

Eosinophil Count in Strongyloides, Hookworm, Liver Fluke or *Taenia spp.* Infestation

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Abstract

Background: It has been believed that parasites are mainly associated with eosinophilia, especially the tissue parasites.

Methods: This cross-sectional study was conducted to compare the rate of eosinophilia among the healthy labors that had and did not have parasites.

Results: Among 1,337 labors, the eosinophilia was found in 16 of 69 individuals with parasites (23.2%) and in 266 of 1,268 without parasites (21.0%). By Chi-square test, there was no statistically significant difference, ($p = 0.661$). When the parasites were categorized into: Strongyloides, hookworm, liver fluke and *Taenia spp.*, the rate of eosinophilia in patients with each parasite was not different from each other or from the individuals without parasites.

Conclusion: The prevalences of eosinophilia among individuals with parasites including Strongyloides, hookworm, liver fluke or *Taenia spp.* infestation and those without parasites are not different.

Keywords: Eosinophilia; Strongyloides; Hookworm; Liver fluke; *Taenia spp*

Introduction

The eosinophilia is defined as the absolute eosinophil count of more than 500 cells/mm³ [1] and one of its outstanding causes is the parasitic infestation [2-4]. However, eosinophilia seems to be more strongly associated with the tissue parasites and the larval phase than the adult phase of the intestinal parasites. The tissue parasites such as *F. hepatica* and hydatid cyst can cause eosinophilia, ranging from 770 to 10,560 cell/mm³ and 825 to 2,970 cell/mm³ respectively [5]. Whereas the intestinal parasites such as hookworm, when the volunteer was purposely infected by *N. americanus*, the eosinophil was increased from 300/mm³ (4.5% of WBC) to 6,370/mm³ (41.5% of WBC) on day 42 after percutaneous infection before declined to a persistently elevated level of around 1,600/mm³ (18% of WBC). During the second infection, there was a transient increase in eosinophil, peaking at 3,380/mm³ at day 46 after infection [6]. The resemble study performed in Australia showed the eosinophil peaked at 1,910/mm³ during week 4 and then gradually declined to a plateau at week 9 [7]. Focusing on the adult hookworm infection, the eosinophilia can be found in 87.5% of 32 hookworm cases, compared with 63.1% of 19 normal people [8] while in another study, the eosinophilia is found in 30 to 60% of hookworm cases [9]. For strongyloidiasis, only 12 from 20 patients (60.0%) had eosinophilia [10]. It appears that the frequencies of eosinophilia in any parasitic infestation from various studies cannot be undoubtedly conclusive. The aim of this study was to find and to compare the blood eosinophil count between the participants whose stools had larvae of *Strongyloides* or ova of hookworm, liver fluke and *Taenia spp* and that of the normal people.

Materials and Methods

This cross-sectional study was conducted at the department of medicine, Maharat Nakhon Ratchasima Hospital. The participants were the healthy laborers who lived in town and would like to work abroad, seeking for the certificate of health between March 2112 and August 2112. All of them were 20 years of age or older and their physical

examinations were all normal. Prior to enrollment, informed consent was obtained from all participants. Many investigations including CBC, BUN, creatinine, FBS, uric acid, lipid profile, liver function test, anti-HIV, VDRL, HBsAg, anti-HCV, urinalysis and stool examination were routinely performed. The imaging included the chest film and the ultrasonography of the whole abdomen. CBC was performed using the automated hematology analyzer, Coulter® STKS, while the stool was examined for only one time, exclusively using the simple concentration smear method within the same day.

The labourers who were found to have any laboratory abnormality would be excluded.

The labourers who had parasitic larvae or ova in the stool were recruited whereas the rest of the laborers who did not have any parasite were used as the control group. The prevalence and types of the parasites were recorded and the eosinophil count among participants whoever had any kind of parasite would be compared with that of the control.

The data were analyzed with chi-square test. If the p-value was less than 0.05, it would be considered statistically significant.

The study was approved by the ethic committee of Maharat Nakhon Ratchasima Hospital.

Results

There were 1,337 laborers, consisting of 1,243 males (93.0%) and 94

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females (7.0 %). Ages ranged from 18 to 57 years, mean 37.5 years. The general demographic data and hemoglobin concentration (Hb), WBC and eosinophil count were shown in the Table 1.

