ORIGINAL RESEARCH

Collateral Benefit Of Mass Drug Administration (DEC And Albendazole): Its Impact On The Prevalence Of Soil-Transmitted Helminths Among School Children In Rural Tamil Nadu

R.Uma Maheswari[1], KR Sowmiya[2], M.Karthikeyan[3]

ABSTRACT

Introduction: Soil-transmitted helminthic infections are considered a public health problem of worldwide importance for reason of their prevalence, widespread distribution and effects on health. This study was thus done to determine the impact of DEC (Diethyl Carbamazine) and Albendazole on soil transmitted helminths and to identify the associated risk factors.

Material and method: Single stool sample was collected from 315 school children in the age group of 5 to 15years before and 3 weeks after Mass drug administration for Filariasis elimination and examined for soil transmitted helminths using Saturated Sodium Chloride floatation technique.

Results: Out of 315, the overall prevalence of soil transmitted helminthic infection was found to be 42.2%. Combined DEC and Albendazole produced significant reduction in the prevalence of Hookworm from 28.9% to 3.8% and Roundworm infection from 13.3% to 0%, with a cure rate of 96.2% and 100% respectively. The risk factors such as maternal education, overcrowding, open air defec- ation, hand washing before food showed a significant relationship with the prevalence of soil transmitted helmint- hs**.**

Conclusion: Mass treatment with broad-spectrum antihelminthic together with health education is recommended for Soil Transmitted Helminths control.

Keywords: Mass drug administration, DEC and Albendazole, Soil transmitted helminths

How to cite this article: Uma Maheswari. Collateral benefit of mass drug administration (dec and albendazole): Its impact on the prevalence of soil-transmitted helminths among school children in rural tamil nadu. International Journal of Contemporary Medical Research 2015;2(3):584-588

[1]Assistant Professor, Department of Community Medicine, Government Kilpauk Medical College, [2]Associate Professor, Department of Community Medicine, Tagore Medical College And Hospital, [3]Tutor, Department of Community Medicine, Government Kilpaulk Medical College, Chennai.

Corresponding author: DR. R.Uma Maheswari, Assistant Professor, Department of Community Medicine, Government Kilpauk Medical College, Chennai.

Source of Support: Nil

Conflict of Interest: None

INTRODUCTION

Soil-transmitted helminths commonly known as intestinal worms are the most common infections worldwide affecting the most deprived countries. According to WHO estimate nearly a quarter of the world's population harbour one or more intestinal worms.[1] In 1993, the World Bank reported that, within the global burden of disease list, soil-transmitted helminthic infections ranked first among children aged 5-14 years, which represents 11.3% of the total burden of diseases in this age group. In India, using mathematical modelling it is estimated that 70% of total burden of the diseases due to soil-transmitted helminthic infection can be prevented in high prevalence communities by treating only school-age children.[2] Hygiene and play habits make children especially vulnerable to Soil-transmitted helminthic infection.[3] The failure to treat the school-age children will hamper their development, yielding a generation of adults disadvantaged by the irreversible sequel of infection and which will compromise the economic development of Communities and nations. Frequently physicians and public health authorities show little interest in them, the reason for this difference could be the relatively low incidence of morbidity and mortality solely due to such infections. Above all, it is suggested that helminthic infections play a major role in the pathogenesis of AIDS and Tuberculosis.[4] The severe financial and logistic difficulties in eradicating poverty and instituting the community-wide programs to improve living conditions, sanitation, water supplies and health education that help to prevent helminth transmission in the long term poses great problem in developing countries.[5] Population based chemotherapy with broad spectrum antihelminthics is likely to be the only way to drastically reduce the prevalence and intensity of soil- helminths. The availability of Diethylcarbamazine (DEC) and Albendazole (ALB), which have anthelmintic and antifilarial properties opens the possibility of controlling geohelminths in a Filariasis

Elimination Programme because of ancillary benefits of albendazole and the resultant enhanced compliance of the population at risk.[6] In light of these facts, this study was done to ascertain the impact of DEC and ALB on the prevalence of soil-transmitted helminthic infections which is given under National Vector Borne Disease Control Program for Filariasis elimination. Present study was done to estimate the prevalence of Soil-transmitted helminths among children aged 5-14 years in rural population, to assess the impact of Mass Drug Administration (DEC and Albendazole) on prevalence of Soil-transmitted helminths among children aged 5-14 years and to find out the possible associated risk factors for the transmission of Soil-transmitted helminths.

