Cyclosporiasis of Human at Wasit Province
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Abstract: The present study aimed to investigate the Cyclospora cayetanensis infection among patients in Wasit Province. The study started from October to December 2017. One hundred stool samples were collected from patients whose suffering from diarrhea of both genders who attended to Al-karamah Teaching Hospital at Wasit province and General Hospital of Martyr Fairuz at Hay district. Data was collected using a questionnaire for including information about gender, age, location. Stool samples were examined by direct-modified acid-fast stain as a standard method. The results of our study revealed that 33% (33%) was positive for C. cayetanensis. The infection rate in males was 16 (48%) while females was 17 (52%). The age group patients (1-20 years) showed the highest 17 (52%) prevalence rate while the lowest prevalence was in patient with age group (40-80 years). Modified acid-fast stain method appeared to be a useful alternative method to detect C. cayetanensis in stool specimens.

Keyword: Modified acid-fast stain, C. cayetanensis, human, stool.

INTRODUCTION
Cyclospora cayetanensis is a protozoan parasite which belongs to the phylum Apicomplexa, subclass Coccidiina, family Eimeriidae. The life cycle of C. cayetanensis typical of monoxenous coccidia, which complete asexual and sexual development within a single host, many species of C. cayetanensis have been identified in animals. However, C. cayetanensis is the only species identified in humans, and appears to be restricted to the host [1, 2]. Once sporulated, organisms of the genus Cyclospora have an oocyst that contains two sporocytes, and each sporocyte contains two sporozoites.

C. cayetanensis oocysts are spherical, measuring 8–10 μm in diameter, and as such are smaller than many other species of Cyclospora [3-5]. The oocysts of C. cayetanensis are spherical, measure about 8-10 μm in diameter, and have a bilayered wall, which consists of a 50 nm cell wall and a 63 nm outer fibrillar coat. A study by Eberhard et al. suggested that this parasite only infects humans [6]. The oocysts that are excreted in the feces by an infected host are not infectious until they sporulate, which takes about 7 to 15 days under favorable environment (23 to 27°C) [7]. The sporulated oocyst has two sporocysts (resistant wall), with each containing two infectious sporozoites. The life cycle of this coccidian parasite begins when food or water contaminated with sporulated oocysts is ingested by a susceptible host. Upon ingestion, the oocysts excyst and release sporozoites, which infect the epithelial cells of the small intestine. Except for sporulation, Cyclospora undergoes its life cycle, asexual and sexual stages, in the human host. C. cayetanensis can cause illness that its severity and duration depend on the immune system of the host. Cyclosporiasis is usually self-limited in immunocompetent hosts; however, much more severe symptoms have been observed in the immunocompromised, as well as in HIV-infected individuals. Following Cyclospora infection, acaulculus cholecystitis, biliary disease, Guillain-Barré syndrome and Reiter syndrome have all been reported in HIV patients [8]. The diagnosis of cyclosporiasis can be based on identifying the oocysts in the fecal samples by microscopy techniques. Detection of Cyclospora oocysts can be done using modified acid-fast staining [9]. Cyclosporiasis is widely distributed throughout the world, commonly in tropical and subtropical regions [10]. The aims of present study to investigate the Cyclospora cayetanensis infection among patients in Wasit Province.

MATERIALS AND METHODS
A total of 100 stool samples collected from suspected patients with cyclosporiasis suffering from diarrhea who attended to Al-karamah Teaching Hospital at Wasit province and General Hospital of Martyr Fairuz at Hay district. This study was conducted during the period from November 2017 to March 2018. The diagnosis of Cyclospora cayetanensis infections directly through smearing with the modified Ziehl-Neelsen stain for fecal smears [9].

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Statistical analysis

Statistical analysis: The statistical analysis was performed using SAS (Statistical Analysis System - version 9.1) [11].

RESULTS

During the study period, stool samples were collected from 100 patients whose suffering from diarrhea during period between November 2017 to March 2018 from Al-Zahraa and Al-Karama hospitals, Wasit, Iraq. The C. cayetanensis were detected in 33% (33/100) of stool samples which considered as a positive result, while 67% (67/100) were negative for C. cayetanensis. Characteristics of the C. cayetanensis detection are shown in (Table-1) (fig-1). Most of the participants 52% (17/33) samples were children less than 20 years of age. The proportion of male was 48% (16/100) while the female was 52% (17/100) (Table-2).

