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Intestinal parasitic infections in Iranian preschool and school children: A systematic review and meta-analysis

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ABSTRACT

Parasitic infections are a serious public health problem because they cause anemia, growth retardation, aggression, weight loss, and other physical and mental health problems, especially in children. Numerous studies have been performed on intestinal parasitic infections in Iranian preschool and school children. However, no study has gathered and analyzed this information systematically. The aim of this study was to provide summary estimates for the available data on intestinal parasitic infections in Iranian children. We searched 9 English and Persian databases, unpublished data, abstracts of scientific congresses during 1996–2015 using the terms intestinal parasite, *Giardia, Cryptosporidium, Enterobiusvermicularis*, *oxyure*, school, children, preschool, and Iran. We conducted meta-analysis using STATA, and for all statistical tests, *p*-value less than 0.05was considered significant. Among the 68,532 publications searched as a result, 103 were eligible for inclusion in the study. The prevalence rate of intestinal parasitic infections was 38% (95% CI- 33%, 43%). Prevalence of protozoa, helminthic intestinal infections, and non-pathogenic parasites was 16.9%, 9.48%, and 18.5%, respectively, which affected 14.27% males and 15.3% females. The rate of infection in preschool and school children was 38.19% and 43.37% respectively. *Giardia*, *Enterobiusvermicularis* and *Entamoeba coli* were the most common among protozoa, helminthic, and non-pathogenic infections (15.1%, 16.5%, and 7.1%, respectively). The data analyses indicated that the prevalence of intestinal parasitic infection is decreasing in Iranian preschool and school children. Improvement of sanitation, personal hygiene, increased awareness of people, seasonal variations, and health education can be effective in reducing parasitic infections in different communities.

Contents

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1. Introduction

Intestinal parasitic infections (IPIs) are a health problem in most countries, especially so in developing countries. The infections cause iron deficiency anemia, growth retardation in children, weight loss, abdominal pain, dyspepsia, and other physical and mental health problems (Norhayati et al., 2003; WHO, 2008; Schmunis and López Antuñano, 2010).

According to a WHO report, 3.5 billion people are affected, and 450 million are sick because of parasitic infections, of which the majority is children. Of the total annual mortalities in developing countries, parasitic diseases accounts for 16 million deaths. Approximately 39 million disability-adjusted life years are attributed to IPIs and these infections represent a substantial economic burden. Preschool and school children are easily identifiable target groups. IPIs are transmitted directly among children through fecal contamination of soil and water, or indirectly through poor sanitation (WHO, 2007; Fan et al., 2012; Stephenson et al., 2000).

Epidemiological studies around the world have shown that the socio-economic status of the people is the main cause of prevalence of IPIs. Moreover, poor hygiene and environmental conditions are known to be related to the propagation of these infective diseases (Gamboa et al., 1998; Tellez et al., 1997).

Investigation of parasitic infections can consider sanitation as an important indicator of disease prevalenceat the community level (Phiri et al., 2000). Geographically, Iran is situated in the Middle East and borders the Caspian Sea, Persian Gulf, and Oman Sea. Iran has favorable conditions for the activity of various parasites because of the geographical location, climate, and biological and cultural characteristics.

Numerous studies have been performed on IPIs in preschool and school children from Iran. However, there is no study to gather and systematically analyze this information. The aim of this study was to provide summary estimates for the available data on intestinal parasitic infections in Iranian children. This study has been carried out to evaluate the prevalence of parasitic infections and demographic data (age and sex).

2. Material and methods

2.1. Search strategy and data extraction

We searched MEDLINE via PubMed, Scopus, Science Direct, Web of Science (ISI), Google Scholar (as English databases); Magiran, Iran Medex, Iran Doc, and SID (as Persian databases) during 1996 to April 2015 using the terms: *intestinal parasites, Giardia, Cryptosporidium, Enterobiusvermicularis* (oxyure), *school, children*, *preschool*, *day care*, *kindergarten*, *Iran*.

Owing to the high number and the importance of studies on *Giardia, Cryptosporidium,* and *Enterobiusvermicularis* (oxyure) in Iranian children, these terms also were searched with intestinal parasites.

