FACTORS RELATED TO HOOKWORM INFECTION AMONG FARMERS IN PHU XUAN SUB-DISTRICT, PHU VANG DISTRICT, THUA THIEN HUE PROVINCE, VIETNAM

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Abstract

The study aimed to determine factors related to hookworm infection among farmers in Phu Xuan sub-district, Phu Vang district, Thua Thien Hue province, Vietnam. Two hundred and twelve farmers were randomly selected by using a simple random technique. They agreed to answer the questionnaire developed by the researcher and feces samples also were collected in a clean plastic bottle. The Kato-Katz technique was used to determine eggs of hookworm infection in the feces samples. Analysis of factors related to hookworm infection by using Chi-square test and Pearson correlation.

The results showed that the majority of the farmers were females (54.2%) with the average age of 40.5±10.87 years old. Most of the farmers graduated from secondary school (37.3%). They (40.1%) worked 8 hours per day. Most of the time, they worked as a farmer in the same farm since they started their career for 21-30 years (34.4%). There were 42.5% of them did not know about soil- transmitted helminthes infection. Most of them never wore shoes (86.3%) and 59.9% of them did not use gloves while working in the field. The study found that 16% of them were infected with hookworm.

Factors related to hookworm infection were age ($p=0.021$), education status ($p<0.001$), income ($p=0.001$), work hour per day ($p=0.001$), the duration of work as farmer in this farm ($p=0.012$), knowledge about hookworm infection ($p<0.001$), and main water supply source ($p<0.001$). Therefore the local government should provide health education and support means to access on health information of soil- transmitted helminthes infection and prevention. The local government and local health care system should be more support to the farmers to improve the quality of drinking

water, and personal hygiene. Besides, they should educate and support farmers to make toilets for the one who has none.

Keywords : Hookworm infection, Farmers, Vietnam

Introduction

Farmers are exposed to several kinds of hazards including biological, chemical, physical and psychological hazards. In a case of biological hazard, parasite infection is a major health problem affecting farmers such as causing blood loss [1], and malnutrition[2]. Previous studies indicated that 740 million people worldwide were infected with hookworms (*Necator americanus and Ancylostoma duodenale*)[3]. Data from a source has estimated that the burden of hookworm infection was 22.1 million disability-adjusted life years (DALYs)[4]. Previous study showed that 21.8 million people in Vietnam were infected with hookworm (prevalence 28.6%) [5]. Some studies in Vietnam showed that the prevalence of hookworm infection was 21.8% in a peri-urban area in Hanoi [6], and 58.1% in Hoa Binh province [7]. In terms of occupational disease, hookworm infection was associated with farming [Odd ratio (OR) =2.1] and a lack of closed latrine (OR=2.0)[8]. Hookworm infection is a recurrent disease [9]. In order to effectively control it, it is important to identify factors related to hookworm infection among the affected population. Phu Vang district has most number of farmers in Thua Thien Hue province. This study aimed to determine the factors related to hookworm infection among farmers in Phu Xuan sub-district, Phu Vang district, Thua Thien Hue province, Vietnam.

Methods

Study design: A cross-sectional study

Subjects:

Two hundred and twelve rice and vegetable farmers, aged between 18 and 60 years old, who working in Phu Xuan sub-district, Phu Vang district. The subjects were randomly selected by simple random sampling. They were not admitted to the study if any of the following criteria were present: (1) Period of working as a farmer less than 1 year, (2) Not willing to participate in the study.

Phu Xuan sub-district has 8 villages. All villages are the same characteristic. The researcher selected one village to obtain representative samples by cluster sampling. Xuan O village was selected. The total farmers of the Xuan O village were 450 farmers. The sample size of this study was determined by using the Taro Yamane formula[10]. The error of random sampling was 5 percent. Therefore, this study requires 212 farmers to be as subjects. In the village, the participants

were selected by using simple random sampling technique. The researcher contacted the leader of the village to get a name list of farmers, and then made ordinal number of the list (1 to 450). Afterward, the researcher used random table to select the participants.

Ethical consideration:

This study was approved by the Human Ethics Committee of Burapha University.

Instruments:

The instruments of the study were questionnaire and feces samples. The questionnaire was constructed by the researchers, consisted of demographic factors, work history, knowledge about hookworm infection, personal hygiene and environmental factors. The criteria for scoring were as follows: "always" was equal to 4 points, "often" was equal to 3 points, "sometime" was equal to 2 points and "never" was equal to 1 point. The questionnaire was tested with 35 farmers in Thua Thien Hue province, Vietnam. The Cronbach's alpha coefficient of the questionnaire was 0.728. The Kato-Katz technique was used to determine eggs of hookworm in the feces samples.

Materials and reagents:

(1) Clean plastic container to collect feces sample (2) Wooden applicator sticks (3) screens made of stainless steel: 60 to 105 mesh, (4) template made of stainless steel, (5) microscope slides (75 × 25 mm), (6) cellophane, 40 to 50 μm thick, strips 25 x 30 or 25 x 35mm, (7) flat-bottomed jar, (8) forceps, (9) toilet paper or absorbent tissue, (10) newspaper, (11) glycerol-malachite green solution (1 ml of 3% aqueous malachite green is added to 100 ml glycerol and 100 ml distilled water; this solution is mixed well and poured onto the cellophane strips and soaked in this solution in a jar for at least 24 h prior to use)[11].

