



UNIVERSITI PUTRA MALAYSIA

**PREVALENCE AND ASSOCIATED RISK FACTORS OF SOIL-
TRANSMITTED HELMINTHS AMONG REFUGEE CHILDREN IN THE
KLANG VALLEY, MALAYSIA**

ALHAMIL FATMA IBRAHEM ALARIBI

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By

ALHAMIL FATMA IBRAHEM ALARIBI

**Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia in
Fulfilment of the Requirements for the Degree of Master of Science**

July 2020

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Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Master of Science

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July 2020

Chairman : Malina Binti Osman, MD, M. Comm.Health
Faculty : Medicine and Health Sciences

Objectives: The main objective of this study is to investigate the prevalence of soil-transmitted helminths (STHs) among refugee children in selected areas in the Klang Valley, and determine its associated risk factors and complications. **Methodology:** This is a cross-sectional study carried out over two years from (February) 2017 to (September) 2019. Tools for the study included a survey questionnaire on socio-demographic profiles of the survey respondents, hygiene practice and clinical manifestations, anthropometric measurements, anaemia determination by HemoCue and determination of the infection by direct microscopy from fecal samples. **Results:** The prevalence of STHs infestation in this study population was 37.2 % and the infection was associated with i.e. being a Rohingya ($p = 0.001$), those with low monthly income parents ($p = 0.001$), those with not-working fathers ($p = 0.01$), living in flats ($p = 0.013$), low levels of parent's education (father; $p = 0.043$, mother; $p = 0.013$), with only one toilet in the house ($p = 0.03$), had previous history of worm infection ($p = 0.01$), had pallor ($p = 0.006$), and anaemia (0.001). Regression analysis showed Rohingya (19.93), those with non-working fathers (8.36), parents with low monthly income (2.38), those with history of worm infection (3.35) are more likely to be infected. Complications like anaemia were high i.e. with prevalence of 37.8 %. It was found that respondents who have STHs infection i.e. 3.67 are more likely to have anaemia ($p < 0.05$). In addition, anthropometric measurements found 12.2 % of respondents were undernourished. **Conclusion:** The evidence from this study suggested that proper and strategic intervention should be conducted among the refugee community to reduce morbidity due to STHs infection. An alternative and efficient system to provide the refugee schoolchildren with basic care for sanitation and health provision is needed. A voluntary clinic provided by non-government organisations is recommended to focus on counselling and advice on personal hygiene of the children.

Keywords: Soil-transmitted helminths; prevalence; Malaysia; Refugees; Risk factors; Anaemia; Malnutrition

