DEVELOPMENT AND EVALUATION OF INTERVENTION TOOLS TO IMPROVE PRIMARY SCHOOL TEACHERS KNOWLEDGE ON ASTHMA AND ITS MANAGEMENT IN PENANG, MALAYSIA

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By

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DEDICATION

This dissertation is dedicated to my family and friends.

Especially to my husband Mr. Nuhung and my three lovely children (Nur Fathihah, Nur Hikmatul Fadhillah and Nur Ahmad Habiburrahman) who continue to amaze me with their strength, spiritual encouragement, patience and love.

Allah, Almighty blesses you all

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ABSTRAK

Kanak-kanak sekolah rendah yang mengalami serangan asma semasa waktu sekolah memerlukan bantuan dari guru-guru mereka atau kakitangan sekolah lainnya. Oleh itu pengetahuan guru mengenai asma dan pengurusannya amat penting bagi membolehkan mereka memberikan bantuan yang diperlukan kepada pelajar-pelajar yang memerlukan. Keadaan ini amat penting di Malaysia kerana kebanyakkan sekolah rendah tidak mempunyai kakitangan yang terlatih dalam perubatan untuk membantu pelajar yang mengalami masalah kesihatan pada waktu sekolah. Tujuan kajian ini adalah untuk: (1) Menilai tahap pengetahuan terhadap penyakit asma dan pengurusannya pada guru-guru sekolah rendah di Pulau Pinang, Malaysia; (2) Membentuk kaedah intervensi yang berkesan dalam pendidikan asma bagi guru-guru sekolah; (3) Menilai tingkat pengetahuan guru-guru terhadap penyakit asma dan pengurusannya setelah didedahkan kepada kaedah-kaedah intervensi tersebut. Kajian ini merupakan kajian prospektif, deskriptif dan perbandingan, menggunakan soal selidik dan alat-alat bantu intervensi yang telah divalidasi. Kajian ini terdiri dari 3 tahap: (1) Menilai tahap semasa pengetahuan guru sekolah rendah mengenai asma dan pengurusannya. Kajian ini menggunakan soal selidik yang telah divalidasi; (2) Pemberian kaedah intervensi yang telah direkabentuk oleh penyelidik untuk meningkatkan pengetahuan dan kesedaran guru-guru terhadap penyakit asma dan pengurusannya. Ada 2 jenis kaedah intervensi yang digunakan serta dibandingkan

keberkesanannya iaitu kaedah buku dan multimedia; (3) Menilai kembali tingkat pengetahuan guru-guru sekolah rendah tersebut pada tiga waktu yang berbeza iaitu sebaik selepas, 3 bulan dan 6 bulan setelah sesi pendedahan terhadap kaedah intervensi. Sejumlah 813 guru terlibat dalam kajian menilai tahap pengetahuan guru-guru sekolah rendah terhadap penyakit asma dan pengurusannya. Secara umum pengetahuan guru-guru sekolah rendah mengenai penyakit asma dan pengurusannya adalah memuaskan dengan purata skor 34.53 dari 47 skor (73.47%), walau bagaimanapun mereka mempunyai pengetahuan yang terhad terhadap asma dan senaman. Pengetahuan guru mengenai asma dipengaruhi oleh hubungan pribadi atau pendedahan terhadap asma tetapi tidak dipengaruhi oleh demografi. Seratus tujuh puluh (170) guru dari kumpulan yang menerima intervensi buku dan 89 guru dari kumpulan yang menerima intervensi multimedia telah mengikuti kajian ini hingga selesai. Kajian ini menunjukan bahwa purata skor setelah 6 bulan pendedahan terhadap intervensi buku adalah 35.36 ± 4.01, walau bagaimanapun peningkatan yang terjadi tidak signifikan berbanding purata skor sebelum pendedahan kaedah intervensi 34.81 ± 3.50. Jumlah guru yang mempunyai tingkat pengetahuan asma yang baik meningkat dari 33.53% ke 39.41% pada 6 bulan setelah pendedahan kaedah intervensi. Sebaliknya, intervensi multimedia menunjukkan peningkatan tahap pengetahuan asma yang signifikan pada akhir 6 bulan susulan dari 33.76 ± 3.46 ke 35.00 ± 3.99. Sebagai tambahan jumlah guru yang mempunyai tahap pengetahuan yang baik diakhir kajian juga meningkat dari 23.60% ke 32.58%. Walaupun, peningkatan pengetahuan asma lebih tinggi terjadi pada kumpulan multimedia berbanding kumpulan buku, perbezaannya adalah tidak signifikan. Kajian ini berkesimpulan bahawa guru-guru sekolah rendah di Pulau Pinang mempunyai pengetahuan yang memadai mengenai asma dan pengurusannya. Keduanya, kaedah

intervensi multimedia dan buku “Asma: Panduan untuk Guru Sekolah” adalah berkesan untuk meningkatkan tahap pengetahuan guru terhadap asma sebaik selepas (Phase II), 3 bulan (Phase III) dan 6 bulan (Phase IV) setelah pendedahan diberikan. Kaedah intervensi multimedia didapati lebih berkesan untuk meningkatkan pengetahuan asma dan pengurusannya berbanding kaedah intervensi buku.