Out of 1,337 participants, 69 cases (5.2%) were found to be infected with various kinds of parasites as follows: 57 with *Strongyloides stercoralis* (4.3%), 6 with hookworm (0.4%), 3 with liver fluke (0.2%), and 3 with *Taenia spp.* (0.2%). Only 16 of 69 patients with parasites (23.2%) were found to have blood eosinophilia, compared with 266 from 1,268 participants (21.0%) who did not have any parasite, had eosinophilia. The percentage of eosinophilia from both groups were compared and analyzed with Chi-square test, as shown in Table 2.

Chi-square was 0.192, p value for 2-tailed was 0.661. The prevalence of eosinophilia from the group with parasites was different from that of the normal control group without statistic significance.

When the participants who harbored each parasite were allocated into 2 groups, with the eosinophilia (eosinophil >500 cells/mm³) and without the eosinophilia, the prevalences of the eosinophilia among each parasite were compared with that of the participants who did not have parasite, using chi-square, shown in the Table 3.

The prevalence of eosinophilia among the participants with *S. stercoralis*, hookworm or *Taenia spp.* was different from that of the participants without parasite without statistic significance while none of three participants with liver fluke did have eosinophilia.

Discussion

The prevalences of eosinophilia among participants who had and had not parasites including *S. stercoralis*, hookworm (mainly *Necator americanus* [11]), liver fluke (mainly *Opisthorchis viverrini* [12]) and *Taenia spp.*, did not differ from each other (p value 0.65), probably because the parasites we concerned were adult forms. In the early stage of larval invasion, parasites can act as potent immunologic stimuli, resulting in the eosinophilia while in the late stage of encystment or adult form, they become immunologically silent and asymptomatic, leading to the subsidence of the eosinophilia. Such a biphasic pattern is seen in new infections with various parasites including *Opisthorchis* [13]. Mawhorter [14] claims that only tissue-invasive helminthic parasites

can cause eosinophilia, and suggests that the use of eosinophilia as a screening tool for parasitic infections is very limited [14,15].

Meeusen and Balic review so many studies and conclude that eosinophils can kill only the larvae, but not adult, of most helminthic parasites [16], probably by depositing cationic proteins possessing helminthotoxic activities from their granules, on the surface of the larvae [17]. Then the eosinophilia spontaneously decreases in numbers even in the absence of treatment after the larvae become mature adults [18].

In fact the people in endemic area who harbor parasites always have multiple more than single helminthes [19,20]. The cause of the eosinophilia in any individual who has intraluminal parasites may be truly the tissue parasites or larval stage of the intraluminal parasites. Zawawy et al. show that the helminthic cause of eosinophilia of only 9 from 53 patients can be diagnosed with the stool examination. With the immunoelectrophoresis for tissue parasite antigen, the helminthic cause can be identified up to 37 cases, because some of them do not pass ova into the stool [5]. And also Seybolt et al. show that parasite is identified in stool of only 29% of eosinophilia while the serology for *Strongyloides* is more common, up to 39% [21]. Furthermore, Goswami shows that in eosinophilia without an intraluminal parasite, the sera tests are still positive to *Strongyloides* and their eosinophilia responds well to ivermectin [22].

Because tissue parasites play role to cause eosinophilia more than intra-luminal parasites [23], our 266 workers who had eosinophilia without parasite in the stool, were treated with albendazole which was proved to be effective in cases of eosinophilia [1].

Conclusion

The prevalence of eosinophilia of participants with strongyloides, hookworm, liver fluke or *Taenia spp.* is similar to that of the participants without parasite. All these parasites are not responsible for the high prevalence of eosinophilia that is around one-fifth of this population.

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	Minimum	Maximum	Mean ± SD
Age (years)	18	57	37.5 ± 3.5
Hb conc (g%)	9.8	18.0	14.5 ± 1.1
WBC (/mm ³)	3,000	17,300	7,773 ± 8.8
Eosinophil count (/mm ³)	0	5,733	359.1 ± 10.8

Table 1: The general characteristics of the participants.

	Present eosinophilia	Absent eosinophilia	Total
Present parasite	16 (23.2%)	53	69
Absent parasite	266 (21.0%)	1,002	1,268
Total	282	1,055	1,337

Table 2: The association between the parasite and the eosinophilia.

Parasite	with eosinophilia	without eosinophilia	p value
<i>S. stercoralis</i> (57)	12 (21.1%)	45 (78.9%)	0.989
Hookworm (6)	3 (50%)	3 (50%)	0.082
Liver fluke (3)	0	3 (100%)	0.372
<i>Taenia spp.</i> (3)	1 (33.3%)	2 (66.6%)	0.600
No parasite (1268)	266 (21.0%)	1002 (79.0%)	

Table 3: The participants with each parasite and the eosinophilia Numbers (%).

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