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INTESTINAL PARASITOSIS IN CHILDREN: A BALKAN PILOT STUDY

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ABSTRACT

Aim: to demonstrate the prevalence and the type of intestinal parasites in a representative sample of children living in the municipality of Dibra (MK) and anemia, a related health problem. **Material and methods:** The study was conducted between January and June 2019 and include 280 school-aged children in the municipality of Dibra. Parents and children were asked to collect a fecal sample, subsequently checked for the presence of intestinal parasites in microbiological laboratories in Dibra. At the same time blood tests were performed on all children with the aim of excluding anemia. **Results:** The main parasites isolated in our study were *Ascaris lumbricoides* in five children (1.79 % of all fecal samples), *Giardia lamblia* in four of them (1.43 %), *Taenia coli* in two samples (0.71%), *Enterobius* in two other children (0.71%) and *Ancylostoma duodenale* in one of them (0.35%). **Conclusion:** Low personal hygiene, low socioeconomic conditions and schooling level of the parents are closely related to intestinal parasitosis in children. This remains an important health problem worldwide, but with relatively low incidence in our study.

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Introduction

Gastrointestinal infections are common and usually due to bacterial and mycotic contaminations [1-3]. Recently has been estimated that more than a quarter of the population is infected by intestinal parasites which are the cause of various diseases, especially in children of school and preschool age [4]. In Macedonia the most common intestinal parasites appear to be those of the species *Ascaris lumbricoides, Giardia duodenalis, Enterobius vermicularis, Taeniae coli*. Intestinal parasites damage the intestinal mucosa thus making digestion and absorption of nutrients more difficult. As a result of these intestinal mucosal injuries, various health complications are common in infected children such as malnutrition and anemia, chronic and recurrent abdominal pain, loss of appetite, growth disorders [5, 6]. Poor absorption of some micronutrients such as vitamins and minerals lead to decreased immunity and increased risk of various infections, and also sepsis [2, 7, 8].

Material and Methods

This study was conducted from January to June 2019 at municipality of Dibra, in northwestern Macedonia. After agreement, the parents were asked to sign an informed consent and 280 children were included in this study, aged 6-15 years, and a complete history of all of them and their parents was collected, including schooling.

The study has been approved by the institutional research committee of the Medical Faculty of Tetovo (Res. Prot. 2018/MicrDept/1593). Exclusions criteria were a history of sickle cell anemia, previous intestinal surgery, recent antibiotic therapy.

The stool examination was carried out on children according to written instructions on how to collect a stool sample, previously provided from the Microbiology Laboratory of the Medical Faculty of Tetovo. The enrolled children were divided in three groups according to their age, 6-8 years, 9-11 and 12-15 years, respectively.

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The stool samples were collected into clean, dry plastic jars with a screw-cap lid, avoiding any mixing with urine and brought to the laboratory as fast as.

Fecal samples were collected in collaboration with parents and pediatricians.

All the samples were examined for the presence of *Ascaris, Taenia*, and *Enterobius* eggs, as well as for protozoan cysts. Perianal and anal tape tests for *Enterobius vermicularis* eggs were performed by the parents before anal area hygiene.

According to the World Health Organization (WHO) anemia is defined as hemoglobin level of less than 120g/l for children of 6-14 years of age, so a whole blood test was performed on all children enrolled in the study to determine hemoglobin and mean corpuscular hemoglobin concentration (MCHC) levels.

Results

The final endpoint of this study was to define the epidemiological features of the intestinal parasitosis in children living in Macedonia. From the 280 fecal samples collected from children of Dibra in the period a single parasite species was detected in 12 children (3.6 %), while in two of them the eggs of two parasites were discovered simultaneously. Isolated parasites have been *Ascaris Lumbricoides in* five children (1.79 %), *Giardia lamblia* in four of them (1. 43 %), *Taeniae coli* in two samples (0.71 %), *Enterobius* in two other children (0.71 %) and *Ancylostoma duodenale* in one of them (0.35 %).

In two children only was recorded the presence of two parasites at the same time. *Giardia duodenalis* and *Enterobius vermicularis* were present in one of the children, while *Ascaris* and *Giardia* in the other one.

In 14 positive cases, the prevalence of intestinal parasites was higher in males, with 9 boys (64.3 %) and 5 girls (35.7 %) affected (Tab.1).

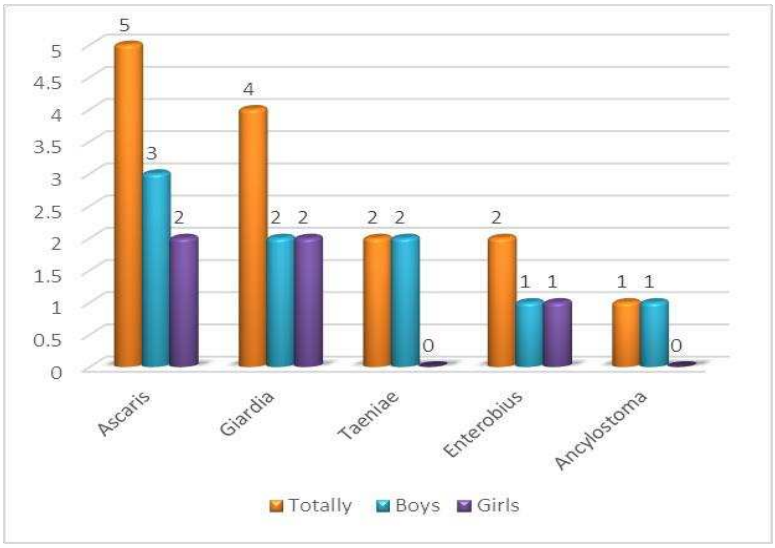

Table. 1 The number of patients with parasitic infections (totally 14 children on 280). Gender and parasites are reported.

