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Retraction

The article "Prevalence and the factors influencing soil transmitted helminths among school age children of 5 to 14 years in a rural area of Coimbatore district" is retracted by the Editor-in-Chief, due to violation of the policies and practices of International Journal of Community Medicine and Public Health. The article is retracted on request of corresponding author and co-authors due to some errors in data which happened by the authors unintentionally.

REFERENCES

1. Rajan XC, Manivasagan S, Boppe A. Prevalence and the factors influencing soil transmitted helminths among school children of age 5 to 14 years in a rural area of Coimbatore district. Int J Community Med Public Health 2019;6:4924-8. DOI: http://dx.doi.org/10.18203/2394-6040.ijcmph20195081.

Original Research Article

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Prevalence and the factors influencing soil transmitted helminths among school age children of 5 to 14 years in a rural area of Coimbatore district

Xavier C. Rajan¹*, Sivamani Manivasagan², Appalaraju Boppe³

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*Correspondence: Dr. Xavier C. Rajan,

E-mail: xavier.v.dr@gmail.com

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ABSTRACT

Background: Highest intensity of soil transmitted helminthiasis (STH) is seen among school age children. The objective of this study is to find out the prevalence and factors associated with STH infection among school age children of 5-14 years in a rural area of Coimbatore district.

Methods: After getting ethical clearance, five of the fourteen villages of Vedapatti were selected by cluster sampling method. Totally 819 participated in the survey conducted between November 2015-July 2016 in the field practice area. Consent from parents and assent from child were obtained. Structured questionnaire was used to collect information. Totally 610 gave one adequate stool sample. Early morning samples were collected and transported to the laboratory within four hours. Formal ether concentration method was performed and examination was done. Data analysis was done with SPSS-19 software. Prevalence is expressed in percentage with 95% confidence interval (CI). Univariate and Multivariate analysis were performed. Strength of association was expressed in terms of odds ratio and adjusted odds ratio with 95% confidence interval. P value <0.05 was considered as statistically significant.

Results: The prevalence of STH was 7.70% (95% CI: 5.58- 9.82). Ascaris lumbricoides was highly prevalent 6.9% (4.89% to 8.91%) followed by hook worm 0.2(0.15% to 0.55%) and Trichuris trichura 0.7% (0.04% to 1.36%). Univariate and Multivariate logistic regression analysis showed that pucca houses offered protection against STH.

Conclusions: STH is still a public health problem in Coimbatore. When regular deworming is accompanied by appropriate sanitation and hygiene activities designed to prevent re infection of STH, a long-term impact can be achieved.

Keywords: Soil transmitted helminthiasis, Prevalence, School age children, Coimbatore

INTRODUCTION

The soil-transmitted helminthes (STH) causing major illness among human beings are *Ascaris lumbricoides*, *Trichuris trichiura, Necator americanus* and *Ancylostoma duodenale*.¹ STH are considered Neglected Tropical Diseases (NTDs). ² STH affects more than one fourth of

the world's population, and it is reported more in tropical and subtropical areas.³ The greatest numbers of cases are occurring in sub-Saharan Africa, the Americas, China and East Asia.⁴ In India the reported prevalence of STH infection varied from 7.8% to 92.6%.⁵⁻⁹ The reported prevalence varies according to the place and time of the study conducted.

¹Department of Community Medicine, Kilpauk Medical College, Chennai, Tamil Nadu, India

²Department of Community Medicine, PSG Institute of Medical Sciences and Research, Coimbatore, Tamil Nadu, India

³Department of Microbiology, PSG Institute of Medical Sciences and Research, Coimbatore, Tamilnadu, India

The highest intensity of soil transmitted helminthes occur in school age children. 10 Children in their schooling age do not fully understand the connections between illness and behaviour.¹¹ It has been demonstrated that children often than adults tend to go barefoot, resulting in more contact with soil, and they often fail to use sanitary facilities even when they are present.12 STH infections are considered as an important cause of sickness absenteeism. They are accounting for loss of 12.3% and 11.4% of disability adjusted life years (DALY) in girls and boys respectively. 13 Over 270 million preschool-age children and over 600 million school-age children live in areas where sanitation is poor and these parasites are intensively transmitted. 14 In India more than 241 million children are at risk of parasitic worm infections. Ministry of Health and Family Welfare (MoHFW), Government of India launched the National Deworming Day (NDD) on Feb 10, 2015. NDD aims to de-worm all children between the ages of 1 to 19 years. 15 The tablets were supplied to children through Government, Government-aided and private schools, and Anganwadi centers.

