

PREVALENCE OF ASTHMA, RHINITIS, AND ECZEMA AMONG CHILDREN IN VIENTIANE CITY, LAO PDR

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Abstract. An International Study of Asthma and Allergy in Childhood (ISAAC) revealed a wide range of prevalences of childhood asthma in the world. Lao PDR had no such epidemiological data yet. This study aimed to investigate the epidemiology of asthma, rhinitis, and eczema in children in the country. A cross-sectional study was conducted in Vientiane City, the capital of Lao PDR, in 1997 using the ISAAC questionnaire. From three primary schools and one high school, 395 children, age 6-7 years, and 468 children, age 13-14 years, were chosen. The prevalence of asthma for children aged 13-14 years in Lao PDR was 25.6%, which ranks the highest in international asthma prevalence. The prevalence in allergic-rhinoconjunctivitis of children was 24.4% and atopic eczema was 7.1%. Contrary to generally accepted risk factors, there were no associations revealed between asthma prevalence and smoking of family members (especially mothers), intake of fish/meat, and male gender.

INTRODUCTION

During the last 30 years the prevalence of childhood asthma and other allergic diseases around the world, especially in developed countries, has increased substantially (Robertson *et al*, 1991; Ninan and Russell, 1992; Crain *et al*, 1994; Peat *et al*, 1994). An increasing trend has also been reported for Asian countries, such as Taiwan (Hsieh and Shen, 1988), Singapore (Goh *et al*, 1996) and Thailand (Vichanond *et al*, 1998). Nishima (2002) reported the epidemiology of asthma in 11 prefectures of western Japan targeting 50,000 children using the same questionnaire. Childhood asthma increased 1.4 fold from

1982 to 1992, and 2.0 fold from 1982 to 2002 (Nishima, 2002).

In a worldwide International Study of Asthma and Allergy in Childhood (ISAAC) phase I study using a standardized questionnaire for children in 155 locations in 56 countries, a wide range of prevalences of childhood asthma, allergic rhinoconjunctivitis, and atopic eczema were found (ISAAC, 1998). In that study, the highest prevalences of asthma were reported from the UK, New Zealand, Australia, Republic of Ireland, Canada, Peru, Costa Rica, Brazil, and USA, suggesting these western countries have environmental factors which may contribute to the high prevalence. The prevalence in Asian countries ranged widely: Japan, Thailand, Hong Kong, Philippines had a middle prevalence of 12.3-13.4%; Singapore, Malaysia, and South Korea were 7.7-9.7%; and Taiwan and China had lower prevalences of 5.2% and 4.2%, respectively (Stewart *et al*, 2001).

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Thailand, a neighboring country of Lao PDR, participated in the ISAAC phase I study, and found an increasing trend of prevalence over a period of less than a decade (Vichanond *et al*, 1998). This data is useful since Lao PDR and Thailand have similarities in culture, ethnicity and lifestyle.

Lao PDR did not participate in the ISAAC. For years, the people have enjoyed a traditional lifestyle, living in wooden houses, being surrounded by nature, and eating traditional sticky rice as staple diet. Therefore, the risk factors for asthma may have been fewer. The country adopted a market economy in 1986 (Nishizawa, 2003), with an influx of western foods, people and vehicles into the country. Dramatic changes in society toward westernization may trigger asthma and other allergic diseases (Zhao *et al*, 2000). Nevertheless, there has been no research on asthma in the country.

This study aimed to describe the epidemiology of asthma, rhinitis and eczema in children living in Vientiane City, Lao PDR, which may be used as basic information for further research to explore causes of asthma in the country.

MATERIALS AND METHODS

Study subjects

A cross-sectional study was conducted in Vientiane City, the capital of Lao PDR, from November 23 to 28, 1997. As shown in Table 1, study children were chosen randomly using a student list from three primary schools and one high school in Vientiane City. There were 395 children age 6-7 years (99 from Kaoyort public school, 104 from Nahaidew public school and 192 from Sinxay private school) and 468 children age 13-14 years from the High School of Vientiane (public school). Most of the subjects were ethnic Lao Loum (low land), with a minority being Lao Theung (middle-land) and Lao Sung (high-land).

Table 1
Characteristics of study children.