MATERIAL AND METHODS

Before and after comparison study without control was done by collecting single stool sample 2-3 weeks before and after Mass Drug Administration (MDA) with DEC (Diethylcarbamazine) and ALB (Albendazole) given under National Vector Borne Disease Control Programme for Filariasis elimination. This study was conducted in Tiruchirapalli district among children aged 5-14 years from December to March 2008. 315 children were chosen by random sampling method. Children who took anti-helminthic in last four weeks were excluded. After getting informed written consent, the children's parents were interviewed using a pre tested structured questionnaire and a numbered sterile plastic container containing 10-15 ml of 10% formal saline was given to collect the fresh stool sample. The stools were examined for the presence of eggs of soil-transmitted helminths using saturated sodium chloride floatation method by the investigator after undergoing adequate training in stool examination technique. Mass Drug Administration of DEC and Albendazole were given in December. Again one stool sample was collected between 3-4 weeks after MDA from the same children by repeating the above said procedure. Logistically, it is not possible to ascertain that they have really taken their drugs, so an 'intention to treat' analysis was done.

STATISTICAL ANALYSIS

Data analysis was done with SPSS 16.0 version. Prevalence was expressed in percentage and associations with the factors were tested for significance using chi square test and the effectiveness of drug on soil-transmitted helminths were tested using Mc nemar test.

RESULTS

Prevalence of Soil-transmitted helminths and its risk factors

Out of 315 stool samples examined prior to Mass drug administration, the overall prevalence of soil transmitted helminthic infection was found to be 42.2% (95% CI:34.2, 44.9). Hookworm was found to be most prevalent soil transmitted helminths (28.9%) followed by Roundworm (13.3%). Trichuris was not reported in any of the samples. 39.7% of the samples had single infection and 2.5% had double infection. After MDA, 305 stool samples could only be collected due to attrition effect. The combined mass drug (DEC and ALB) administration produced statistically significant ($p<0.05$) reduction in the prevalence of Hookworm from 28.9% to 3.8% and Roundworm infection from 13.3% to 0% with a cure rate of 96.2% and 100% respectively in this study (Table-1).

In this study, correlates such as gender, type of house, standard of living, overcrowding, water source, handwashing with soap after defecation, presence of live stock, food habits such as eating foods other than home made in relation to soil-transmitted helminths infections was not statistically significant ($p>0.05$). Factors which were significant are shown in Table-2,3.

Before MDA	After MDA		X^2Mc	P value
	Yes	No		
Hook worm				
Yes	12	79	77	<0.001*
No	0	214		
Round worm				
Yes	2	40	38	<0.001*
No	0	263		

Table-1: Prevalence of STH before and after MDA (n=305); *Statistically significant

DISCUSSION

Control of filariasis in India had taken a new turn with the introduction of single-dose, two-drug (DEC + ALB) mass administration by the Government of India. This gave us an opportunity to study the role of DEC + ALB on soil transmitted helminthes. Our data reveal that the study population of this area was infested at a moderate level, the prevalence of soil transmitted helminthiasis being about 42.2% prior to MDA. Interestingly, studies done in Chennai,[8] thiruvananthapuram,[7] Villupuram[6] and Lucknow[9] showed a higher prevalence of Ascaris, but our finding of higher prevalence of hookworm infection than round worm can be attributed to nature of the soil and prevailing moist warm and shady environment since this area was along the river side of Cauveri. Not even

Risk factors	Hook worm		OR(95% CI)	X^2(p value)
	Yes	No		
Sex				
Male	44	121		0.8(>0.05)*
Female	47	103		
Maternal education				
Illiterate	61	95	2.7(1.6-4.7)	15.6(0.01)*
Literate	30	129		
Overcrowding				
Yes	80	178	1.8(0.8-4.0)	3.12(>0.05)
No	11	46		
Excreta disposal				
Open Air defaecation	73	139	2.5(1.3-4.6)	9.7(<0.01)*
Sanitary latrine	18	85		
Use of footwear outdoors				
Yes	8	50	2.9(1.9-7.1)	7.88(<0.01)*
No	83	174		

