Major Chronic Respiratory Diseases in Chiang Mai: Prevalence, Clinical Characteristics, and Their Correlations

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Objective: *To identify the prevalence, clinical characteristics, disease severity, and correlations of major chronic respiratory diseases (CRDs) among the adult population living in Chiang Mai.*

Material and Method: *A cross-sectional study was conducted with adults living in municipal areas of Chiang Mai. All clinical relevant data collected by face-to-face interview was confirmed by pulmonologists. The chest radiographic findings and post-bronchodilator spirometry were done in all subjects. The aeroallergen skin test and rhinoscopy were performed in all chronic rhinitis and asthma subjects.*

Results: *Five hundred seventy four subjects with mean age 52.9±10.0 years, 59.6% female, and 37.5% smokers were recruited. The prevalence of overall CRDs was 59.2%. Chronic rhinitis was the most prevalent chronic respiratory disease (n = 239, 41.6%), followed by asthma (n = 58, 10.1%), and chronic obstructive pulmonary disease (COPD) (n = 21, 3.7%). The most common abnormal pulmonary function test was restrictive lung disorders (n = 53, 9.6%). Asthma subjects were determined to be more allergic than chronic rhinitis subjects (58.1% vs. 39.9%, p-value = 0.033). Regarding the disease severity, 14.9% of chronic rhinitis and 10.3% of asthma subjects were classified as moderate to severe degree, whereas 81% of chronic obstructive pulmonary disease subjects were classified as moderate to very severe degrees. In asthma patients, there were positive association with chronic rhinitis (OR 3.9, 95% CI 2.1-7.0, p-value <0.001).*

Conclusion: *The prevalence of major CRDs in adults among Chiang Mai population was significantly high with overlapped respiratory symptoms and varying disease severity. Additionally, chronic rhinitis had correlation with asthma but not with COPD.*

Keywords: *Asthma, Chronic obstructive pulmonary disease, Rhinitis, Spirometry*

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Chronic respiratory diseases (CRDs) are recognized as the major cause for premature death and health problems in adult population worldwide[1]. Preventable and treatable CRDs include chronic obstructive pulmonary disease (COPD), asthma, and respiratory allergies[1]. Many risk factors for preventable CRDs were identified and efficient preventive measures were proposed. Tobacco smoking in both developed and developing countries, indoor air pollution (particularly in developing countries), allergens, and occupational agents, all are determined as preventable risk factors for CRDs with significant impact on morbidity and mortality. However, preventable CRDs and their risk factors are under-recognized, under-diagnosed, under-treated, and insufficiently prevented[2]. In Thailand, the diagnosis and treatment of CRDs are commonly implemented passively under hospital settings and may lead to high morbidity and impact on healthcare utilization. In Chiang Mai, study of respiratory health status in adult population has never been systematically studied. We therefore conducted a study on the prevalence, clinical characteristics, disease severity, and correlations of major CRDs diagnosed by pulmonologists among the adult population living in Chiang Mai designated as the Chiang Mai Lung Health (CMLH) study.

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Material and Method

Study population and design

A population-based, cross-sectional survey study was set up to evaluate CRDs in adults living in municipal areas of Chiang Mai province. The sample size was calculated from 60,000 registered population (age >40 years) living in municipal areas of Chiang Mai district, Chiang Mai. The minimal sample size of 398 was determined by using Slovin's formula[3] with

a 95% confidence interval and a two-sided type I error rate of 0.05. With approximately 60% of patients expected to deny participating in the study, we therefore planned to enroll 664 subjects. The selection of the municipal areas was performed by random-route methodology. The chosen areas were divided into several blocks, and systematic sampling of households within these randomized blocks was conducted. The subjects were randomly selected from those who lived in single houses (ratio 1:3) and only one subject per house was permitted to respond to the face-to-face interview with standardized respiratory health questionnaire by trained interviewers. The respiratory questionnaire was adapted from the European Community Respiratory Health Survey (ECRHS)[4] for information on general health, patients' dyspnea levels was measured using the modified Medical Research Council (mMRC)[5]. The issues raised by the questionnaires as well as responsiveness to questionnaires were tested in pilot groups of chronic rhinitis, asthma, and COPD subjects who attended our chest clinic before being used in the study. The study was approved by the Ethics Committees of the Faculty of Medicine, Chiang Mai University [Institutional Review Board (IRB), approval number: Med-2557-02677, date approval: 2 December 2014)] and filed under Thai Clinical Trials Registry (Study ID: TCTR20150123001, date approval: 23 January 2015).

