

## SECONDHAND SMOKE EXPOSURE AT HOME AND RESPIRATORY SYMPTOMS AMONG PRIMARY SCHOOL CHILDREN IN KOTA BHARU, KELANTAN.

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### ABSTRACT

In recent years, there has been concern that non-smokers may also be at risk from secondhand smoke exposure, especially children. This study was done to determine the prevalence of secondhand smoke exposure at home and the association between secondhand smoke exposure and respiratory symptoms among primary schoolchildren in Kota Bharu, Kelantan. This was a comparative cross-sectional study involving children, aged 10-12 years. A structured questionnaire was used to obtain the information on sociodemographic, respiratory symptoms and smokers in the house. A random sample of 10 from 95 primary schools in Kota Bharu was included. Six classes were randomly selected from each school, two classes each from each school year of primary 4-6. A total of 795 children completed the questionnaire during September 2003 till March 2004. 386 of children (48.6%) were boys and 409 children (51.4%) were girls. Most of the children were Malay (99.9%). A total of 442 (55.6%) children lived with at least 1 smoker in the house mainly from the smoking fathers. Significantly increased odds ratios due to secondhand smoke exposure were observed for most of the respiratory symptoms. The odds ratios (95% confidence interval) were 1.67 (1.18, 2.39) for cough in the morning, 1.59 (1.10, 2.30) for cough at night, 1.76 (1.16, 2.65) for cough most days for the previous 3 months, 1.57 (1.14, 2.17) for phlegm in the morning, 1.49 (1.08, 2.07) for phlegm during daytime or at night, 1.38 (1.03, 1.86) for nose problems in the morning, 1.40 (1.03, 1.90) for nose problems at night and 1.78 (1.14, 2.78) for throat problems at night, 1.55 (1.06, 2.26) for ever wheeze or diagnosed asthma by doctor, 1.57 (1.05, 2.36) for throat problems in the morning and 1.81 (1.15, 2.85) for throat problems during daytime. The odds ratios increased with increasing number of smokers at home for cough in the morning, cough most days for the previous 3 months, phlegm in the morning, ever wheeze or diagnosed asthma by doctor, throat problems in the morning, throat problems during daytime and throat problems at night. In view of the significant health risks posed to children by secondhand smoke, public health policies are needed to protect this vulnerable population. The aim of such policies is to ensure the right of every child to grow up in an environment free of tobacco smoke.

### INTRODUCTION

Secondhand smoke is derived from a mixture of side-stream smoke and mainstream smoke. Side-stream smoke contains considerably higher concentrations of many carcinogenic and toxic substances than the mainstream smoke (US EPA, 1992). Exposure to secondhand smoke is defined as the exposure of a person to tobacco combustion products from smoking by others (US DHHS, 1984). Exposure to secondhand smoke is also used to describe exposure of a fetus to tobacco combustion products and/or their metabolites from an actively or passively smoking mother (Spitzer *et al.*, 1990). Given that more than a thousand million adults smoke worldwide, WHO estimated that around 700 million, or almost half of the world's children

breathe air polluted by tobacco smoke, particularly at home (WHO, 1997). When the exposure was classified into numbers of household smokers, Lam *et al.* (1999) in Hong Kong found that 32.9% of the children were living with one smoker, 8.6% with two smokers, 2.5% with three smokers, 1.3% with 4 smokers and 2.1% with 5 or more smokers. Respiratory diseases are a major health burden in children. An estimated 150,000-300,000 case of lower respiratory tract infections in children younger than 18 months are annually attributed to secondhand smoke (US EPA, 1992). In Malaysia, symptoms of upper respiratory tract infections represented about 35% of medical problems among adolescents who seek treatment from health clinics in certain districts (MOH, 2000). Many studies have shown that secondhand smoke exposure can cause respiratory ill health in children. For example, Strachan & Cook (1997) found that in households where both parents smoked, young children have a 72 % increased risk of respiratory illnesses. Lam *et al.* (1999) found that in never smokers who were exposed to secondhand smoke, there was an increased risk of throat problems, any cough, any phlegm, ever

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wheezing and nose problems. The excess risks ranged from 15 to 46%. The odds ratios for the symptoms increased with increasing number of smokers at home. These results suggested a 'dose-response relationship' and provided strong evidence that the association between respiratory ill health and secondhand smoke exposure was likely to be causal. The objectives of the present study were to determine the prevalence of secondhand smoke exposure at home among primary school children in Kota Bharu, Kelantan and to determine the association between secondhand smoke exposure and respiratory symptoms among them.

