JITMM Proceedings
www.jitmm.com/proceeding
J I T M M Proceedings 9 (2021) 1-7

KNOWLEDGE AND PREVALENCE OF HELMINTHIASIS IN EXPECTANT MOTHERS IN MALANG, INDONESIA

Sri Poeranto[1], Yulia Dwi Setia[1*], Nadya Ratu[1], Wike Astrid Cahayani[2], Dearikha Karina Mayashinta[1], Rivo Yudhinata Brian Nugraha[1], Aulia Rahmi Pawestri[1]

[1] Department of Parasitology, Faculty of Medicine, Universitas Brawijaya
[2] Department of Anatomy and Histology, Faculty of Medicine, Universitas Brawijaya

ABSTRACT

Helminthiasis in pregnant women, leading to anemia, low birth weight and stunting, is a major health concern in Indonesia, including in urban settings. Despite being the second largest city in East Java, Malang still has a high number of helminthiasis. This study aimed to determine the relative prevalence of helminthiasis in expectant mothers and explore their knowledge regarding disease-related risk factors. Forty-three expectant mothers from three districts were enrolled. They were given questionnaires assessing the level of knowledge regarding risk factors, transmission, and prevention of helminthiasis. Stool samples were also collected and microscopically examined for helminths. Almost half (47%) of participants had experienced anemia before. Yet, 42% of participants did not have knowledge on risk factors and symptoms of helminthiasis. One third had no knowledge on the transmission route and prevention. Only three samples were positive for helminths (6.9%). Chi-square analysis did not show significant association between the prevalence and knowledge level. In summary this study demonstrated the inadequate helminthiasis-related knowledge in pregnant women in an urban setting in Malang, Indonesia. The low relative prevalence could be attributed to the technical limitation of a single stool sample collection. Nevertheless, since many study participants showed moderate-to-poor knowledge regarding helminthic infection, an integrated health education is urgently needed, especially in expectant mothers.

Keywords: helminthiasis, expectant mothers, knowledge level, health education

INTRODUCTION

Soil transmitted helminths (STH) refers to human intestinal nematode infection that requires soil for their infective development and is thus transmitted through contaminated soil. Commonly found STH include species of roundworm (*Ascaris lumbricoides*), whipworm (*Trichuris trichiura*), and hookworm (*Ancylostoma duodenale* and *Necator americanus*). These helminths cause many health problems worldwide, with more than one billion people infected by at least one species of STH. The global prevalence of these helminths was estimated as 807 million cases for roundworm, 604 million cases for whipworm, and 576 million cases for hookworm (Merisa Damanik et al., 2014). In Indonesia, the prevalence of STH is still high both in rural and urban settings, with an approximate incidence of 28%. Some attributing risk factors include the tropical climate, poor sanitation, and inadequate community hygiene (Wibowo *et al*., 2019).

Intestinal nematode infection gives rise to many health issues, such as malnutrition, anemia, and stunting (Merisa Damanik *et al*., 2014; Wibowo *et al*., 2019). In pregnant women, helminth infection results in more serious problems and may lead to

***Correspondence:** Yulia Dwi Setia, MD, Department of Parasitology, Faculty of Medicine, Universitas Brawijaya, Jl. Veteran Malang, 65145, Indonesia.
Phone +6281333467504
Email: dr.yulia.fk@ub.ac.id

fetal problems, including low birth weight and growth and developmental delays in their early 1000 days of life. In addition, as helminthiasis is a neglected disease, it often remains undiagnosed. Malnutrition and anemia due to helminth infection could worsen during pregnancy, leading to pregnancy complications. In the developing countries, young women, pregnant women, and their infants frequently experience a vicious cycle, where undernutrition (macro- and micronutrient depletion) and repeated infection, including parasitic infections, lead to adverse consequences that continue from one generation to the next. Among parasitic infections, intestinal helminth infection coexists widely with micronutrient deficiencies and contribute importantly to anemia and the cycle of retarded growth and development. In a more limited or focal geographic setting, other parasitic diseases, such as schistosomiasis or filariasis, contribute similarly to this cycle (Rodríguez-Morales *et al*., 2006).

To overcome this issue, the World Health Organization (WHO) recommends the administration of periodic anti-helminthic treatment (deworming) to all people at-risk, such as preschool and school-age children, women in the reproductive age (includes pregnant and breastfeeding mother), and adults in high-risk occupations in endemic areas. In addition, health and hygiene education should also be given to reduce transmission and re-infection, by encouraging healthy behaviors. Provision of adequate sanitation is also important, although it is not always possible in limited resource settings (WHO, 2020). It is noteworthy that community perceptions, knowledge and practices have a major role in sustainable control interventions (Midzi *et al*., 2011). Unfortunately, information on the knowledge level of pregnant women in relation with helminthiasis is still unknown. Thus, this study aimed to determine the prevalence of helminthiasis in expectant mothers and explore their knowledge regarding disease-related risk factors. This result of this study would suggest the importance and need for health education to improve community awareness regarding neglected tropical diseases.