DEVELOPMENT AND EVALUATION OF INTERVENTION TOOLS TO IMPROVE PRIMARY SCHOOL TEACHERS KNOWLEDGE ON ASTHMA AND ITS MANAGEMENT IN PENANG, MALAYSIA

ABSTRACT

Primary school children who develop asthmatic attack during school hours required assistance from their teachers or school staff. Therefore teacher's knowledge on asthma and its managements are vital in order for them to provide necessary assistance to their needy students. This scenario is particularly important in Malaysia as most primary schools do not have medically trained staff to assist students who develop medical problems during school hours. The objectives of this study were (1) to asses the level of knowledge regarding asthma and its management among school teachers in Penang, Malaysia; (2) to develop effective intervention methods of asthma education for school teachers; (3) to asses the level of teachers' knowledge on asthma and its management among school teachers after exposure to intervention methods. This study was a prospective, descriptive and comparative study using validated questionnaires and self developed intervention tools. This study consisted of three stages: (1) Assessment of current knowledge on asthma among primary school teacher in Penang, Malaysia using a validated questionnaire; (2) Administration of the self developed intervention tools targeted to improve the teachers knowledge and awareness on asthma and its managements. There were 2 interventions tools i.e booklet and multimedia used and compared in term of the effectiveness; (3) Reassessment of the teacher's knowledge on asthma at three different occasion, immediately, three months and six month after the end of the intervention sessions. A total of 813 teachers participated in the assessment of the

level of knowledge regarding asthma and its management. Generally, the primary school teachers knowledge about asthma and its management were satisfactory with mean score of 34.53 of 47 scores (73.47%), however they have limited knowledge on asthma and sport. The teacher's knowledge on asthma was influenced by personal contact or exposure to asthma but not the demographic of the teachers. One hundrend and seventy (170) teachers from booklet intervention group and 89 teachers from multimedia intervention group completed this study. This study showed that the mean score of after 6 months in the booklet intervention was 35.36 ± 4.01, however the improvement was not significant compared to the mean score before intervention 34.81 ± 3.50. The number of teachers who have good level of asthma knowledge increased from 33.53% to 39.41% at 6 months after intervention. On the other hand, the multimedia intervention showed significant improvement in the level of asthma knowledge at the end of 6 month follow-up from 33.76 ± 3.46 to 35.00 ± 3.99. In addition the number of teachers who have good level of asthma knowledge at the end of study also increased from 23.60% to 32.58%. Although the improvement of asthma knowledge was higher among multimedia group than booklet group, the difference was not significant. This study concluded that the primary school teachers in Penang have adequate knowledge on asthma and its management. Secondly, the multimedia and booklet entitled "Asthma: Guidelines for the School Teachers" were effective to increase the level of teacher's knowledge on asthma immediately (Phase II), at 3 months (Phase III) and at 6 months after the intervention given. The multimedia intervention was more effective to improve asthma knowledge than the booklet intervention.

CHAPTER I

INTRODUCTION

1.1 Background

Asthma is a common chronic disorder of the airways characterized by recurring symptoms, airflow obstruction, bronchial hyperresponsiveness, and an underlying inflammation. The disease is presented by recurrent attacks of shortness of breath, coughing, wheezing, and chest tightness. The pathogenesis of asthma involved four different processes: acute bronchoconstriction, swelling of the bronchial tissue, increase mucus secretion, and airway wall remodeling (NAEPP, 2007). Asthma is associated with high morbidity and mortality, increases economic burden in term of health care cost, lost of productivity and lack of participation in social life. Some studies found that asthma is the leading cause of the school absenteeism and works (Rabe et al., 2004; Wang et al., 2005).

It was estimated globally that about 300 million individuals suffering from asthma and it was one of the leading cause of disability adjusted life years lost worldwide in 2001. The prevalence of asthma in Southeast Asian countries varies, with the lowest rate was in Indonesia and the highest rate was in Philippines and Singapore (Masoli et al., 2004). The prevalence of asthma symptoms was reported between 4.1% -15.7% in 6 to 7 years old children and 1.3% – 9.9% in 13-14 years old children (Beasley, 1998). A report from The International Study of Asthma and Allergies in Childhood (ISAAC) Steering committee showed that the prevalence rate

of asthma in Malaysia were between 4.5-7.8% in 6-7 years old children and 3.9 - 6.9% in 13 -14 years old children (Beasley, 1998).

There are many factors contributing to the increased in acute asthmatic attack include: undertreatment, underdiagnosis, non-compliance to medication and management, underawareness, underestimation of severity, failure to recognize triggering factors, delayed treatment and poor patient medication (Adams et al., 2003; Dhuper et al., 2003; Gibson et al, 1995; Halterman et al 2002; Nolte et al., 2006; Rabe et al., 2004).

Many studies highlighted that asthma education is very useful to achieve a good asthma control among asthmatic patients (Buckner et al., 2005; Carruthers et al., 1995; Raynor et al., 2004; Schaffer & Tian, 2004). Asthma education programs were developed in various formats to improve teacher's knowledge such as seminar, workshop and pamphlet (Eisenberg et al., 1993; Abdel Gawwad & El-Herishi, 2007; Henry et al., 1994). Asthma education is targeted to educate patients, parents, teachers and others who are involve in managing asthmatic attack. The knowledge on asthma includes the understanding of asthma pathophysiology, recognizing sign and symptoms of asthma, knowledge and skill necessary to manage symptoms of asthma, medications for asthma and adjustment in the daily activity (NAEPP, 1997).

