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Prevalence of intestinal parasitic infections and associated risk factors among pre-school children in tribal villages of North Maharashtra, India

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Abstract:

Background: Intestinal parasitic infections (IPIs) are endemic worldwide and have been described as one of the major cause of illness and disease. The prevalence of different parasitic infections depends on various social, economical and environmental factors. Therefore the study aimed to estimate prevalence and identify factors associated with intestinal parasitic infections among 1-5 years old children residing in tribal area of Maharashtra. **Materials and methods:** A cross-sectional study was conducted from June 2012 to Nov 2012. A simple random sample of 385 children aged 1-5 years was collected. The study used pre-tested self-administered questionnaire based on demographic, domestic and peri-domestic factors. For each enrolled child in the study, a standard stool ova and parasite test with formal-ether concentration technique was done for the assessment of the outcome. **Results:** Out of 385 children examined, 145 (37.66%) were found positive for various intestinal parasitic infections. The highest frequency of 32.41% was noted for Giardia lamblia followed by Entamoeba histolytica (21.37%). Variables like No. of children in a family under-five years of age, low maternal education, self-latrine care, lack of solid waste collection and visible sewage near the house are found to be significant risk factors for IPIs. **Conclusion:** The frequency of intestinal parasite infections was found to be high among pre-school children (under five years) residing in tribal area. Major contributory factors included social, domestic as well as peri-domestic factors related with poverty, hygiene and education. There is need for campaigns to create awareness about health and hygiene among parents.

Key words: Factors associated; Helminthes; Intestinal parasitic infections (IPIs); Pre-school children; Protozoa; Tribe

Introduction

Intestinal parasitic infection (IPIs) is a serious public health problem throughout the world particularly in developing countries [1,2]. Indeed children of an endemic community can be expected to have intestinal parasitic infection soon after weaning and high risk of re-infection in the rest of his or her life [3]. The consequences of these parasitic infections results in malnutrition, anemia, cognitive impairment and increased susceptibility to other infections [2,4]. Various risk factors are associated with this prevalent disease, which include low socioeconomic status, poor hygienic conditions, impure drinking water and low literacy rate of parents, large size of the family and poor health status of the child [1,2,4].

Estimation of the global magnitude of morbidity and mortality due to parasitic infections is a major concern [5]. A prevalence survey of IPIs in different regions is a prerequisite for developing control strategies. There are few studies conducted in different parts of India, mostly in school-children. But such studies are not conducted in pre-school children in tribal area. Therefore the present study was undertaken to estimate IPIs among preschool children in tribal area of Nasik district in Maharashtra and to assess epidemiological factors associated.

Aims and Objectives

1. To know the prevalence of Intestinal parasitic infections among pre-school children in tribal villages/area.
2. To know the prevalence of various Intestinal parasites among pre-school children in tribal villages/area
3. To know the associated risk factors of Intestinal parasitic infections among pre-school children in tribal villages/area.

Materials and Methods

This study was undertaken in the department of Microbiology, Dr. Vasantrao Pawar Medical College & Hospital, Nasik from June 2012 to November 2012.

This cross-sectional study was carried out in three tribal villages of Nasik district namely Ambe Dindori, Ganorwadi and Mohadi.

Total population of three villages surveyed was 9342. The study population consisted of all children from 1-5 years of age residing in these three villages.

The sample size was calculated for primary objective taking the prevalence of to be estimated of 50% that gives the maximum sample size, with 95% level of confidence and 5% bound on the error of estimation. The minimum sample size required was 385 children. Simple random sampling method was used to select the households.

A total of 1425 children were present in the sample households and of which about 385 were randomly selected. Demographic data of every child that included the age, sex, residence, monthly family income, education/occupation of mother, number of children under 5 years. Domestic data like latrine care of child (by mother, caretaker or self), child's habits including hand washing (with soap, with only water, do not wash), eating mud/pica, methods of purifying drinking water, mother's habit of washing hands before preparing food, and type of toilet (open air defecation or sanitary latrine) was recorded by trained interns posted in the department of Community Medicine.

Also peri-domestic factors like method of purification of drinking water, type of toilet (open or sanitary latrine), frequency of solid waste collection (regular or irregular) and presence of visible sewage near house (present or not) asked, observed and recorded by those interns.

Weights of children were taken in minimal clothing. At the time of interview, Mothers/caretakers were explained how to collect the stool sample. They were given a dry, clean, leak proof container labeled with the name and identification number for the collection of stool sample of the child next day. The collected samples were immediately sent to the laboratory for light microscopy and differential diagnosis of protozoa, cyst and ova.