## **METHODS**

A comparative cross-sectional study was conducted to determine the association between secondhand smoke exposure at home and respiratory symptoms. Ten out of ninety five government primary schools in Kota Bharu were selected by simple random sampling. For each school, two classes were randomly selected from each primary four, five and six. All children who were consented by parents or guardian and fulfilled the inclusion criteria were included in the study. A questionnaire was used in this study which consisted of 2 sections. The first section of the questionnaire was answered by the children in the classroom with the guidance from the researcher. It required responses on name, sex, race, class and school, respiratory symptoms and secondhand smoke exposure of the children. Questions on respiratory symptoms were adapted and translated from the Medical Research Council Respiratory Questionnaire 1986. Minor changes were made to several questions in the questionnaire to suit the local situation. The second section of the questionnaire was answered by parents or **guardian**. It required responses on sociodemographic, medical history of the children and household smoking status. Data collection commenced in September 2003 and data collection was completed in March 2004. Data analysis was done using Stata Intercooled 7.0 software. Children were classified as exposed to secondhand smoke at home when at least one household member smoked (**Lam** et al., 1999). Simple logistic regression and Multiple logistic regression were used to determine the association between secondhand smoke exposure and respiratory

symptoms among schoolchildren and the confounders selected were sex, class, family history of asthma, parental educational status and family income.

## **RESULTS**

A total of 795 children from ten selected government primary schools in Kota Bharu were included in this study. A total of 386 of children (48.6%) were boys and 409 children (51.4%) were girls. The distribution by class was: Primary 4; 35.3%; Primary 5; 29.9% and **Primary 6**; 34.7%. Most of the children were Malay (99.9%) with only 1 Indian child who was included in this study. There was no Chinese child. There were 358 (45%) children who lived with 1 smoker, 73 (9.2%) lived with 2 smokers, 9 (1.1%) lived with 3 smokers and 2 (0.3%) lived with 4 smokers in the household. A total of 442 (55.6%) children lived with at least 1 smoker in the house. There were 389 (48.9%) children having currently smoking fathers. None of the mothers smoked. Table 1 shows the prevalence and risks of respiratory symptoms in exposed and non-exposed children to secondhand smoke at home. The most prevalent symptom among the exposed group was nose problems in the morning (48.2%). The least prevalent symptom among the same group was throat problems during daytime (15.8%). For the unexposed children, the most prevalent symptom was also nose problems in the morning (41.1%) and the least prevalent symptom was also throat problems during daytime (9.1%). At multivariate level, 11 respiratory symptoms were significantly associated with secondhand smoke exposure. Only nose problems during daytime were not associated with the exposure. The odds ratios (95% confidence interval) were 1.67 (1.18, 2.39) for cough in the morning, 1.59 (1.10, 2.30) for cough at night, 1.76 (1.16, 2.65) for cough most days for the previous 3 months, 1.57 (1.14, 2.17) for phlegm in the morning, 1.49 (1.08, 2.07) for phlegm during daytime or at night, 1.38 (1.03, 1.86) for nose problems in the morning, 1.40 (1.03, 1.90) for nose problems at night and 1.78 (1.14, 2.78) for throat problems at night, 1.55 (**1.06, 2.26**) for ever wheeze or diagnosed asthma by doctor, 1.57 (1.05, 2.36) for throat problems in the morning and 1.81 (1.15, 2.85) for throat problems during daytime.