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Master Sains

PREVALENS DAN FAKTOR-FAKTOR RISIKO BERKAIT CACING BAWAAN-TANAH DIKALANGAN KANAK-KANAK PELARIAN DI LEMBAH KLANG, MALAYSIA

Oleh

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Objektif: Matlamat kajian ini adalah untuk menentukan prevalens jangkitan cacing tularan tanah (JCTT) di kalangan anak-anak pelarian di kawasan terpilih di Ampang, kaitan dengan faktor risiko dan komplikasi yang berkaitan. Metodologi: Kajian rentas lintang telah dijalankan untuk tempoh 2 tahun mulai bulan Febuari 2017 hingga September 2019. Alatan untuk kajian ini termasuk soal selidik yang mengumpulkan mengenai ciri sosiodemografi, amalan kebersihan dan maklumat klinikal; pengukuran anthropometrik, penentuan anaemia melalui kaedah Hemacue dan pengenalpastian diagnosis JCTT dari sampel tinja. Keputusan: Prevalens jangkitan cacing tularan tanah dalam populasi kajian adalah 37.2% dan jangkitan telah dikaitkan dengan; iaitu sebagai seorang Rohingya ($p = 0.001$), mereka yang mempunyai ibu bapa dengan pendapatan bulanan yang rendah ($p = 0.001$), mereka yang mempunyai bapa yang tidak bekerja ($p = 0.01$), tinggal di rumah pangsa ($p = 0.013$), tahap rendah pendidikan ibu bapa (bapa; $p = 0.043$, ibu; $p = 0.013$), mempunyai satu tandas di rumah ($p = 0.03$), mempunyai sejarah lampau jangkitan cacing ($p = 0.01$), mempunyai pucat ($p=0.006$), dan anaemia (0.001). Analisis regresi menunjukkan bahawa Rohingya (19.93), mereka dengan para bapa yang tidak bekerja (8.36), ibu bapa mempunyai pendapatan bulanan yang rendah (2.38), mempunyai sejarah jangkitan cacing (3.35) mempunyai kerentanan yang lebih tinggi untuk mendapat jangkitan. Komplikasi seperti anaemia adalah tinggi iaitu dengan prevalens 37.8%. Kajian mendapati bahawa peserta yang mempunyai jangkitan JCTT iaitu 3.67 mempunyai kecenderungan untuk mempunyai anaemia ($p < 0.05$). Di samping itu, 12.2% responden kurang zat makanan. Kesimpulan: Bukti dari kajian ini menyarankan bahawa intervensi yang tepat dan strategik harus dijalankan di kalangan masyarakat pelarian di negara ini untuk mengurangkan morbiditi yang disebabkan oleh jangkitan JCTT. Pendekatan kesihatan sistem alternative dan cekap untuk menyediakan pelajar-pelajar sekolah pelarian dengan penjagaan kesihatan asas bagi menjamin kebersihan dan kesihatan adalah diperlukan. Klinik sukarelawan yang disediakan oleh organisasi bukan kerajaan adalah disyorkan untuk memberi tumpuan kepada kaunseling dan nasihat tentang kebersihan peribadi kanak-kanak.

Kata kunci: prevalens jangkitan cacing tularan tanah (JCTT); Prevalens Malaysia
Pelarian Faktor risiko; Anaemia; Malnutrisi



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I certify that a Thesis Examination Committee has met on 20 July 2020 to conduct the final examination of Alhamil Fatma Ibrahim Alaribi on her thesis entitled "Prevalence and Associated Risk Factors of Soil-Transmitted Helminths among Refugee Children in the Klang Valley, Malaysia" in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the Master of Science.

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LIST OF ABBREVIATIONS

WHO	World Health Organisation
CDC	Centers for Disease Control and Prevention
IMR	Institute for Medical Research
STHs	Soil-Transmitted Helminths
BMI	Body Mass Index
JKEUPM	Jawatankuasa Etika Universiti untuk Penyelidikan Melibatkan Manusia
UPM	Universiti Putra Malaysia
NGOs	Non-Governmental Organisations
Hb	Haemoglobin
UNHCR	United Nations High Commissioner for Refugees
NTDs	Neglected Tropical Diseases
ICSH	International Council for Standardization In Haemoglobin

CHAPTER 1

INTRODUCTION

1.1 Background of the Study

Soil-transmitted helminths (STHs) are defined as “pathogenic intestinal nematodes which are non-segmented roundworms” (Seesao et al., 2017). They can infect humans and domestic animals as well. There are four main species of STHs namely, *Ascaris lumbricoides* (roundworm), *Trichuris trichiura* (whipworm), and hookworms including both *Ancylostoma duodenale* and *Necator americanus* (Jourdan et al., 2017a). They are all soil principle infection referred to them as geohelminths (Cappello & Hotez, 2012).

It could be transmitted by ingestion of the infective eggs or by skin penetration of infective larvae (Jourdan et al., 2017a). These pathogenic geohelminths inhabit the small and large intestines of the host and cause injury, either due to their activity such as secretion, excretion, feeding, and reproduction or due to their mechanical destruction (Saki et al., 2017).