MATERIALS AND METHODS

Study area and population

This study was conducted during May to October 2019 in Malang, East Java, Indonesia. The survey and fecal sample collection were performed in pregnant mothers (n = 43) living in urban settings in three selected districts in Malang. Despite being the second largest city in East Java, Indonesia, the prevalence of helminthic infection in Malang was reported to range from 4.1 to 48% in 2015, after which no data was available (Briaseran, 2015; Andini, 2015). In 2020, the population of women in productive age (20 to 40 years) was a little over 150,000, with the number of pregnant women reaching 13,000 (Dinas Kesehatan Provinsi Jawa Timur, 2020). Ethical approval was granted by the institutional review board of the Faculty of Medicine Universitas Brawijaya (Ethical approval reference number 264/EC/KEPK/10/2019). Each participant signed an informed consent prior to enrollment in this study.

Stool sample collection and examination

Pregnant women were selected by purposive sampling and enrolled with the assistance of public health officers and health volunteers in three districts (Sukun, Kedungkandang, and Lowokwaru) in Malang. Inclusion criteria consisted of pregnant women without any complication in their pregnancy (e.g. gestational diabetes, hypertension, eclampsia), able to understand and fill the questionnaire, and willing to participate in this study. The exclusion criteria comprised failure to submit the stool sample or submitting inadequate amounts of stool. They were given labeled leak-proof stool cups and asked to return it on the next day to the collection sites. The stool samples were kept in ice boxed and transported to the Faculty of Medicine, Universitas Brawijaya, maintaining a temperature of 4^{o}C.

The stools were subjected to direct smear and concentration technique (simple salt floatation) as previously described (Parameshwarappa *et al*., 2012), then examined microscopically. The samples were examined in duplicates by

experienced microscopists. Positive stool refers to the finding of a larval or egg stage of helminths. Other specific findings were also recorded.

Knowledge assessment

Questionnaires were developed and pretested. The questionnaire contained basic demographic data and multiple-choice questions assessing the participants' experience with helminthiasis and anemia. Respondents' knowledge about symptoms, risk factors, infection routes, and prevention of helminthiasis and anemia were also evaluated. The association between the relative prevalence of helminthiasis and knowledge level was statistically analyzed using chi-square test, with $P < 0.05$ considered as statistically significant.

RESULTS

Relative prevalence of helminthiasis

Microscopic examinations of the stool samples revealed that only three out of 43 samples were positive for helminth larvae or eggs, resulting in a relative prevalence of 6.9%. One sample was positive for the filariform larva of hookworm, while two other samples showed *Ascaris lumbricoides* eggs (Figure 1).

Disease-related knowledge level of pregnant women

We enrolled 43 pregnant women as respondents in this study, most of them residing in Sukun (44.2%) and Kedungkandang (41.9%), while a minority (13.9%) resided in Lowokwaru. More than half of the respondents (55.8%) were in their third trimester of pregnancy. The majority of them graduated high school (41.9%) and secondary school (30.2%), while the rest finished either primary school (4.7%), diploma degree (2.3%), or bachelor's degree in the university (11.6%). Only 9.3% of our respondents did not attend any formal education.

Most respondents (93%) admitted that they have never experienced helminthiasis before or were not aware of it. Almost half (42%) of respondents did not have knowledge on the symptoms and risk factors of helminthic infection, while 37% of them had little knowledge. Moreover, 91% of respondents lacked the knowledge on the infection routes of helminthiasis. Similarly, 79% of respondents also had little or no knowledge on prevention of helminthic infections (Table 2).

Since intestinal helminth infection often leads to anemia, we also collected data regarding respondents' experience and knowledge about anemia. Our questionnaire survey revealed that almost half of the respondents (47%) had experienced anemia. Unfortunately, 86% of respondents had little to no knowledge about the diagnosis of anemia, while 46% of them lacked the knowledge about symptoms of anemia (Table 2).