All relevant data including age, sex, smoking history, family history of atopic diseases, respiratory symptoms, previous medical history, and diagnoses of respiratory diseases were reviewed from the written questionnaires. The subjects were invited to the pulmonary administrative office at the Maharaj Nakorn Chiang Mai hospital to confirm the information by face-to-face interview, and physically checked by pulmonologists in the study team. All study patients underwent a chest radiograph and post-bronchodilator pulmonary function test in the form of standard chest radiograph and standard American Thoracic Society (ATS)/European Respiratory Society (ERS) post-bronchodilator (BD) spirometry[6] interpreted by a radiologist and pulmonologists. The spirometric values as% predicted were calculated using the National Health and Nutrition Examination Survey (NHANES) III reference equations[7]. However, for Asians, a correction factor of 0.88 was applied to the forced vital capacity (FVC) and forced expiratory in first second (FEV_1) predicted[8]. The standardized aeroallergen skin prick test and anterior rhinoscopy were performed in all subjects diagnosed as chronic rhinitis and asthma. The allergens tested (Allertech Laboratories, Inc., Miami, Florida) were, mites (*Dermatophagoides pteronyssinus*, *Dermatophagoides farinae*), cockroaches (American cockroach, German cockroach), animal dander (cat, dog), pollens (Johnson grass, Bermuda grass, Timothy grass, grass mixed, careless weed), fungal allergens (*Alternaria*, *Cladosporium*, *Aspergillus*); a negative (normal saline) and positive control (histamine 10 mg/mL) were also included. The skin prick test was done according to standard procedure[9]. The patients who used antihistamines during the seven days before the test were excluded.

Clinical definitions

Non-ill subject referred to a subject who had no chronic respiratory symptoms, no previous diagnosis of any chronic respiratory diseases, non-smoker or smoking less than 5 pack-years, normal general physical examination, and normal chest radiograph. Asthma subject was defined by a positive history of wheezing in the past year (current wheezer), post-BD FEV_1/FVC >0.7 (for a chronic smoker >5 pack-years) or <0.7 (for a non-smoker), and no pulmonary infiltration, pleural effusion, bronchiectasis, or mass on chest radiographs. The COPD subject was defined by detection of airflow obstruction based on fixed threshold criterion (a ratio of post-BD FEV_1/FVC less than 0.7)[10] in chronic smokers of more than five pack-years with normal or abnormal chest radiographs compatible with the disease (presence of diffuse pulmonary hyperinflation with flattened diaphragms). Chronic rhinitis subject was defined as recurrent or chronic symptoms of nose blockage, posterior nasal drip, sneezing or runny nose off and on without fever in the past year. Pulmonary tuberculosis (TB) subjects were defined by history of physician-diagnosed pulmonary TB or abnormal chest radiographs compatible with the disease (fibrotic scar, fibronodular or patchy infiltration with or without thin wall cavitation in apicoposterior segment of upper lobe). The severity of chronic rhinitis, asthma, and COPD were determined by guidelines from the Allergic Rhinitis and Its Impact on Asthma (ARIA)[11], Global Initiative for Asthma (GINA)[12], and Global Initiative for Chronic Obstructive Lung Disease (GOLD)[10], respectively.

Statistical analysis

Results for numerical values were expressed as means ± SD and those for categorical data as absolute frequencies and percentages. The comparison

of the qualitative parameters in different groups were carried out by using Chi-square test. Taking into consideration the cross-sectional nature of the study, 95% confidence intervals (CI) for odds ratio (OR) was calculated to estimate the statistical significance. All results were considered statistically significant at the level of *p*-value <0.05. All analyses were carried out with the SPSS Statistical Package, Version 16 for Windows (SPSS Inc. IL, USA).

Results

Five hundred seventy four subjects were enrolled with an age of 52.9±10.0 years, 59.6% were female, and 37.5% were smokers with 16.3±16.3 pack-years. The most common co-morbidity was hypertension (n = 112, 28.5%). The baseline demographic characteristics of all subjects were shown in Table 1. Table 2 demonstrates the chest radiograph and pulmonary function test reports. The most common abnormal chest radiograph finding was perihilar calcific spots 412 (77.9%). The chest radiographs compatible with COPD (bilateral pulmonary hyperinflation with flattened diaphragms) were 20 (3.8%), with pulmonary TB 2 (0.4%), and lung mass 2 (0.4%). The most common abnormal pulmonary function tests were restrictive pattern

Table 1. Demographic characteristics of participants

Characteristics	Male (n = 232)	Female (n = 342)	Total (n = 574)
Age (years)	53.6±10.4	52.3±9.8	52.9±10.0
Age group			
40-60 years	175 (75.4)	263 (76.9)	438 (76.3)
Over 60 years	57 (24.6)	79 (23.1)	136 (23.7)
Smoking status			
Non-smoker	60 (25.9)	299 (87.4)	359 (62.5)
Current smokes	78 (33.6)	17 (5.0)	95 (16.6)
Have ever smoked	94 (40.5)	26 (7.6)	120 (20.9)
Smoking pack-year	18.3±17.0	7.8±8.5	16.3±16.3
- Smoker ≤5 pack-year	40 (23.3)	23 (53.5)	63 (29.3)
- Smoker >5 pack-year	132 (76.7)	20 (46.5)	152 (70.7)
Exposure to biomass	73 (31.5)	188 (55.0)	261 (45.6)
Co-morbidities	151 (65.1)	236 (69.0)	387 (67.4)
Cardiovascular disease	15 (9.9)	14 (5.9)	29 (7.5)
Hypertension	43 (28.5)	69 (29.2)	112 (28.9)
Diabetes mellitus	17 (11.2)	23 (9.7)	40 (10.3)
Respiratory disease	29 (19.2)	49 (20.8)	78 (20.2)
Other disease	47 (31.1)	81 (34.3)	128 (33.1)