Table 1 Prevalence and risks of respiratory symptoms among exposed and unexposed children to **secondhand smoke**

<i>Symptoms</i>	<i>Exposed No (%)</i>	<i>Non exposed No (%)</i>	<i>Crude OR 95% CI</i>	<i>Adjusted OR 95% CI</i>
1. Cough morning				
Yes	119 (26.9)	66 (18.7)	1.60	1.67
No	323 (73.1)	287 (81.3)	(1.14, 2.25)	( 1.18, 2.39)
2. Cough night				
Yes	117 (26.5)	66 (18.7)	1.56	1.59
No	325 (73.5)	287 (81.3)	(1.11, 2.20)	(1.10, 2.30)
3. Cough 3 months				
Yes	99 (22.4)	46 (13.0)	1.93	1.76
No	343 (77.6)	307 (87.0)	(1.32, 2.82)	(1.16 2.65)
4. Phlegm morning				
Yes	152 (34.4)	85 (24.1)	1.65	1.57
No	290 (65.6)	268(75.9)	(1.21, 2.26)	(1.14 2.17)
5. Phlegm day or night				
Yes	130 (29.4)	77 (21.8)	1.49	1.49
No	312 (70.6)	276 (78.2)	(1.08, 2.07)	(1.08, 2.07)
6. Ever wheeze or diagnosed asthma				
Yes	93 (21.0)	51 (14.4)	1.58	1.55
No	349 (79.0)	302 (85.6)	(1.08, 2.95)	(1.06, 2.26)
7. Nose problems morning				
Yes	213 (48.2)	145 (41.1)	1.33	1.38
No	229 (51.8)	208 (58.9)	(1.00, 1.77)	(1.03, 1.86)
8. Nose problems daytime				
Yes	168 (38.0)	111 (31.4)	1.34	1.34
No	274 (62.0)	242 (68.6)	(0.99, 1.80)	(0.99, 1.80)
9. Nose problems night				
Yes	182 (41.2)	120 (34.0)	1.36	1.40
No	260 (58.8)	233 (66.0)	(1.02, 1.82)	(1.03, 1.90)
10. Throat problems morning				
Yes	80 (18.1)	45 (12.7)	1.51	1.57
No	362 (81.9)	308 (87.3)	(1.02, 2.25)	(1.05, 2.36)
11. Throat problems daytime				
Yes	70 (15.8)	32 (9.1)	1.89	1.81
No	372 (84.2)	321 (90.0)	(1.21, 2.94)	(1.15, 2.85)
12. Throat problems at night				
Yes	75 (17.0)	35 (9.9)	1.86	1.78
No	367 (83.0)	318 (90.1)	(1.21, 2.88)	(1.14, 2.78)

The associations between secondhand smoke exposure and the respiratory symptoms were further compared according to number of household smokers (no smoker, 1 smoker and two or more smokers). The odds ratios increased with increasing number of smokers at home for cough in the morning, cough most days for the

previous 3 months, phlegm in the morning, ever wheeze or diagnosed asthma by doctor, throat problems in the morning, throat problems during daytime and throat problems at night. No increased in odds ratio observed for cough at night, phlegm during daytime or at night, nose problems at any time (table 2).

Table 2 Adjusted odds ratios (OR) for respiratory symptoms by number of smokers at home

Symptoms	0 smoker	1 smoker	1 2 smokers
		OR (95% CI)	OR (95% CI)
1. Cough, morning	1.00	1.51 (1.06, 2.17)	2.22 (1.31, 3.76)
2. Cough, night	1.00	1.62 (1.11, 2.36)	1.48 (0.80, 2.71)
3. Cough for 3 months	1.00	1.76 (1.15, 2.70)	2.34 (1.18, 4.23)
4. Phlegm, morning	1.00	1.48 (1.06, 2.07)	2.04 (1.23, 3.41)
5. Phlegm, day or night	1.00	1.49 (1.06, 2.09)	1.52 (0.90, 2.58)
6. Ever wheeze or diagnosed Asthma	1.00	1.48 (0.99, 2.20)	1.88(1.05, 3.36)
7. Nose problem, morning	1.00	1.47 (1.08, 2.00)	1.02 (0.61, 1.71)
8. Nose problem, daytime	1.00	1.34 (0.98, 1.83)	1.31(0.80, 2.17)
9. Nose problem, night	1.00	1.38 (1.02, 1.87)	1.23 (0.75, 2.01)
10. Throat problem, morning	1.00	1.45 (0.95, 2.22)	2.20 (1.18, 4.08)
11. Throat problem, daytime	1.00	1.74 (1.09, 2.79)	2.11 (1.08, 4.11)
12. Throat problem, night	1.00	1.71 (1.07, 2.71)	2.17 (1.10, 4.27)

