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ASSOCIATED FACTORS OF INTESTINAL WORM INFECTION AMONG ORANG ASLI SCHOOL CHILDREN IN TAPAH, PERAK, MALAYSIA

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ASSOCIATED FACTORS OF INTESTINAL WORM INFECTION AMONG ORANG ASLI SCHOOL CHILDREN IN TAPAH, PERAK, MALAYSIA

By

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ASSOCIATED FACTORS OF INTESTINAL WORM INFECTION AMONG ORANG ASLI SCHOOL CHILDREN IN TAPAH, PERAK, MALAYSIA

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September 2016

Chairman : Professor Lekhraj Rampal, DrPH
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Worm infection is one of the major global public health problems in human especially in the developing countries with about 135, 000 deaths annually. The highest prevalence of the infection is found among children between five to twelve years and usually those with deprived living resources. In Malaysia, despite a thriving economy, intestinal worm infection is very prevalent among the Orang asli population. The objective of the study was to determine the prevalence of intestinal worm infection and risk factors among the Orang Asli school children in Tapah, Malaysia. A cross-sectional study was conducted among 411 Orang Asli school children aged 6-13 years in Tapah, Perak. Sample size was calculated using two proportion formula, and also selection of respondents using simple random sampling. Data was collected using questionnaires and laboratory fecal examination from the school children.

The results showed that the overall prevalence of intestinal worm infection was 60.8% and about 57.2% presented with multiple infections. The predominant species was *Trichuris trichura* 53.8% among other nematodes. Few cestodes and trematodes were also recovered among the children. Intestinal worm infection was highest among age group 11-13 years (62.2%) and higher among males (65.5%). Multivariate analysis result showed that the predictors of intestinal worm infections among the Orang Asli children were presence of river (OR = 1.90; 95% CI = 1.16, 3.10; p = .011), presence of lake (OR = 0.21; 95% CI = 0.05, 0.93; p = .040), toilet system (OR = 1.67; 95% CI = 1.08, 2.56; p = .021), and general hygiene practice (OR = 2.15; 95% CI = 1.35, 3.41; p = .001). In conclusion, prevalence of intestinal worm infection is high. A de-worming along with a comprehensive health education on intestinal worm infections program should be organized among this population group.

Keywords: Intestinal worm infection, Ascaris, Trichuris, Hookworm, Orang Asli

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sebagai memenuhi keperluan untuk Ijazah Master Sains

FAKTOR FAKTOR BERKAITAN DENGAN JANGKITAN CACING USUS DIKALANGAN PELAJAR ORANG ASLI DI TAPAH, PERAK, MALAYSIA

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Jangkitan cacing merupakan salah satu masalah kesihatan awam utama di peringkat global, di mana terdapat 135,000 kes kematian tahunan telah dilaporkan terutamanya di kalangan negara-negara membangun. Kanak-kanak berusia di antara lima hingga ke dua belas tahun merekodkan prevalens tertinggi dan mereka ini terdiri dari kumpulan masyarakat yang serba kekurangan dari segi aspek kehidupan. Di Malaysia, walaupun ekonominya telah berkembang pesat, namun prevalens jangkitan cacing usus masih lagi tinggi di kalangan masyarakat Orang Asli. Objektif utama kajian ini adalah untuk mengenalpasti prevalans jankitan cacing usus dan faktor-faktor resiko di kalangan pelajar Orang Asli di Tapah, Perak Malaysia. Satu kajian keratan rentas telah dijalankan ke atas 411 orang pelajar sekolah Orang Asli yang berusia 6-13 tahun di Tapah, Perak. Pengiraan saiz sampel adalah menggunakan formula dua perkadaran dan pemilihan responden menggunakan kaedah pensampelan rawak. Pengumpulan data telah dijalankan menerusi kaedah soaljawab dan juga pemeriksaan makmal ke atas sampel tinja daripada pelajar-pelajar tersebut. Hasil kajian secara keseluruhannya menunjukkan prevalens jangkitan cacing usus adalah 60.8% dan 57.2% daripadanya adalah terdiri daripada jangkitan pelbagai jenis cacing. Trichuris trichuria merupakan spesis jangkitan cacing usus yang pradominan. Terdapat beberapa kes jangkitan yang berpunca dari sestoda dan trematoda telah direkodkan. Kadar jangkitan cacing usus tertinggi adalah dari kalangan kumpulan umur 11-13 tahun (62.2%) dan tertinggi di kalangan pelajar lelaki (65.5%). Daripada keputusan analisis multivariat menunjukkan petunjuk-petunjuk seperti kedapatan sungai (OR = 1.90; 95% CI = 1.16, 3.10; p = .011), kedapatan tasik (OR = 0.21; 95% CI = 0.05, 0.93; p = .040),sistem tandas OR = 1.67; 95% CI = 1.08, 2.56; p = .021),dan tabiat kebersihan keseluruhan (OR = 2.15; 95% CI = 1.35, 3.41; p = .001) adalah merupakan peramal bererti prevalens utama di dalam jangkitan cacing usus di kalangan kanak-kanak Orang Asli. Kesimpulan daripada hasil kajian ini menunjukkan kadar prevalens jangkitan cacing usus adalah masih tinggi. Pengambilan ubat cacing dan program pendidikan kesihatan secara komprehensif perlu dijalankan kepada kumpulan sasaran di kawasan tersebut.