	6-7 years (n=395) n (%)	13-14 years (n=468) n (%)
Gender		
Boy	213 (54.6)	185 (39.7)
Girl	177 (45.4)	281 (60.3)
No answer	5 (-)	2 (-)
Ethnicity		
Lao Loum	366 (92.7)	463 (98.9)
Lao Theung	15 (3.8)	1 (0.2)
Lao Sung	14 (3.5)	4 (0.9)

Data collection

The ISAAC questionnaire consisted of three one-page modules with questions used to determine the prevalence of wheezing, asthma, rhinitis, and eczema and their characteristics (Vichanond *et al*, 1998; ISAAC, 1998). The questions were considered a minimum set for inclusion in a self-completed or interview-administered questionnaire. For this study, questions regarding ethnicity, smoking history, and food were also included to explore the risk factors for asthma. The original English questionnaire was translated into Lao by a Laotian pediatrician in the research team. Children age 13-14 years answered the questions themselves; for those age 6-7 years, their parents answered the questions. For both age groups, simple one-page, questionnaires were used to assess symptoms of asthma, allergic rhinoconjunctivitis and atopic eczema. A video asthma questionnaire designed by ISAAC was also used for the interviews with the children age 13-14 years. The components of questionnaires were slightly different by age group as below:

Children age 6-7 years. For the younger age group, the following were used: the ISAAC questionnaire for wheezing, asthma, rhinitis, and eczema and a questionnaire regarding

ethnicity, smoking and diet.

Children age 13-14 years. For the older age group, the following questionnaire were used: the ISSAC questionnaire for wheezing, asthma, rhinitis, and eczema; a questionnaire regarding ethnicity, smoking and diet; and a video questionnaire (10 minutes) regarding the symptoms of asthma, designed by ISSAC.

The research team consisted of a Lao-tian chief pediatrician, a nurse from a pediatric ward of a national hospital, and two Japanese pediatricians who were members of the Japanese Pediatric Allergic Society.

Data analysis

All the data were entered and analyzed

using SPSS (version 7.5). For statistical comparison, the χ^2 test was applied and $p < 0.05$ was taken as the level of significance.

Ethics

Ethical approval was obtained from the Ministry of Health in Lao PDR. In addition, informed consent was obtained from the study children or their parents before starting the interviews.

RESULTS

Prevalence of wheezing and asthma

Table 2 shows the distribution of children with asthma related symptoms. The prevalence of ever wheezing was 13.7% (48/351) in children age 6-7 years and 30.4% (133/437)

Table 2
Prevalence of wheezing and asthma among study children.

	6-7 years n (%)	13-14 years n (%)
Q1. Have you ever had wheeze/whistling?	n=395	n=468
Ever wheeze	48 (13.7)	133 (30.4)
In the past 12 months	32 (9.1)	112 (25.6)
Before	16 (4.6)	21 (4.8)
Never	271 (86.3)	304 (69.6)
No answer	44 (-)	31 (-)
<i>"If had wheeze in the past 12 month in Q1..."</i>	n=32	n=112
How many times?		
> 12 times	21 (65.6)	23 (20.5)
4-12 times	2 (6.3)	18 (16.1)
< 4 times	9 (28.1)	70 (63.4)
Wheeze affecting sleep		
Yes (\geq one time/week)	12 (37.5)	14 (12.5)
Yes (< one time/week)	17 (53.1)	28 (25.0)
Never	3 (9.4)	70 (62.5)
Experienced severe wheezing limiting speech		
Yes	21 (65.6)	38 (33.9)
No	11 (34.4)	74 (66.1)
Q2. Have you ever been diagnosed with asthma?	n=395	n=468
Yes	29 (8.3)	19 (4.3)
No, but had exercise-induced wheeze	34 (9.7)	186 (42.6)
No, but had night cough	54 (15.4)	89 (20.3)
No	234 (66.6)	143 (32.8)
No answer	44 (-)	31 (-)

Table 3
Prevalence of rhinitis among study children.

	6-7 years n (%)	13-14 years n (%)
Q1. Have you ever had sneeze or runny/blocked nose?	n=395	n=468
Ever sneeze	112 (31.0)	277 (61.0)
In the past 12 months	96 (26.7)	223 (49.1)
Before	16 (4.3)	54 (11.9)
Never	249 (69.0)	177 (39.0)
No answer	34 (-)	14 (-)
<i>"If had sneeze in the past 12 month in Q1..."</i>	n=96	n=223
With itchy-watery eyes		
Yes	56 (58.3)	111 (49.8)
No	40 (41.7)	112 (50.2)
Symptoms interfering with daily activities		
Yes	27 (28.1)	45 (20.2)
No	69 (71.9)	178 (79.8)
Q2. Have you ever been diagnosed with hayfever?	n=395	n=468
Yes	136 (37.7)	224 (49.3)
No	225 (62.3)	230 (50.7)
No answer	34 (-)	14 (-)

in those age 13-14 years. The prevalence of wheezing in the past 12 months was also higher in older age group (25.6%) than in the younger group (9.1%). Among those with wheeze in the past 12 months, younger children had wheeze more frequently. Percents of children with wheeze >12 times in the previous year were 65.6% among those age 6-7 years, and 20.5% among those age 13-14 years. Younger children were more likely, than older ones, to have wheeze affecting sleep (90.6% in 6-7 years, 37.5% in 13-14 years), as well as severe wheeze limiting speech to only one or two words at a time between breaths (65.6%, 33.9%).