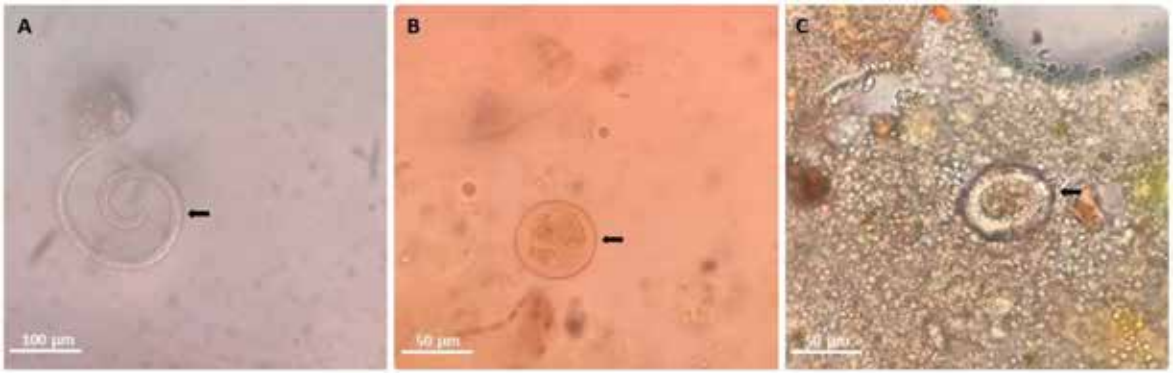

Fig 1- Microscopic findings from wet smear preparations of stool samples. (a) Filariform larva of hookworm, as indicated by arrow (under 100X magnification). (b) and (c) *Ascaris lumbricoides* eggs are indicated by arrows (under 400X magnification).

Table 1 Demographic data of study participants.

Demographic data	Number	(%)
Age (years)	16 – 41, median 29	
District		
Sukun	19/43	(44.2)
Kedungkandang	18/43	(41.9)
Lowokwaru	6/43	(13.9)
Gestational age		
First trimester	5/43	(11.6)
Second trimester	14/43	(32.6)
Third trimester	24/43	(55.8)
Highest education		
Illiterate	4/43	(9.3)
Primary school	2/43	(4.7)
Secondary school	13/43	(30.2)
High school	18/43	(41.9)
Diploma	1/43	(2.3)
Bachelor's degree	5/43	(11.6)

We found no significant association between the relative prevalence of helminthiasis and the respondents' level of knowledge ($p = 0.959$) using chi-square test.

DISCUSSION

Our study revealed that the relative prevalence of helminthiasis in pregnant women in Malang Indonesia was relatively low (6.9%) compared to the global prevalence. This might be attributed by the limited number of participants enrolled in this study. The number of pregnant women in the study area was sparse and many of them were reluctant to submit their stool samples for further examination. Moreover, the sensitivity of a single stool sample collection is also low. A previous study explained that three stool specimens submitted for microscopic ova and parasite examination yielded in a higher positivity rate (53%) than double or single specimen examination (Cartwright, 1999). Thus, adequate diagnostic sensitivity of intestinal parasitic infection required at least two independently collected stool specimens, which was unfortunately not possible in this study due to technical limitations.

Another factor contributing to the low relative prevalence was the urban setting, where the population might have better hygiene practices and sanitation infrastructures than those of rural areas. However, it should be considered that urban areas with high population densities could also create problems of high transmission of infectious diseases, especially in slum areas, where hygiene and sanitation are inadequate. A study in an urban slum setting in India showed that only 45% households had proper toilets (Joshi *et al*., 2014). Therefore, the problem of helminthiasis could still linger in urban areas.

Table 2 Knowledge assessment regarding helminthic infection and anemia.

Questions	Number	(%)
Helminthic infection		
Have you experienced helminthic infection before?		
Yes	3/43	(7.0)
No	40/43	(93.0)
Do you know the risk factors of helminthic infection?		
Know very well	9/43	(20.9)
Not sure	16/43	(37.2)
Don't know	18/43	(41.9)
Do you know the route of helminthic infection?		
Know very well	4/43	(9.3)
Not sure	24/43	(55.8)
Don't know	15/43	(34.9)
Do you know the symptoms of helminthic infection?		
Know exactly	2/43	(4.6)
Know very well	7/43	(16.3)
Not sure	16/43	(37.2)
Don't know	18/43	(41.9)
Do you know how to prevent helminthic infection?		
Know exactly	3/43	(7.0)
Know very well	6/43	(13.9)
Not sure	20/43	(46.5)
Don't know	14/43	(32.6)
Anemia		
Have you experienced anemia before?		
Yes	20/43	(46.5)
No	23/43	(53.5)
Do you know the symptoms of anemia?		
Know exactly	6/43	(13.9)
Know very well	17/43	(39.5)
Not sure	14/43	(30.2)
Don't know	7/43	(16.3)
Do you know how anemia is diagnosed?		
Know very well	6/43	(13.9)
Not sure	20/43	(46.5)
Don't know	17/43	(39.5)

Interestingly, our study showed moderate to low disease-related knowledge in all aspects (symptom, risk factor, transmission, and prevention). Most respondents never experienced helminth infection before or were not aware of the infection. Since helminthiasis is a neglected disease with mild or non-specific symptoms (Han *et al*., 2019), this is not surprising. Nevertheless, helminthiasis still has a high potency to cause other health problems, especially due to the low community awareness of this disease (Rodríguez-Morales *et al*., 2006).