Kata kunci: Jangkitan cacing usus, Ascaris, Trichuris, Cacing kait, Orang Asli

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Edward Tunbosun Olawumi.

I certify that a Thesis Examination Committee has met on 28 September 2016 to conduct the final examination of Olawumi Edward Tunbosun on his thesis entitled "Associated Factors of Intestinal Worm Infection among Orang Asli School Children in Tapah, Perak, 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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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

LIST OF ABBREVIATIONS

CDC	Center for Disease Control
CM / cm	Centimeter
CNS	Central Nervous System
CSF	Cerebrospinal fluid
DALY	Disability-Adjusted Life Year
DEFF	Design Effect
EITB	Enzyme-linked Immunotransfer Blot assay
ELIZA	Enzyme-linked Immunosorbent Assay
EPG / epg	Eggs per gram of faeces
FBC	Full Blood Count
FECT	Formol Ether Concentration Technique
GPIA	Gelatin Particle Indirect Agglutination
IgA	Immunoglobulin A
IgE	Immunoglobulin E
IgG	Immunoglobulin G
IgM	Immunoglobulin M
IL	Interleukin
M / m	Meter
Mm	Millimetre
MOH	Ministry of Health, Malaysia
NCC	Neurocysticercosis
Rpm	Revolution per minute
UNICEF	United Nations' Children Emergency Fund
UNOS	United Network for Organ Sharing

µm	Micrometer
WHO	World Health Organization

CHAPTER 1

INTRODUCTION

1.1 Background of the study

Worm infection is one of the major global public health problems in human (WHO, 2011). It is more prevalent in tropical and sub-tropical countries of the world (Adefemi, 2006; WHO, 2011; Sah *et al*., 2013; Abate *et al*., 2013). Globally, more than one billion people are infected with intestinal worms and about 135, 000 deaths occur annually (Anuar *et al*., 2014). The prevalence of ascariasis has been estimated to be 320 million, whipworm infection 233 million, hookworm 239 million and strongyloidiasis 100 million (Adefioye *et al*., 2011; Martins and Sawhney, 2011). Taeniasis infected over 40 million people with major prevalence in Asia and Africa and hymenolepiasis about one million people (Ullah, *et al*., 2009). *F. buski* infected approximately 10 million people globally and most prevalent in Southeast Asia, Korea, China and India (Keiser & Utzinger, 2009). Schisostomes have been reported to infect 200 million globally and co-infect with malaria and soil-transmitted helminthes (Grimes *et al*., 2014). The risk of the infection is higher in Southern and sub-Saharan Africa as well as South-America including Brazil, Suriname, and Venezuela (CDC Report, 2012).

The highest prevalence of worm infection is found among children between five to twelve years and usually those with deprived living resources (Omorodion *et al*., 2012; Gelaw *et al*., 2013; Khadka *et al*., 2013). As a global concern, World Health Organization (WHO) postulated more than 266 million pre-school aged and 876 million school – aged children needed preventive chemotherapy for worm infection (WHO, 2015b). Health complications with worm infection include obstructive jaundice, abdominal pain, cholangitis, acute pancreatitis and hepatic abscess which sometimes requires surgery (Baba *et al*., 2013), gallbladder ascariasis and trematodiasis (Gyampomah, 2009; Gude *et al*., 2013), and poor child development as a result of childhood malnutrition, anaemia, and physical and mental impairment (Ahmed *et al*., 2003; Abate *et al*., 2013). Furthermore, cases of acute appendicitis (Mowlavi *et al*., 2004), central nervous system disorder, ocular disorder and epilepsy (Rajshekhar *et al*., 2003; O'Neal *et al*., 2012; Mwanjali *et al*., 2013) and death in more extreme cases (Bath *et al*., 2010; Abate *et al*., 2013)

In Malaysia, despite a thriving economy, intestinal worm infection is the major health problems among the poor and the deprived rural areas (Huat *et al*., 2012; Nasr *et al*., 2013b; Anuar *et al*., 2014). Prevalence of worm infection among the group is associated with poor socioeconomic, environmental and behavioural factors (Lim *et al*., 2009; Ngui *et al*., 2011; Ngui, *et al*., 2012; Anuar *et al*., 2014).

1.2 Problem Statement

Worm infection is a global health threat with over one billion infected (WHO, 2015a). *A. lumbricoides* infection resulted into 1.2 - 10.5 million DALYs lost with reported 3,000 - 60,000 deaths, Hookworm 1.8 - 22.1 million DALYs lost with reported 3,000 - 65,000 deaths, *T. trichura* 1.6 - 6.4 million DALYs lost with 3,000 - 10,000 deaths and schistomes 1.7 - 4.5 million DALYs lost with 15,000 - 280,000 deaths (WHO, 2011).