When regular deworming is accompanied by appropriate sanitation and hygiene activities designed to prevent reinfection, a long-term impact can be achieved Epidemiological studies are needed to identify risk factors which may represent critical control points. There is no recently published article on prevalence of soil transmitted helminthes in Coimbatore, where open air defecation is a common practice. As per 2011 census, 46% of the households in Coimbatore district lack toilets. Hence this cross sectional study was conducted with the objective of finding the prevalence and risk factors associated with soil transmitted helminth infections in school age children of 5-14 years in a rural area of Coimbatore district.

METHODS

The study was conducted in the field practice area of the Rural Health Training Centre (RHTC) Vedapatti, Coimbatore. RHTC caters to a total population of 23,841 distributed in 14 villages of Thondamuthur and Madukarai block of Coimbatore district. The total number of school aged children of 5–14 years is 3266.

Ethical clearance was obtained from IHEC, in 2014. The sample size was calculated to be 819 assuming 34.5% as prevalence, relative precision of 15%, design effect of 2, and non-response rate of 20%. Five out of fourteen villages were selected by cluster sampling method. House to house survey was conducted in the five villages during November 2015 to July 2016. All school-age children (aged 5–14 years) who were permanent residents of Vedapatti field practice area of RHTC were included in the study. Children who were not available on three visits within a week time were excluded from the study.

At the home setting, after getting consent from the parent and assent from the child any of the parents of the child

was interviewed in the evening hours of the day. A structured questionnaire was used to collect information on demographic, socioeconomic and environmental information like availability of type of drinking water and availability of functioning sanitary toilet etc. Few questions were asked regarding the knowledge and attitude of the parents on STH. Respondent was asked to give comment on the personal hygiene practices of childlike washing hands with soap before taking food and after defecation, eating fallen foods on the floor, wearing foot wear outside the house and intake of de-worming tablets in the last three months. Observations were also made regarding the personal hygiene of the children related to STH like clipped nails etc. Knowledge and attitude score was generated from the correct responses for the knowledge and attitude questions. The correct responses were given a score of one, and maximum score one could get was nine. Score five and above was considered as adequate knowledge and attitude score.

At the end of survey a screw-capped plastic container with identification of the child was given to collect the stool sample of the child on the next morning. Instructions regarding stool collection were given. The stool samples were transported to microbiology lab within four hours of sample collection. Stool samples were examined by saline wet mount and Iodine wet mount .17 Iodine preparations was done for better visualization of morphological details of ova. All Samples were reexamined after concentrating with WHO recommended.¹⁸ Formalin-Ether sedimentation method (FES). To reduce human error, duplicate slides (both direct and after concentration method) were prepared from each sample and the slides were read by two different Microbiologists and the opinion of Chief Microbiologist was considered as final. 19

Statistical analysis

Data entry was made in the Microsoft Excel software in codes and analysis was done using SPSS-19 computer package. The Presence of ova of Ascaris lumbricoides, Trichuris trichiura, Necator americanus and Ancylostoma duodenale was considered as dependent variable. Prevalence is expressed in percentage with 95% confidence interval (CI). Uni-variate analysis and logistic regression were performed to find the associations between independent variables and dependent variables. Strength of association was expressed in terms of odds ratio and adjusted odds ratio with 95% CI and p value <0.05 was considered as statistically significant.

RESULTS

The results of this study are based on only 610 children, who gave one adequate stool sample. Totally 819 children participated in the survey, hence the non-response rate was 24.42%. Analysis showed that more number of risk group (29.13%) were found among the non-responders when compared to younger children (22.72%, p=0.02).

The distribution of study population and their risk factors is shown in (Table 1 and 2). The mean age of the study population was 8.92 ± 2.68 . Among them Children below ten year, female participants (52.1%), children belonged to nuclear family (62.1%) and children belonged to low socio economic status (52.3%) class IV and V according to modified Prasad classification were found in majority. Illiteracy was found among 20.2% of mothers 16.1% of fathers. Open air defecation was found among 33.4% of

the children. Regarding the toilet usage only 50.7% of the children were using the toilets in the home. Around 66% did not wash their hands with soap before taking food. And 44.6% did not wash their hands with soap after defecation around 63 % children regularly used foot wear and around 70% of the children had trimmed nail during the visit. Nearly half of the parents of children were having adequate knowledge on STH. Only 59% reported intake of de-worming tablets in the last three months.

