CHAPTER I

GENERAL INTRODUCTION

1.1 BACKGROUND

Intestinal parasitic infections (IPI) are still public health problems in many communities, particularly among children in rural areas of developing countries. It is estimated that more than 2 billion people worldwide are infected with IPI and more than half of the world's population are at risk of infection (Hotez *et al.*, 2009; WHO, 2002). These infections are caused by helminth parasites such as soil-transmitted helminths (*Ascaris lumbricoides, Trichuris trichiura, Strongyloides stercoralis* and hookworm), *Taenia* spp., and *Hymenolepis nana* or by intestinal protozoa such as *Entamoeba histolytica, Giardia duodenalis,* and *Cryptosporidium* spp.

Soil-transmitted helminthiasis, also known as soil-transmitted helminth (STH) infections are among the most common neglected tropical diseases (NTDs) and still prevalent and of public health concern throughout the developing countries. The World Health Organization (WHO) defines NTDs as those that persist exclusively in the poorest and most marginalized communities, and have been largely eliminated elsewhere and thus are often forgotten (WHO, 2012). Hence, NTDs are common in communities with low socioeconomic status including poverty, poor housing conditions, lack of access of safe water and poor sanitation. STH are a group of parasitic

nematode worms causing human infection through the ingestion of parasite eggs or through skin penetration by larvae that survive in a warm and moist soil in the tropical and subtropical countries. The most common STH species are *A. lumbricoides, T. trichiura* and hookworms. It is estimated that *A. lumbricoides* infects 800 million people and *T. trichiura* and hookworms infect 600 million each (Hotez *et al.*, 2009).

STH infections have been recognized as important causes of morbidity especially among children and women of childbearing age in the underprivileged rural communities (Hotez and Kamath, 2009). When measured in disability-adjusted life years (DALYs), STH infections are as important as malaria or tuberculosis with 39 million life years lost to STH (22.1 million by hookworm, 10.5 million by *Ascaris* and 6.4 million by *Trichuris*), and together with schistosomiasis, STH infections represent more than 40% of the morbidity caused by all tropical diseases, excluding malaria (WHO, 2006; Stephenson *et al.,* 2000). Numerous studies have shown that STH infections during childhood are significantly associated with protein-energy malnutrition, iron deficiency anemia (IDA), vitamin A deficiency (VAD), intellectual retardation and educational deficits which consequently lead to poor school attendance and poor educational achievement (Ahmed *et al.,* 2012; Ngui *et al.,* 2012; Al-Mekhlafi *et al.,* 2010; Al-Mekhlafi *et al.,* 2007; Bundy *et al.,* 1997a; Nokes and Bundy, 1994). Moreover, these adverse consequences of STH infections may continue to the adulthood with effects on the economic productivity which trap the endemic populations in a vicious cycle of poverty, underdevelopment and disease (Miguel and Kremer, 2004).

Periodic mass deworming, proper and adequate sanitation and effective health education are the three major and vital interventions for long-term control and elimination of STH (WHO, 2005). Although there are few success stories in terms of eliminating or reducing the transmission of STH in Japan, South Korea, China and Zanzibar (Yap *et al.,* 2012; Knopp *et al.,* 2009; Hong *et al.,* 2006; Kobayashi *et al.,*

2006), the global war against worms seems to be eternal, as about 70% of school children who are at risk of STH infections are still not covered by deworming programmes, making the goal of complete STH eradication impossible at this point of time (WHO, 2012). Hence, the WHO programmes and initiatives focus on the elimination of morbidity through the periodic treatment of at risk populations living in endemic areas. However, the main challenges to this strategy are that chemotherapy does not kill immature worms and cannot prevent the typical forms of re-infection which can occur soon after treatment (Campbell *et al.*, 2014). Moreover, there are increasing fears surrounding the possible emergence of benzimidazole drugs resistance among human STH, which occurs as a result of point mutations in the nematode-β-tubulin gene (Diawara *et al.*, 2013; Vercruysse *et al.*, 2011; Haswell-Elkins *et al.*, 1988). Similarly, sanitation is crucial in eliminating these infections by reducing the environmental sources of such infections. However, the higher cost of proper sanitation methods compared to other interventions limits its implementation in many communities, particularly where resources are limited (Asaolu and Ofoezie, 2003). Moreover, the positive impact of improved sanitation is slow and may take few years to achieve desired benefits.