The infection is characterized by nutritional impairment, poor child mental and physical development resulting into cognitive dysfunction (Ahmed *et al*., 2003; Ahmed *et al*., 2011), conditions requiring surgical operations due to disseminated infection and encystations that affect the central nervous and respiratory systems (Rajshekhar *et al*., 2003; Mwanjali *et al*., 2013) as well as tissue reactions resulting into intestinal, urogenital and liver dysfunctions (WHO, 2011). The damaging effect of this infection has necessitated the World Health Organization to advocate a large-scale antihelminthics program wherever prevalence is above 20% (WHO, 2015b).

In Malaysia, worm infection is a health threat among the Orang Asli community (Hesham *et al*., 2008; Lim *et al*., 2009). The problem of worm infection is associated with poverty among the population (Lim *et al*., 2009; Baer, 2010). Several studies among the group across the country have reported over 50% prevalence of worm infection (Hesham *et al*., 2008; Ngui *et al*., 2011; Anuar *et al*., 2014;). This implies public health danger among this deprived group because the worm prevalence rate has exceeded the WHO recommended prevalence threshold (of 20%) for the administration of preventive chemotherapy.

Nasr *et al.* (2013a) reported that parasitic infection still remains prevalent among the group despite continuous effort to improve their life quality. In view of this degree of vulnerability, there is a need for investigations to determine the underline factors associated with emphasis on knowledge, attitude and hygiene practices which are lacking in many of the previous studies.

1.3 Significance of the study

This study will provide up-to-date information with regards to prevalence of intestinal worm infection and risk factors among the Orang Asli school children in Tapah, Malaysia. This information will also contribute to the existing body of knowledge. Since this study is the first known investigation to be carried out over the last 10 years among the orang asli population in Perak, the information would be vital for the health care providers in the planning and implementation of relevant intervention program to effectively prevent and possibly control the growing infection among the group.

1.4 Objectives of the study

1.4.1 General objectives

To determine the prevalence of intestinal worm infection and risk factors among the Orang Asli school children in Tapah, Malaysia.

1.4.2 Specific objectives

1. To determine socio-demographic characteristics (age, gender, total family monthly income, father's job, mother's job, father's education, mother's education, type of house and family size) and environment and sanitation (water source, presence of electricity, presence of pets, presence of river & lake, toilet and disposal systems) in the population.

2. To determine prevalence of intestinal worm infection (ascariasis, trichurasis, hookworm infection, strongyloidiasis, taeniasis, hymenolepiasis, fasciolosis, schisostomiasis and echinostomiasis) in the population.

3. To determine parents' knowledge of worm infection (definition, names of worm, mode of transmission, signs & symptoms and prevention), parents' attiude towards worm infections (attitude towards severity of worm infection, knowledge acquisition, preventive practices and treatment) and children's hygiene practices {toilet practice, hand-washing practice, fishing practice, nail-cutting and finger-sucking habit, feeding and drinking practice, shoe-wearing practice and geophagy (eating of sand)} in the population.

4. To determine the association between prevalence of intestinal worm infection and socio-demographic factors ((age, gender, total family monthly income, father's job, mother's job, father's education, mother's education, family size and type of house) and environment and sanitation (water source, presence of electricity, presence of pets, presence of river and lake, toilet and disposal systems)

5. To determine the association between prevalence of intestinal worm infection and parents' knowledge (definition, names of worm, mode of transmission, signs & symptoms and prevention), parents' attitude (attitude towards seriousness of infection, knowledge acquisition, worm infection in a child, child's preventive practices and treatment) and hygiene practice of the children {(hand-washing practice, fishing practice, nail-cutting habit, finger-sucking habit, feeding and drinking practice, shoe-wearing practice, and geophagy (eating of sand)} in the population.

6. To determine predictors to intestinal worm infections

1.5 Research hypothesis

1. There is a significant association between prevalence of intestinal worm infection and socio-demographics (age, gender, total family monthly income, father's job, mother's job, father's education, mother's education, type of house and family size)

2. There is a significant association between prevalence of intestinal worm infection and environment and sanitation (water source, presence of electricity, presence of pets, presence of river and lake, toilet and disposal systems)

3. There is a significant association between prevalence of intestinal worm infection and parents' knowledge (definition, names of worms, mode of transmission, signs & symptoms and prevention)

4. There is a significant association between prevalence of intestinalworm infection and parents' attitude (attitude towards seriousness of worm infection, knowledge acquisition, child's preventive practices and treatment)

5. There is a significant association between prevalence of intestinal worm infection and hygiene practice of the children{(hand-washing practice, fishing practice, nail-cutting habit, finger-sucking habit, feeding and drinking practice, shoe-wearing practice and geophagy (eating of sand)}

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