International Journal of Contemporary Pediatrics
Kumar SV et al. Int J Contemp Pediatr. 2019 Sep;6(5):1893-1897
http://www.ijpediatrics.com
pISSN 2349-3283 | eISSN 2349-3291

DOI: http://dx.doi.org/10.18203/2349-3291.ijcp20193601

Original Research Article

Intestinal parasitic infections and prevalence of anaemia among tribal school going children: a one year study

Sarvepalli Vijaya Kumar[1]*, Krishnan Ramalingam[2]

[1]Department of paediatrics, Lincoln University College, Malaysia
[2]Department of Biochemistry, Narayana Medical College, Chinthareddypalem, Nellore, Andra Pradesh, India

Received: 13 July 2019
Accepted: 22 July 2019

***Correspondence:**
Dr. Sarvepalli Vijaya Kumar,
E-mail:sujetha2481@gmail.com

ABSTRACT

Background: Intestinal parasitic infections are one of the neglected tropical diseases listed by world health organization. Parasitic infections among school going tribal children cause significant anaemia and malnutrition. Our study mainly focused on estimating the prevalence of intestinal parasitic infections and focused on iron deficiency anaemia among the tribal school going children.
Methods: A prospective study for one year was conducted at a tertiary care hospital and study group was tribal children from hostels and schools. Ethical committee approval was obtained and study included collection of socio demographic data, anthropometric data, stool examination for intestinal parasitic infections, Hb% estimation by "Hemocue globinometer Hb 301 System" a portable hemometer for Hb estimation. S. iron, S. transferrin and Total iron binding capacity were also estimated. Statistical analysis was performed by using SPSS version 20 and analyzed. P value <0.05 was considered significant.
Results: This 428 study participants with 66.36% boys and 33.64% girls were enrolled. The prevalence of parasitic infections was 42.06%. Protozoal infections were 41.11% when compared to helminthic infections (26.67%) and mixed infections in 32.22%. Entamoeba histolytica was the predominant protozoal parasite identified (30%) and Ascaris lumbricoides among the helminthic infection (13.3%). Presence of anaemia in the present study population was 11.21% and among the study group with parasitic infections it was 66.67%.
Conclusion: To conclude, regular deworming practices, awareness regarding hand washing practices, iron and folic acid supplementation irrespective of nutritional status and health education could significantly reduce the incidence of anaemia associated with intestinal parasitic infections.

Keywords: Anaemia, Ascaris lumbricoides, Entamoeba histolytica, Hemocue globinometer

INTRODUCTION

Anaemia is one of the common clinical illnesses affecting most of the school going children. The causes may be multi-factorial in different age groups ranging from congenital disorders in neonates to malignancy in older age group. Anaemia is a condition which results from a reduction in haemoglobin concentration or reduction in red blood cell number or both resulting in lower ability of oxygen delivery to support the body's activities. Globally as per the WHO statistical data, the prevalence of anaemia among school age children ranges from 12-60%.[1] The consequences of anaemia among school age children results in lowered resistance to disease, increased susceptibility to infection, poor cognitive development, impaired physical development, poor school performance and reduced work capacity with

impaired social and economic development of the country.[2]

Intestinal parasitic infections are one of the neglected tropical diseases listed by world health organization. Soil transmitted helminthic infections constitutes 80% of the neglected tropical disease burden. These infections also impose serious socioeconomic impact on the development of the nation. The most common parasitic infections are helminthic such as Ascaris lumbricoides, Strongyloides, Trichuris trichura and protozoal like Entamoeba histolytica, Entamoeba coli and Giardia intestinalis. The causes of anaemia in parasitic infections are by reducing iron uptake from the intestine, directly sucking blood and destructing the mucosal structure of intestine thereby interfering with the micronutrients absorption and iron metabolism. These multiple effects alter the host's nutritional status leading to iron deficiency and immune system and then alter their immune mechanism. These conditions become a vicious cycle that imparts the quality of life of children.[3] These parasitic infections are prevalent in areas of poor sanitation, practising improper hygienic practices and inadequate health care services. The effects of these parasitic infections are not limited to morbidity but extend to poor cognitive performance, malnutrition, anaemia, decreased school attendance and increased susceptibility to opportunistic infections. Hence our study mainly focussed on estimating the prevalence of intestinal parasitic infections and focussed on iron deficiency anaemia among the tribal school going children.

