HAEMATOLOGICAL VARIATION IN INFECTIOUS STATUS OF SCHOOL GOING CHILDREN

Rukhsana Talat*, Yasmeen A. Qadir, Farzana Ibrahim and Nasreen Khan*

Department of Zoology, Jinnah University for Women, 5-C Nazimabad, Karachi, Pakistan
*Email: rukhsanatalat4@gmail.com
*Email: nasreen_khan2007@yahoo.com

ABSTRACT

Blood, urine and stool samples of 770 students of 5 different schools of Karachi were collected during January to December 2013 for observing the effects of malaria, hook worm and round worm on prevalence of hemoglobin concentration and anaemic condition. Out of 770 and 661 children were found infected with species of helminthes and plasmodium, 532 children were found anaemic. The children who were not infected with any parasites also to be showed anaemic (Table 3), while the children co-infected with *plasmodium falciparum* and helminthes showed anaemia with lowest Hb levels, i.e. 119-125g/L (Table 2 & 4).

Key-words: Blood, urine, stool, anaemia, *Plasmodium*, hook worm, round worm.

INTRODUCTION

Anaemia and parasitic infestations are medical and public health problem in Pakistan. Many workers studied haematozoan and helminthes co-infection and their contribution for anaemia in febrile patients. Dreyfuss *et al* (2000) investigated that hookworm, malaria and deficiency of vitamin A cause anaemia and iron deficiency among pregnant women of Nepal. Egwunyenga *et al.* (2001) observed plasmodium and helminthes co-infections among pregnant Nigerian women. Ezeamama *et al.* (2005) studied the functional significance of low intensity polyparasite helminth infection in anaemia. Brooker *et al.* (2007) assessed an empirical approach to studying the geography and epidemiology of co-infection and association between patterns of co-infection and haemoglobin in different age groups. Andrea (2007) suggested that co-infection of a host by multiple parasite species has important epidemiological and clinical implications. Maqbool *et al*. (2007) discussed the frequency of anaemia and intestinal parasitic infestation. Ezeamama *et al.* (2008) observed the synergistic effect of concomitant schistosomiasis, hook worm and trichuries infection on children's anaemia burden. Humphrey *et al.* (2010) studied the association of intestinal parasite and *plasmodium falciparum* in school children of North West Tanzania. Olusole *et al.* (2011) observed the symptomatic malaria and intestinal parasite co-infection among school children in Nigeria. Hannah and Falade (2013) adopted the prevalence rates of malaria in intestinal helminthes individually and as co-infection among asymptomatic children in a rural community. Co-infections increase the problems associated with anaemia and aggravate the burden of disease in Nigerian children. Naing *et al.* (2013) synthesized available evidence on the extent of malaria and soil-transmitted intestinal helminthes (STH) co-infections in people living in endemic countries and to explore the effect of interaction between malaria and STHs on anaemia. Millio *et al.* 2013 observed the prevalence of STHs and malaria among pregnant women and risk factor in south west Ethiopia. Abraham *et al.* (2014) observed that plasmodium and helminthes parasite affect nutritional status when they co-exist in a host.

The present studies based on the observations and possible impacts of haematozoans and helminthes co-infection among school going children in Karachi, Pakistan.

MATERIAL AND METHOD

For parasitological examination and assessment for Hb concentration, samples of blood, stool and urine aged 5 years and above also enrolled from the surrounding communities. Stool were collected during January to December 2013. Five primary schools were selected from Maripur namely PMA, PAF, Maripur Govt. school, Sheema Public School and Bahria Foundation. In each primary school all children in grade 1 and preparatory grade (nursery) were selected. Pre-school children samples were examined for Roundworm and Hook worm using the Kato Katz technique (WHO 1994). Intensity of infection for Round worm was expressed as the mean number of eggs/g of feces (epg). Infection was classified as light (epg< 100), moderate (epg 100-299) and heavy (epg > 400). Urine samples were examined for Round worm eggs in 10 ml urine according to the Nuclepore filtration method (WHO, 1991). Egg counts were expressed as mean number of eggs/10ml of urine of the two replicate samples. Round worm

infection was classified as light (< 50 eggs/10ml of urine) and heavy (>50 eggs/10ml of urine). Blood samples (approximately 3ml) were collected using plain vacutainer tubes or disposable syringes. Thick blood smear were prepared, stained with Giemsa and examined microscopically for malaria parasites. Malaria parasites density was estimated by counting the of parasites per 200 erythrocytes in thick film at 100x magnification. Hb concentrations were determined using a portable digital haemocue machine (HamoCue® Angelholm, Sweden). Anaemia was defined as Hb concentrations <120 g/L and severe anaemia < 80 g/L based on normal range of Hb concentrations for school age children in Karachi (WHO,1996; Fleming and Menendez, 2004).

RESULTS AND DISCUSSION

The present investigation based on the prevalence of human intestinal parasite among the children of different schools of Karachi city. Stool , urine and blood samples of 770 boys and girls students of age 3- 11 years, collected from 5 different schools including PMA, PAF, Sheema public , Maripur Government School and Bahria Foundation school, were investigated during January to December 2013.