Table-1: The result of modified Ziehl–Neelsen staining test

<table>
<thead>
<tr>
<th>Result</th>
<th>Samples</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive</td>
<td>33</td>
<td>33%</td>
</tr>
<tr>
<td>Negative</td>
<td>67</td>
<td>67%</td>
</tr>
</tbody>
</table>

Table-2: The positive cases in relationship to the age and the gender

<table>
<thead>
<tr>
<th>Age/Year</th>
<th>+ Ve Case</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 1-20</td>
<td>17 (52 %)</td>
<td>9 (56.25 %)</td>
<td>8 (47%)</td>
</tr>
<tr>
<td>20-40</td>
<td>9 (27 %)</td>
<td>5 (31.25 %)</td>
<td>4 (23%)</td>
</tr>
<tr>
<td>40-60</td>
<td>3 (9 %)</td>
<td>1 (6.25 %)</td>
<td>2 (12%)</td>
</tr>
<tr>
<td>60-80</td>
<td>4 (12 %)</td>
<td>1 (6.25 %)</td>
<td>3 (18%)</td>
</tr>
<tr>
<td>Percentage of (+ Ve Case)</td>
<td>33 (33%)</td>
<td>16 (48%)</td>
<td>17 (52%)</td>
</tr>
</tbody>
</table>

Fig-1: The mean for modified Ziehl–Neelsen staining results

DISSCUSSION

The coccidian parasites are important pathogens. Many physicians remain unaware of their clinical importance [12]. Cyclospora has now been identified worldwide in the feces of both immunocompetent and immunocompromised patients with diarrhoea [13-15]. Several studies have documented the fact that C. cayetanensis is a diarrhoea causing agent [16-18].

A variety of methods have been developed for the detection of Cryptosporidium spp., Cystoisospora, and Cyclospora which include microscopic, immunological, and molecular techniques. Immunological and molecular techniques are more time-consuming, complex, and expensive, making them less beneficial methods for screening, especially in resource-poor settings [19]. However, they have usually better sensitivities and specificities. Effective diagnosis of infections caused by these coccidian parasites requires diagnostic tools to be timesaving, cost-effective, accurate, and sensitive. As microscopy is a speedy, economical, and reliable diagnostic tool, it can be used for screening in primary health care settings as well. Microscopic detection is based on finding the environmentally and chemically resistant oocysts in the stool samples. It provides the advantage of direct visual confirmation of the presence of Cryptosporidium, Cystoisospora, and Cyclospora oocysts [20].

This study has documented prevalence of C. cayetanensis infections among people living in Wasit, Iraq. The prevalence of C. cayetanensis was higher among patients age less than 20 years. A previous study in similar set up showed higher prevalence (8.3%) of C. cayetanensis among children [21]. In Peru, in an endemic community, C. Cyclospora was present among children [22], that is in agreement with our study which noted that the most patients whose

infected with *C. cayetanensis* were under 20 years. And also, our studies with agreement with [23-26] which described that all age groups can infect this disease, the most vulnerable age group seems to be less than 1 year to 15 years of children.

It might be due to the fact that the coccidian parasites are opportunistic and infect both immunocompetent and immunocompromised patients. However, it may not occur after infection. Some amount of immunity may be present in adults who are exposed to the infection, as the infection is less prevalent in adults living in endemic areas.

In addition, the prevalent among female was more than male, which agree with previous studies in Nepal, which observed *C. cayetanensis* tends to be more prevalent among female [27]. The results also showed no significant difference between males (48%) and females (52%) infection with Cyclospora, although the rate of infection in females was relatively higher than the rate of males, this may be due to that both genders can be exposed to *Cyclospora* oocysts equally and both male and female have the same sensitivity to infection especially at the early stages of their lives. This result agrees with the results of [27] in Nepal [28] in Anhui, China and [29] in Egypt, but the result disagree with results of [30] in Alexandria, Egypt.

**CONCLUSION**

Coccidian parasites infections are common among people in Wasit, Iraq. As *C. cayetanensis* is known to be associated with fecal–oral route of transmission, it is directly or indirectly due to consumption of the contaminated water. As chlorination is not enough to get rid of these parasites, we suggest boiling drinking water coming from the high-risk sources.

**REFERENCES**

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