METHODS

The present prospective study was conducted at a tertiary care hospital by the department of Paediatric for a period of 12 months from January 2018 to December 2018. The study was presented before the institutional ethical committee and was approved. The guidelines of the committee were followed strictly throughout the study. The study details were clearly explained to all the parents or guardians and schoolteachers and written informed consent was obtained from them. The study group involved were all the school going tribal children between 6-15 years of age residing in the tribal welfare hostels and schools. Four hostels and two schools located in the study area were identified and data was collected from all the participants who consented for the study. The details and purpose of the study was clearly explained to the school authorities and permission was obtained for the study. The list of the students were obtained from both the hostels and filtered based on the inclusion criteria. Children diagnosed with parasitic infections were treated as per management protocol.

The data collection process involved three steps: 1. Interviewing the parents, guardians and teachers. 2. Measuring the anthropometric details and 3. Stool collection and Haemoglobin estimation by finger prick using "Hemocue globinometer' and laboratory estimation of S. ferritin, S. Iron and Total iron binding capacity (TIBC).

Data for the study was collected by interviewing the participants, parents and teachers which was prepared in a structured questionnaire format. The data include socio demographic details, dietary habits, hand washing practices, type of toilets used by them, defecating practices and history of any anti parasitic infections and medications for past three months. School performance was assessed by using the previous scores, absenteeism from schools Parents not consented for the study, students who were unable to give stool and blood samples, known cases of anaemia, history of iron medical supplementation and history of anti-parasitic medication for past three months period were excluded from the study.

Weight of each participant was noted by using digital weighing scale and rounded to nearest 0.1 kilograms. Height was measured by using a Stadiometer and rounded off to nearest 0.1 cms.

The parents and students were clearly explained about procedure of collection of stool. Stool collection containers were distributed to all the participants and a minimum of one gram of collected stool was sent to central microbiology laboratory for examination for parasites. Concentration of Haemoglobin was estimated by finger prick blood sample using "Hemocue globinometer Hb 301 System" which is a portable battery operated Hb meter used for haemoglobin determination in the field. Four ml of blood was collected and sent to biochemistry laboratory for serum Iron, Ferritin estimation and TIBC (Total Iron binding capacity).

Statistical analysis

The collected data was entered in Microsoft excel sheet primarily and corrections were done. The corrected data was transferred into SPSS software version 20. (SPSS Inc. Chicago. USA) The descriptive data was given as a means with standard deviations, frequency counts and percentages. Association between two qualitative variables was explored using Chi-square test and statistical significance was meant if P value <0.05.

RESULTS

In the present prospective study, a total of 428 tribal students who fulfilled the inclusion criteria were enrolled. A clear male study population dominance with 284 boys (66.36%) and 144 girls (33.64%) were present.

All the children were from Grade- 2 to Grade-10. Majority of the study participants were in the age group of 11-15 years (59.35%) and 40.65% in the age group of 6-10 years. The mean age of the study participants was 11.25±6.5 years and the range was from 6-15 years.

Mean age of boys in the study was 11.21±1.8 years and female was 10.65±3.8 years.

Table 1: Socio demographic variables of cases in the study.

