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Symptoms and pathogenesis of giardia (systematic review)

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Abstract
For a long time, Giardia was thought to be a non-pathogenic parasite and was often isolated from individuals without clinical symptoms. However, there has been found a huge bulk of evidence indicating the potential of this parasite for developing disease. Children are more likely to be infected than adults, but different age groups may experience clinical symptoms such as mild diarrhea, flatulence, anorexia, abdominal pain, pain in the epigastric region and ultimately maladaptive syndrome.
Methods: Searches were conducted by two independent researchers in international (PubMed, Web of science, Scopus and Google scholar) and national (SID, Magiran) databases for related studies from the inception of the databases to September 2017 (without time limitation) in English and Persian languages.
Discussion: Giardia has global expansion. In the United States, it is the most common parasitic infection and is the leading cause of epidemic diarrhea caused by water pollution. The same socio-economic factors affecting the spread of Entamoeba histolithic also affect Giardia [15]. Giardiasis should be considered in the differential diagnosis of all cases of "diarrhea in travelers" [16]. The first epidemic of giardiasis caused by contaminated water has been reported in St. Petersburg passengers in Russia. Other short-term epidemics have been reported in the United States and some other places. In general, the points that are relevant to the prevention of ami-bialis also apply to giardiasis contamination. Since studies have shown that Giardia is capable of sustaining the purification and chlorination of water resources, it seems that a better (and perhaps impossible) way of preventing pollution of urban water reservoirs by humans, dogs and mice could be effective.

Keywords: symptom, giardia, review

1. Introduction
For a long time, Giardia was thought to be a non-pathogenic parasite and was often isolated from individuals without clinical symptoms. However, there has been found a huge bulk of evidence indicating the potential of this parasite for developing disease [1]. Children are more likely to be infected than adults, but different age groups may experience clinical symptoms such as mild diarrhea, flatulence, anorexia, abdominal pain, pain in the epigastric region and ultimately maladaptive syndrome [2]. The incubation period, or the time before the onset of clinical symptoms, when the parasite has not still appeared in the stool test, has turned out to be a period of 10-36 days in a group of students [3]. In the same group, the average incubation has been reported to be 8 days, similar to that observed in cases of celiac disease in children and the same disease in adults. In acute giardiasis, symptoms such as excessive fatty stools with bright color, decreased blood protein associated with a decrease in blood gamma globulins, lack of folic acid and fat-soluble vitamins and changes in the structure of the intestinal parenchyma become quite frequent [4].
Self-recovery and inhibition of parasites in people with Giardiasis infection is apparently normal and it seems that the activity of T cells is effective in this process. In this regard, it has been shown that non-thymus mice are frequently infected with Giardia Morris, while in normal conditions, the mice are able to kill the parasite [5]. Using an electron microscope, it has been shown that in mature and healthy mice, along with the process of removing the parasite from their intestines, lymphoid cells migrate into the intestinal tract and adhere to the giardia throozoites [6]. Macrophages that have been separated from the old plaque in the gut have been able to eat parasites in the lab and are thought to be involved in hostile defenses against giardiasis [7]. Destruction of Giardia's trophozoite in mothers breastfeeding babies is a result of the lipase present in the non-immune individuals relating to the release of free fatty acids from milk triglycerides with the help of bile salts; thus, human milk may be a protective item against intestinal parasites in infants [8].
The jejuna biopsy in some patients and the shortness and proliferation of the peptides reveals the decrease in the height of the mucous membrane covering cells and increase in the cellularity of the laminate layer [9]. Sometimes, the complete degeneration of the mucus membranes has been reported. Such changes are observed in those who have a primary reduction in gamma globulins in the blood [10]. When coloring the samples from a specific colored jejune biopsy, the invasion of giardia is considered in the intestinal mucosa and is shown by the images obtained from the electron microscope of the parasite invasion [11]. But, it's the connection between the cellular or tissue invasion and the pathophysiology of Giardiasis infections is not still quite clear [12]. Illustrations of intestinal radiography in affected individuals show mal-absorption with mucosal edema and barium fragmentation [13]. The pancreatic giardiasis, which is accompanied by an undesirable, but reversible, function in the external discharge

of the gland, has been reported in an old woman with diabetes [14].

