 DOI: 10.18231/2455-6807.2017.0011

Prevalence of intestinal parasitic infections and predisposing factors among children in field practice area of tertiary care centre in South India

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Abstract

Introduction: The intestinal parasitic infections are more common in many parts of the world with the developing countries being affected the worse. These are more common children due to presence of varied risk factors in this group.

Aim: To estimate the prevalence of intestinal parasitic infections and their predisposing factors among children.

Methods: The study involved 204 children and their stool samples were collected and examined by wet mount-saline and iodine, and concentration- saturated salt solution and formol ether sedimentation techniques.

Results: Among the 204 stool samples examined, 56 were positive contributing to a prevalence of 27.5% of intestinal parasitic infection. The most common intestinal parasite was found to be *Entamoeba histolytica/dispar/moshkovskii* (8.33%) followed by hook worm (7.4%) and *Giardia intestinalis* (5.4%). Other parasites like cysts of *E.coli* in 5 cases (2.5%), ova of *Ascaris lumbricoides* and *Trichuris trichura* in 3 patients (1.5%) and *Enterobius vermicularis* egg in 2 children (1%) were also found. Predisposing factors such as lack of toilet facilities, children not washing their hands and walking with barefoot were found to be the significantly associated with intestinal parasitic infections in this study.

Conclusion: Proper health and hygienic education should be provided to children and their parents. Periodic deworming programmes should be implemented successfully in the community.

Keywords: IPI, Prevalence, Children, Risk factors

Introduction

Intestinal parasitic infections are endemic throughout the world and are one among the major public health problems in developing countries like India. It has been estimated that nearly 3.5 billion people worldwide are infected, with children being the majority due to their life style activities and less developed immune system. It has also been associated with morbidity in 450 million people.[(1)] Apart from causing morbidity and mortality among children in developing countries, it also leads to growth disturbances, cognitive impairment, poor academic career and easy susceptibility to other infections.[(2,3)] The occurrence of intestinal parasitic infections are associated with multiple predisposing factors like poverty, illiteracy, low socio-economic status and lack of good hygienic practices as well as climatic and environmental status.[(4,5)]

The prevalence of IPI varies across different countries and even among various regions within a country, due to the difference in disease nature, environmental, climatic and socio-economic conditions prevailing in those regions. In India also the prevalence rates greatly vary as shown – 49% in East Godavari of Andhra Pradesh,[(4)] 75.28% in Kashmir,[(6)] 51.5% in Karnataka,[(7)] 26.88% in East Delhi,[(8)] 37.66% in Maharashtra[(5)] and 60-91% in studies from Chennai.[(9,10,11)]

Though deworming programmes are available, studies in and around Chennai still have reported a higher prevalence of 60-91%.[(9,10)] Therefore, the aim of the current study is to estimate the prevalence and predisposing factors of intestinal parasitic infections among children in field practice area of tertiary care centre in Kancheepuram district. The study findings might help the decision makers in designing effective strategies to overcome the intestinal parasitic infections.

Materials and Method

This was a cross-sectional study carried out in the department of Microbiology in the months of June and July 2016, using samples from the field practice areas of tertiary health care centre in Kancheepuram district. All children ≤ 12 years of age in field practice areas were included in the study. Based on a prevalence of 75.7% in a study,[(5)] with an absolute precision error of 6% at 5% significance level, sample size was calculated to be 204. A convenience sampling method was used to select the respondents till the sample size was reached. This study was approved by the Institute Ethics Committee.

Stool samples were collected from children after obtaining informed and written consent from the parents. They were provided with a clean, dry, leak proof container labelled with the name of the child for stool collection in the next day. The samples collected were received and examined in the Microbiology department. Each stool sample was screened for intestinal parasitic infections using saline and iodine wet mount and concentration techniques like saturated

salt solution and formol ether sedimentation technique. The parents of the infected children were notified and referred to the nearby primary health centre for immediate treatment. Also information on socio-demographic and environmental characteristics was collected by an interview using a structured questionnaire.

Statistical analysis: The collected data was checked for completeness and consistency. GraphPad software was used to analyse the results. For the descriptive data, percentages were used. Predisposing factors were analysed using chi-square test. P value of less than 0.05 was considered as statistically significant.

Results

General characteristics of study population: A total of 204 children were included in this study, of which 113(55.4%) were girl children and 91(44.6%) were boys. Majority of children were in the age group of 5-10 years (39.2%) followed by children more than 10 years of age (33.3%). Children less than 5 years of age contributed to about 27.5% (Table 1). Nearly half of the children's father had obtained high school education (47.1%), whereas half of the mothers (50.5%) were able to read and write only.