Table -2: Factors associated with Hookworm (n=315) * Statistically significant

Risk factors	Roundworm		OR (95% 0f CI)	X^2(p value)
	Yes	No		
Sex				
Male	19	146		0.99(>0.05)*
Female	23	127		
Maternal education				
Illiterate	32	124	3.8(1.7-8.7)	13.8(<0.01)*
Literate	10	149		
Overcrowding				
Yes	80	178	1.8(0.8-4.0)	3.12(>0.05)
No	11	46		
Excreta disposal				
Open air defaecation	32	180	2.5(1.3-4.6)	9.7(<0.01)*
Sanitary latrine	10	93		
Hand washing before food with water or soap with water				
Yes	11	153	3.5(1.6-7.9)	12.9(<0.01)*
No	31	120		

Table-3: Factors associated with Roundworm (n=315) * statistically significant

a single stool sample reported Trichuris. Similar report of nil Trichuris prevalence was reported in a study conducted in Lucknow, Uttar Pradesh.[9] Three weeks after administration of DEC and ALB our study found a statistically significant ($p<0.05$) reduc- tion in the prevalence of Hookworm from 28.9% to 3.8% and Roundworm infection from 13.3% to 0% with a cure rate of 96.2% and 100% respectively. Similarly study done in Villupuram among 1-15 years age group, combination drug therapy with DEC and ALB produced a cure rate of 74.3% for geo helmi- nths, which was higher than corresponding rates (30.4%) observed with DEC alone.[6] Also the odds of cure with combination therapy were significantly higher for roundworm (5.3 times) and hookworm (3.5 times), than odds of cure with DEC alone in this study. In a study on sustainability of STH control, the combination therapy showed a long term efficacy than DEC.[10] Similarly a study done in Haiti showed a reduction in prevalence of roundworm and hookworm by 24.9% and 81.2% respectively nine months after two rounds of MDA with DEC and ALB.[11] Our study findings concludes that the combination therapy DEC and ALB given once in a year for lymphatic filariasis was effective in reducing the prevalence of soil-transmitted helminths in the school children. This result is mainly due to ALB which has both antihelmintic and microfilaricidal properties. But this treatment once a year may not be sufficient to control morbidity in children due to soil-transmitted helminths when its prevalence is 25% in the community. Periodic deworming atleast two or three times a year with antihelminthic Albendazole will only help in sustaining these reductions in the community.

Risk factors such as maternal education, eating raw vegetables, not washing hands with water or water and soap, open air defecation and not wearing foot wear outdoors showed a significant association with the prevalence of geohelminths. Study done in fishing families in south India showed children of mothers with poor education had the highest intensity of infection.[12] Similar finding was seen in our study which showed that as the level of maternal education increases, there will be reduction in prevalence which can be attributed to better knowledge of literate mothers on mode of transmission and personal hygiene measures.

In the present study children who have the habit of open air defecation showed higher prevalence of Hookworm infection which confirmed findings of a cross sectional study done in rural Honduran Communities that lack of sanitary latrine and open air defecation were associated with higher prevalence of soil-transmitted helminths.[13] This can be due to moist soil, shade by trees provide a perfect environment for development of geohelminth larvae and would constitute a significant source of infection and re-infection to the community. Study done among the Ethiopian children[14] and in the Alabama[15] found a strong association between barefoot walking and a high prevalence of hookworm infection as seen in our study. This is attributed to the cutaneous penetration of hookworm larvae while walking or playing barefoot in the contaminated soil.

In our study, children who have the habit of eating raw vegetables/ fruits showed a higher prevalence of Hookworm infection (34.4%) than children not eating raw vegetables. Though this route of transmission was rare but this can be attributed to children's habit of picking seasonal fruit (jamun) from contaminated fields without wearing footwear. Children who do not wash their hands before food showed higher prevalence of hookworm and Roundworm infection in this study was similar to study done in the tribal population which showed that the practice of hand washing has a significant reduction in helminthic infestation.[16] The high prevalence of helminthic infection among Nepali children was due to poor personal hygiene measures.[17] So health education in schools should stress the importance of personal hygiene measures to children which will decrease the prevalence of infection.