The percent of children who had ever been diagnosed with asthma was 8.3% in children age 6-7 years and 4.3% in those age 13-14 years. On the other hand, exercise-induced wheeze in the past 12 months was more likely to be reported by older children (42.6%) than younger ones (9.7%). Dry cough

at night, apart from a cough associated with a cold or chest infection, was reported by 54 younger children (15.4%) and 89 older children (20.3%), respectively.

For children age 13-14 years, a video questionnaire was also given, to see if they had ever experienced similar symptoms to those shown in the video. Of 456 children, 51 (11.2%) previously had breathing like that. The percent of those who had similar breathing difficulties in the past one year was 8.8% (40/456), and the percent of those who had the same symptoms during the previous month was 3.3% (15/456). Three hundred forty-nine (76.5%) have ever experienced exercise-induced wheezing, and 15 (3.3%) had been awoken in the night due to wheezing symptoms.

Prevalence of rhinitis

Table 3 shows the distribution of children with rhinitis symptoms. The prevalence of ever-sneezing or having a runny/blocked nose apart

Table 4
Prevalence of eczema-related symptoms among study children.

	6-7 years n (%)	13-14 years n (%)
Q1. Have you ever had an itchy rash lasting for 6 months?	n=395	n=468
Ever rash	94 (27.6)	70 (16.1)
In the past 12 months (eczema-specific sites)	42 (12.3)	31 (7.1)
In the past 12 months (at other sites)	47 (13.8)	39 (9.0)
Before	5 (1.5)	0 (-)
Never	247 (72.4)	365 (83.9)
No answer	54 (-)	33 (-)
<i>"If had rash at eczema-specific sites in Q1..."</i>	n=42	n=31
Rash cleared in the past 12 months		
Yes	31 (73.8)	28 (90.3)
No	11 (26.2)	3 (9.7)
Q2. Have you ever been diagnosed with eczema?	n=395	n=468
Yes	31 (9.1)	30 (6.8)
No	310 (90.9)	405 (93.2)
No answer	54 (-)	33 (-)

from cold/flu was 31.0% (112/361) in the children age 6-7 years and 61.0% (277/454) in those age 13-14 years. The prevalence of sneeze or runny/blocked nose in the past 12 months was also higher in the older age group (49.1%) than in the younger group (26.7%). Of those with sneeze during the previous 12 months, the percentage of children with a history of itchy, watery eyes was 58.3% in the younger children and 49.8% in older ones. Symptoms interfering with daily activities at moderate or high levels were reported in 27 younger children (28.1%) and 45 older children (20.2%).

The percentage of children ever diagnosed with hay fever was 37.7% (136/361) in children age 6-7 years and 49.3% (224/454) in those age 13-14 years.

Prevalence of eczema

Table 4 shows the distributions of children with eczema related symptoms. The percentage of having an itchy intermittent rash for at least 6 months was 27.6% (94/341) in

the children age 6-7 years and 16.1% (70/435) in those age 13-14 years. The percentage of children with an itchy rash at any time during the previous 12 months at any eczema-specific sites (the folds of the elbows, behinds the knees, in front of the ankles, under the buttocks, or around the neck/ears/eyes) was 12.3% (42/341) in younger children and 7.1% (31/435) in older ones. The percentage of children with an itchy rash affecting other sites was 13.8% in younger children and 9.0% in older children. Of those which a rash in the previous 12 months, 73.8% in younger children and 90.3% in older children completely cleared the rash during the previous 12 months.

The percentage of children who had ever been diagnosed as eczema was 9.1% (31/341) in children age 6-7 years and 6.8% (30/435) in those age 13-14 years.

Factors affecting the asthma and other diseases

The possible risk factors for asthma, passive smoking and allergen-containing diets,

Table 5
Influencing factors for asthma and other allergies.