In the laboratory, Stool direct wet mounts were examined under light microscope prepared with direct saline as well as Lugol's iodine solution. Each stool sample then was concentrated by formal-ether concentration method [6] and again iodine stained slides were prepared and examined microscopically.

Ethical considerations

The protocol for this study was approved from the Chairman, and the secretary, institutional ethical committee (IEC). Infected children were referred to the primary health center in the area for immediate treatment.

Results

A total of 385 children were included in this study. There were 205 (53.24 %) males and 180 (46.75 %) females. Out of 385 children, 145 (37.66%) were found positive for various intestinal parasitic infections.

Highest prevalence of 37.24% was found in 3-4 years of age group and lowest (13.79%) in 1-2 years age group as shown in Table-1.

Table 1: Intestinal Parasitic infections in relation to age.

Age (Years)	Total no. of samples (n=145)	Percentage (%)
1-2	20	13.79
2-3	25	17.24
3-4	54	37.24
4-5	46	31.72
TOTAL	**145**	**100**

In 73% samples, single parasite was observed and mixed parasitic infection was observed in 26.89% of samples. As shown in Table 2, among the IPIs detected, overall prevalence of protozoa was 62.05% and helminthes was 37.95%.The highest frequency of 32.41% was noted for Giardia lamblia. Relatively high frequency of 21.37% was also seen for Entamoeba histolytica. Other parasites found were Hymenolepis nana (17.24%), Ascaris lumbricoides (11.72%), Ancyclostoma duodenale (4.82%) and Enterobius vermicularis (4.13%).

Table 2: parasitic distribution in stool specimen

Name of parasite	No. of stool samples showed the parasite	Percentage (%)
Giardia lamblia	47	32.41
Entamoeba histolytica/ dispar/ moshkovskii	31	21.37
Entamoeba coli &Endolimax nana (Nonpathogenic cysts)	12	8.27
Ascaris lumbricoides	17	11.72
Ancyclostoma duodenale	7	4.82
H. nana	25	17.24
Enterobius vermicularis	6	4.13
TOTAL	**145**	**100**

In Table 3 and 4, various Demographic, Domestic and Peri-Domestic factors are analyzed as Risk Factors associated with Intestinal parasitic infections among children, 1-5 years of age. Among these, risk factors found significantly associated with IPIs were low maternal education, no. of children under five in the family, self latrine care, excessive crying, lower socioeconomic status, lack of solid waste collection and visible sewage near the house.

Discussion

We have estimated the prevalence and factors associated with Intestinal parasitic infections (IPIs) among children aged 0-5 years residing in tribal area.

The prevalence of IPIs was estimated to be 37.66%, which is comparable to the study of Bisht et al (38%) [7] and Mahajan et al (26.8%) [8].

The other Indian studies have reported higher prevalence ranging from 46.7% to 75.28% in Kashmir by Wani SA et al [9-11], 51.5% in Karnataka by Shubha DS et al [12], 47.1% in Andhra Pradesh and 60-70% in Gujarat [13], 62% in rural Chennai by Paran Rayan et al [14].

Table 3: Univariate analysis of Risk Factors associated with Intestinal parasitic infections among children, 1-5 years of age

Variables	Positive samples (%) (n-145)	Negative samples (%) (n-240)	OR (95% CONFIDENCE INTERVAL)	'P' value
Gender				
Male	71 (48.97)	134 (55.83)		
Female	74 (51.68)	106 (44.17)	1.3 (0.8;1.9)	0.19
Age in years				
(M ± SD)	3.2 (1.3)	2.5 (1.2)	------	<0.001
Education of mother				
Above primary	41 (28.28)	106 (44.17)		
Primary & below	104 (71.71)	134 (55.83)	2.0(1.3;3.1)	0.001
Monthly family income				
BPL Card Holder	14 (9.66)	39 (16.25)		
BPL Card Non- Holder	131 (90.34)	201 (83.75)	1.8 (0.9;3.5)	< 0.05
Wt/Age				
Normal	101(69.66)	156 (65)		
Underweight	44 (30.34)	84 (35)	0.8(0.5;1.26)	0.35
Latrine care				
Mother	117(80.7)	224(93.33)		
Other	9(6.2)	7(2.92)	2.46 (0.9;6.8)	0.07
Self	19 (13.1)	9(3.75)	4.04 (1.8;9.2)	0.0004
Geophagia				
No	106 (73.1)	190 (79.17)		
Yes	39 (26.9)	50(20.83)	1.4 (0.8;2.2)	0.17
H/o abdominal pain				
No	73 (50.34)	141 (58.75)		
Yes	72 (49.66)	99 (41.25)	1.4 (0.9;2.1)	0.10
H/o excessive crying				
No	73 (52.14)	164(68.33)		
Yes	67 (47.86)	76(31.67)	1.9 (1.3;3.0)	< 0.001
Mothers hand washing before preparing food				
With soap	67(46.2)	136(56.7)		
Without soap	51(35.2)	72(30.0)	1.4 (0.9;2.3)	0.12
Do not wash	27(18.6)	32(13.3)	1.7 (0.9;3.1)	0.07
No .of children in family < 5 years				
One	70(48.28)	153 (63.75)		
More than one	75(51.72)	87 (36.25)	1.9 (1.2;2.9)	0.002