Table 1: Association of STH with socio economic and demographic factors by univariate and multivariate analysis.

Factors	Category	STH		Unadjusted	Adjusted	
		Yes	No	odds ratio (95% CI)	odds ratio (95% CI)	P value
	≥10	24	229	1.52 (0.80-2.90)	1.45 (0.78-2.7)	0.24
Age (years)	<10	23	334	1	1	0.24
Sex	Male	24	268	1.15 (0.60-2.18)	1.07 (0.58-2.00)	0.82
	Female	23	295	1	1	
Total number of	Less than 4	22	253	1.08 (0.56- 2.05)	1.21 (0.64- 2.27)	0.55
family members	Four and above	25	310	1		
Type of house	Pucca house	4	115	0.36 (0.09-1.03)	0.34 (0.10- 0.91)	0.05
	Others (semipucca, kutcha house)	43	448	1	1	
Mother's	Illiterate	10	113	1.08 (0.46-2.29)	1.03 (0.43- 2.30)	
educational status	Literate	37	450	1	1	0.94
Socio economic	Lower SES (Class IV,V)	26	293	1.14 (0.60-2.19)	1.10 (0.56-2.20)	
status (modified prasad scale)	High SES (Class I,II,III)	21	270	1	1	0.78

Table 2: Association of STH with Risk factors by univariate and multivariate analysis.

Eastana	Category	STH		Unadjusted odds ratio	Adjusted odds ratio	Dwolno
Factors		Yes	No	(95% CI)	(95% CI)	P value
Open air defecation	Yes	16	188	1.03 (0.51-2.00)	1.10 (0.56-2.20)	0.68
Open an defecation	No	31	375	1	1	
Type of safe drinking	Pipe water	36	427	1.04 (0.50-2.33)	0.93 (0.45-2.06)	0.86
water	Others (UV/RO/boiled water)	11	136	1	1	
Habit of eating	Yes	13	168	0.90 (0.42-1.80)	0.82 (0.38-1.72)	0.61
unwashed vegetables	No	34	395	1	1	
Habit of eating foods	Yes	1	21	0.56 (0.01-3.66)	0.62 (0.03-3.30)	0.65
fallen on ground	No	46	542	1	1	
Washing with soap	No	27	313	1.08 (0.57-2.08)	0.89 (0.40-1.93)	0.76
before eating	Yes	20	250	1	1	
Washing with soap after	No	24	248	1.32 (0.70-2.52)	1.57 (0.71-3.51)	0.27
Toilet	Yes	23	315	1	1	
Regular foot wear usage	No	16	207	0.89 (0.44-1.72)	0.92 (0.46-1.79)	0.81
Regulai 100t wear usage	Yes	31	356	1	1	
Nail clipping	No	11	175	0.68 (0.30-1.40)	0.63 (0.28-1.34)	0.25
Nan Cupping	Yes	36	388	1	1	
Deworming during past	No	22	228	1.29 (0.68-2.45)	1.43 (0.76-2.66)	0.26
three months	Yes	25	335	1	1	
Knowledge attitude	Inadequate	25	296	1.02 (0.54-1.96)	0.90 (0.47-1.72)	0.75
score regarding STH	Adequate	22	267	1	1	

The prevalence of STH among 610 children who had given one adequate stool sample and whose parents participated in survey was 7.70% (95% CI: 5.58-9.82). Among all STH, *Ascaris lumbricoides* was highly prevalent 6.9% (95% CI: 4.89-8.91) followed by hook worm 0.2% (95% CI: 0.15-0.55) and *Trichuris trichura* 0.7% (95% CI: 0.04-1.36).

There was no significant association found between STH and factors influencing STH by univariate analysis. Since none of the factors came as significant in univariate analysis, all independent variables were subjected to multivariate logistic regression analysis. Only pucca houses offered protection OR 0.36 [95% CI: 0.09-1.03] against STH, by multivariate analysis.

DISCUSSION

Relatively high non response rate (24.42%) was noted in this study. It is also evident from a similar study by Shubha et al that surveys involving bio samples shows high non response rate (30.9%) when compared to simple questionnaire based surveys.²⁰

The prevalence of STH in the study population is 7.7% (95% CI 5.58- 9.82). Results of current study were lesser than other studies conducted in the nearby areas.