	6-7 years (n=395) n (%)	13-14 years (n=468) n (%)
Family members smoking		
Yes	137 (36.2)	147 (32.1)
No	241 (63.8)	311 (67.9)
No answer	17 (-)	10 (-)
Does the child like eggs?		
Yes	326 (86.7)	401 (88.7)
No	50 (13.3)	51 (11.3)
No answer	19 (-)	16 (-)
Frequency of meat/fish intake		
Eat meat > fish	203 (58.0)	241 (52.4)
Eat fish > meat	147 (42.0)	219 (47.6)
No answer	45 (-)	8 (-)

are shown in Table 5. The percentage of children with smoking family members, most of whom were fathers or grandfathers/grandmothers, was 36.2% (137/378) in children age 6-7 years and 32.1% (147/458) in those age 13-14 years. In this study, there were very few smoking mothers (n=16). Among older children, 3 (2.0%) smoked.

Questions regarding the consumption of eggs, meat and fish were asked. Most children stated they liked eggs (86.7% of the younger children and 88.7% of older ones). The percentage of those ate meat more than fish was 58% (203/350) in younger children and 52.4% (241/460) in older ones.

The association between asthma prevalence and risk factors, including gender/ethnicity, was examined. For children age 6-7 years, ethnicity and preference of eggs had significant associations, where Lao Tunes had the highest asthma prevalence followed by Lao Soung ($p<0.05$). Those who did not like eggs had a higher prevalence ($p<0.05$). For the children age 13-14 years, a gender difference was detected with girls having a significantly higher

asthma prevalence than boys ($p<0.05$). In neither age group was an association detected between smoking of family members (especially mothers) and asthma on the intake of meat and fish and asthma.

DISCUSSION

As far as we know, this is the first epidemiological study of allergic diseases in Lao PDR. Because we used the same methodology as the global epidemiological study on allergic diseases by ISAAC (1998), our data can be analyzed more accurately by comparing factors of the country's location, living conditions, and ethnicities with other countries.

The prevalence of wheeze in children age 13-14 years was 25.6%. This is categorized as a high percentage compared to other countries evaluated in the ISAAC study. Other high prevalence groups included: the UK (32.2%), New Zealand (30.2%), Australia (29.4%), Republic of Ireland (29.1%), Canada (28.1%), Peru (26.0%), Costa Rica (23.7%), Brazil (24.0%), and the USA (21.7%). This prevalence was higher than in most Asian countries: Ja-

pan (13.4%), Thailand (13.0%), Hong Kong (12.4%), Philippines (12.3%), South Korea (7.7%), Taiwan (5.2%), China (4.2%), and Indonesia (2.1%). Those children were born in 1986 or 1987 when the influx of western lifestyle into Lao PDR started abruptly. Such a lifestyle may have influenced the prevalence of asthma in those children. Comparing the prevalence determined by the video questionnaire, the children in Lao PDR had a prevalence of 11.2%, which is smaller than other countries in highest prevalence, such as Peru (18.5%), New Zealand (18.4%), Australia (17.6%), and Uruguay (15.0%), and similar to some Asian countries, such as Japan (10.2%), Hong Kong (10.1%), Singapore (9.9%), Philippines (9.6%) and Thailand (9.6%). This discrepancy between written and video questionnaires of the prevalence in Lao PDR may be due to language factors (translated into Lao language from the original English version), as suggested by the ISAAC report (ISAAC, 1998).

Compared with the prevalence in Thailand (Vichanond *et al*, 1998), where the culture and ethnicity are similar to Lao PDR, Lao PDR had a lower prevalence in the 6-7 year age group (9.1% in Lao PDR vs 11.7% in Thailand), and higher prevalence in the 13-14 year age group (25.6% vs 13.6%). The difference between the two age groups in Thailand was smaller, suggesting that Thailand has already been exposed to a western lifestyle for decades, affecting both age groups equally as well as mothers. Thailand also had an increase in the prevalence of asthma from 4.29% (9-10 years) in 1990 to 11.7% (6-7 year olds) and 13.6% (14-15 year olds) in 1995 (Vichanond *et al*, 1998), suggesting the prevalence in Lao PDR is increasing and the difference in prevalence between the two age groups may be narrowing. Further epidemiological studies are needed to confirm this.