To collect precise information, a comprehensive search was carried out on all published and unpublished articles including full texts, abstracts, and parasitology congress summaries. Data were collected from articles in the English and Persian language. A protocol for data extraction was defined and assessed independently by two authors. Disagreements were resolved by discussion.

Extracted data from the studies included year of the study, first author, province of the study, total sample size, the age of samples (preschool or school children), and the number of male and female subjects.

Entamoeba coli, Iodamoebabütschlii, Entamoebahartmanni, Endolimax nana, Dientamoebafragilis, Trichomonashominis and *Chilomastixmesnili* were considered non-pathogenic protozoa, in our study.

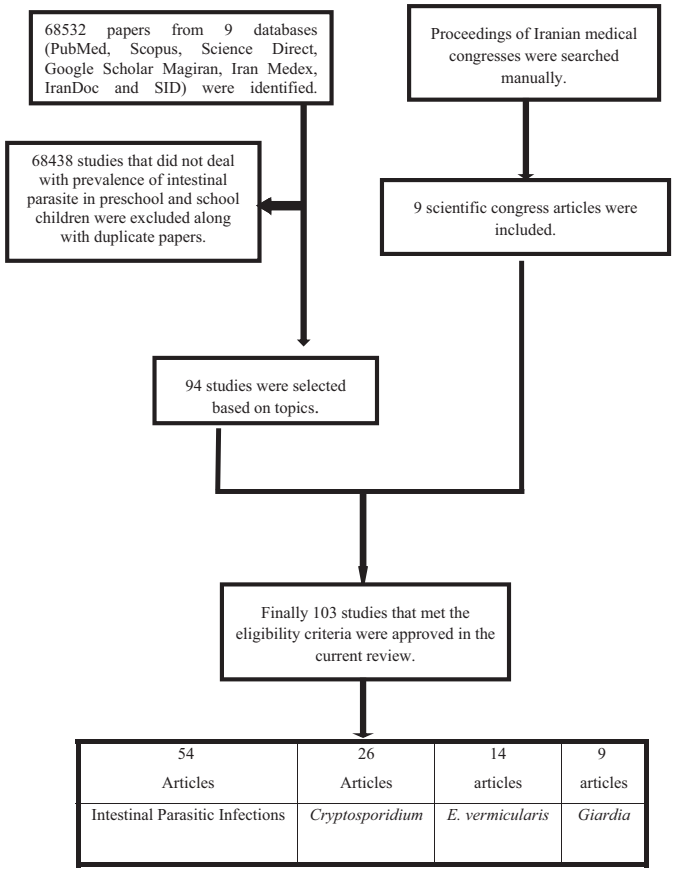

Fig. 1. Flow diagram describing the study design process.

The quality of selected studies was assessed using the STROBE scale (score under 7.75 was considered as low quality; 7.76–15.5, moderate; 15.6–23.5, moderate to high; and above 23.6, high quality).

2.2. Statistical analysis

In this study, forest plots were used to estimate pool effect size and effect of each study with their confidence interval (CI) to provide a visual summary of the data. To evaluate heterogeneity among studies, common approaches including the Cochran's *Q* test and I-square indices were used. A significance threshold of $p = 0.05$ was applied to the heterogeneity $\chi 2$. I-squared values less than 25% were defined as low heterogeneity, 25–50% as moderate, and greater than 50% as high heterogeneity. At present heterogeneity, random effects model (DerSimonian Laird model) and the otherwise applied fixed effect model (Mantel Haenszel) were used to compute overall effect. Begg's Funnel plot (Qualitative method) and Egger's regression test (Quantitative method) were used for evaluating the possibility of publication bias. We conducted meta-analysis using STATA software (Intercooled, version 11, STATA Corp, College Station, TX), and for all statistical tests, $p < 0.05$ was considered significant.

3. Results

Of the 68,532 publications that were gathered for this systematic review, 103 were eligible for inclusion under intestinal parasitic infections (Fig. 1 and Table 1).