Results are expressed as mean ± SD or n (%)

Table 2. Chest radiograph and pulmonary function test of study population

Chronic respiratory disease	Male	Female	Total
Chest radiograph	n = 212	n = 317	n = 529
Normal	42 (19.8)	38 (11.9)	80 (15.1)
Perihilar calcific spots	150 (70.8)	262 (82.6)	412 (77.9)
Compatible with COPD	15 (7.1)	5 (1.6)	20 (3.8)
Tuberculosis	1 (0.5)	1 (0.3)	2 (0.4)
Lung mass	0	2 (0.6)	2 (0.4)
Other	4 (1.9)	9 (2.8)	13 (2.5)
Pulmonary function test (post-BD)	n = 229	n = 325	n = 554
Normal	192 (83.8)	277 (85.2)	469 (84.7)
Obstructive pattern by ratio FEV_1/FVC <0.7	19 (8.3)	6 (1.8)	25 (4.5)
Restrictive pattern	13 (5.7)	40 (12.3)	53 (9.6)
Mixed obstruction and restrictive pattern	5 (2.2)	2 (0.6)	7 (1.3)

BD = broncodilator; FEV_1 = forced expiratory volume in first second; FVC = forced vital capacity; COPD = chronic obstructive pulmonary disease
Results are expressed as n (%)

53 (9.6%), followed by obstructive pattern 25 (4.5%), and mixed obstruction and restriction pattern 7 (1.3%). The prevalence of CRDs diagnosed by previous physicians and current pulmonologists was shown in Table 3. The prevalence of chronic rhinitis, asthma, and COPD were significantly higher with the current pulmonologist diagnoses (p-value <0.001).

Comparison of the respiratory symptoms and pulmonary function among subjects with chronic rhinitis, asthma, and COPD were shown in Table 4. The respiratory symptoms were mostly overlapped among the three diseases. However, the nasal symptoms, wheezing, and low lung function were significantly different among chronic rhinitis, asthma, and COPD,

Table 3. Prevalence of previous physician-diagnoses vs. current pulmonologist-diagnoses of chronic respiratory diseases

Chronic respiratory diseases	Previous-physician diagnoses n = 574	Current pulmonologist-diagnoses n = 574	p-value
Non-ill	NA	234 (40.8)	-
Pulmonary disease before age 16	23 (4.0)	NA	-
Pneumonia	35 (6.1)	NA	-
Chronic bronchitis	18 (3.1)	NA	-
Lung mass	NA	1 (0.2)	-
Other respiratory disease	NA	5 (0.8)	-
Tuberculosis	14 (2.4)	16 (2.8)	0.157
Chronic rhinitis	129 (22.5)	239 (41.6)	<0.001
COPD	5 (0.9)	21 (3.7)	<0.001
Asthma	22 (3.8)	58 (10.1)	<0.001

NA = not available data
Results are expressed as n (%)

Table 4. Respiratory symptoms and lung function in subjects with chronic respiratory diseases

Characteristics	Chronic rhinitis (n = 239)	Asthma (n = 58)	COPD (n = 21)	p-value
Recurrent or chronic nasal symptoms (nose blockage, posterior nasal drip, sneeze, running nose) without flu	229 (95.7)[a,b]	42 (72.4)[c]	4 (19.0)	<0.001
Cough				
≥3 weeks	21 (8.7)	9 (15.5)	2 (9.5)	0.326
≥3 months	10 (4.3)	5 (8.6)	2 (9.5)	0.347
Phlegm				
≥3 weeks	40 (16.6)	16 (28.6)	5 (23.8)	0.134
≥3 months	26 (11.1)	9 (15.5)	5 (23.8)	0.158
Cough + phlegm ≥3 months	4 (1.6)[b]	3 (5.2)	2 (9.5)	0.077
Current wheeze	22 (9.2)[a,b]	52 (89.7)[c]	9 (42.9)	<0.001
mMRC dyspnea score				
0-1	216 (90.2)[a]	44 (75.9)	19 (90.5)[c]	
≥ 2	23 (9.8)	14 (24.1)	2 (9.5)	0.016
% predicted of FEV_1	89.4±14.8[a,b]	78.6±16.4[c]	58.6±17.5	<0.001
% predicted of $FEF_{25-75\%}$	89.3±25.2[a,b]	70.7±27.1[c]	32.4±12.9	<0.001
Family history of atopic disease	70 (29.3)	18 (38.3)	0 (0.0)	0.124