On the other hand, health education that is effective, targeted and simple is often recommended as a first option to create the enabling environment for other interventions to succeed (Keiser and Utzinger, 2008). Health education can be provided simply and economically, without any potential contraindications or risks, and the benefits of increased understanding of health practices among rural communities go beyond the control of helminth infections (Hotez *et al.*, 2006). In general, providing basic information on the disease and the possible adoption of preventive measures frequently result in an increase in awareness amongst the targeted population towards specific health problem. This does not necessarily translate to behavioral changes, which are

often more difficult to achieve requiring long periods of time ensure compliance with healthier habits (Asaolu and Ofoezie, 2003). Health educational materials (e.g. posters, leaflets and radio and video messages) with some practical activities on hygienic practices have been traditionally used to transmit and disseminate health-related messages.

Few studies have previously investigated the impact of health education interventions on STH incidence or re-infection rates and intensities and yielded various results (Bieri *et al.,* 2013; Gyorkos *et al.,* 2013; Albright and Basaric-Keys, 2006; Hadidjaja *et al.,* 1998; Albonico *et al.,* 1996; Aung *et al.,* 1988). It is clear that assessing the cultural, intellectual, emotional, environmental and socioeconomic background of the target population was absolutely crucial prior to designing or implementing any health education intervention. This information is essential in order to consider and integrate the most related effective key messages into everyday situations that people could identify with.

It is also important to investigate the beliefs of the target population pertaining to diseases and treatment. An ecological approach to health promotion named PRECEDE-PROCEED Model (PPM) was developed and introduced in 1974 by Dr. Lawrence W. Green to help health programme planners, policy makers, and other evaluators to analyze situations and to design health programmes efficiently (Green, 1974). It is a participatory model for creating successful community health promotion and other public health interventions. Based on PPM, effective health education programmes should investigate the social, ecological, beliefs and cultural situation of the target population, identify the factors which contribute to the prevalence of a disease, then plan educational activities intervention to affect those factors. Hence, the intervention supposedly will improve the quality of health or decrease the prevalence of the disease (Ekeh and Adeniyi 1986; Green *et al.,* 1980). Ignoring these points may

result in the failure of a health education programme due to the incompatibility of interventions with the needs and beliefs of the target population.

1.2 PROBLEM STATEMENT OF THE STUDY

The high prevalence of STH infections and their associated morbidities among Orang Asli people continue to have a significant impact on public health in rural Malaysia. *A. lumbricoides, T. trichiura*, and hookworm are the most common intestinal parasites of medical importance in Malaysia and their infections are worse in underprivileged communities. Several studies have demonstrated high prevalence rates of ascariasis, trichuriasis and hookworm infections in Orang Asli children, where the prevalence ranges between 30.2 – 69.0%, 15.8 – 100% and 6 – 51.0%, respectively (Nasr *et al.*, 2013a; Ngui *et al.*, 2011; Al-Mekhlafi *et al.*, 2006; Norhayati *et al.*, 1997a; Bundy *et al.*, 1988a; Kan, 1982; Sinniah *et al.*, 1978).

Despite the significant reduction in the overall prevalence of intestinal parasitic infections in the urban areas (Jamaiah and Rohela, 2005; Mahmood *et al.*, 2002), the trend in rural areas, especially among the underprivileged Orang Asli populations, remains largely unchanged since the 1920s. Several previous reports showed that Orang Asli communities are heavily infected with intestinal parasites and the exposure of these people particularly children to the sources of infection is substantially high (Nasr *et al.*, 2013a; Ahmed *et al.*, 2011; Ngui et al., 2011; Lim *et al.*, 2009; Al-Mekhlafi *et al.*, 2007; Norhayati *et al.*, 1997a). Poverty prevails in these communities and sanitation system is inadequate and most of the houses lack treated drinking water supply. Moreover, open defecation especially in the rivers is common in these communities (Nasr *et al.*, 2013a; Ahmed *et al.*, 2011). The knowledge, attitude and practices (KAP) of targeted people toward infections have been found to be crucial in designing and implementing effective control programmes. However, the knowledge and practices of Orang Asli people

toward STH infections were found to be poor and significantly associated with the high prevalence of STH infections among their children (Nasr *et al.,* 2013b). Furthermore, the national mass chemotherapy programme using a single dose of pyrantel pamoate once or twice a year was launched in 1974 and discontinued in 1983 due to the low effectiveness of the drug against trichuriasis and hookworm infection. However, children in some rural areas are still receiving albendazole tablets. This is an intermittent distribution, without any monitoring system, of anthelmintics by researchers and community health campaigns by the Ministry of Health. This practice is not recommended as it may contribute to the emergence of anthelmintics drug resistance.