Variable	No	%
Sex		
Male	284	66.36
Female	144	33.64
Age distribution		
6-10 years	174	40.65
11-15 years	254	59.35
Dietary habits		
mixed diet	108	25.23
hostel diet	320	74.77
Hygienic practices		
Washing hands after toilets		
yes	158	36.92
no	270	63.08
Washing hands before food		
yes	188	43.93
no	240	56.07
Defecating practice		
Sanitary latrine	248	57.94
Open field	180	42.06
Absenteeism (Days)		
≤ days (Low)	284	66.36
≥5 days (High)	144	33.64
Anthropometric measurements		
Height (In Cms)		
103-122	84	19.63
123-142	184	42.99
143-162	124	28.97
163-182	24	5.61
>182	12	2.80
Weight (In Kgs)		
15-34	104	24.30
35-54	175	40.89
55-74	84	19.63
>75	65	15.19
Malnutrition		
Undernourished	124	28.97
Not undernourished	304	71.03

This 74.77% (320/428) had hostel diet when compared with 25.23% (108/428) who had mixed diet. Hostel diet comprises a balanced diet whereas mixed diet was prepared in home and was lacking essential micronutrients as per the age requirements. In the present study it was observed that 63.08% of students were not washing hands after toilets and 56.07% were not washing hands before food consumption. This reflects the poor educational knowledge and lack of awareness among the children regarding hygienic health practices. It was also observed that 42.06% of children were practising open field defecation due to improperly maintained toilets in the schools and hostels. Lack of awareness regarding sanitary latrine practices was observed only in very few (<2%) in our study. Table 1 Around 33.64% of participants were absent for more than the 5 days during one month period which was obtained from the school & hostel caretaker of the students.

Table 2: Types of parasites identified in study group.

Types of Parasites	No	%
Entamoeba histolytica	54	30
Giardia lamblia	20	11.1
Ascaris lumbricoides	24	13.3
Trichuris trichura	8	4.4
Ancylostoma duodenale	16	8.9
E. histolytica and G. lamblia	23	12.8
Ascaris lumbricoides and E. histolytica	20	11.1
Ascaris and Trichuris	5	2.8
Ancylostoma and E. histolytica	10	5.6

In the present study, anthropometric readings of the participants, regarding height and weight were recorded following standard guidelines. 43% of the participants were between 123-142 cms in height and 40.89% were between 25-54 kg in weight.29% of the children were undernourished based on the anthropometric recordings in our study.

Table 3: Laboratory parameters of study participants.

Hb% (<11.5g/dl)	No	%
Yes	48	11.21
No	380	88.79
Serum Iron		
Normal	369	86.21
Less than <50 µg/ml)	59	13.79
Serum ferritin		
Less than <12 µg/ml)	10	2.34
Normal	418	97.66
TIBC		
High (> 346 µg/ml)	38	8.88
Normal	390	91.12

Out of the 428 study participants the prevalence of parasitic infections was 42.06% (180/428) with predominant distribution of protozoal infections (41.11%) when compared to helminthic infections (26.67%) and mixed infections in 32.22%.

Table 2 summarizes the type of parasitic infections in the present study. *Entamoeba histolytica* was the predominant protozoal parasite identified (30%) and *Ascaris lumbricoides* among the helminthic infection (13.3%). Among the mixed infections, *entamoeba histolytica* and *giardia lamblia* was the commonest (12.8%) followed by *Ascaris lumbricoides* and *E. histolytica* (11.1%). Other lefewerrommon parasites are

summarized in table 2. In conclusion, single infections were more common than co-infections.

The presence of anaemia in the present study population was 11.21% (48/428) and among the 48 cases with anaemia only 32 were identified with parasitic infections. 13.79% of study cases were observed with S. iron levels <50 µg/ml. 2.34% of cases had serum ferritin <12µg/ml and total iron binding capacity (TIBC) was higher in 8.88% of cases. Among the identified cases of anaemia all of them were of moderate type and no cases of severe anaemia were noted. Table 3.