mMRC = modified Medical Research Council score; FEV_1 (% predicted) = percentage predicted of forced expiratory volume in first second; $FEF_{25-75\%}$ = forced expiratory flow at 25-75%
Data are n (%) or mean ± SD
[a] p<0.05, comparison between subjects with chronic rhinitis and asthma groups
[b] p<0.05, comparison between subjects with chronic rhinitis and COPD groups
[c] p<0.05, comparison between subjects with asthma and COPD groups

respectively (p-value <0.001). The COPD subjects had the significantly lowest nasal symptom and pulmonary function as compared with the other two diseases. However, COPD subjects had significantly less dyspnea level than asthma subjects (p-value <0.001).

Aeroallergen skin prick test was performed in only 196 out of 297 (66%) subjects because the rest had taken antihistamines within the last seven days before the test and 86 (43.9%) were identified to be positive (Table 5). The asthma subjects were more allergic than chronic rhinitis subjects (p-value = 0.033). However, the top five allergens (house dust, mite, cockroach, cat, and grass) were equally prevalent in both diseases. Among the study population, asthma subjects had more family history of atopic disease than chronic rhinitis subjects (38.3% vs. 29.3%) but the difference was not statistically significant (p-value = 0.830). Majority of chronic rhinitis subjects (73.7%) revealed abnormal anterior rhinoscopy (congested and/or watery nasal mucosa).

The disease severities of the three major CRDs showed that chronic rhinitis and asthma were mostly mild whereas COPD was mostly moderate to very severe (Table 6). A significant positive association was found between the prevalence of chronic rhinitis in asthma (OR 3.9, 95% CI 2.1-7.0, p-value <0.001]. In contrast, there was a negative association between chronic rhinitis and COPD (OR 0.2, 95% CI 0.1-0.8, p-value = 0.011) (Table 7).

Table 5. Allergic skin prick test in subjects with rhinitis and asthma

Allergic skin prick test	Chronic rhinitis n = 153	Asthma n = 43	p-value
Positive	61 (39.9)	25 (58.1)	0.033
House dust	42 (68.9)	17 (68.0)	0.736
Mite	47 (77.0)	20 (80.0)	0.958
Cockroach	29 (47.5)	13 (52.0)	0.854
Cat dander	9 (14.8)	6 (24.0)	0.357
Grass pollen	10 (16.4)	3 (12.0)	0.558
Dog dander	1 (1.6)	3 (12.0)	0.046
Careless weed	1 (1.6)	3 (12.0)	0.046
Mold	1 (1.6)	4 (16.0)	0.013

Results are expressed as n (%)

Table 6. Classification on disease severity of chronic rhinitis, asthma, and COPD

Disease severity	Chronic rhinitis n = 228	Asthma n = 58	COPD n = 21
Mild	194 (85.1)	52 (89.7)	3 (14.3)
Intermittent	143 (62.7)	32 (55.2)	
Persistent	51 (22.4)	20 (34.5)	
Moderate	16 (7.0)	4 (6.9)	11 (52.4)
Severe	18 (7.9)	2 (3.4)	6 (28.6)
Very severe	NA	NA	1 (4.7)

NA = not available data
Results are expressed as n (%)

Table 7. Association between chronic rhinitis in patients with asthma and COPD

	Chronic rhinitis (n = 239)	Odds ratio (95% CI)	p-value
Asthma (n = 58)	41 (70.7)		
Non asthma (n = 516)	198 (38.4)	3.9 (2.1-7.0)	<0.001
COPD (n = 21)	3 (14.3)		
Non COPD (n = 553)	236 (42.7)	0.2 (0.1-0.8)	0.011

CI = confidence interval; COPD = chronic obstructive pulmonary disease
Results are expressed as n (%)

Discussion

The CMLH study was the first comprehensive cross-sectional population-based epidemiological study among a representative sample, using standardized research methodology with clinical diagnostic criteria and investigations by pulmonologists to determine the accurate prevalence of CRDs in municipalities of Chiang Mai in northern Thailand. The cornerstone investigations in the present study were chest radiographs interpreted by a single radiologist; pulmonary function tests and aeroallergen skin prick tests interpreted by pulmonologists from the study team. Perihilar calcific spots were the most common abnormal finding in chest radiographs. This finding implied previous infection of hilar lymph nodes in which TB is the most common causative agent in high disease burden countries like Thailand. The second most common abnormal chest radiograph, bilateral pulmonary hyperinflation with flattened diaphragms compatible with COPD, was found in 20 subjects (3.8%) but only 15 subjects were diagnosed as COPD, four as asthma, and one as a false positive. This finding suggested that the radiographic findings established for COPD was insensitive and nonspecific for COPD assessment. The strength of our study was that spirometry was conducted in all study patients both symptomatic and asymptomatic and applying post-bronchodialtor test[13]. The most common abnormal pulmonary function test was a restrictive pattern, which was found twice in females, whereas an obstructive