Among 770 students, 661 students were found infected , out of which 200 students (119 boys and 51 girls) were found infected with *Ascaris*, only 65 students (23 boys and 42 girls) were infected with *Ancylostoma*, only 180 students (93 boys and 87 girls) were infected with *P. falciparum*, only while the cases of co-infection i.e. *P. falciparum* with *Ascaris* were 110 (65 boys and 45 girls), *P. falciparum* with *Ancylostoma* were 32 (16 boys and 16 girls) and multiple infection of *P. falciparum* with *Ascaris* and *Ancylostoma* were found in 20 students only (15 boys and 5 girls) (Table 1).

The significance of *P. falciparum*, *Ascaris*, *Ancylostoma* as major public health problems in school and pre-school children in the study area not only as single infection but also as concurrent infection. High prevalence rates and intensity of *Ascaris* and *Plasmodium* infections were found in the studied population (Table 1).

Children with multiple parasite infection had lower haemoglobin concentration compared to children infected with single or no parasite (Table. 2).

Children who were not infected with any parasite had the highest Hb levels (i.e. 125-128g/L).Children that were infected with more than one parasite species tended to have lower haemoglobin levels compared to children infected with one parasite. There was a significant difference in the prevalence of anaemia and haemoglobin levels between uninfected children and those infected with one or more parasites (Table 2)

Out of 770 children over all 278 (36.6%) boys and 254 (32.3%) girls were found anaemic. While the HB concentration were found 122 -124 (g/L) in 123 boys and 123 -125 (g/L) in 124 girls (Table 3).

Malaria and helminthes co-infections were observed in 96 cases (Table 1) and tended to occur more frequently in boys than girls though the difference was not significant. The anaemia is associated with malaria (*P. falciparum)* and Hb level decrease with increasing infection intensity.

Hb concentrations in boys were low as compared to girls (Table 4) because the boys are effected badly with multiple parasites as compared to girls and that's why anaemia was high in boys as compared to girls (Table 3). Anaemia was specially associated with malaria, while helminthes co infected with malaria show high intensity of anaemia and low Hb level because anaemia is inversely proportional to Hb level (as reported by Spiegel, 2003, Sokhana, 2004).

Table 1. Prevalence of single and multiple parasite infection in school and pre-school children in Karachi.

Infection status	Boys	Girls	Total	P-Value
Not infected	54 (13.27%)	55(15.15%)	109(14.15%)	0.487
Ascaris only	119(29.24%)	81(22.31%)	200(25.97%)	0.484
Ancylostoma only	23(5.65%)	42(11.57%)	65(8.44%)	0.049
P. falsiparum only	93(22.85%)	87(23.96%)	180(23.37%)	0.675
Ascaris and *Ancylostoma*	22(5.41%)	32(8.82%)	54(7.01%)	0.267
Ascaris and *P. falsiparum*	65(15.97%)	45(12.40%)	110(14.28%)	0.146
Ancylostoma and *P. falsiparum*	16(3.93%)	16(4.41%)	32(4.15%)	0.918
Ascaris, *Ancylostoma* and *P. falsiparum*	15(3.69%)	5(1.37%)	20(2.59%)	0.020
Total	407(100%)	363(100%)	770(100%)	0.479

Table 2. Prevalence of anaemia and Hb levels in relation to infection.

Infection status	No. of Anaemic cases	Range of Hb levels g/L
Not Infected	127(23.87%)	125-128
Single parasite infection	225(42.29%)	122-125
Two parasites infection	134(25.18%)	120-123
Three parasites infection	46(8.64%)	119-125

$\sum$=***532***

Table 3. Prevalence of anaemia by gender and age groups.

Age group (Years)	**Number of anaemic cases**		
	Boys	**Girls**	**Total**
3-5	58(10.90%)	55(10.33%)	113(21.24%)
6-8	171(32.14%)	166(31.20%)	337(63.35%)
9-11	49(9.21%)	33(6.20%)	82(15.41%)
Overall	278(52.25%)	254(47.75%)	532(100%)

Table 4. Prevalence of Hb levels by gender and age groups.

Age group (Years)	**Range of Hb(g/L)**		
	Boys	**Girls**	**Total**
3-5	119-126	122-126	119-126
6-8	122-125	123-128	122-128
9-11	120-124	123-128	120-128
Overall	119-126	122-128	120-128

Although variations existed among schools, age groups and gender with regard to prevalence and intensity as well as associated morbidity, all schools, irrespective sexes and age groups were affected. Multiple parasite infections involving two or more parasites were frequently encountered the majority of which involved *Plasmodium* with *Ascaris* and *Ancylostoma*.

REFERENCES

Abraham Degarege, Abebe Animute, Mengistu Legesse, Girmay Medhin, Berhanu Erko (2014). Malaria and helminth co-infection and nutritional status of febrile patient in southern Ethopia. *J. Infect Public Health; 7*(1): 32-37

Andrea, L.Graham (2007). Ecological rule governing helminth miroparasite co-infection. *Proceeding of the National Academy of Science of the United States of America*;105(2):566-570.