1.2 Problem Statement

The incidence of asthma reaches the peak at primary school age (Beasley, 1998). Next to home, children spend most of their days at school. Therefore, asthma

is known to have negative impact on school, students and their families. Asthma has been reported to reduce patient's participations in physical activities, increase school absenteeism, drop in school performance, increases parental absenteeism from work, and increases domestic stresses (Eisenberg et al., 1993; Rabe et al., 2004; Wang et al., 2005). Physical education activities increase the risk of asthmatic attack among school children suffering from asthma. The attack is likely to occur during or immediately after exercise, therefore it is important for these children to be given proper asthma management to prevent asthmatic attack or appropriate treatment once the children developed an attack (Lacroix, 1999).

In Malaysia, the school system does not have full time nurse or medically trained staff to assist students who develop medical problems at school. In this case, teachers and other non medically trained staff are responsible to assist students for their daily asthma management during school hours (Bahari et al., 2003; Eisenberg et al., 1993; Tse & Yu, 2002). Therefore, it is very important to improve the knowledge on asthma and its management for school teachers and other staff which are responsible for student affairs.

Previous studies found that improvement in asthma knowledge of patients and parents have been shown to improve asthma outcome in patients and their children after intervention (Homer et al., 2000; Krishna et al., 2003). It would be expected that improved knowledge of school teachers on asthma would produce similar outcomes. Improved asthma knowledge among teachers will be able to improve teachers' confidence to manage the school children with asthma and to deal with emergency medical situation appropriately.

1.3 Objective of the Study

A. General objective

To develop and evaluate of intervention tools to improve teachers asthma knowledge and its management in Penang, Malaysia.

B. Specific objective

1. To develop and evaluate a Booklet entitle “Asthma: Guideline for the School Teachers” developed in Bahasa Malaysia. It contains information about asthma and prevention asthma attack in the school.
2. To develop and evaluate a multimedia education program entitle “Asthma: Guideline for the School Teachers” developed in Bahasa Malaysia. It contains information about asthma and prevention asthma attack in the school.
3. To assess the current level of knowledge among school teachers on asthma and its management (Baseline phase).
4. To assess factors associated with knowledge about asthma among primary school teachers.
5. To assess the level of knowledge on asthma and its management among school teachers after the multimedia intervention (immediately after intervention, 3 months after intervention and 6 months after intervention).
6. To assess the level of knowledge on asthma and its management among school teachers after the booklet intervention (immediately after intervention, 3 months after intervention and 6 months after intervention).
7. To compare the level of knowledge among school teachers on asthma and its management after multimedia and booklet intervention.

8. To assess the teacher's opinion about asthma education and management in school.

1.4 Significant of the Study

This study was the first study to develop and to evaluate the methods to improve teachers' knowledge on asthma in Malaysia. The result of this study will be able to assist relevant authority in designing the best intervention methods to improve teachers asthma knowledge and skill to assist students with asthmatic attack at school. In addition this finding can be extrapolated to other diseases that commonly affecting school children such as epilepsy, skin diseases and others. This study might also be able to assist the development of guidelines or policy related to asthma and other diseases care among children at school.

1.5 Hypothesis of the Study

Hypothesis of the study are arranged as follows:

1. The level of knowledge on asthma is not adequate among school teachers before intervention.
2. The level of asthma knowledge among school teachers will improve after the multimedia and the booklet intervention.
3. The improvement of asthma knowledge among school teachers who received multimedia is better than those who received booklet intervention

CHAPTER II

LITERATURE REVIEW

2.1 Prevalence of Asthma in School Children

Asthma is a chronic respiratory illness presented with short of breath, cough and chest tightness. According to the Expert Panel of the National Institute of Health National Asthma Education and Prevention Program (NAEPP), the definition of asthma is:

> "Asthma is a common chronic disorder of the airways characterized by recurring symptoms, airflow obstruction, bronchial hyperresponsiveness, and an underlying inflammation" (NAEPP, 2007)

Asthma is one of the most common chronic illnesses in the world. It was estimated that more than 300 million people in the world are currently suffering from asthma and it was the 25th leading cause of disability adjusted life years lost worldwide in 2001 (Masoli et al., 2004). This number is at par with that of other chronic diseases such as diabetes, liver cirrhosis or schizophrenia. Asthma affecting patients from all countries and people of all ages (Singh, 2005). There is evidence that over the last two decades its prevalence has increased, especially among children. The increased in the prevalence of asthma is associated with an increase in atopic sensitization and other allergic disorders such as eczema and rhinitis (Beasley, 1998; ISAAC, 1998).

The International Study of Asthma and Allergies in Childhood (ISAAC) Steering Committee 1998 reported the prevalence of asthma among schoolchildren from Europe, Asia, Africa, Australia and North and South America. The studies was conducted among children 6 – 7 years from 91 centres in 38 countries, and children aged 13 – 14 years from 155 centres in 56 countries. The lowest prevalence of asthma was found in parts of Eastern Europe, South and Central Asia (Beasley, 1998; ISAAC, 1998).

In the United states, National Health Interview Survey Data from 1980 – 1996 reported that 12 month prevalence of asthma has increased by 74% or about 14.5 million persons. The prevalence was highest among children (5-14 years) in 1997 (Mannino et al., 2002).