pattern was found four times in males. The association of restrictive pattern with females might be due to the use of the European Equation as the standard reference of pulmonary function parameters even with a correction factor in contrary to the fixed threshold criteria independent on any standard references. The prevalence of chronic rhinitis, asthma, and COPD currently diagnosed by pulmonologists were significantly higher than those previously diagnosed by physicians. Based on current diagnoses by pulmonologists applying standard clinical diagnostic criteria with radiographic and pulmonary function investigations, we found that more than a half of the subjects (59.2%) suffered from the three majors CRDs (chronic rhinitis 41.6%, asthma 10.1%, and COPD 3.7%) which were well recognized as major public health problems with increasing morbidity and mortality[1]. Although the severity of chronic rhinitis and asthma were moderate to severe in only 14.9% and 10.3%, the impact of these two diseases in the community would be significant because of the high prevalence (41.6% and 10.1%). On the other hand, the COPD prevalence was relatively low (3.7%) but with a majority (81%) of high severity, the disease might have a greater impact on the community. With such a high disease burden on the health care system, emphasis on better diagnosis and management of these diseases must be prioritized, together with achieving reliable epidemiological data on the prevalence and severity of diseases crucial to guide health care policy[14].

Chronic rhinitis is escalating to epidemic proportion, which leads to aggravating the socio-economic burden of the disease across the world[15]. Prevalence of chronic rhinitis in adults was reported only in a few Asia-Pacific nations: China 8.7 to 24.1%, Singapore 5.5%, Japan 35.5%, and Korea 16.4 to 24.7%[16-19]. Chronic rhinitis if untreated, may have a considerable effect on economics and quality of life of the patients[20,21]. Allergic rhinitis, is increasing in Thailand and its prevalence shows no signs of abating[22]. The incidence of chronic rhinitis (41.6%) in the present study was much higher than the previous study conducted in Bangkok and its vicinity (13.15%)[23]. Only 39.9% of chronic rhinitis in the present study was confirmed to be allergy by skin prick test. Therefore, we could not conclude from the questionnaires survey that chronic rhinitis was mostly allergic rhinitis. All subjects with non-allergic rhinitis in the present study were identified as vasomotor rhinitis. Therefore, the high prevalence of chronic rhinitis in Chiang Mai might indicate exposure to both aeroallergens and air pollution. The percentage of positive skin prick test revealed that house-dust mite was the most common causative allergen (75.9%), followed by house dust (67.6%), and cockroach (45.4%), which was similar to the previous report from Bangkok[22]. Asthma and rhinitis were frequently linked as concurrent diseases based on clinical observations, epidemiological studies, immunological observations, as well as outcomes of the therapy[24-29]. Between 20% and 50% of patients with rhinitis had asthma, and 30 to 90% of patients with asthma had concomitant rhinitis[27-29]. The present study confirmed that chronic rhinitis had a strongly positive correlation with asthma, as the statistically significant association was found.

Asthma is one of the most common chronic diseases worldwide and it is estimated to be accountable for about one in every 250 deaths worldwide[30]. The prevalence of asthma may vary considerably in different countries, from 4 to 18% of populations[12]. Even though asthma is much more presented in developed countries, its prevalence in less industrialized regions is growing[31]. Two previous multi-regional studies in Thailand[32,33] revealed that the prevalence of physician-diagnosed asthma was 4%[32] in Chiang Mai, which did not differ much from our study (3.8%). However, the prevalence of current asthma diagnosed in our study was much higher than the other study (10.1% vs. 1.97%) because the other used much more restricted diagnostic criteria than our study[33]. Asthma subjects in the present study were diagnosed by using standardized questionnaires with confirmation by face-to-face interview by pulmonologists, excluding abnormal pulmonary infiltrative disease, pleural disease or lung mass on chest radiographs that could mimic asthma, and performing post-bronchodilator spirometry to exclude COPD in subjects smoking more than five pack-years. Based on our findings we considered these criteria as practical and should be considered applicable in real world practice.

COPD is the fourth cause of death worldwide[1]. An estimation from the World Health Organization suggests that COPD will be the third cause of death by 2030. The problem of COPD under-diagnosis is well-known worldwide[34-36]. In northern Thailand, only one-fourth of COPD was diagnosed by a general practitioner[37]. The prevalence of COPD has often been reported in the range of 6 to 10% of the adult population in western countries[38]. The COPD prevalence rates in Asia-Pacific region were estimated based on the relationships of the major risk factors for COPD by the calculated model algorithm[39]. The estimated prevalence

varied twofold between the 12 Asian countries ranged from 3.5 to 6.7%, and in Thailand the estimated COPD prevalence rate was 5.0%[37]. The present study is the first prevalence study of COPD in Thailand. The respiratory symptoms (cough, phlegm, and cough with phlegm of more than three months) did not differ from the other two major CRDs (chronic rhinitis, asthma). The nasal symptoms of COPD subjects were significantly much less than chronic rhinitis and asthma subjects and the negative association with chronic rhinitis was seen. Smoking is a universal risk factor causing COPD, which may be expected to insult nasal mucosa causing rhinitis too. Further study need to explore the underlying mechanism. The dyspnea level of COPD subjects was mostly mild to moderate and not differed from chronic rhinitis despite its moderate to very severe stages. It is well recognized among the pulmonologists but not general practitioners that the level of dyspnea among COPD patients might be under recognized by the patients even when they were in severe stage[37].