Considering the age of the children, the highest number of positive samples was observed in the group of children aged 6-8 years (Tab. 2).

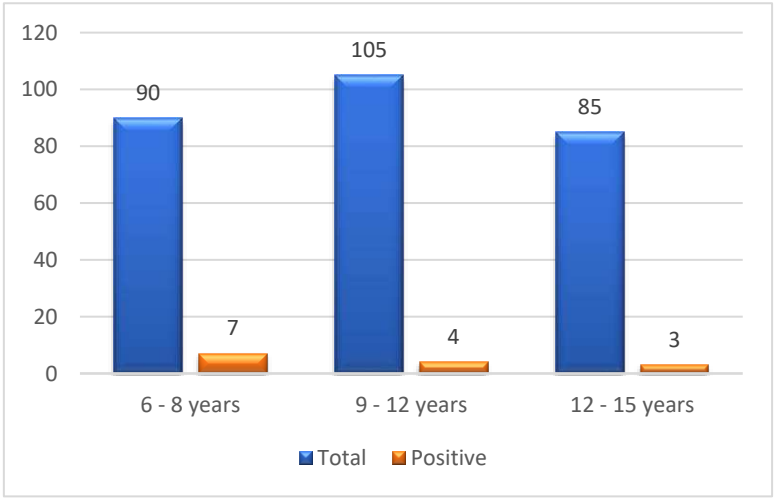

Table. 2 The grouping of patients by age. Parasitic infections (totally 14 children on 280) prevail in the second group, aged 9-12 years.

The secondary endpoint of the study was to define the incidence of anemia in children having an intestinal parasitosis. Blood tests showed low hemoglobin levels in all infants with intestinal parasites. The mean hemoglobin level in all infected children was below 12 g/dl, while was 32% for MCHC. In the group of non-infected children, low hemoglobin and MCHC levels were recorded in 33 of them (12.4%). This indicates a significant difference in hemoglobin levels and MCHC between infected and not infected children.

Discussion

Intestinal parasitosis is one of the most common forms of parasitic diseases in children worldwide [4, 9]. According to WHO, the most important route of transmission of intestinal parasites is the fecal-oral route, through contaminated food, water, and soil [9-11]. *Ascaris lumbricoides* was the most common intestinal parasite in our study, whereas *G. intestinalis* was the second most common. The prevalence of *Ascaris* infection was about 1.79 % whereas *G. intestinalis* (1.42 %), and both are lower in respect of other studies. As for the frequency of *Enterobius* parasite, it turned out to be around 0.35%, although it is estimated to be one of the most frequent helminths worldwide [11-14]. In our study the incidence of intestinal parasites turns out to be more frequent in boys than in girls.

Incidence of intestinal parasitosis in our study is much lower than that reported by some other authors. Biadun et al. reported a prevalence of intestinal parasitosis from around 45.9 % after examination of 2828 children [15]. In another study, Basso et al. reported a prevalence of enteric parasitosis between 37-89% [16]. The high incidence of intestinal parasitosis among school children was reported in a study by Aksoy et al [17].

The number of positive samples with one parasite resulted significantly higher than those with more parasites; out of the total number of positive samples, 12 of them resulted to be positive for one parasite, while only two of them had two parasites. A similar situation is reported by many other studies, although there are authors who report that the prevalence of polyparasitism is higher than monoparasitism [4, 18-20].

As in most other studies, in our study it also turns out that the difficult economic situation is an important predisposing factor for intestinal parasitosis [10, 16]. In fact, a high percentage of infected children had at least one parent with primary school education only, According to data from this pilot study, all children with intestinal parasitosis also had anemia, while the prevalence of anemia in uninfected children seems to be much lower. Iron deficiency anemia, usually associated with intestinal parasitosis, can be treated and prevented by supplementing iron, consuming iron-rich foods, and by eradicating intestinal parasites and preventing further infection [16-21]. For this purpose, supporting diet with natural products rich in anti-infective molecules and probiotics may be helpful [22-26].

Conclusion

Intestinal parasites pose a health problem in many countries around the world. They can be controlled through education as well as improved sanitary conditions in families and schools. Intestinal parasitosis is often associated with varying degrees of anemia which must be corrected as soon as possible by the addition of iron supplements, iron-rich foods and most importantly, the eradication of intestinal parasites. Our results confirm that wide epidemiological studies are needed to better understand the real incidence of intestinal parasitosis in Balkan countries and their influence on the health status, moreover in children.

Ethical statement:

This study has been conducted according to the ethical standards of the Helsinki Declaration of 1975 as revised in 1983, and with the agreement of ethical committee on human experimentation of the Medical Faculty of Tetovo (Res. Prot. 2018/MicrDept/1593).

Conflict of interest:

The authors declare no conflict of interests, financial or otherwise.

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