A study by Mitchell & Asher (1994) concluded that in Europe the prevalence of asthma symptoms has increased by 35% from 1985 to 1991 in European schoolchildren. A Similar study in Aberdeen found that two surveys in 25 years showed the prevalence of wheezing increased from 10.4% in 1964 to 19.8% in 1989 and the prevalence of episodes of shortness of breath increased from 5.4% to 10% particularly in boys (Ninan & Russell, 1992). The prevalence of wheezing continued to increase until four years later (Omran & Russell, 1996).

Another study at Northern Sweden found that the incidence and remission of asthma and wheezing over one year period in children 7 – 8 years old has increased and the prevalence rate was similar among boys and girls (Ronmark et al., 2001). In the United Kingdom, ISAAC UK reported that the prevalence of asthma among

children 12-14 years old was high (33.5% had symptoms of wheezing and 20.9% have had a diagnosis of asthma). Underdiagnosis and undertreated asthma still were substantial (Kaur et al., 1998).

According to ISAAC report in 1998, the prevalence of wheezing in children aged 13-14 years old in Latin American countries ranged from 5% to 10% in Mexico and Argentina, and from 20-25% in Brazil, Peru, and Costa Rica. A similar study conducted in Costa Rica found that the prevalence of asthma children aged between 5-17 years old showed an increasing tread (Soto-Quiros et al., 2002). In addition, another study in Mexico found the prevalence of asthma in children aged 6-8 years old and 11-14 years old were relatively lower compared with other studies done in Latin America (Barraza-Villarreal et al, 2001).

A survey by ISAAC Steering Committee 1998, found that Australia has the second highest prevalence of asthma for children 13-14 years old (Beasley, 1998; ISAAC, 1998). However, another study over 9 years period among Melbourne school children showed that there was reduction in the prevalence of wheeze from 27.2% in 1993 to 20% in 2002 (Robertson et al, 2004). Similar finding was reported in New South Wales where the prevalence reduced from 38% in 1992 to 32% in 2002 (Toelle et al., 2003). In Hong Kong, prevalence of asthma was reported to have reduced from 12.8% in 1994 to 8.6% in 2002 (Wong et al., 2003). Germany also reported that the prevalence of asthma do not increase from 1992-2001 (Zollner et al., 2005). The factors that contributed to the decrease of prevalence of asthma include; increased awareness on asthma and interpretation of respiratory symptoms as asthma, as the result of a public awareness campaign (Robertson et al., 2004). In

addition, the physicians were reluctant to confirm the diagnosis as asthma dispute the present of asthma and symptoms. In stand, they prefer to use wheezing or asthma related diagnosis (Adams et al., 2003).

In Eastern Mediterranean, the prevalence of asthma symptoms among children ages 13-14 years old was between 8-17%. The lowest wheezing prevalence rate was seen in Pakistan, and the highest in Kuwait (Beasley, 1998; ISAAC, 1998). A study in Oman found that the prevalence of self-reported asthma diagnosis among 13-14 years old children was 20.7% and among 6-7 years old was 10.5% (Al-Riyami et al., 2001). Besides, a cross-sectional population-based study in Southern Turkey showed that the prevalence of asthma in schoolchildren 6-18 years old was 12.6%, the prevalence rate was the highest among 6-10 years old children (14.7%) while the lowest was amongst 15-18 years old children (6.0%) (Beasley, 1998). The similar study in Palestine, the authors found that the prevalence rate of asthma among children of 6-12 years old in Palestine was 8.8%, lower than that of other countries in Arab region (El-Sharif et al., 2002).

Studies done in South Asia and Southeast Asia, found that the prevalence of asthma and allergic diseases were lower than in Western countries (Awasthi et al., 2004; Beasley, 1998; Leung & Ho, 1994; Omar, 1990). A study in India found that the prevalence of asthma over a year among 6-7 years old and 13-14 years old were 2.3% and 3.3% respectively. Patients presented with wheezing were 6.2% and 7.8% and one fourth of them were reported to have asthma (Awasthi et al., 2004). At the same time the prevalence of asthma among schoolchildren in Taiwan was reported at 5.6% of the girls to 8.1% of the boys (Lee et al., 2003) and the latest reports was

7.0% (Liao et al., 2005). The results of a study in Hong Kong and San Bu (China) showed that the prevalence of asthma was 11.6% and 1.9% (Leung & Ho, 1994). Another study in Hong Kong showed a reduction in the prevalence of asthma from 12.4% in 1994 to 8.7 % in 2002 (Wong et al., 2004).

There is a wide variation of asthma prevalence rate in Southeast Asia, with the lowest rates was reported in Indonesia and Vietnam and the highest rates were in Thailand, Philippines, and Singapore (Beasley, 1998; Masoli et al., 2004). ISAAC Steering Committee reported that the prevalence of asthma symptoms in the Southeast Asian region was between 2.1% in Indonesia to 13% in Thailand in children 13-14 years old group. The prevalence was higher among in children 6-7 years of age group, between 4.1% in Indonesia to 15.7% in Singapore (ISAAC, 1998). Similar studies in Thailand found consistent findings where the prevalence of asthma showed an increasing trend (Teeratakulpisarn et al., 2000; Trakultivakorn, 1999; Vichyanond et al., 1998). On the other hand, the prevalence of asthma in Singapore in 1994 and in 2001 reduces among children of 6 – 7 years old (16.6% to 10.2%), however at the same time, the prevalence of asthma among 12-15 years old children increases from 9.9% to 11.9% (Wang et al., 2004).