## DISCUSSION

In this study the exposure was measured by questionnaire and Jennifer A. Seifert *et al.* (2002) has proved that a questionnaire survey reflected the child's exposure to secondhand smoke and the survey was sensitive to varying levels of exposure. Assuming that the smoking family members did smoke at home this study found that 55.6% of the children were exposed to at least one smoker at home mainly from the father. None of the children have a smoking mother. When categorized into number of smoking household, 45% children lived with 1 smoker, 9.2% lived with 2 smokers, 1.1% lived with 3 smokers and 0.3% lived with 4 smokers. The prevalence of secondhand smoke exposure among children in this study was comparable to other studies in other countries. For example, WHO estimated that almost half of the world's children breathe air polluted by tobacco smoke, particularly at home. Lam *et al.* (1999) in Hong Kong also observed about 47% of the children exposed to secondhand smoke particularly at home. This study found a number of statistically significant associations between secondhand smoke exposure and respiratory symptoms among children. Significant associations were seen for cough in the morning (OR=1.67), cough at night (OR=1.59), cough most days for the previous 3 months (OR=1.76), phlegm in the morning (OR=1.57), phlegm during daytime or at night (OR=1.49), nose problems in the morning (OR=1.38), nose problems at night (OR=1.40), throat problems at night (OR=1.78), ever wheeze or diagnosed asthma by doctor (OR=1.55) throat problems in the morning (OR=1.57) and throat problems during daytime (OR=1.81). No significant odds ratios observed

for nose problems during daytime. In this study, ever wheeze or diagnosed asthma was combined because it was felt that 'doctor diagnosed asthma' alone was inappropriate since a large number of Malaysian children with symptoms may not have been diagnosed by a doctor giving rise to possible bias. Most of the studies focused on the symptom of cough, phlegm and wheeze only. The US EPA review considered cough, phlegm and wheezing particularly in infants and preschool children and the estimated odds ratio were between 1.1-2.0. Lam *et al.* (1998) included throat problems (frequent itchy or sore throat of throat discomfort) and nose problems (frequent blocked or runny nose) in secondary schoolchildren. This finding provided additional evidence to support a causal relationship between secondhand smoke exposure and throat problems and possibly an association between secondhand smoke exposure and nose problems in older school children. Many studies which showed a positive association between secondhand smoke exposure and respiratory symptoms also demonstrated a dose-response relationship for example; Lam *et al.* (1999) showed that the adjusted odds ratio increased with increasing number of smokers at home for throat problems, cough, phlegm and nose problems. This study also observed a dose response relationship for cough in the morning, coughs most days for the previous 3 months, phlegm in the morning, ever wheeze or diagnosed asthma by doctor, throat problems in the morning, throat problems during daytime and throat problems at night This study has been designed with much thought and care to obtain valid results as far as possible. However, there were limitations which were beyond the control of the author and scope of the study. The main limitation of the study was that the smoking

status of the children was not asked in the questionnaire. This is because it is a very sensitive issue and the children may not give a valid answer to the question. The second limitation was the cross-sectional design of the study. Because passive smoking and respiratory symptoms were measured at the same time, the time sequence of the associations observed could not be ascertained definitively. Other sources of indoor air pollution such as cooking stoves and domestic insect repellents were not included. In view of the significant health risks posed to children by secondhand smoke, public health policies are needed to protect this vulnerable population. The aim of such policies is to ensure the right of every child to grow up in an environment free of tobacco smoke. Government has a responsibility to legislate and to enforce the legislation to control exposure to secondhand smoke in public places. Legislation is of limited value in reducing exposure in private homes. Educational strategies including education about the risks to children from secondhand smoke exposure and steps to eliminate exposure are likely to be more effective in these setting.

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