DISCUSSION

Anaemia among the school going children is one of the major illness which is missed or neglected because of lack of specific clinical findings or unawareness about the clinical condition. The exact prevalence of anaemia among the school children are overrated or underestimated because of wide differences in the dietary habits, hygienic conditions and various multiple etiological factors associated with the area and region. Intestinal parasitic infections among the children are one of the common neglected and important causes of malnutrition and anaemia. The prevalence of intestinal parasitic infections and anaemia among the school children are widely studied and also are differing from region to region based on multiple factors and considerations. In our present study the prevalence of intestinal parasitic infections was 42% which is quite high than other studies which were done in India and abroad. The reason behind the high prevalence in our study is the study participants were all the tribal school children who are underexposed to national health programmes and lack proper sanitary conditions. The children are also exposed to inadequate sanitary conditions in the hostels and families.

However the findings of our study were in accordance with the findings of Tsuyuoka et al, in Brazil and Okyay et al, in Turkey, where the prevalence among school children was found to be 42% and 31.8%, respectively.[4,5] In India, a wide variation in the prevalence of parasitic infection is noted in different studies from different regions was found to be as low as 11.4% in a study conducted by Kotian et al, in Uttarakhand, 23.4% in a study conducted by Mareeswaran et al. in Tamil Nadu, 30.11% in a study conducted by Rai et al. in Nepal, and as high as 63.9% in a study conducted by Ashok et al, among school children in Andhra Pradesh.[6-9] These wide differences are due to heterogeneity of study populations, socio demographic characters and various study locations.

In the present study, protozoal infections were predominant than helminthic infections and mixed infections which was similar to the findings in the study of Chajhlana S P S, et al.[10] In our study Entamoeba histolytica was the most common parasite (30%) followed by Ascaris lumbricoides (13.3%), similar findings were reported in study findings of Shariff ZM, et al.[11] In the mixed infections, protozoal infection with Entamaoeba and Giardia was the commonest (12.8%). Findings of our study suggest that since majority of parasitic infections are protozoal, it shows that feco-oral contamination of food and water is high in the study area and study population.

In the present study, 42.06% of study group were practising open field for defecation. This high percentage may be due to the study group selected who are tribal children as compared to various studies where study group was mainly rural children who practise sanitary latrine for toilets. As described in many studies earlier open field defecation increases the risk of intestinal parasitic infections. In our study the prevalence of parasitic infections were higher among study participants who did not follow adequate hand washing practices before food and after going to toilets. Similar results were observed in the study findings of B. Amare et al.[12] Findings of our study strongly suggests the need to increase health awareness and hand washing practices among the school going children to reduce the incidence of intestinal parasitic infections. In the present study, diet had no significant role in the presence of parasitic infections however our finding was contrary to the finding of Egger RJ, et al.[13] A study report by Rati and Jawadagi revealed that parasitic infections were predominant among those with vegetarian diet.[14] The prevalence of intestinal parasitic infections among the undernourished in our study was 12% which is similar to the findings in the study of Garba C, et al.[15]

The prevalence of anaemia in our study group was 11.21% and among the study group with anaemia, 66.67% were identified to have intestinal parasitic infections. A statistically significant association was observed between anaemia and parasitic infections in our study. Similar findings and association was reported in the findings of Melwani et al., Soman et al. who reported the prevalence of 175 and 18% in their study.[16,17] These findings suggest that parasitic infections and coexisting anaemia are significant health problem and need to be intervened with increasing awareness to increase the overall health and wellbeing of the tribal children.

CONCLUSION

To conclude, regular deworming practices, awareness regarding hand washing practices, iron and folic acid supplementation irrespective of nutritional status and health education could significantly reduce the incidence of anaemia associated with intestinal parasitic infections.