Technique

During feces samples collection, it must be careful and wear gloves all the time.

(1) Soak the cellophane strips in the 50% glycerol-malachite green solution for more than 24 hours before use, (2) transfer a small amount of faeces to a piece of scrap paper (newspaper is ideal), (3) press the screen on top of the faeces sample, (4) using a flat-sided applicator stick, scrape across the upper surface of the screen to sieve the faecal sample, (5) place a template on a clean microscope slide (6) transfer a small amount of sieved faecal material into the hole of the template and carefully fill the hole. Level with the applicator stick, (7) remove the template carefully so that all the faecal material is left on the slide and none is left sticking to the template, (8) cover the faecal sample on the slide with a glycerol-soaked cellophane strip, (9) if an excess of glycerol is present on the upper surface of the cellophane, wipe off the excess with a small piece of toilet paper or absorbent tissue, (10) invert the microscope slide and press the faecal sample against the cellophane on a smooth surface (a piece of tile or flat stone is ideal) to spread the sample evenly, (11) do not lift the slide straight up. The cellophane may separate. Gently slide the microscope slide sideways holding the cello-

phane. The Kato-Katz template shown the delivery of 41.7 mg of faeces. The number of eggs observed was multiplied by 24 to obtain the number of eggs per gram of faeces[11]. People, who had egg in the feces, were grouped into three categories: light (1-1,999 eggs per gram; epg), moderate (2,000-3,999 epg) and heavy (≥4,000 epg) infection[12].

Data collection:

All participants were interviewed by questionnaire from a research team. They were trained the correct way to interview by the researcher. Afterward, the researcher checked the interviewer team again to make sure that they understood the interviewing process. After participants had already interviewed, they were collected feces sample by receiving a clean plastic container labeled with the participant's ID. Feces samples were collected one time after they finished the work. After the distribution of the containers one day by local health officers who were trained about the method of feces collection, feces samples were immediately transported to the Department of Parasitology, College of Medicine and Pharmacy, Hue University for parasitological examination. After the feces examination, participant who had positive test was received treatment with albendazole 400mg. The study was conducted from July to August, 2012.

Statistical analysis:

Factors related to hookworm infection were determined by using Pearson correlation and Chi-square test.

Results

Demographic factors

The majority of the farmers were females (54.2%) while the males consisted of 45.8%. Most of them were in the age from 31-50 years old (61.8%). The average age of the farmers were 40.5 years old (40.5 ± 10.87). The majority of education level of the farmers was graduated from secondary school (37.3%). The average income of the farmer family was 1,991,037.74 Vietnamese Dong per month. There was 43.9% of farmer family that had income between 1,500,001 and 2,000,000 Vietnamese Dong. Moreover, every farmer did not use antihelminthics.

Work history

The study found that the majority of working times of farmers were 8 hours per day (40.1%) and most of the duration of work they worked as farmer in this farm for 21-30 years (34.4%) and none of participants (100%) worked as farmer in other farm. Moreover, the study found that 42.5% farmers had no knowledge of hookworm infection.

Personal hygiene

The study found that 86.3% of farmers never wore shoes while working in the field. Similarly, 59.9% of farmers did not use gloves while working in the field.

Environmental factors

The study found that the majority of type of latrine of the farmers was good hygiene toilet (79.7%) and 13.7% participants did not use toilet. Moreover, the main water

supply sources which farmers use were tap water (57.1%) and well (42.9%).

Intensity of hookworm infection from 212 farmers, the study found that 16% of them infected with hookworm and all cases were light intensity.

Factors related to hookworm infection

The results found that there were relationships between age, income, hours work/day, the duration of work as farmer in this farm, and hookworm infection at statistically significant level of 0.05 (p=0.021, p=0.001, p=0.001; and p=0.012, respectively). However, this study found no relationship between wearing shoes while working in the field, wearing gloves while working in the field. Data are shown in table 1.

Table 1 Relationship between demographic factors (age, income), work history (hours work/day, duration of work as farmer in this farm), personal hygiene (wear shoes while working in the field, wear gloves while working in the field) and hookworm infection

Factors	r	p
Demographic factors		
Age	0.158	0.021
Income	0.236	0.001
Work history		
Hours work/day	0.218	0.001
Duration of work as farmer in this farm	0.171	0.012
Personal hygiene		
Wear shoes while working in the field (n=212)	0.128	0.063
Wear gloves while working in the field (n=212)	0.128	0.063

Moreover, the findings showed that there were relationships between education status, knowledge about hookworm, washing hands before eating, type of latrine, main water supply source for using and hookworm infection at statistically significant level of 0.05 ($p < 0.001$, $p<0.001$, $p<0.001$ and $p<0.001$, respectively). However, this study found no relationship between sex and hookworm infection. Data are shown in table 2.