In Malaysia, nearly one million people are suffering from asthma. This data was based on the study conducted by Public Health Institute, Ministry of Health Malaysia. The report shows that the prevalence of asthma in Malaysia was between 3.9% to 4.4% (mean 4.2%). In addition, about 4.5% of children between 1-4 years old and 4.1% of adults were suffering from asthma (Rugayah et al, 1999). A study on hospital admission in 1996 found that asthma case contributed to 1.6% of total

admissions in Malaysia, and contributed to about 27% of all respiratory cases admitted to hospital (Ishak, 2002). The prevalence rate for asthma admission showed that the state of Perlis, Perak, Melaka, Pahang, and Kuala Lumpur were higher than the national prevalence rate. The state of Perlis recorded the highest hospital admissions due to asthma with the rate of 3.5%. These studies showed that Malaysian Indians has higher prevalence rate followed by Malays and Chinese (Ishak, 2002; Rugayah et al., 1999). Another study in Kuala Lumpur found that Malays contributed to the highest number of patients being diagnosed as having asthma than other ethnic groups (Omar, 1990). The studies on the prevalence of asthma among school children found that the prevalence of asthma in Kuala Lumpur, Kota Kinabalu and Kelantan were 13.8%, 8.2% and 9.4% respectively. (Leung & Ho, 1994; Omar, 1990; Quah et al., 1997).

Previous studies on the prevalence of asthma found that there were wide differences between developed and developing countries, particularly in Asian regions. The prevalence of asthma in developing countries is lower than in developed countries. These studies also found that the prevalence of asthma is in declining trend in some countries. These phenomena occurred because of the plethora of public awareness campaigns since the mid 1990s. Nevertheless, asthma contributed to higher health care cost and lost of productivity, and quality of life worldwide.

2.2 Risk Factor for Asthma in School Children

There are lot of factors influencing the prevalence of asthma in school children. Among these factors are exposure to outdoor environment, exposure to indoor environment, genetic factor, and lifestyle (Knorr et al., 2004; Lee et al., 2003). The indoor environment that could precipitate asthma includes dust, mites, pets, cockroaches, tobacco smoke, molds and others. The outdoor environment such as industrial smoke, photochemical proceeds, pollen, fungi, motor vehicles emissions, and agricultural burning may also precipitate asthma (GINA, 2005). Genetic such as family history, race and ethnicity also influence prevalence of asthma (Quah et al., 2000; Rugayah et al., 1999). In addition, psychosocial factors, socioeconomic condition, food, drug, infections also play an important role in asthma (Ahn et al., 2005; Awasthi et al., 2004; Hancox et al., 2004; Kraft, 2000; Weil et al., 1999).

According to the Environmental Protection Agency (EPA), many indoor environmental problems influence the health of students and staff, including those who have asthma. Some of the indoor environmental problems in school include chemical pollutants from building or building maintenance material, chemical pollutants from science and art classes, improperly maintained ventilation systems, and allergens from classroom animals and cockroaches or pets, mold growth, carpets and other furnishing, humidity, and second-hand smoke (EPA, 2000). In order to help improve indoor environmental problems in school, the EPA developed the *Indoor Air Quality (IAQ) Tools for School Action Kit.* This kit helps school personnel identify, solve, and prevent school indoor environmental problems.

There are many studies trying to identify the risk factor that provokes asthmatic attack. A cross-sectional study in Perlis, Malaysia found that the indoor environment (carpet, cigarette smoke, cat, bird, and mosquito insecticide) and outdoor environment (as measured by their house proximity to environmental pollution source) played very a important role in the increase asthmatic cases (Muhamed et al., 2004). Etzel (2004) in his review concluded that cockroach, house dust mites, and animal allergen were important risk factors for asthma development and exacerbation.

Other study conducted in three cities, Hong Kong, Kota Kinabalu in Malaysia and San Bu in China. This study found that dust mites and cockroach were the two most common inhaled allergens in more than 95% of schoolchildren. Other risk factors identified in this study were mold, animal allergen, pollen, and family history. The study also noted that sensitization to indoor allergen, particularly house dust mite was more important than outdoor allergen which was more strongly associated with asthma (Leung & Ho, 1994; Leung et al., 1997).

Study in Taiwan also found cockroaches and dust mites were the most common factors contributing to the development asthma. Other risk factors associated with the occurrence of asthma in children were mold, water supply problem, outdoor environment, parent's education level, maternal smoking and fewer siblings. This study also demonstrated that paternal and maternal asthma are the stronger risk factors for childhood asthma in both sexes, while girls are more sensitive to indoor environment than boys (Lee et al., 2003).

The Clean Air Act of 1971 has listed six types of air pollutant known to be adversely associated with human health. These pollutants include lead, carbon monoxide, nitrogen dioxide, sulphur dioxide, ozone, and particulates with diameter less than 10 micrometer. Patients with asthma are generally more sensitive to air pollutants than the general population. The National Ambient Air Quality Standard (NAAQS) established under the Clean Air Act, has set standards to prevent the effect of outdoor pollutants on asthma (Suh et al., 2000).