Asthma severe enough to limit speech accounted for a large proportion of the asthmatics in both age groups (65.6% of the 6-7

year olds and 33.9% in the 13-14 year olds) among children with wheeze in the past 12 months, but a smaller proportion in the Thailand study (15.4% vs 29.4%) (Vichanond *et al*, 1998). Japanese studies of asthma death rates for children age 5-19 years found two peaks in 1970 and 1985-1995. The factors contributing to death were: 1) delays in receiving appropriate medical care due to misjudgment of the severity of the attacks and over reliance on β 2 antagonist MDI, and 2) unexpected exacerbation of asthma (JSPACI, 2002; IAAI, 2005). This suggests that pediatricians in Lao PDR needs to recognize the severity of asthma in patients, although deaths were not ever experienced in the hospitals according to the chief pediatrician of this study team. The figure of 65.6% of asthmatics having 12 or more attacks in the past 12 months also predicts an increasing number of severe cases. The rate of diagnosis of asthma was lower, especially in older children, than the prevalence of wheezing symptoms in the past 12 month (8.3% vs 9.1% in younger children, 4.3% vs 25.6% in older children), indicating low access rates for older children with wheeze to medical facilities. Hidden cases exist in the community.

The prevalence of allergic rhinoconjunctivitis in children age 13-14 years in Lao PDR was 24.4% (111/454), which is categorized in the high group in global prevalence: Nigeria (39.8%), Paraguay (34.5%), Malta (28.9%), Hong Kong (24.0%), Argentina (22.8%), and Canada (20.0%). The prevalences in Asian countries were: Thailand (15.5%), Japan (14.8%), Malaysia (13.7%), Taiwan (11.3%), South Korea (10.2%), China (7.2%), and India (5.6%) (Stewart *et al*, 2001). There may be criticism of the validity of this study because Lao PDR, which still preserves a traditional lifestyle, has a higher prevalence of asthma than most newly industrialized nations of Asia. Lao PDR and Thailand have a similar high prevalence in "ever sneeze" symptoms (31% vs 37.5% for

younger children, 61% vs 50.6% for older children). Allergic rhinoconjunctivitis in Lao PDR is more common than in Thailand according to several studies (15.5% to 24.4% vs 10.4% to 15.6%) (Vichanond *et al*, 1998; JSPACI, 2002), suggesting that there may be some factors inducing allergic rhinitis in Lao PDR.

The prevalence of atopic eczema in the past 12 months in Lao PDR was 7.1%, which ranked middle in the global prevalence: Thailand (8.2%), Peru (8.2%), Malaysia (8.0%), Panama (7.8%), Malta (7.7%), Singapore (7.4%), Argentina (7.3%), Uruguay (7.2%), Costa Rica (7.2%), Germany (6.9%), Belgium (6.7%), and Romania (6.3%), and far below the high prevalence of Caucasian countries, like UK (15.8%), Finland (15.6%), Sweden (14.5%), Republic of Ireland (13.6%), and New Zealand (12.7%), and higher than in other Asian countries: Hong Kong (2.7%), Taiwan (1.4%), Indonesia (1.2%), and China (1.2%) (Stewart *et al*, 2001). Younger children suffer this symptom more than older children (12.3% vs 7.1%). This tendency was also observed in Thailand (16% vs 9.1%), suggesting an increase in atopic eczema in the two countries facing each other across the Mekong river. The high proportion of atopic eczema cases clearing in the past 12 months (74% in younger children, 90% in older children), indicate the symptoms were still mild nature. High recovery rates were also observed in Thailand (71% in younger children, 80.2% in older children) (Vichanond *et al*, 1998). The epidemiology of atopic eczema was the most similar between Laos and Thailand of the three allergic diseases, suggesting that some common factors exist in both countries.

Concerning risk factors for asthma prevalence, the Lao Theung ethnic group had the highest risk. This may be related to relocating to the low land because of the current national policy of stopping slash-and-burn agriculture, which is a traditional way of farming in mountainous areas. However, the sample number

is too small, so no conclusions can be drawn. Contrary to reported risk factors (Odajima, 2005), younger children who disliked eggs and older male children had an increased risk. Smoking in family members (especially mothers) and intake of fish and meat had no association with asthma.

Our study was carried out in schools in Vientiane City where the students were from families with a moderate income, so the results do not represent children in the whole city.

To overcome the bias of the questionnaire (originally written in English, then translated into Lao language), we plan another study using a spirometer to diagnose asthma more precisely, targeting schoolchildren not only in Vientiane but also provinces outside this city.

In summary, our survey reveals the prevalence of asthma and allergic-rhinoconjunctivitis in Lao PDR ranked among the highest in global prevalence. The prevalence of atopic eczema ranked in the middle of global levels, similar to Thailand. The high prevalence of severe wheezing limiting speech and the high frequency of wheezing suggests urgent action is needed to set up a system of early detection, treatment and prevention of childhood asthma. Because of this first epidemiological data, further etiological research into lifestyle, environment, and medical care factors affecting these disorders has become more realistic and feasible.

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