Table 1: General and Socio-demographic characteristics of study population

Factor	N=204 (%)	Positive (%)	Negative (%)	P value
Age				
<5	56 (27.5%)	14 (25%)	42(75%)	
5-10	80 (39.2%)	24 (30%)	56 (70%)	0.7934
>10	68 (33.3%)	18 (26.5%)	50 (73.5%)	
Sex				0.2115
Boys	91 (44.6%)	29 (31.9%)	62 (21.5%)	
Girls	113 (55.4%)	27(23.9%)	86 (67.1%)	
Monthly family income				0.2571
≤ 5000	44 (21.6%)	9(20.5%)	35 (79.5%)	
5001-10000	76 (37.3%)	22(29%)	54 (71%)	
10001-20000	52 (25.5%)	12(23.1%)	40 (76.9%)	
>20000	33 (16.2%)	13(39.4%)	20 (60.6%)	
Education of father				
Illiterate	18 (8.82%)	6(33.3%)	12 (66.7%)	
Read & write /primary school	45 (22.1%)	9(20%)	36 (80%)	0.1264
High school	96 (47.1%)	23(24%)	73 (76%)	
Graduate	45 (22.1%)	18(40%)	27(21.5%)	
Education of mother				
Illiterate	17 (8.33%)	5(29.4%)	12 (21.5%)	
Read & write /primary school	103 (50.5%)	28(27.2%)	75 (21.5%)	0.4731
High school	55 (26.9%)	12(21.8%)	43 (78.2%)	
Graduate	29 (14.2%)	11(37.9%)	18 (62.1%)	

Prevalence of Intestinal parasitic infections: Among the 204 stool samples examined, 56 were found to be positive contributing to a prevalence of 27.5% of intestinal parasitic infection in the study population. The most common intestinal parasite was found to be *Entamoeba histolytica/dispar/moshkovskii* (8.33%) followed by hook worm (7.4%) and *Giardia intestinalis* (5.4%). Other less commonly detected parasites were cysts of *E.coli* in 5 cases (2.5%), ova of *Ascaris lumbricoides* and *Trichuris trichura* in 3 patients (1.5%) and *Enterobius vermicularis* egg in 2 children (1%) (Table 2).

Table 2: Prevalence of intestinal parasitic infections in the study population

S. No	Parasite	Number	%
1	*Entamoeba histolytica*	17	8.33
2	*Entamoeba coli*	5	2.5%
3	*Giardia intestinalis*	11	5.4%
4	*Hook worm egg*	15	7.4%
5	*Ascaris lumbricoides egg*	3	1.5%
6	*Trichuris trichura egg*	3	1.5%
7	*Enterobius vermicularis*	2	1%

Presence of risk factors and their association with intestinal parasitic infections: The age and sex of children, educational status of their parents and socio-economic status of the family did not have statistically significant association with the positivity of intestinal parasitic infections (Table 1). However, children those who had used open field for toileting purpose showed higher risk of acquiring parasitic infection than those using latrine facilities.

Though the habit of mother's hand washing did not have association with IPI, the children's hand washing habits showed significant association with IPI ($p<0.0001$). Also noticed in this study was the association between children's habit of walking with barefoot in the fields and IPI ($p<0.05$). Other factors like pica and consumption of raw or uncooked food has not shown statistically significant difference in the occurrence of IPI in this study. The irregular waste collection and presence of visible sewage near the house also did not show increase in the positivity of intestinal parasitic infections (Table 3).

Table 3: Distribution of intestinal parasitic infection according to predisposing factors

Risk factor	Parasite status		Total	P value
	Positive n=56	Negative n=148		
Toilet Open field Private/sharing toilet	24(43.6%) 32(21.5%)	31 (56.4%) 117 (78.5%)	55 (26.9%) 149(73.04%)	0.0025
Hand washing of mother After using toilet Yes No	12 (40%) 44 (25.3%)	18 (60%) 130 (74.7%)	30 174	0.1481
Hand washing of mother Before cooking Yes No	22 (28.9%) 34 (26.6%)	54(71.1%) 94(73.4%)	76 128	0.8362
Hand washing of child Yes No	23 (15.6%) 33 (57.9%)	124(84.4%) 24(42.1%)	147 57	<0.0001
Source of drinking water Tap River Others	27(24.5%) 14(28.6%) 15(33.3%)	83(75.5%) 35(71.4%) 30(66.7%)	110 49 45	0.5275
Drinking purified water Yes No	40(28.8%) 26(40%)	99(71.2%) 39(60%)	139 65	0.1510
Walking bare foot Yes No	29(35.8%) 27(22%)	52(64.2%) 96(78%)	81 123	0.031
Eating uncooked food Yes No	11(20.8%) 45(29.8%)	42(79.2%) 106(70.2%)	53 151	0.2754
PICA Yes No	9 (29%) 47 (27.2%)	22(71%) 126(72.8%)	31 173	0.8304
Solid waste collection frequency Regular Irregular	39 (27.3%) 17 (27.9%)	104(72.7%) 44(72.1%)	143 61	0.9304
Visible sewage near house Present Absent	23 (27.4%) 33 (27.5%)	61(72.6%) 87(72.5%)	84 120	0.9850