A few limitations of the present study should be mentioned. Firstly, some of the minor and asymptomatic respiratory diseases might be under-estimated or undetected. Secondly, the study was based on data from municipal areas only; therefore, it might not be reliably extrapolated to the entire region of Chiang Mai. Thirdly, the spirometry was performed as post-BD test only; therefore, we could not evaluate the reversibility in the tested subjects. Fourthly, the aeroallergen skin prick test could not be performed in all of the chronic rhinitis and asthma subjects and some local aeroallergens had not been incorporated for allergy testing commercially, thereby, underestimating the proportion of allergic subjects.

Conclusion

Most of CRDs among adults living in Chiang Mai were chronic rhinitis, asthma, and COPD with varying disease severity but sharing a large socio-economic burden to the community. The chronic rhinitis in the present study was strongly linked with asthma but not COPD which might be primarily contributed by allergy and air pollution. Although the prevalence of COPD was not high as the other diseases, its severity was mostly moderate to very severe which could impose a large burden to the community.

What is already known on this topic?

There has been no prevalence study of chronic respiratory diseases in Thai adults using standard clinical diagnostic criteria.

What this study adds?

This study added the information on prevalence of chronic respiratory diseases, international standard severity classification of the diseases and their linkage (chronic rhinitis vs. asthma vs. COPD) in Chiang Mai.

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Potential conflicts of interest

None.

References

1. World Health Organization: Global surveillance, prevention and control of chronic respiratory diseases. A comprehensive approach [Internet]. Geneva: WHO; 2007. [cited 2014 Aug 1]. Available from: http://www.who.int/
2. Bousquet J, Dahl R, Khaltaev N. Global alliance against chronic respiratory diseases. Allergy 2007; 62: 216-23.
3. Cochran W. Sampling techniques. 3rd ed. New York: John Wiley and Sons; 1977.
4. Burney PG, Luczynska C, Chinn S, Jarvis D. The European community respiratory health survey. Eur Respir J 1994; 7: 954-60.
5. Bestall JC, Paul EA, Garrod R, Garnham R, Jones PW, Wedzicha JA. Usefulness of the Medical Research Council (MRC) dyspnoea scale as a measure of disability in patients with chronic obstructive pulmonary disease. Thorax 1999; 54: 581-6.
6. Miller MR, Hankinson J, Brusasco V, Burgos F, Casaburi R, Coates A, et al. Standardisation of spirometry. Eur Respir J 2005; 26: 319-38.
7. Hankinson JL, Odencrantz JR, Fedan KB. Spirometric reference values from a sample of the general U.S. population. Am J Respir Crit Care Med 1999; 159: 179-87.
8. Hankinson JL, Kawut SM, Shahar E, Smith LJ, Stukovsky KH, Barr RG. Performance of American Thoracic Society-recommended spirometry reference values in a multiethnic sample of adults: the multi-ethnic study of atherosclerosis (MESA) lung study. Chest 2010; 137: 138-45.

