated and analysed with 10% formalin-ether concentration method. Moreover, samples of cellophane-tape taken from the anal region were examined by light microscopy.

Serological examination

Blood samples were obtained from each patient and IgE levels were analysed using Cobas® e 411 analyzer (Roche Diagnostics, Basel, Switzerland) through electrochemiluminescence method after centrifuging for 10 min at 4000 rpm. The results were recorded in the patient's file and in the hospital's automation system.

Statistical analysis

All analyses were performed using SPSS 21.0 for Windows (Licensed to Istanbul University). Categorical variables were reported as numbers and percentages. Chi-Square or Fisher's exact tests were used to test the significance of differences and associations between variables. Significance was evaluated at $p < 0.05$ level.

RESULTS

Ten intestinal parasites were detected among the children participating in the study. The most common parasites found in the study were *Taenia* spp. (39.9%), *E. vermicularis* (38.6%) and *Giardia intestinalis* (30%) (Table 1). 53.5% of the 357 children were female and 46.5% were male. One or more intestinal parasites were detected in 223 (65.3%) out of 357 children attending the study. The prevalence of intestinal parasitic infection was 118 (61.8%) and 105 (63.3%) in girls and boys, respectively. The rates of single, double and triple parasitic infections in children were 52.0%, 35.9% and 12.1%, respectively. Ten

Table 1. The prevalence of intestinal parasitic infections by parasite types and by the number of infections

Intestinal parasites	Number of infections (n:223)	Percentage of infections
Nematodes	139	62.3
<i>Enterobius vermicularis</i>	86	38.6
<i>Ascaris lumbricoides</i>	52	23.3
<i>Strongyloides stercoralis</i>	1	0.5
Cestodes	100	44.8
<i>Taenia</i> spp.	89	39.9
<i>Hymenolepis nana</i>	11	4.9
Trematodes	1	0.5
<i>Dicrocoelium dendriticum</i>	1	0.5
Protozoa	111	49.8
<i>Giardia</i> spp.	67	30
<i>Dientamoeba fragilis</i>	25	11.2
<i>Blastocystis hominis</i>	17	7.6
<i>Entamoeba histolytica</i>	2	0.9
Infectiontype (n:223)		
Monoparasitism	116	52.0
Polyparasitism	107	48
No. of parasitespecies (n:107)		
Two	80	74.8
Three	27	25.2

parasitic species were identified among the children who participated in the study. The most common parasites detected in the study were *Taenia* spp. (39.9%), *E. vermicularis* (38.6%) and *Giardia intestinalis*. (Table 1).

There was no statistically significant difference between the IgE mean values in serum of blood samples taken from 223 children with parasitic diagnosis and 134 children without parasitic diagnosis ($p>0.05$).

DISCUSSION

Parasitic infections are not well known by clinicians and are often overlooked in cases where differential diagnosis is needed. Intestinal parasitic infections have been largely eliminated in societies, where the social consciousness is of a high level and in the areas having sound infrastructure and are frequently seen in rural areas, urban slum areas and areas where immigrants are concentrated. Due to these differences, it continues to be a public health problem

especially in children, as one of the most widely neglected tropical diseases worldwide (Hotezet *et al.*, 2009).

In this study, intestinal parasites were detected in 65.3% of the children living in the province of Sirnak, which is located in the east of Turkey, neighbouring Iraq and Syria in the South. It is observed that this rate decreases towards the west of Turkey, as the infrastructure conditions are better there (Dagci *et al.*, 2008; Köksal *et al.*, 2010; Alver *et al.*, 2006). This difference may be due to the frequent use of fecal matter as fertilizer in the plantation areas in eastern Turkey.

In a study, examining the risk factors of intestinal parasitic infections in the paediatric age group, it was reported that the prevalence largely varies by the species of parasite (El-Sherbini *et al.*, 2013). In our study, *Taenia* spp., was determined to be the most frequently encountered parasite as 39.9%, followed immediately by *E. vermicularis* (38.6%) and *Giardia intestinalis* (30%).

Taenia spp., is a common parasite in humans. There are two important species, being *T. saginata*, transmitted from bovine meat and *T. solium*, transmitted from pork. Also in Asia, the subtype *T. saginata* called as *T. saginata asiatica* is also available. It is known that the contagion is mostly caused by undercooked meat in the world. It is recommended that hygiene be maintained by cooking well while preparing these foods (Fan *et al.*, 1995).

In our study, this rate, determined for parasite *Taenia* spp., is higher than the rate specified in many studies carried out in the world (Laranjo-Gonzalez *et al.*, 2017). We believe that this situation is due to the widespread consumption of raw or undercooked meat in our region due to food culture.

Enterobiasis affects school-aged children worldwide. The infection is directly from person to person by taking the egg in the hands from the mouth (Okay *et al.*, 2004). *E. vermicularis* can be considered as a source of high contagiousness cause on account of the nature of parasite due to failure to wash hands with soap after defecation and lack of personal hygiene.

Giardiasis is most commonly spread by contaminated water and is classified as an endemic region in many developing countries. *Giardia intestinalis* infection, transmitted as a result of lack of hygiene, is more common in childhood in developing countries (Einarsson *et al.*, 2016). It is reported that prevalence varies between 2-30% in the world and 2-38% in various regions of our country (Ak *et al.*, 2007; Uyar and TaylanÖzkan 2009). In this study, *Giardia intestinalis* was determined to be 30%. We believe that the reason of this is lack of personal hygiene and the problems experienced in obtaining clean water resources.

In our study, 52% of infected children had monoparasitism and 48% had poli-parasitism. Although the effects of poli-

parasitism are not clinically obvious, in some cases they may aggravate the clinical picture (Keusch *et al.*, 1982). More prospective studies are needed to evaluate the reality of these effects.

As a result, intestinal parasitic infections continue to be an important public health problem in Sirnak province, in the eastern of Turkey. In comparison to the western regions of our country, the increased risk of infection in rural areas in the East is associated with many environmental risks. These include lack of personal hygiene, lack of washing hands after toilet, lack of infrastructure, the problems in having obtaining fresh water supply and related training.

For this reason, prevention of intestinal parasitic infections is of considerable importance especially for the children in school age by providing them with health education about personal hygiene rules and regularly supervising them and providing a healthy infrastructure.

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