Air pollutants produced by motor vehicles, industrial facilities, agriculture burning, gas stove, kerosene, wood-burning stove and other sources are hazardous especially to children (Leikauf, 2002; Sotir et al., 2003). Long term exposure to air pollutants such as NOx, CO, and Ozone increased the risk of asthma in children (Hwang et al., 2005). A study in USA found that exposure to wood or oil smoke, root or exhaust, pesticides, herbicides from environment at early life were associated with increased risk for asthma. The study showed that exposure to wood or oil smoke, root or exhaust increased the risk of asthma up to 1.6 fold and exposure since the first year of life was associated with increased risk more than 5 fold (Salam et al., 2004).

The incidence of asthma is higher in urban areas than rural areas (Hancox et al., 2004; Rugayah et al., 1999). This phenomenon is related to the higher concentration of air pollutant in urban area due to large number of vehicle that emit particles with diameter of less than 10 micrometer, nitrogen dioxide and ozone (D'Amato et al., 2002). Hancox et al. (2004) also concluded that the increased risk for asthma is associated with children living in urban areas, it is not related to race or

low income. Nevertheless, socioeconomic status may also contribute to the risk factor for asthma. For example, in Malaysia the incidence of asthma was higher among the lower income population (Rugayah et al., 1999).

Exposure to the environmental tobacco smoke could also precipitate asthmatic attack in children. Approximately 43% of children 2 months to 11 years of age live together with at least one smoker at home (Pirkle et al., 1996) and 23.8% of children were exposed to maternal smoking during pregnancy (Gergen et al., 1998). The effect of tobacco smoke was greater among asthmatic children than children without asthma. They found that children of a mother who was smoking throughout the pregnancy have higher risk of asthma in the first five years of life. However, children of a mother who quit smoking prior to the pregnancy showed no increase in the risk of asthma (Li et al., 2005). Many studies found that one of the risk factor for asthma among school children was maternal or parental smoking (Ronmark et al., 2002; Sotir et al., 2003). Another study that compares the relationship between asthma symptoms and active smoking or passive smoking among school children found that asthma is strongly associated with passive smoker than with active smokers (Strum et al., 2004).

Exercise induced asthma (EIA) is more common among active children, adolescents, and young adults. EIA is more common to occur during school hours. EIA occurs in up to 90% asthmatics and 40% of patients with allergic rhinitis, and 6% - 13% among the general populations. EIA commonly occurs within 10-15 minutes from the beginning of exercise and resolved about 60 minutes later (Lacroix, 1999). A study among Malay school children in Malaysia showed that

47.7% children reported “ever wheeze” during exercise, and another 51.6% children reported “current wheeze”. However about 50% of children who have exercised induced asthma did not receive any form of preventive therapy (Zainudin et al., 2001). Another study in India also found that exercise was one of the risk factor for wheezing in 13-14 years age group (Awasthi et al., 2004).

Cold and dry environment play very important role in triggering EIA. Therefore, the most important step to avoid EIA is to avoid exercise in cold and dry environment. In addition, air pollutants and airborne allergens such as molds and pollens also have been shown to induce EIA (Lacroix, 1999). Proper control of environment, level of exercise intensity, and airway status could allow an asthmatic patient to perform harder exercise such as using treadmill and free running (Garcia de la Rubia et al., 1998). Similar study also found that children with a well controlled mild to moderate asthma could achieve equal level of exercise performance as those healthy children (Santuz et al., 1997). Some studies suggested that warming up at last 15 minutes before exercise is beneficial for children with exercise induced asthma. Cooling down, instead of stopping exercise abruptly will also reduce EIA. However, avoiding exercise in cold and dry air is the most important part of prevention (Lacroix, 1999; Milgrom & Taussig, 1999).

2.3 Teacher Knowledge on Asthma

There were many studies found the relationship between asthma school absenteeism and reduced participation in sports and other activities (Al-Dawood, 2002; Bener et al., 1994; Rabe et al., 2004). According to a study by the Global

Asthma Insights and Reality Survey, the percentage of children absent from school due to asthma is about 16% - 68%. School children in Asia are less frequently loss schooldays because asthma than school children from other part of the world (Rabe et al., 2004).

According to data from CDC, over 14 million schooldays were missed due to asthma each year in the United States with an average of 2.48 days per child (Mannino et al., 2002; Wang et al., 2005). In Rochester, Minnesota, school children with asthma had two or more day's absence compared with non asthmatic children per year. The study also showed that the asthmatic children have similar academic performance to that of non asthmatic children (Silverstein et al., 2001). In Kingdom of Saudi Arabia, asthmatic children have 13.6 days absenteeism annually compared to 3.7 days in non-asthmatic (Al-Dawood, 2002). In Singapore, teachers reported that more than 50% of teachers recorded student missing from school for 4–14 days per month because of asthma symptoms (Lim et al., 2003). Girl was reported to have more frequent absent from school due to asthma than boys. The absenteeism were more frequent during spring and occurred least during autumn in countries with 4 seasons (Bener et al., 1994). Some studies believed that the morbidity of asthma in the school was underestimated because most of absenteeism due to asthma exacerbation was not recorded (Bonilla et al., 2005; Filmore et al., 1997).

School is the most important environment in childhood next to home. Children above 5 years old spent up to 30% of their day at school under the care and supervision of teachers. In addition to teaching responsibilities, teachers also responsible to assist students who develop medical problems at school including

asthmatic attack. In Malaysia particularly, teachers are responsible to supervise the administration of medication; to advice on the need for extra treatment during acute attack; to decide whether children should participate in sport or go out in cold weather; and to send children home or to hospitals. Physical education teachers must be aware that physical activities may increase the risk of asthmatic attack. Therefore, it important for them to advice students to take proper prophylactic medication before participates in any physical activities. Teachers also need to know the type of abortive medication to be use in case of acute attack (Lacroix, 1999; Milgrom & Taussig, 1999).