9. The European Academy of Allergology and Clinical Immunology. Position paper: allergen standardization and skin tests. Allergy 1993; 48: 48-82.
10. Rabe KF, Hurd S, Anzueto A, Barnes PJ, Buist SA, Calverley P, et al. Global strategy for the diagnosis, management, and prevention of chronic obstructive pulmonary disease: GOLD executive summary. Am J Respir Crit Care Med 2007; 176: 532-55.
11. Bousquet J, Khaltaev N, Cruz AA, Denburg J, Fokkens WJ, Togias A, et al. Allergic Rhinitis and its Impact on Asthma (ARIA) 2008 update (in collaboration with the World Health Organization, GA(2)LEN and AllerGen). Allergy 2008; 63 (Suppl 86): 8-160.
12. Global Initiative for Asthma: Global strategy for asthma management and prevention [Internet]. 2006 [cited 2014 Aug 1]. Available from: http://www.ginasthma.org
13. Halbert RJ, Isonaka S, George D, Iqbal A. Interpreting COPD prevalence estimates: what is the true burden of disease? Chest 2003; 123: 1684-92.
14. Martins P, Rosado-Pinto J, do Ceu TM, Neuparth N, Silva O, Tavares H, et al. Under-report and underdiagnosis of chronic respiratory diseases in an African country. Allergy 2009; 64: 1061-7.
15. Pawankar R, Bunnag C, Khaltaev N, Bousquet J. Allergic Rhinitis and Its Impact on Asthma in Asia Pacific and the ARIA Update 2008. World Allergy Organ J 2012; 5 (Suppl 3): S212-7.
16. Zhang L, Han D, Huang D, Wu Y, Dong Z, Xu G, et al. Prevalence of self-reported allergic rhinitis in eleven major cities in china. Int Arch Allergy Immunol 2009; 149: 47-57.
17. Ng TP, Tan WC. Epidemiology of chronic (perennial) rhinitis in Singapore: prevalence estimates, demographic variation and clinical allergic presentation. Ann Acad Med Singapore 1994; 23: 83-8.
18. Sakurai Y, Nakamura K, Teruya K, Shimada N, Umeda T, Tanaka H, et al. Prevalence and risk factors of allergic rhinitis and cedar pollinosis among Japanese men. Prev Med 1998; 27: 617-22.
19. Kim TB, Kim YK, Chang YS, Kim SH, Hong SC, Jee YK, et al. Association between sensitization to outdoor spider mites and clinical manifestations of asthma and rhinitis in the general population of adults. J Korean Med Sci 2006; 21: 247-52.
20. Fineman SM. The burden of allergic rhinitis: beyond dollars and cents. Ann Allergy Asthma Immunol 2002; 88: 2-7.
21. Schoenwetter WF, Dupclay L Jr, Appajosyula S, Botteman MF, Pashos CL. Economic impact and quality-of-life burden of allergic rhinitis. Curr Med Res Opin 2004; 20: 305-17.
22. Bunnag C, Jareoncharsri P, Tantilipikorn P, Vichyanond P, Pawankar R. Epidemiology and current status of allergic rhinitis and asthma in Thailand -- ARIA Asia-Pacific Workshop report. Asian Pac J Allergy Immunol 2009; 27: 79-86.
23. Bunnag C, Jareoncharsri P, Voraprayoon S, Kongpatanakul S. Epidemiology of rhinitis in Thais: characteristics and risk factors. Asian Pac J Allergy Immunol 2000; 18: 1-7.
24. Bousquet J, Vignola AM, Demoly P. Links between rhinitis and asthma. Allergy 2003; 58: 691-706.
25. Casale TB, Amin BV. Allergic rhinitis/asthma interrelationships. Clin Rev Allergy Immunol 2001; 21: 27-49.
26. Togias A. Unique mechanistic features of allergic rhinitis. J Allergy Clin Immunol 2000; 105 (6 Pt 2): S599-604.
27. Leynaert B, Neukirch F, Demoly P, Bousquet J. Epidemiologic evidence for asthma and rhinitis comorbidity. J Allergy Clin Immunol 2000; 106 (5 Suppl): S201-5.
28. Simons FE. Allergic rhinobronchitis: the asthma-allergic rhinitis link. J Allergy Clin Immunol 1999; 104 (3 Pt 1): 534-40.
29. Sibbald B, Rink E. Epidemiology of seasonal and perennial rhinitis: clinical presentation and medical history. Thorax 1991; 46: 895-901.
30. Bateman ED, Boushey HA, Bousquet J, Busse WW, Clark TJ, Pauwels RA, et al. Can guideline-defined asthma control be achieved? The Gaining Optimal Asthma ControL study. Am J Respir Crit Care Med 2004; 170: 836-44.
31. Braman SS. The global burden of asthma. Chest 2006; 130 (1 Suppl): 4S-12S.
32. Boonsawat W, Charoenphan P, Kiatboonsri S, Wongtim S, Viriyachaiyo V, Pothirat C, et al. Survey of asthma control in Thailand. Respirology 2004; 9: 373-8.
33. Dejsomritrutai W, Nana A, Chierakul N, Tscheikuna J, Sompradeekul S, Ruttanaumpawan P, et al. Prevalence of bronchial hyperresponsiveness and asthma in the adult population in Thailand. Chest 2006; 129: 602-9.
34. Lundbäck B, Lindberg A, Lindström M, Rönmark

E, Jonsson AC, Jönsson E, et al. Not 15 but 50% of smokers develop COPD?--Report from the Obstructive Lung Disease in Northern Sweden Studies. Respir Med 2003; 97: 115-22.
35. Siafakas NM, Vermeire P, Pride NB, Paoletti P, Gibson J, Howard P, et al. Optimal assessment and management of chronic obstructive pulmonary disease (COPD). The European Respiratory Society Task Force. Eur Respir J 1995; 8: 1398-420.
36. Lindberg A, Bjerg A, Ronmark E, Larsson LG, Lundback B. Prevalence and underdiagnosis of COPD by disease severity and the attributable fraction of smoking Report from the Obstructive Lung Disease in Northern Sweden Studies. Respir Med 2006; 100: 264-72.
37. Pothirat C, Phetsuk N, Deesomchok A, Theerakittikul T, Bumroongkit C, Liwsrisakun C, et al. Clinical characteristics, management in real world practice and long-term survival among COPD patients of Northern Thailand COPD club members. J Med Assoc Thai 2007; 90: 653-62.
38. Viegi G, Pedreschi M, Pistelli F, Di Pede F, Baldacci S, Carrozzi L, et al. Prevalence of airways obstruction in a general population: European Respiratory Society vs American Thoracic Society definition. Chest 2000; 117 (5 Suppl 2): 339S-45S.
39. Regional COPD Working Group. COPD prevalence in 12 Asia-Pacific countries and regions: projections based on the COPD prevalence estimation model. Respirology 2003; 8: 192-8.