2. Methods

2.1 Search strategy

Searches were conducted by two independent researchers in international (PubMed, Web of science, Scopus and Google scholar) and national (SID, Magiran) databases for related studies from the inception of the databases to September 2017 (without time limitation) in English and Persian languages. To ensure literature saturation, the reference lists of included studies or relevant reviews identifed through the search were scanned. The specifc search strategies were created by a Health Sciences Librarian with expertise in systematic review search using the MESH terms and free terms according to the PRESS standard. After the MEDLINE strategy was finalized, it was adapted to search in other databases. Accordingly, PROSPERO was searched for ongoing or recently related completed systematic reviews. The key words used in the search strategy were "Giardiasis, pathogenesis, sign and symptom" which were combined with Boolean operators including AND, OR, and NOT.

2.2 Study selection

Results of the Literature review were exported to Endnote. Prior to the formal screening process, a calibration exercise was undertaken to pilot and refine the screening. Formal screening process of titles and abstracts were conducted by two researchers according to the eligibility criteria, and consensus method was used for solving controversies among the two researchers. The full text was obtained for all titles that met the inclusion criteria. Additional information was retrieved from the study authors in order to resolve queries regarding the eligibility criteria. The reasons for the exclusion criteria were recorded. Neither of the review authors was blinded to the journal titles, the study authors or institutions.

3. Epidemiology

Giardia has global expansion. In the United States, it is the most common parasitic infection and is the leading cause of epidemic diarrhea caused by water pollution. The same socio-economic factors affecting the spread of Entamoeba histolithic also affect Giardia [15]. Giardiasis should be considered in the differential diagnosis of all cases of "diarrhea in travelers" [16]. The first epidemic of giardiasis caused by contaminated water has been reported in St. Petersburg passengers in Russia. Other short-term epidemics have been reported in the United States and some other places [17]. In some of these epidemics, it is possible to separate Giardia cysts from water sources. In case of an epidemic in the state of Washington, they have been able to separate Anger cysts from purified and chlorinated urban water sources and, according to other reasons, the epidemiology of giardiasis contributes to the contamination of drinking water sources by Giardia infected dogs [18]. Giardia is found, in addition to water dogs, in mice and in in northern America and Europe and in other regions, and this justifies the cases of giardiasis in climbers and tourists who have drank out of reeks and lakes in the high mountains where there is no possibility of contamination with human stools [19]. Dogs and mice can be infected with human cysts that have been excreted in human stools. According to a survey conducted to investigate diseases caused by water pollution in Colorado between 1980 and 1983, Giardia was responsible for 9 out of 18 epidemics. Giardia is responsible for common diarrhea in the U.S., which has emerged following a flood of snow melt and water contamination [20].

Kindergartens are considered as the main source for the spread of Giardiasis infections and their transmission. According to the Center for Disease Control and Prevention (CDC) reports, there are two high risk groups for acute giardiasis: children under the age of 5 and women at gestational age [21]. Both groups are exposed to pollution through contact with kindergartens. In the United States, 65% of women who have children under the age of one and are employed, and 60% of those who send their children to kindergarten care are at risk of infection with Giardia lamblia [22].

Previous studies on isoenzymes signify the presence of at least several types of giardia lamblia. Some of these may be good indicators for epidemiology. Other studies have shown that some of the isoenzymes are shared between giardiasis isolated from different hosts from the mammalian group, and this calls into question the specificity of different hosts for giardia species [23]. In addition, the determination of the isoenzymic characteristics of giardia isolated in Switzerland has created the suspicion that domestic animals (cattle, sheep and dogs) can be a parasitic reservoir for humans; additionally, the transmission of cross-infection between humans and these animals should be considered. Sexual relations, especially the type of anal-oral contact, may be a way of transmitting a parasite. Some reports show an increase in the prevalence of infection in gay men [24].

4. Treatment

Metronidazole and tinidazole are selective drugs for the treatment of giardiasis; tinidazole in liquid form has been recently produced suitable for children. Other effective drugs includealbendazole and mebendazole [25].

5. Prevention

In general, the points that are relevant to the prevention of ami-bialis also apply to giardiasis contamination. Since studies have shown that Giardia is capable of sustaining the purification and chlorination of water resources, it seems that a better (and perhaps impossible) way of preventing pollution of urban water reservoirs by humans, dogs and mice could be effective. To decontaminate small amounts of drinking water, iodine saturation solution, which is doubled in concentration for 20 minutes at 20 ° C, kills giardia cysts. To optimize drinking water tankers whose water is most often used by campers, disinfecting water with iodine solution is the most effective way [26].

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