Based on the above argument, it is important for the teachers to understand the risk factor of asthma and to know how to manage asthma in case the development an attack at school (Bahari et al., 2003; Carruthers et al., 1995; Seto et al., 1992; Storr et al., 1987; Tse & Yu, 2002). If the teachers do not have adequate knowledge to enable them to assist student with asthmatic attack, the student will be exposed to the risk of more serious conditions such as status asthmaticus. Teachers should be able to recognize early symptoms of asthmatic attack; the types of medications needed, correct time to administer, route of administration; who to call in an emergency, and when to call a doctor or send the student to hospital (McMahon et al., 2003). If the teachers are not fully aware of the high prevalence of asthma, the precipitating factors and signs of an attack as well as the appropriate use of bronchodilator during attack, asthmatic children would be deprived of necessary care and treatment should asthmatic attack occur at school.

Inadequate disease knowledge has been identified as one of the factors potentially predicting asthma management problems among children with asthma. Adams et al. recommended that the research should identify the family's knowledge of factors preceding asthma exacerbation, techniques for managing asthma-related symptoms and crises, information regarding the type of medication prescribed to the child and recall of the dose, and frequency of prescribed medication in order to evaluate the patient or family knowledge on asthma. (Adams et al., 2001).

Toward the end 1980's, a study in London found that the teachers have limited knowledge and understanding about asthma. This study showed that only 27% of teachers knew that playing games in cold air induces asthmatic attack and only 34% knew that wheezing during/after exercise is one of the symptoms of asthmatic attack. Majority of the respondents believed that asthmatic children should receive education in normal school. However, 18% of teachers still believe that asthmatic children are different from other children. Almost 80% teachers said the asthmatic student should be encouraged to take part in all school sports and activities, and only 33% of them knew that premedication with Ventolin® (a widely known used as bronchodilator) before activities could prevent asthma attack (Bevis & Taylor, 1990).

A study by Brook (1990) on asthmatic knowledge of school teachers at Holon, Israel, using 69 gymnastic teachers found that the gymnastic teachers do not have significantly better knowledge than other teachers. His study also found that the general knowledge of classroom teachers and various subject teachers were

similar. The main reason given was majority of teachers received the information about asthma from reading articles and books.

A study at Southampton found that the knowledge of asthma among teacher was inadequate where less than 50% of teacher knew that exercise can induced asthma attack. Majority of the teachers did not aware about the asthma precipitating factors and the important of premedication. Only eight percent (8%) knew viral infection could exacerbate asthma, 8% of them were aware the important of premedication before exercise and 17% of teacher allowed the children to keep their inhaler at school. In addition, there was no policy to handle asthmatic children in school and most of the teachers were not aware about their deficiency in asthma knowledge. As the result, many asthmatic students were not recognized and not properly managed by their teachers (Brookes & Jones, 1992). In contrast a study in South Auckland, New Zealand found that teachers had good basic knowledge on asthma, but they had limited knowledge about asthma medications. However, most teachers knew that Ventolin® (Salbutamol) is a symptoms reliever but did not realize that Becotide® (Beclomethasone) and Intal® (Sodium Cromoglycate) are preventative medications. This study also found that the majority of teachers allowed the children with asthma to keep their inhaler with them (Seto et al., 1992).

Carruthers et al., 1995 conducted a study in West Gloucestershire, United Kingdom looked at teachers knowledge on asthma and found that the level of teachers' knowledge on asthma also was low. This study found that most teachers have inadequate knowledge on asthma triggering factors. Only 7% knew asthma is inflammation of airways disease, 32% knew asthma is the constriction of airways

and more than 40% of teachers mentioned stress, exercise and allergen as triggers of asthma. Additionally, there were only 41% of teachers have the confident to assist asthmatic students using their inhaler during an asthma attack. The teacher's knowledge were better among those who have attended asthma training or who have direct contact with asthma and they were more likely to take appropriate action in the event of asthma attack. The study concluded that the improvement in teachers asthma knowledge is associated with their ability to assist asthmatic student and subsequently reduce the risk of asthma attack at school (Carruthers et al., 1995). A similar finding was also observed in New York by Appea in 1999. He found that majority of the teachers had low level of asthma knowledge. Teachers with asthma or have children with asthma and have primary family member with asthma have significantly higher level of asthma knowledge, self-efficacy, and management of asthma than the teachers without such experience. This study also found that teachers who have attended training were more knowledgeable, self-efficacy, and management than those untrained teachers.

Hussey in 1999 found that the level of teacher's knowledge about sign and symptoms and triggers of asthma in Dublin was generally satisfactory. Almost all of teachers knew that breathlessness is a symptom of asthma and 37% of teachers mentioned that cold wind could trigger asthma. However, teachers have limited knowledge on asthma management and on exercise induced asthma. Most of the teachers knew the existence of reliever and preventive inhalers and allowed the students to keep their own inhaler. They were more comfortable to assist the student to use their inhaler. However, only 17% of teachers knew that exercise-induced

asthma could be prevented if a child takes a reliever bronchodilator prior to exercise (Hussey et al. 1999).