Brooker, S., Akhwale, W., Pullan, R., Estambale, B., Clarke, S. E., Snow, R. W., Hotez, P. J. (2007). Epidemiology of plasmodium-helminth co-infections in Africa: Population at risk, potential impact on anaemia and prospects for combined control. *Am. J. Trop. Med. Hyg*, 77: S88-S98.

Dreyfuss, M. L., Stoltzfus, R. J., Shrestha, J. B., Pradhan, E. K., Leclerc, S. C., Khatri, S. K., Shresha, S. R., Katz.., Albonico, M., West, K. P. (2000). Hookworms, malaria and vitamin A deficiency contributes to anaemia and iron deficiency among pregnant women of Nepal. *J Nutr*, 130: 2527-2536.

Egwunyenga, O. A., Ajaji, J. A., Nmorsi, O.P.G., Duhlinska-Popova, D. D. (2001). Plasmodium/ intestinal helminthes co-infection among pregnant Nigerian women. *Mem. Inst. Oswaldo Cruz,* 96(8): 1055-1059.

Ezeamama, A. E., Friedman J. F., Olveda R. M., Acosta L. P., Kurtis J. D., Mor V.,McGarvey, S. T. (2005). Functional significance of low intensity polyparasite helminth infections in anaemia. *J. Inf. Dis*, 192: 2160-2170.

Ezeamama, A. E., McGarvey, S. T., Acosta L. P., Zierler S., Manalo D. L., Wu, H. W., Kurtis J. D., Mor V., Olveda R. M., Friedman J. F. (2008). The synergistic effect of concomitant schistosomiasis, hookworm, and trichuris infections on children's anaemia burden. *PLoS Negl Trop Dis*, 2 (6): e245.

Fleming, A. F. and Menendez, C. (2004). Anaemia in Africa: Normal range of haemoglobin concentrations in different age groups. In: Eldryd Parry., Richard Godfrey., David Mabey and Geofrey Gill (2004). *Principals of Medicine in Africa.* 3rd Edition. Cambridge University Press. London: UK. pp 924.

Hannah O. Dada-Adegbola,Olufunke A.Oluwatoba,Catherine O. Falade (2013). A symptomatic malaria and intestinal helminth co-infection among children in a rural community in southwest Nigeria. *MWJ, 4*, 18.

Humphrey D Mazigoi, Benson R Kidenya, Emmanuela E Ambrose, Maria Zinga and Rebecca Waihenya (2010). Association of intestinal and *P. falciparum* infection in co-infected school children in north west Tanzania. *Tanzan J. Health Res;12* (4) ; 299-301.

Maqbool Alam, Abdul Latif Khattak, Muhammad Talha (2007). Anaemia and intestinal parasitic infestation in school children in Skardu. *Pak. Armed Forces Med. J; 57*(1):77-81.

Millio Getachew,Ketema Tafess, Ahmed Zeynudin and Delenesaw Yewhalaw (2013). Prevalance soil transmitted helminthiasis and malaria co-infection among pragnant women and risk factors in Gilgel Gibe dam Area,southwest Ethiopia. BMC Research notes. *Bio Med. Central;6:263.*

Naing,Cho whittaker,Maxine A.Nyunt-Wai,Victor Reid.Siman A.Wang,Shew Mak,Joon Wah Tanner,Marcel, (2013). Malaria and soil transmitted intstinal helminth co-infection and its effect on anaemia. *Transactions of the Royal society of Tropical Medicine and Hygiene;107*(11):672-683.

Olusole Ojurongbe, Adebola M Adebayi and Oluwaseyi A Adeyeba (2011). Asymptomatic *falsiparam* malaria and intestinal helminths co-infection among school children in Osogbo, *Nigeria.J.Res.Med. Sci.;* 18(5): 680-686.

Sokhna, C., Le Hesran, J. Y., Mbaye, P. A., Akiana, J., Camara,, P., Diop, M., Ly, A., Druilhe, P. (2004). Increased malaria attacks among children presenting concomitant infections by S. mansoni in Senegal. *Mal. J.* 3: 43.

Spiegel, A., Tall, A., Raphenon, G., Trape, J. F., Druilhe, P. (2003). Increased requency of malaria attacks in subjects co-infected by intestinal worms and plasmodium felciparum malaria. *Trans. Roy. Soc. Trop. Med. Hyg.*, 97: 198-199.

WHO (1991). *Basic Laboratory Method in Medical Parasitology*. WHO, Geneva, Italy.

WHO (1994). *Bench Aids for Diagonosis of Intestinal Parasite*. WHO, Geneva, Italy.

WHO (1996). Report of informal consultation o hookworm infections and anaemia. WHO, Geneva: Mimeographed document, WHO/CTD/SIT/96.1

(*Accepted for publication September 2015*)