The explanations for low prevalence are more number of risk group (29.13%) were found among the nonresponders compared to younger children (22.72%, p=0.02). The study results were based on single stool sample, Modified Formol-ether concentration (FEC) method with low sensitivity (63.1%) which could have estimated the low prevalence. ²¹The other probable explanations are Mass Drug Administration under National Deworming Day (NDD) might have changed the scenario.⁵⁻⁹ However there is no sufficient data from to compare prevalence before de-worming in this area to support this statement. Coimbatore first round of National De-worming Day was just completed and second round was on- going at the time of the survey (Febraury 2016). Kattula et al also explains the reason for low prevalence of STH (7.8%) in Vellore area is due to Albendazole supplied in Mass Drug Admininistation (MDA) along with Diethylcarbamazine since 2004.8 Deworming using Albendazole rapidly declines the overall prevalence of STH, and this is evident from Mani et al study on efficacy of Albendazole in Tamilnadu.²² However there are other studies reported with higher prevalence in nearby areas. Kaliappan et al explains the reason for the increased prevalence (39%) in Thiruvanamalai District in the year 2013 could be due to five stool samples collected among tribal population where open air defecation and bare foot walking were common practice.²³ Ragunathan et al explains the reason for higher prevalence (34.56%) reported in Pudhuchery, a coastal area using FEC method in year 2006 is due to poor hygienic practices of the participants.¹⁶

This study showed the most common soil transmitted helminth as *Ascaris lumbricoides* with the prevalence of 6.9% (95% CI 4.89-8.91) followed by Hook worm 0.7% (95% CI 0.04%-1.36%) and *Trichuris Trichura* 0.2% (95% CI 0.15-0.55). In general studies showed that *Ascaris* and *Trichuris* were more common among urban children and hookworm infestation among rural children.²⁴

Regarding the factors influencing STH pucca houses offered protection OR 0.36 [95% CI 0.09-1.03] against STH, by multivariate analysis. A cross sectional study by Kattula et al showed that children living in Hut/ Kutcha houses, are at higher risk for STH.⁸

Kattula et al also showed that children of more than 10 years of age, living in households without toilet, open air defecation, unhygienic practices like keeping untrimmed nails are important risk factors for STH.⁸ Kattula showed that consumption of deworming tablets offered protection. However there was no significant association between STH and factors influencing STH noted in this study.⁸

The major limitations of the study are, the results were based on single stool sample which could have estimated the low prevalence. The newer techniques with higher sensitivity would have given higher prevalence. Sample size was not adequate to comment on factors influencing STH. This is a cross-sectional study; hence the cause-effect relationship cannot be determined

In Asia, several countries, notably Japan, South Korea and Taiwan, showed that they have achieved sustained and successful control of STH infections over the last forty years (WHO, 1996). More recently, Sri Lanka has reduced prevalence to less than five percent.²⁵

CONCLUSION

It is evident from our results that soil-transmitted helminth (STH) infections can be controlled by improving the coverage of NDD, and NDD should be evaluated for further control. Open air defecation is a biggest concern (33.4%), hence more private, public toilets should be built in this area. The children should be trained to use toilet facilities either private or public. It is also very important to raise the awareness about these infections, hence parents of children with inadequate knowledge should be given Health education. Regular deworming if accompanied by appropriate sanitation and hygiene activities designed to prevent reinfection, a long-term impact can be achieved.

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Ethical approval: The study was approved by the

