Prevalence and Associated Risk Factors for Giardiasis among Children in District Anantnag of Kashmir Valley, India

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Abstract
The present study aims to determine the prevalence of giardiasis among different age groups, sexes and rural/urban categories of children in district Anantnag of Kashmir valley and to find out the risk factors associated with it. A total of 268 samples were collected out of which 8.2% were found to be positive for giardiasis. The prevalence rate was significantly higher in case of male children (10.4%) than in females (6.29%). The prevalence rate was highest in the age group of 5-8 years (13.7%) and least in the age group of 13-15 years (3.88%). The difference in prevalence rate among different age groups was statistically significant. Rural urban comparison showed that children in rural areas (9.87%) were more infected than the children in urban areas (6.03%). Source of drinking water, defecation site, education of mother and personal hygiene proved to be important factors which influenced the prevalence rates among children.

Keywords: Giardia; Prevalence; Intensity; Risk Factors

Introduction

Giardiasis is a common gastrointestinal disease, caused by flagellate protozoan parasite, *Giardia lamblia*. It is known to infect 2% to 7% of population in developed countries and 20-30% in developing countries, majority of which are children [1-3]. In India the value ranges between 3.8% to 23.5%. In Kashmir valley, the studies conducted so far demonstrated the prevalence rates of 12.28% and 36% for protozoan parasites *Giardia intestinalis*, and *Cryptosporidium parvum* among children respectively [4,5]. In India several studies have been carried out demonstrating presence of *Giardia* in humans and animals [6-8]. The infection may cause severe diarrhea and malabsorption syndrome resulting in growth retardation and poor psychomotor development of children [2,9]. *Giardia* infection also results in reduced hemoglobin (Hb) level and hypoalbuminemia [10-12]. Most of the infected individuals tend to be asymptomatic making the control of this parasite a difficult task [13]. However the trophozoites and cysts of this parasite are highly characteristic and can be easily diagnosed through stool examination. Studies have shown that infection spreads through contaminated food and water or through direct oro-fecal contact [14,15]. This study was undertaken to estimate the prevalence of *Giardia lamblia* among children and to identify the possible risk factors associated with it. The prevalence was studied in different age groups, sexes and among rural and urban children. Since the infection spreads through contamination the possible risk factors were also worked out with the aim of providing awareness to people.

Material and Methods

Study area and study sites

The present work was carried out from August 2014 to July 2015 in the district Anantnag which is one of the ten districts of Kashmir Valley. The study area having a population of 1,069,749 was divided into six study sites, one in each of the six tehsils. The study sites were selected randomly three in rural areas and three in urban areas.

Study population

The study was conducted on the children of the age group 5-15 years belonging to both the genders. Children under five years of age were not included for study since it was considered that they would not have been able to grab the accurate data from them.

Collection and preservation of stool samples

A total of 268 stool samples were randomly collected in clean, well labeled stool containers, containing 10ml of 10% formalin. Eighty seven were loose stools and 181 were hard stools. Each specimen was properly labeled, bearing patients name, age and an identification number. The samples were brought to parasitology laboratory in the department of Zoology, University of Kashmir and processed as quickly as possible.

Samples analysis

Samples analysis was done by direct smear method and Formol Ether Concentration Technique.

Questionnaire survey

The participating children were also given a questionnaire to collect the information regarding their personal hygiene, socio-economic status, maternal education, type of drinking water, defecating habits etc. The information gained through questionnaire was correlated with their infection rates to find out the risk factors associated with protozoan infection in children.

Statistical analysis

Data analysis was done by Primer software. The data was represented as mean of replicates followed by standard deviation i.e. Mean ± standard deviation (SD). The mean value in each group was analyzed and compared with others by Student’s t test. The differences were considered to be significant when the p-value obtained was found to be less than 0.05.

Results and Discussion

Sex wise prevalence

Of the 268 children (125 males and 143 females) who provided the samples, 8.2% were found to be positive for giardiasis as shown in the figure 1. The infection rate was found to be higher in case of male children (10.4%) than in female ones (6.29%). This difference was significant when compared statistically (p = 0.05). The results of higher prevalence in case of males agree with those of Jassim et al., Mahdi et al., Al-Saeed, Ibrahim QA and Bernawi et al. [16-20], who were having the opinion that males are more involved
in outdoor activities and are more exposed to infectious agents in environment.