CONCLUSION

The results of our study clearly show a significant reduction in the prevalence of STH with the mass drug administration of DEC and ALB among the children. This reduction in prevalence of STH was an additional benefit of Lymphatic Filariasis Elimination programme. This collateral benefit on geohelminths will enhance the people compliance to mass drug administration in future rounds. Hence a health programme consisting of mass administration of children in the age group of 3-15 yrs with broad spectrum anthelmintic Albendazle at six months interval will be a cost effective measure to the community for reducing environmental contamination in addition to non chemotherapeutic interventions.

REFERENCES

1. Prevention and control of Schistosomiasis and soil-transmitted helminths. WHO Technical Reports Series 912,2002.
2. Stephenson L. S., Latham M. C. and Ottesen E. A. Malnutrition and parasitic helminth infestation. Parasitol. 2000;121: 523 -38
3. Michael C. Latham. Anaemia and Anorexia, Helminths & Health. Proceedings of the Nutrition society of India. 1993;6:1-12.
4. Borkow G, Weisman Z, Leng Q et al. Helminths,human immunodeficiency virus and tuberculosis. Scandinavian Journal of Infectious Diseases 2001;33, 568–571.
5. Lani S. Stephenson, Michael C. Latham et al. Treatment with a single dose of Albendazole improves growth of Kenyan School Children with Hookworm, Trichuris trichiura and Ascaris lumbricoides infections. American Journal of Tropical Medicine Hygiene. 1989;41:78-87.
6. Mani TR, Rajendren R, Sunish I.P, Munirathinam A. Effectiveness of two annual, Single dose Mass Drug Administration of DEC alone or in combination with Albendazole on soil transmitted helminthiasis in Filariasis Elimination program. Tropical Medicine & International health. 2004;9:1030-1035.
7. Raman Kutty V, Soman CR, Vijayakumar K. Helminthic infestation in primary school children of Thiruvananthapuram. Research Report Health Action by people 8:1-31.
8. Maria carol Fernandez, Susan verghese, Bhuvaneswari R, Elizabeth S J, Mathew T, Anitha A, Chitra A K. A comparative study of the intestinal parasites prevalent among children living in rural & urban setting in & around Chennai. Journal of communicable diseases 2002;35:35-39.
9. Shukla Nitin, Venkatesh V, Hussaiin N, Masood J, Agarwal GG. Overview of Intestinal Parasitic Prevalence in Rural and Urban population in Lucknow, North India. Journal Communicable Disease 2007;3:217-223.
10. Rajendran R., Mani T R et al. Sustainability of soil transmitted helminthic control following a single dose co-administration of Albendazole and DEC. Transactions of the Royal Society of

Tropical Medicine and Hygiene 2003;97:355-359.
11. Madsen beau de rochars, Abdel N. Direny, et.al. Community-wide reduction in prevalence and intensity of Intestinal helminths as a collateral benefit of lymphatic filariasis elimination progr-ams. American Journal of Tropical Medicine and Hygiene. 2004;71:466–470
12. Naish S, McCrathy J, Williams GM. Prevalence, Intensity and Risk factors for soil transmitted helminthic infection in a South India Fishing Village. Acta trop, 2004;91: 177-87.
13. Smith HM, Dekaminsky RG, Niwas S, Soto RS, Jolly P E. Prevalence and intensity of infections of Ascaris lumbricoides and Trichuris trichura and Associated socio-demographic variables in Four rural Honduran communities Meminstoswaldocruz, Rio de Janeiro 2001;96: 303-314
14. Lopiso Erosie et al. Prevalence of Hookworm infection and Hemoglobin status among rural elementary school children in Southern Ethio-pia. Ethiop. J. Health Dev. 2002;16:113-115
15. Rebecea S Stolzfus, Michale L. et.al. Hook worm control as a strategy to prevent iron deficiency .Nutrition reviews 1997;55:223-232
16. Umarul Farook M, Sudharmini S, Ramadevi S, Vijaya Kumar K. Intestinal helminthic infestati-ons among tribal populations of kottoor & Achankovil areas in Kerala (India) Journal communicable disease 2002;34:171-178.
17. Ram R, Manasi Chakaraborty, Manas Sarkar.et al. A Study among Nepali children in the district of Darjeeling. Journal Indian Medical Associa-tion 2004;102: 349-352