STHs are viewed as a relatively neglected tropical disease along with other helminthic infections, despite their extensive negative impact and complications on the community. It affects a quarter or more of the world’s population (Jourdan, et al., 2017b). South and Southeast Asian countries, including Malaysia, are endemic for STHs due to a moist and tropical climate which is essential for ova and larvae survival and development (Dunn et al., 2016a; Silver et al., 2018a). A recent global survey revealed that 70 % of the infection was recorded in Asia (Silver et al., 2018b).

Although STHs affect all ages and both sexes, the higher rate occurs among preschool and school-aged children, particularly the high occurrence of *Ascaris lumbricoides* and *Trichuris trichiura* in children aged ten years and below (Al-Delaimy et al., 2014a; Saki et al., 2017). In contrast, previous studies have shown that hookworm infection occurs commonly among adults (Mong et al., 2017).

As a consequence of the infection, it could cause serious symptoms and /or complications especially among children. It might cause mucus and /or bloody diarrhoea, abdominal pain, and might be complicated by anaemia, malnutrition, stunting of growth and delay both mental and cognitive development (Strunz et al., 2014).

In Malaysia, there are many people facing parasitic infections due to a lack of good sanitation and poor socio-economic status. Among these populations are the people who live in rural areas and near the jungle, such as Orang Asli, who depend mainly on

agriculture for survival and live in low socio-economic conditions as well (Anuar et al., 2014).

Another marginalised population is the refugees who fled their countries due to political conflicts or financial crises. They are facing almost the same harsh living conditions and risk factors as the Orang Asli (Teng & Zalilah, 2011; Mahmood et al., 2017).

In the year 2012, the estimated number of refugees in the world was 10.4 million (Letchamanan, 2013). Children represented about 46% of worldwide refugees (Murray, 2016). In Malaysia, the population of refugees and asylum seekers continues to increase. They arrive from several countries, including Myanmar, Somalia, Pakistan, and Syria among others (Murray, 2016). Refugees registered with the United Nations High Commission for Refugees Malaysia (UNHCR) number around 150,460, with about 92.5 % of them from Myanmar (Kok et al., 2017). Child refugees, those born in Malaysia are considerably large in number. An estimated 33,000 of Myanmar refugees are under the age of eighteen in the country, but the actual number of refugee children is not known (Kok et al., 2017).

Among the refugee population, the most common health issues recorded were related to infectious diseases. Moreover, intestinal parasitic infections along with malnutrition represent the most common causes of mortality and morbidity among them (Letchamanan, 2013; Murray, 2016). In Bangladesh camps for Rohingya, the diarrhoeal disease and respiratory tract infections are highly prevalent, the condition being related to lack of the means of basic cleanliness compounded by contamination of the water with human wastes (White, 2017). In comparison, no refugee camps exist in Malaysia, instead, most of them live in crowded houses. They stay mainly in the urban areas in Klang Valley and some of them reside in other sites in the country, where there are available employment opportunities as well as forthcoming assistance from the surrounding community (Amara & Aljunid, 2014; Wake & Cheung, 2016).

Although many volunteers and non-governmental organisations (NGOs) offer humanitarian aid to the refugee community and work hard to improve their living conditions (Kaur, 2007), there is still a need for proper health care programmes, and adequate information regarding their health status (Wake & Cheung, 2016).

1.2 Problem Statement

Although the massive therapy control regime has been proposed by the World Health Organisation, the high incidence of STHs remains a major health concern and a worrying economic issue worldwide (Pullan et al., 2014). Despite the various efforts to generate GREATER awareness of STHs infection, it is still viewed as one of the neglected tropical diseases (NTDs) (Dunn et al., 2016b; Moser et al., 2017). The protocol planned by WHO aims to lower the burden of STHs infection and its morbidity to the level at which it is not considered as a health issue among children aged below 14 years by the year 2020

(Nikolay et al., 2014; Pullan et al., 2014). Furthermore, the ineffectiveness of the bulk deworming programmes in situations where the risk factors are not controlled, such conditions like re-infection after deworming is very high and can rapidly occur, and attain pre-deworming levels after only six months (Ngui et al., 2011).