Hence, in the absence of an effective control programme, it is more likely that STH infections will continue to have devastating consequences and public health implications in these communities. Within this context, developing health educational package to improve the awareness and practices of these people toward STH infections will help to reduce the transmission and morbidity of these infections significantly in order to save the vulnerable population from their adverse effects.

1.3 OBJECTIVES OF THE STUDY

1.3.1 General objective

This study was carried out to develop a health educational package for STH infections and to evaluate its impact in reducing the incidence and intensity of STH infections among Orang Asli school children in rural areas of Peninsular Malaysia.

1.3.2 Specific objectives

1- To determine the prevalence and distribution of intestinal parasitic infections, especially STH infections among Orang Asli school children in Lipis, Pahang, Malaysia.

2- To assess the KAP towards STH infections among Orang Asli people in Lipis, Pahang, Malaysia.

3- To develop a health educational package towards STH infections that meets the ecological and cultural considerations and needs of Orang Asli people.

4- To evaluate the impact of the developed health educational package on the incidence and intensity of STH infections among Orang Asli school children in Lipis, Pahang, Malaysia.

5- To evaluate the impact of the developed health educational package on the KAP towards STH infections among Orang Asli people in Lipis, Pahang, Malaysia.

6- To evaluate the impact of the developed health educational package on the knowledge about STH infections among teachers in primary schools in Lipis, Pahang, Malaysia.

1.4 HYPOTHESES

1. Intestinal parasitic infections including STH infections are prevalent with high intensity among Orang Asli school children in Lipis, Pahang, Malaysia.

2. There are significant associations between the high prevalence rate and intensity of STH infections and some demographic, socioeconomic,

environmental and behavioral factors among Orang Asli school children in Lipis, Pahang, Malaysia.

3. There are significant reductions in the incidence and intensity of STH infections after introducing the health educational package intervention among Orang Asli school children in Lipis, Pahang, Malaysia.

4. There are significant improvements in the KAP of Orang Asli people towards STH infections after introducing the health educational package intervention among Orang Asli school children in Lipis, Pahang, Malaysia.

5. There is a significant improvement in the knowledge of teachers about STH infections after introducing the health educational package intervention in the involved primary schools in Lipis, Pahang, Malaysia.

1.5 SIGNIFICANCE OF THE STUDY

Despite sustained socioeconomic and infrastructural development in Malaysia, STH infections are still prevalent in rural areas especially among impoverished Orang Asli communities. Several previous studies have revealed high prevalence rates of STH infections among Orang Asli and other rural populations in Malaysia (Nasr *et al.,* 2013a; Ngui *et al.,* 2011; Al-Mekhlafi *et al.,* 2006; Norhayati *et al.,* 1997a). Prominent morbidity and significant associations of STH infections with protein-energy malnutrition, VAD, IDA and school absenteeism were also reported among Orang Asli children (Ngui *et al.,* 2012; Al-Mekhlafi *et al.,* 2010; 2008a, 2005a)

Intensive efforts to improve the quality of life of these people have been made with the main strategy being the relocation of those living in remote areas to new settlements at the periphery of towns. However, the adherence of Orang Asli people in Peninsular Malaysia to their jungle habitats has constrained the efforts to improve the

quality of their life. The government has provided hundreds of new houses and treated water supply for Orang Asli people in different areas in Peninsular Malaysia. However, there has been no previous study on health education intervention towards STH infections in these communities. Hence, the health educational package developed by this study will help significantly in improving the awareness of Orang Asli people towards these infections and in reducing the prevalence, intensity and their consequences among their communities. It is also hoped that the findings of this study would be useful to the health authorities and policy makers to establish an integrated and effective STH control programme that can be implemented in the rural areas throughout the country.