Findings of our study suggest that anaemia associated with intestinal parasitic infestation is significant public health problem among school going tribal children. Hence necessary interventional measures such as health education to school children, about various personal and

environmental hygiene practices and maintaining a good balanced diet could significantly alter the health status of the children and the society in total.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Resolution WHA65.6. Comprehensive implementation plan on maternal, infant and young child nutrition. In: Sixth-fifth World Health Assembly, Geneva, 21-26 May 2012.
2. Brooker S. Estimating the global distribution and disease burden of intestinal nematode infections: Adding up the numbers - a review. Int J Parasitol. 2010 Aug 15;40(10):1137-44.
3. Hall A, Hewitt G, Tuffrey V, de Silva N. A review and meta-analysis of the impact of intestinal worms on child growth and nutrition. Matern Child Nutr. 2008 Apr;4:118-236.
4. Tsuyuoka R, Bailey JW, Guimarães AM, Gurgel RQ, Cuevas LE. Anemia and intestinal parasitic infections in primary school students in Aracaju, Sergipe, Brazil. Cad Saude Publica. 1999 Apr;15(2):413-21.
5. Okyay P, Ertug S, Gultekin B, Onen O, Beser E. Intestinal parasites prevalence and related factors in school children, a western city sample-Turkey. BMC Public Health. 2004 Dec;4(1):64.
6. Kotian S, Sharma M, Juyal D, Sharma N. Intestinal parasitic infection-intensity, prevalence and associated risk factors, a study in the general population from the Uttarakhand hills. Int J Med Public Health. 2014;4(4):422-5.
7. Mareeswaran N, Savitha AK, Gopalakrishnan S. Prevalence of intestinal parasites among urban and rural population in Kancheepuram district of Tamil Nadu. Int J Community Med Public Health 2018;5(6):2585-9.
8. Rai L, Saud B, Paudel G, Dhungana G. Prevalence of intestinal parasitic infection among rural area school children of Lokhim VDC, Nepal. J Microbiol Exp. 2017;4(1):00102.
9. Ashok R, Suguneswari G, Satish K, Kesavaram V. Prevalence of intestinal parasitic infection in school going children in Amalapuram, Andhra Pradesh, India. Shiraz E-Med J. 2013;14(4):e16652.
10. Chajhlana SPS, Mahabhasyam RN, Varaprasada MSM. Nutritional deficiencies among school children in urban areas of Hyderabad, Telangana, India. Int J Community Med Public Health 2017;4:607-12.
11. Shariff ZM, Bond JT, Johnson NE. Nutrition and educational achievement of urban primary schoolchildren in Malaysia. Asia Pacific J Clin Nutri. 2000 Dec 29;9(4):264-73.
12. Amare B, Ali J, Moges B, Yismaw G, Belyhun Y, Gebretsadik S, Woldeyohannes D, Tafess K, Abate E, Endris M, Tegabu D. Nutritional status, intestinal parasite infection and allergy among school children in Northwest Ethiopia. BMC pediatr. 2013 Dec;13(1):7.
13. Egger RJ, Hofhuis EH, Bloem MW, Chusilp K, Wedel M, Intarakhao C, et al. Association between intestinal parasitoses and nutritional status in 3-8-year-old children in northeast Thailand. Trop geogr med. 1990 Oct;42(4):312-23.
14. Rati S, Jawadagi S. Prevalence of anemia among adolescent girls studying in selected schools. IJSR 2014;3:1237-42.
15. Garba CM, Mbofung CM. Relationship between malnutrition and parasitic infection among school children in the Adamawa Region of Cameroon.. Pak. J. Nutr. 2010:9(11):1094-9.
16. Melwani V, Dubey M, Khan A, Toppo M, Choudhary Y, Priya A. A study to assess the prevalence of anaemia amongst adolescent girls residing in selected slum of Bhopal city. Int J Community Med Public Health. 2018 Feb 24;5(3):1096-9.
17. Soman SK, Areekal B, Murali AJ, Varghese RG. Adolescent anaemia its prevalence and determinants: A cross-sectional study from south Kerala, India. Int J Community Med Public Health. 2017 Jul 22;4(8):2750-6.

Cite this article as: Kumar SV, Ramalingam K. Intestinal parasitic infections and prevalence of anaemia among tribal school going children-a one year study. Int J Contemp Pediatr 2019;6:1893-7.