Many studies have reported that the infection by STHs has negative health implications, especially among children, which can lead to some serious health consequences including anaemia, malnutrition and long-lasting physical and mental disability (Strunz et al., 2014). Furthermore, STHs infection could reduce children's immunity and increase their susceptibility to other infections. School absenteeism and lethargy that are associated with anaemia, which complicates the infection is predominant (Gedle et al., 2017). Consequently, decreased child learning abilities due to poor physical and cognitive performance could have long term economic effects (Strunz et al., 2014; Gedle et al., 2017).

Poverty along with low socio-economic conditions, poor hygiene and cleanliness are identified risk factors of the infection (Muslim et al., 2019; Nery et al., 2019). Previous studies in the country have indicated that the prevalence of infections is still high in rural areas and poor communities such as the indigenous Orang Asli population (Lim, et al., 2009; Murtaza et al., 2018; Muslim et al., 2019). On the other hand, there is a shortage of data about certain poor communities in the country, the refugees, even though there is a large number of them in the country and they find it difficult to access public health services (Wake & Cheung, 2016). Currently, based on the information from non-governmental organisations, the Klang Valley is known to have the majority of the refugee population, who live in harsh economic conditions, and ignore taking care of their health, as their priority is the need to put food on their table (Mahmood et al., 2017).

Despite the refugee children being at risk of exposure to a wide variety of infections, policy-wise they are not allowed to access public health care facilities. However, more research is needed to identify their health condition if their health issues they face are to be adequately addressed (Mahmood et al., 2017).

Indeed, this issue requires concerted action to identify its magnitude and determine how the refugee children are impacted. Finally, the goals of this study are to determine some of the risk factors, clinical features and, complications associated with STHs infection among refugee children as well as look for prevalence in presumed healthy refugee children. The need for this study has been motivated by the obvious lack of information and data on refugee children within Malaysia.

1.3 Justification of the Study

Based on previous studies, STHs are a major health concern in the country, where a high prevalence of the infection continues to be recorded, especially among the indigenous population (Murtaza et al., 2018; Muslim et al., 2019). A range of risk factors related to personal hygiene behaviour and environmental factors expose the mentioned population

to the infection. Moreover, the high prevalence of the complications was detected among the infected people results in high morbidity and mortality rates (Nguai et al., 2015; Muslim et al., 2019). Thus, continuity of uncontrolled risk factors exposes the high-risk populations to the risk of infection along with complications.

This study provides an assessment of one of the important neglected infections among disadvantaged populations, such as refugee children. Besides, assessing the associated risk factors among them in Malaysia for the first time, this study will provide baseline platform information about the prevalence and major risk factors of STHs infection as well as determine to what extent it could affect children's wellbeing. The result of this study will facilitate decision-makers in formulating proper plans and interventions to control the condition. Refugee children could have a better chance to benefit from country-planned health programmes to reduce morbidity through either deworming or campaign programmes about risk factors and preventive measures. Hence, it is beneficial to know how the infection is transmitted and how to prevent it. In addition, control of the infection among this large group in the country will help reduce continuous contamination of the environment with the parasite lead to the reduction of the overall occurrence of the infection in the country.

1.4 Research Questions

- a. What is the prevalence of STHs (*Ascaris lumbricoides*, *Trichuris trichiura*, *Ancylostoma duodenale*, and *Necator americanus*) among the refugee children in the selected areas in the Klang Valley, Malaysia?
- b. What are the socio-demographic profiles (age, gender, ethnicity, monthly income, working parents, level of parent's education and type of accommodation), hygiene risk factors (hand hygiene, food hygiene, access to clean drinking water, the number of toilets in the house and whether with or without flush system, indiscriminate defecation, and contact with soil) characteristics of respondents?
- c. What are the clinical manifestations (abdominal pain, diarrhoea, abdominal distension, vomiting, fatigue, fever, and clinical pallor) of STHs and what is the previous history of worm infection among the respondents?
- d. What are the possible complications of STHs (anaemia and under nutrition)?
- e. What are the associations between socio-demographic profiles and hygiene risk factors with STHs?
- f. What are the associations between clinical manifestations, previous history of worm infections and complications with STHs?
- g. What are the predictors influencing the prevalence of STHs among the respondents?