Institutional Ethics Committee

REFERENCES

- World Health Organization, Focusing on STH: towards an integrated approach for STH control. Available at http://www.who.int/intestinal_worms/ en/http://whqlibdoc.who.int/publications/2012/9789 241503129_eng.pdf?ua=1. Accessed 10 September 2019.
- 2. Statement regarding Soil Transmitted Helminths, by CDC. Available at http://www.cdc.gov/globalhealth/ntd/. Accessed 10 September 2019.
- Pullan RL, Smith JL, Jasrasaria R, Brooker SJ. Global numbers of infection and disease burden of soil transmitted helminth infections in 2010. Parasites Vectors. 2014;7:37.
- 4. WHO: 2012. Eliminating soil-transmitted helminthiasis as a public health problem in children soil-transmitted helminthiasis progress report; 2001-2010
- Ramesh GN, Malla N, Raju GS, Sehgal R, Ganguly NK, Mahajan RC, et al. Epidemiological study of parasitic infections in lower socio-economic group in Chandigarh (north India). Indian J Med Res. 1991;93:47-50.
- Singh P, Gupta ML, Thakur TS, Vaidya NK. Intestinal parasitism in Himachal Pradesh. Indian J Med Sci. 1991;45:201-4.
- 7. Singh S, Raju GV, Samantaray JC. Parasitic gut flora in a north Indian population with gastrointestinal symptoms. Trop Gastroenterol. 1993;14:104-8.
- 8. Kattula D, Sarkar R, Ajjampur SS, Minz S, Levecke B, Kang G. Prevalence and risk factors for soil transmitted helminth infection among school children in south India. Indian J Med Res. 2014;139:76-82.
- 9. Naish S, McCarthy J, Williams GM. Prevalence, intensity and risk factors for soil-transmitted helminth infection in a South Indian fishing village. Acta Trop. 2004;91:177-87.
- World Bank. The global burden of disease. Appendix B. In: World development report. Investing in health-world development indicators. New York: World Bank and Oxford University Press; 1993;213-25.
- 11. Richmond JB, Kotelchuck M. Personal health maintenance for children. West J Med. 1984;141:816–23.
- 12. Abera B, Alem G, Yimer M, Herrador Z. Epidemiology of soil transmitted helminths, Schistosomamansoni and haematocrit values among schoolchildren in Ethiopia. J Infect Dev Ctries. 2013;7(3):253-60.
- 13. Curtale F, Pezzotti P, Sharbini AL, al Maadat H, Ingrosso, Saad YS. Knowledge, perceptions and behaviour of mothers toward intestinal helminths in Upper Egypt: implications for control. Health Policy Plan. 1998;13:423-32.

- 14. World health organisation: 1998. Control of Tropical Disease Geneva. Available at http://www.who.int/neglected_diseases/en/.
 Accessed 10 September 2019.
- 15. Information regarding National Deworming Day in India from NHM website. Available at http://nrhm.gov.in/nrhm-components/rmnch-a/child-health-immunization/national-deworming-day-august-2016.html. Accessed 10 September 2019.
- Ragunathan L, Kalivaradhan SK, Ramadass S, Nagaraj M,Ramesh K. Helminthic infections in school childrensPudhuchery, South India. Microbiol Immunol Infect. 2010;43(3):228–32.
- 17. Manual of basic techniques for a health laboratory, Second Edition: World Health Organization, Geneva 2003.
- 18. World Health Organization; Geneva: 1994. Bench Aids for the Diagnosis of Intestinal Parasites. Available at http://apps.who.int/iris/handle/10665/37323. Accessed 10 September 2019.
- 19. Chatterjee KD. Text book of Parasitology 13th edition, CBS publishers and distributors. 2015.
- Shubha D, Fatima F. A coprological survey for assessing intensity of parasitic infection in school children: cross-sectional study. Trop Parasitol. 2011;1(2):88-93.
- 21. Yimer M, Hailu T, Mulu W, Abera B. Evaluation performance of diagnostic methods of intestinal parasitosis in school age children in Ethiopia. BMC Research Notes. 2015;8:820.
- 22. Mani TR, Rajendran R, Munirathinam A, Sunish IP, Md Abdullah S, Augustin DJ, et al. Efficacy of coadministration of albendazole and diethylcarbamazine against geohelminthiases: a study from South India. Trop Med Int Health. 2002;7:541-8.
- 23. Kaliappan SP, George S, Francis MR, Kattula D, Sarkar R, Minz S, et al. Prevalence and clustering of soil-transmitted helminth infections in a tribal area in southern India. Trop Med Int Health. 2013;18(12):1452–62.
- 24. Fernandez MC, Verghese S, Bhuvaneswari R, Elizabeth SJ, Mathew T, Anitha A, et al. A comparative study of the intestinal parasites prevalent among children living in rural and urban settings in and around Chennai. J Commun Dis. 2002;34:35–9.
- 25. WHO (World Health Organization) Report of the WHO Informal Consultation on the use of chemotherapy for the control of morbidity due to soil-transmitted nematodes in humans. Geneva: WHO; 1996. (WHO/ CTD/ SIP/ 96.2). Available at http://apps.who.int/iris/handle/10665/63331. Accessed 10 September 2019.

Cite this article as: Rajan XC, Manivasagan S, Boppe A. Prevalence and the factors influencing soil transmitted helminths among school children of age 5 to 14 years in a rural area of Coimbatore district. Int J Community Med Public Health 2019;6:4924-8.