Table-4: Univariate analysis of Peri-Domestic Risk Factors associated with Intestinal parasitic infections among children, 1-5 years of age

Variables	Positive samples (%) (n-145)	Negative samples (%) (n-240)	OR (95% C.I)	'P' value
Method of purification of drinking water				
Boiling + filtration	20 (13.79)	36 (15.00)		
Boiling only	20 (13.79)	24(10.00)	1.5 (0.7;3.4)	0.2
Filtration only	54 (37.24)	96(40.00)	1.0 (0.5;1.9)	0.5
None	51 (35.17)	84(35.00)	1.1 (0.6;2.1)	0.4
Type of Toilet				
Sanitary latrine	51(35.17)	80 (66.67)		
Open air defecation	94 (64.83)	160 (33.33)	0.9 (0.6;1.4)	0.36
Frequency of solid waste collection				
Regular				
Irregular	110 (75.86)	213(88.75)	2.5	
	35 (24.14)	27(11.25)	(1.4;4.36)	<0.001
Presence of visible sewage near house				
Not present	113 (77.93)	211(87.92)	2.06	
Present	32 (22.07)	29(12.08)	(1.2;3.6)	<0.01

Most of these studies have included school children except study done by Bisht et al [7] who have included pre-school children along with school children. They have reported 12.5% prevalence of IPIs in pre-school children.

There are foreign studies done in Pakistan, Thialand and Sudan among pre-school children, which reported prevalence ranging from 32.2% to 68.8% [15-19].

In our study, the most common intestinal parasite observed was Giardia lamblia (32.41%). Similar results were obtained in many studies done in pre-school children [15, 19]. Next common parasite observed was Entamoeba histolytica /dispar/ moshkovskii (21.37%). These intestinal parasites have been observed as a common finding in tropical and subtropical countries and are responsible for diarrhea in several studies [7,18,20]. Transmission of these intestinal parasites is by faeco-oral route. In India, quality of water used for drinking as well as quantity of water used for hygiene is associated with increased prevalence of such IPIs.

The most common helminthic infection in our study was Hymenolepis nana (17.24%), followed by Ascaris lumbricoides (11.72%), Ancyclostoma duodenale (4.82%) and Enterobius vermicularis (4.13%).

Most frequent age group associated with parasitic infections in this study was 3-5 years. This could be due to more outdoor activities (playing), self latrine care (improper) in this age group compared to younger children playing inside the house and dependent for latrine care.

Number of children in a family under-five years of age is an important risk factor for IPIs [21-23]. More the number of under-five children in the family, more will be crowding and higher the

chances of transmission of infection between children within the family.

We have found low maternal education levels to be associated with parasitic infections (P< 0.001), similar findings showed by the study done in Mexican rural children [2]. This may be due to lack of awareness regarding health and hygiene habits among less educated mothers.

Self latrine-care is also found to be significant risk factor compared to latrine care by mother or caretaker. This may be due to improper latrine care by children themselves and not washing hands with soap after latrine care.

Peri-domestic factors like lack of solid waste collection and visible sewage near the house are found to be significant risk factors for IPIs. This explains why IPIs are more prevalent among children over two years than the younger toddlers [15,24].

Lower socioeconomic status (SES) is also a risk factor for IPIs [25]. We have taken BPL card holder as a proxy measure of lower SES and found to be significantly associated with IPIs. The effect of SES on risk of parasitic infections could be attributed to several other factors such as poor hygienic environment, lack of access to clean water/closed drainage system, small houses and overcrowded conditions [26,27].

We also found history of excessive crying to be positively associated with IPIs.

Conclusion

The prevalence of intestinal parasitic infections was high in tribal areas.

We have identified domestic factors like mother education, no. of under-five children in the family, low SES and peri-domestic factors like lack of solid waste collection and visible sewage near the house.

These factors could benefit from health education of mothers, adequate family planning, regular deworming of children and care of peri-domestic factor by people as well by Government.

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Source of Conflict - Nil
Source of Interest- Nil

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