1.5 Research Objectives

1.5.1 General Objective

The general objective of this study is to determine the prevalence, risk factors, clinical manifestations, and complications of STHs and associations between the variables of the study among the refugee children in selected areas in the Klang Valley, Malaysia throughout 2017 to 2019.

1.5.2 Specific Objectives

- a. To determine the prevalence of STHs among refugee children in selected areas in the Klang Valley, Selangor, Malaysia.
- b. To determine the socio-demographic profiles of the respondents (age, gender, ethnicity, parents monthly income, working parents, level of parent's education and type of accommodation), hygiene and behaviour risk factors (hand hygiene, food hygiene, access to clean drinking water, the number of toilets in the house and presence of flush system, indiscriminate defecation and contact with soil) among the respondents.
- c. To determine common clinical manifestations related to STHs infection (abdominal pain, diarrhoea, abdominal distension, vomiting, fatigability, fever, and clinical pallor) among the respondents.
- d. To determine the complications (body weight, height, body mass index, and haemoglobin level) of STHs infection.
- e. To determine the association between socio-demographic profiles and hygiene risk factors with STHs.
- f. To determine the association between clinical manifestations, previous history of intestinal parasitic infestation and complications with STHs.
- g. To determine the predictors influencing the prevalence of STHs among the respondents.

1.6 Research Hypothesis

Based on these data, it hypothesized that:

- H1. Socio-demographic profiles, and hygiene risk factors are significantly associated with the prevalence of STHs among refugee children.
- H2. Clinical manifestations and previous history of intestinal parasitic infection are significantly associated with the prevalence of STHs among refugee children.
- H3. Anaemia and undernutrition are significantly associated with the prevalence of STHs among refugee children.
- H4. Predictors are associated with the prevalence of STHs among refugee children.

1.7 Variables of the Study

1.7.1 Dependent Variable

- Prevalence of STHs among refugee children.
- Anaemia and malnutrition complicating STHs.

1.7.2 Independent Variables

- Socio-demographic profiles including age, gender, ethnicity, parents' monthly income, non-working parents, level of parents' education and the type of accommodation.
- Hygiene risk factors, including washing hands with or without soap before meals and after use of the toilet, finger-sucking, nail-biting habits, source of drinking water, eating fruits and vegetables without washing, the number of toilets in the house, presence of flush system, defecation in open areas, walking barefooted and playing with or handling of soil.
- Clinical manifestations (abdominal pain, diarrhoea, abdominal distension, vomiting, fatigue, fever, and clinical pallor).
- History of previous intestinal parasitic infections.

Table 1.1: List of Independent and Dependent Variables According to the Objectives

Objective	Independent variable	Dependent variable
1	Socio-demographic profiles and hygiene habit risk factors	Soil-transmitted helminths infection.
2	Clinical manifestations and previous history of intestinal parasitic infection,	Soil-transmitted helminths infection
3	Infection with STHs.	Anaemia and malnutrition

1.8 Definition of the Variables

The conceptual definition and the operational definition of the variables can be found in Appendix B.

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LIST OF PUBLICATION

Fatma Ibrahim Alaribi, Ngah Zasmy Unyah, Norashiqin Misni, Siti Norbaya Masri, Malina Osman. (2020). Epidemiology and Clinical Characteristics of Soil-transmitted Helminths among Refugees School Children in Selected Area in Klang Valley, Malaysia. *Malaysian Journal of Medicine & Health Sciences*. (Accepted).

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