Table 2 Relationship between demographic factors (sex, education status), knowledge about hookworm, environmental factors (type of latrine, main water source for using) and hookworm infection

Factors	Hookworm infection				χ^2	p
	Yes		No			
	N	%	n	%		
Sex						
Male	19	19.6	78	80.4	1.673	0.196
Female	15	13.0	100	87.0		
Education status						
Elementary	19	33.3	38	66.7		
Secondary	4	5.1	75	94.9	19.866	<0.001
High school	11	14.5	65	85.5		
Knowledge about hookworm						
Yes	9	7.4	113	92.6	16.008	<0.001
No	25	27.8	65	72.2		
Type of latrine						
Toilet, but not hygienic	4	28.6	10	71.4		
Good hygiene toilet (absorbent materials)	16	9.5	153	90.5	29.434	<0.001
No toilet use	14	48.3	15	51.7		
Main water source						
Tap water	10	8.3	111	91.7	12.649	<0.001
Well	24	24.6	67	73.6		

Discussion

There was no relationship between sex and hookworm infection. This finding was similar to other studies [13,14]. Male in farming household had higher prevalence of hookworm infection than female with no statistical significant (χ^2= 3.46, p=0.063)[13]. However, sex was related to hookworm infection[15,6].

Age was related to hookworm infection (p=0.021). This finding was similar to other studies [6,13]. The prevalence of hookworm infection was highly significant age-relationship in farming households with highest prevalence in the age groups of 10-14 years, 15-24 years and 25-39 years[13]. Adult (≥15 years old) had higher prevalence of hookworm infection than children with less than 6 years old[6]. It may be due to older person spent more time in the farm. Consequently, the hookworm larvae accumulate over time to increase the worm population in the human body.

A relationship was found between educational status and hookworm infection (p <0.001). This finding was similar to other studies[14,16,17,18]. The level of education increased, the people were less likely to be infected with hookworm [14]. Furthermore, education level was related to the prevalence of soil-transmitted helminthes[17]. Additionally, there was a relationship between educational level of the women and the prevalence of co-infection with all three species of soil-transmitted helminthes[18].

The finding of this study indicated that there was a relationship between income and hookworm infection (p=0.001). This result was similar to other studies[19,20,21]. A family income was the risk of soil- transmitted helminthes infection[19]. Family income was associated with the prevalence co-infection of three intestinal helminthes infection [21].

Frequency and duration of work were related to hookworm infection (p=0.001 and p=0.012, respectively). It was possible that the more farmers work, the more likely they became at risk of exposure to hookworm larvae.

There was relationship between knowledge about hookworm infection and hookworm infection (p<0.001). This finding was similar to other study[19]. Lack of knowledge of soil- transmitted helminthes was the risk of the infection[19]. It was possible that the farmers who knew about the transmission and prevention of hookworm infection seemed to know how to prevent themself from hookworm infection than those who did not.

Surprisingly, there was no relationship between wore shoes, and gloves while working in the field and hookworm infection (p=0.063 and p=0.063, respectively). This finding was similar to some other studies[22,23]. However, the risk factor for acquiring hookworm infection was barefoot walking [24]. The people walking barefoot outdoors were more possible to harbor hookworm [14]. Theoretically, hookworm infection is mainly acquired when walking bare foot on soil

carrying infective larvae[25,26]. In this study, from the interview and analyze the feces samples, 100% of farmers, who were positive with hookworm infection (34 cases), did not wear shoes when working in the field because it made uncomfortable. From the direct observation confirmed that farmers did not wear shoe in the field. It was a reason to cause hookworm infection in this area. It can explain that the result showed relation to water-contact and feces samples.

There was a relationship between type of latrine at home and hookworm infection ($p<0.001$). This finding was similar to some studies[6,23,27,28]. Not having a latrine was a high risk factor for helminthes infection with hookworm [28]. People who lived in a household without a latrine had a risk factor for hookworm infection [6].

There was a relationship between main water source for using and hookworm infection ($p<0.001$). This finding was similar to some studies[23,13]. The source of water for bathing and washing had significant effect for the prevalence and intensity of hookworms infection[23]. Moreover, there was an association between hookworm infection and the use of domestic water from a well[13].

Conclusion and recommendation

Factors related to hookworm infection were age, work as farmer in this farm at statically significant level of 0.05 and education status, income, work hour per day, knowledge about hookworm infection, type of latrine at home and main water source for using at statically significant level of 0.001. Therefore, the local government should provide health education and support means to access on health information of soil- transmitted helminthes infection and prevention. The local government and local health care system should be more support to the farmers to improve the quality of clean drinking water, and personal hygiene. Besides, they should educate and support farmers to make toilets for the one who has none.

Acknowledgement

This research was partially supported by the US National Institutes of Health Fogarty International Center, Collaborative Center for Healthy Work and Environment, Grant number: D43TW000642, University of Washington, USA, and the Faculty of Public Health, Burapha University. The authors wish to thank the cooperation of the farmers in Phu Xuan sub-district, Phu Vang district, Thua Thien Hue province who involved in this study.

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