Discussion

The prevalence of intestinal parasitic infections in this study was found to be around 27.5%, which lies in consistent with the studies done in urban region of South Chennai in India (33%),[11] tribal villages of North Maharashtra (37.66%),[5] East Delhi (26.8%)[8] and in other countries like Saudi Arabia (17.7%),[12] Nepal (31.7%)[13] and Ethiopia (17.3%).[14] In contrast higher prevalence has also been consistently reported from several studies in different parts of the country by Rayan *et al* (62% in rural and 54.7% in urban),[9] Ferandez *et al* (91% in rural),[11] Jeevitha Dhanapal *et al* (75.7%),[10] Wani SA *et al* (75.28%)[6] and Padmaja *et al* (49%).[4] Higher prevalence has also been reported in studies from other countries like Pakistan (52.8%),[15] Ethiopia (72.9 and 62.3%)[16,17] and Nigeria (58.5%).[18] The short duration of the study and the collection of only one stool sample from children could have also influenced the lesser prevalence obtained in this study. These variations in the prevalence within the country and between different countries are also likely to occur due to the difference in the disease transmission pattern, socio-economic, environmental factors, study timings and methods used.[18]

Among the children in different age groups, children in the 5-10 years are more infected. The increased frequency of playing outside houses and in schools, and their unhygienic practices like eating mud and not washing hands before eating pose the children in this age group to be more commonly infected, while the exposure is less in younger age group and the elderly children are likely to become knowledgeable and develop good hygienic practices. Similar to this study Dongre *et al* and Khanal *et al* had shown increased prevalence in 6-8 years of age group.[19,20]

While considering the sex distribution, 31.9% of the boys were infected with intestinal parasites which are higher than the infection rate in girl children (23.9%). However, the difference is not statistically significant. This statement goes in line with most of the studies which have also failed to show association between sex and IPI.[12,13,18] However few studies state that there is a significant association with boys being more commonly infected than girls.[16,21] This fact could be due to the scenario that boys are most commonly exposed to infections due to their excessive outdoor activities when compared with girls.

Among the intestinal parasites diagnosed in this study, *E.histolytica/dispar/moshkovski* (8.33%) was most commonly seen followed by hook worm (7.4%) and *Giardia intestinalis* (5.4%). This is in contrast with most of the studies which show either *Ascaris lumbricoides* or *Giardia intestinalis* as the most common finding followed by *E.histolytica* in the second position.[5,11,12,15,17,21,22]

In line with the studies by Aleka *et al* and Alamir *et al*, parent's educational status and their family income did not show any association with the intestinal parasitic infection in this study.[14,23] However, certain studies showed that parents, especially mother's low educational status and poverty have significant association with the increased risk of IPI in their children.[4,12,21,22,24]

Considering the potential predisposing factors associated with acquiring intestinal parasitic infections, usage of open field for defecation purpose, absence of hand washing habit in children and walking with bare foot in open fields are significantly associated with increased prevalence of IPI in this study population ($p<0.05$). Similar to this study, children's hand washing habit along with possessing dirty untrimmed nails has been linked with IPI in few studies and it has also been shown to improve after providing hygiene education to them.[17,19,23] This can be clearly explained due to the fact that these infections are mainly transmitted by feco-oral route. Also associated is the lack of toilet facility and not wearing protective shoes with IPI in many studies which goes in accordance with this study.[13,16,17,21,23]

Other risk factors like hand washing habit of mothers, consumption of uncooked food, pica, source of drinking water and its purification, irregular waste collection and presence of visible sewage near the house lack significant association with intestinal parasitic infections in this study. However studies by Aleka *et al* and Doni *et al* had shown the association of absence of hand washing habit of parents and geophagia with increased risk of IPI.[14,21] Mane *et al* in their study have stated that presence of visible sewage near the house and irregular waste collection to be significantly associated with increased risk of IPI.[5] In addition to the predisposing factors mentioned above, other factors like overcrowded families, father's occupation as farmer, working mothers, presence of house maid and children attending day care centres have also been linked with increased risk of acquiring infection with intestinal parasites.[12,13,23,24]

The current study possess following limitations. *E.histolytica* was not differentiated from *E.dispar* and *E.moshkovskii* due to the lack of antigen testing or molecular facilities. Modified acid fast staining was not done to detect coccidian parasites. Not all potential risk factors were included in this study. Three consecutive stool samples were not collected from study population.

Conclusion

Entamoeba histolytica/dispar was the most common parasite detected in this study. Predisposing factors such as lack of toilet facilities, children not washing their hands and walking with barefoot were found to be the significantly associated with intestinal parasitic infections in this study. Since IPI in children could lead to serious consequences, multiple intervention strategies have to be implemented and followed up. Proper health and hygienic education should be provided to children and their parents.

Measures have to be taken to check whether periodic deworming programmes are successfully implemented in the community.

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