A study in South Essex found that increasing teachers' knowledge resulted in improved care of children with asthma in school. In this study, the respondents were divided into four groups: trained/with asthma, trained/no asthma, untrained/with asthma and untrained/no asthma. Their result showed that no significant difference in the mean score of asthma knowledge between trained/with asthma group and untrained/with asthma, but trained/with asthma teachers were more knowledgeable than untrained/with asthma teachers. The trained/with asthma teachers were the most knowledgeable than other groups. Majority of teachers reported that school office were responsible for keeping student's medicine, but only 20% indicated that children were allowed to carry their own medication. This study also found that 47% of teachers reported concern about dealing with a child suffering from asthma attack, but 16.1% of them were confident to deal with a child suffering from severe asthma attack (Rachel et al., 2001).

The study in Istanbul, Turkey found that the primary school teachers have a satisfactory knowledge on asthma. However, they have lack the knowledge on triggers of asthma attack and on the management of the diseases. Generally, the teachers knew that shortness of breathing, wheezing, and cough were the common asthma symptoms. This study found that only 25%, 3.7% and 7.8% teachers respectively knew that aspirin, laughing, and exercise could trigger asthma attack. About 68.9% of the teachers completely agree that salbutamol or terbutalin as quick-relief medication for acute asthma. This study also found that the asthma knowledge

level was not related to teachers' age, education level, and teaching experience, but related with gender (Ones et al., 2006). Similar result was observed in Georgia. This study found that no significant difference in knowledge of asthma among school teachers based on level of education. However the middle-school teachers were more knowledgeable about asthma than elementary school teachers. This study also showed that teachers with asthma and other chronic diseases were more knowledgeable about asthma and its management (Getch & Neuharth-Pritchett, 2009).

In Asia, several studies have been done to assess the level of teachers knowledge on asthma particularly in Hong Kong, Bahraini, Taheran, and Malaysia (Tse & Yu, 2002; Al-Nasir, 2004; Movahedi et al., 2000; Bahari et al., 2003). The study in Hong Kong showed that teachers' score for general asthma, asthma and exercise and asthma management were 67%, 59% and 39% respectively. These scores showed that teachers in Hong Kong are quite deficient in knowledge on asthma, particularly in the area of medication, management, and exercise induced asthma. Majority of teachers knew that difficulty in breathing, wheezing, and chest tightness were the main symptoms of asthmatic attack. About 77.1% of the teachers knew that bronchodilator could relieve asthma attack, but more than 50% did not know the importance of bronchodilator treatment before exercise. Only 39% of teachers mentioned that the asthmatic students were as competent as normal children in sports and other activities (Tse & Yu, 2002).

Movahedi et al. (2000) evaluated the level of teachers' knowledge of asthma in Teheran, Iran. They found that teachers in primary schools have a good basic

knowledge on asthma and its triggering factor. However, teachers have poor knowledge on etiology of asthma. This study also found that the asthma knowledge was not related and associated with teaching experiences, level of education, and contact with asthmatic children.

A more recent study in Babol, Iran by Mohammadzadeh et al. (2010) showed that the level of asthma knowledge among teachers was intermediate. This study found the mean score of asthma knowledge among teachers was 12 of 16 (75%), and indicated that teachers in this study have level of asthma was higher than Mohavedi's study (2000). This study also found that the level of asthma knowledge was not associated with age and sexes, but associated with level of education.

Bahari et al. (2003) studied the asthma knowledge among school teacher in Kelantan, Malaysia. They found similar finding to other previous studies in other countries. The school teachers have better knowledge about causes and triggers of asthma, but they were less informed about the management and treatment of asthma. Teachers were quite knowledgeable about risk factors and symptoms of asthma, although, these teachers still lack of understand that rain, smoking and cold weather could be induced asthma attack. More than 80% teachers found that children with asthma were less active in sport, but majority believed that children with asthma can participate in all type of sport. Although this study found that teachers have poor knowledge about asthma management, more than 60% teachers knew that Salbutamol inhaler is effective to relieve an asthmatic attack.

The study in Bahrain by Al-Nasir (2004) study found that the mean teachers' asthma knowledge score was inadequate (51.6%). The teachers who have contact with an asthmatic patient or who received previous training on asthma had a significantly better knowledge.

The above studies revealed that the knowledge of school teachers on asthma were very limited, particularly regarding the care or management and treatment of students with acute attack. Clearly, teachers need to access to information about asthma and its managements to enable the teachers to assist students who developed asthma attack at school. Most school in developing countries, including Malaysia does not have permanent nurses or medically trained staff in school; therefore, teachers are responsible to handle the management of children with chronic illnesses including asthma. Therefore, teachers need to have satisfactory knowledge and understanding about risk factor, symptoms, management and treatment of asthma. Education of asthma should be given regularly to increase awareness teachers on asthma (Al-Nasir, 2004; Bahari et al., 2003; Tse & Yu, 2002).

2.4 Involvement of School Teacher in Management of Asthma

The burden of asthma on the patients, families and community are lies on the direct and indirect costs, loss of schooldays, loss of learning time, impaired socializing with friends and community, and missed of recreating time (Sennhauser et al., 2005). The schools have to develop a comprehensive, coordinated and systematic approach to handle students with asthma and other chronic illnesses. The benefit to students include reduced loss of schooldays, improved physical stamina,