Prevalence in different age groups

On the basis of their age, children were divided into three groups. Group 1 included the children between 5-8 years of age; group 2 and group 3 included the children between 9 to 12 and 13 to 15 years of age respectively. The infection rate was highest in case of group 1 (13.7%), then showed a decline with increase in age and was least in case of group 3 (3.88%) (Table 1). This difference was significant when compared statistically \( p = 0.01 \). The reason for decline of infection with increase in age may be possibly due to strengthening of the immune system and children becoming more conscious of hygienic habits [21]. Our findings are in close association with those of Mbuh et al. [22], who reported highest protozoan infection rate in age group of 6-13 years which then declined in higher age groups. Chaudhary, et al. [23], (from his study in Barabanki, Uttar Pradesh) also reported the peak prevalence of *Giardia lamblia* in the age group of 1-10 years (35.84%), which then declined gradually with successive increase in age reaching a least infectivity rate in the age group of 51-60 years (3.77%). Pinheiro et al. [24], (from his study in Minas Gerais, Brazil) found that the children of below six years age are most susceptible to giardia infection, the infection rate then decreased in higher age groups with minimum infection rate in the age group of 15-24 years.

Prevalence in rural and urban children

Rural vs urban comparison showed that the infection rate was higher among the children belonging to rural areas (9.87%) than in children belonging to urban areas (6.03%) (Figure 2). This difference was insignificant when compared statistically \( p = 0.07 \). The findings are in accordance with those of Chaudary et al. [25], found that the children in rural areas were more infected than the children from urban areas, however the difference was non-significant. Faraji et al. [26], and Opara et al. [27], found that the rural children were more infected than urban children.

Intensity of parasitic infection

The samples which are positive for infection were categorized into three types as having light, moderate and heavy infection as described by Coulibaly et al. [28], and Utzinger et al. [29]. Out of 22 positive samples, 59.09% showed light infection and 27.20% were having moderate infection and 13.63% were having heavy infections (Figure 3). Light infections were more common in males (61.53%) than females (55.55%) while moderate infections were present more in females (44.44%) than in males (15.38%). Our findings are supported by the studies of Canate et al. [30] in Cuba who observed mainly light infections of intestinal parasites among children. Mahsol et al. [31], also observed only light (80.65%) and moderate infections (19.35%) of protozoan parasites among children in Inam Sabha Malaysia.

Risk factors

Among the various possible risk factors studied through questionnaire analysis, the drinking water, defecation site, education of mother and personal hygiene showed statistically significant \( p < 0.05 \) association with the prevalence of infection among the children (Figure 4). Parasitic infection was more prevalent among.

### Table 1: Prevalence of giardiasis in different age groups

<table>
<thead>
<tr>
<th>Age group</th>
<th>Examined</th>
<th>Infected</th>
<th>%</th>
<th>Mean ± SD</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 to 8</td>
<td>73</td>
<td>10</td>
<td>13.7</td>
<td>8.76 ± 4.91</td>
<td>0.01</td>
</tr>
<tr>
<td>9 to 12</td>
<td>92</td>
<td>8</td>
<td>8.69</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13 to 15</td>
<td>103</td>
<td>4</td>
<td>3.88</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>268</td>
<td>22</td>
<td>8.2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Figure 1:** Sex wise prevalence of giardiasis

**Figure 2:** Prevalence of giardiasis in rural vs urban children

**Figure 3:** Parasitic burden among infected children

**Figure 4:** Risk factors of giardiasis
the children of illiterate mothers than among children of educated mothers which is in agreement with the studies of Chaudhary et al.; Tafti et al.; Quibui et al. [25,32,33]. Children drinking water from open water bodies (rivers/ponds) were more infected followed by those using tap water and well water. Children drinking unboiled water were more infected than those using boiled water. Similar results were found by Ayalew et al. and Tigabu et al. [34,35]. Infection rate was higher in children with poor personal hygiene. Children who used to wash hands with plain water and maintained untrimmed nails were more prone to infection than those who used soaps for hand washing after defecation and maintained clean trimmed nails. Our results are similar to those of Sah et al. [36], who conducted a study in Dharan, Nepal. Jayarani et al. and Shrestha et al. [7,37], also made similar findings. Children defecating in open areas were more infected than those using pit or sanitary latrines which are in good agreement with that of Ankarklev et al. [38].

Conclusion

Findings of this study show that the incidence of giardiasis is 8.2% in the study area. Awareness on various potential risk factors, improved personal and environmental hygiene can help in reducing the parasitic burden further.

References


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