Taken together, our study reported the inadequate knowledge regarding helminthiasis in pregnant women in the urban setting. In the future, better study designs need to be implemented to recruit larger numbers of study participants. Nevertheless, it is obvious that disease-related health education is highly needed to increase public awareness to reduce the community problems due to neglected infectious diseases.

ACKNOWLEDGEMENTS

The authors would like to thank the public health officers and health volunteers for their assistance in participant recruitment and stool sample collection.

FUNDING

This study was supported by the Research and Community Service Unit (Badan Penelitian dan Pengabdian Masyarakat) BPPM Faculty of Medicine Universitas Brawijaya for the funding of community service in 2018. The funders did not have any influence in the design, analysis, and presentation of results in this study.

COMPETING INTERESTS

All authors declare no conflict of interests.

REFERENCES

Andini A. Prevalensi kecacingan Soil Transmitted Helminths (STH) pada siswa SDN I Kromengan Kabupaten Malang. Thesis. 2015 (*unpublished data*), Universitas Negeri Malang.

Bria S, Dionisius C. Hubungan status ekonomi dengan kejadian kecacingan pada anak SD negeri di Kecamatan Sukun Kota Malang tahun 2014. Thesis 2015 (*unpublished data*), Universitas Brawijaya.

Cartwright CP. Utility of multiple-stool-specimen ova and parasite examinations in a high-prevalence setting. J Clin Microb. 1999;37(8): 2408–11.

Dinas Kesehatan Provinsi Jawa Timur. Profil kesehatan Provinsi Jawa Timur. 2020. Dinas Kesehatan Provinsi Jawa Timur, Surabaya, Indonesia

Han KT, Wai KT, Aye KH, Kyaw KW, Maung WP, Oo T (2019). Emerging neglected helminthiasis and determinants of multiple helminth infections in flood-prone township in Myanmar. Trop Med Health. 2019;47:1.

Joshi A, Prasad S, Kasav JB, Segan M, Singh AK. Water and sanitation hygiene knowledge attitude practice in urban slum settings. Glob J Health Sci. 2014;6(2): 23–34.

Merisa Damanik D, Soeyoko S, Sutomo AH. Sanitation of House and School, Personal Hygiene and Infection of Soil Transmitted Helminths among Elementary School Students. International Journal of Public Health Science (IJPHS).2014; 3(1): 43.

Midzi N, Mtapuri-Zinyowera S, Mapingure MP, Paul NH, Sangweme D, Hlerema G, Mutsaka MJ, Tongogara F, Makware G, Chadukura V, Brouwer KC, Mutapi F, Kumar N, Mduluza T. Knowledge attitudes and practices of grade three primary school children in relation to schistosomiasis, soil transmitted helminthiasis and malaria in Zimbabwe. BMC Infect Dis. 2011;11: 169.

Parameshwarappa KD, Chandrakanth C, Sunil B. The prevalence of intestinal parasitic infestations and the evaluation of different

concentration techniques of the stool examination. J Clin Diagn Res. 2012;*6*(7 SUPPL.): 1188–91.

Rodríguez-Morales AJ, Barbella RA, Case C, Arria M, Ravelo M, Perez H, Urdaneta O, Gervasio G, Rubio N, Maldonado A, Aguilera Y, Viloria A, Blanco JJ, Colina M, Hernández E, Araujo E, Cabaniel G, Benitez J, & Rifakis P. Intestinal parasitic infections among pregnant women in Venezuela. Infect Dis Obstet Gynecol. 2006;2006: 23125.

WHO. *Soil-transmitted helminth infections*. WHO. 2020. https://doi.org/10.1007/978-1-137-00426-0_3

Wibowo RC, Kurniawan Y, Triani E. Hubungan Kejadian Kecacingan dengan Anemia Defisiensi Besi pada Anak-Anak Pengrajin Gerabah di Lombok Barat. Jurnal Kedokteran. 2019;8(3): 27–32.