ความชุก ลักษณะทางคลินิก และความสัมพันธ์ของโรคระบบการหายใจเรื้อรังในประชากรเขตเทศบาลเมืองเชียงใหม่

ชายชาญ โพธิรัตน์, นิตยา เพชรสุข, เฉลิม ลิ่วศรีสกุล, ชัยวัฒน์ บำรุงกิจ, อรรถวุฒิ ดีสมโชค, ธีรกร ธีรกิตติกุล

วัตถุประสงค์: *เพื่อศึกษาความชุก ลักษณะทางคลินิก ความรุนแรงของโรค และความสัมพันธ์ระหว่างโรคระบบการหายใจเรื้อรังในประชากรผู้ใหญ่ที่อาศัยอยู่ในเขตเทศบาลเมืองเชียงใหม่*

วัสดุและวิธีการ: *การศึกษาแบบตัดขวางในประชากรผู้ใหญ่ที่อาศัยอยู่ในเขตเทศบาลเมืองเชียงใหม่ ข้อมูลทางคลินิกทั้งหมดรวบรวมโดยการสัมภาษณ์และยืนยันการวินิจฉัยโดยแพทย์เฉพาะทางโรคระบบการหายใจ ผู้เข้าร่วมการศึกษาทุกรายจะได้รับการตรวจภาพถ่ายรังสีทรวงอกและการตรวจสมรรถภาพปอดหลังพ่นยาขยายหลอดลม นอกจากนี้แล้วในผู้ป่วยที่ได้รับการวินิจฉัยว่าเป็นโรคโพรงจมูกอักเสบเรื้อรัง และโรคหอบหืดจะได้รับการทดสอบภูมิแพ้ทางผิวหนัง*

ผลการศึกษา: *ผู้เข้าร่วมการศึกษาทั้งสิ้น 574 ราย อายุเฉลี่ย 52.9±10.0 ปี ร้อยละ 59.6 เป็นเพศหญิง และร้อยละ 37.5 มีประวัติสูบบุหรี่ พบความชุกของโรคระบบการหายใจเรื้อรังร้อยละ 59.2 โดยพบความชุกของโรคจมูกอักเสบเรื้อรัง (chronic rhinitis) มากที่สุด 239 ราย คิดเป็นร้อยละ 41.6 ตามมาด้วยโรคหอบหืด 58 ราย คิดเป็นร้อยละ 10.1 และโรคปอดอุดกั้นเรื้อรัง 21 ราย คิดเป็นร้อยละ 3.7 ในการตรวจสมรรถภาพปอดพบลักษณะความผิดปกติที่มีการจำกัดในการขยายตัวของปอด (restrictive lung disorders) 53 ราย คิดเป็นร้อยละ 9.6 ในผู้ป่วยโรคหืดนั้นตรวจพบโรคจมูกอักเสบจากภูมิแพ้ (allergic rhinitis) ร่วมด้วยมากกว่าผู้ป่วยโรคจมูกอักเสบเรื้อรังอย่างมีนัยสำคัญทางสถิติ (ร้อยละ 58.1 ต่อร้อยละ 39.9, p-value = 0.033) ในส่วนของระดับความรุนแรงของโรคนั้นพบว่า ร้อยละ 14.9 ของผู้ป่วยโรคจมูกอักเสบเรื้อรังและร้อยละ 10.3 ของผู้ป่วยโรคหอบหืดนั้นมีระดับความรุนแรงของโรคอยู่ในระดับปานกลางถึงรุนแรง ในขณะที่ร้อยละ 81 ของผู้ป่วยโรคปอดอุดกั้นเรื้อรังนั้นมีระดับความรุนแรงของโรคอยู่ในระดับปานกลางถึงรุนแรงมาก และยังพบว่าโรคจมูกอักเสบเรื้อรังในผู้ป่วยโรคหอบหืดนั้นพบมากกว่าคนปกติอย่างมีนัยสำคัญทางสถิติ (odds ratio [OR] 3.9, 95% confidence interval [CI] 2.1-7.0, p-value <0.001)*

สรุป: *ความชุกของโรคระบบการหายใจเรื้อรังในประชากรผู้ใหญ่ที่อาศัยอยู่ในเขตเทศบาลเมืองเชียงใหม่นั้น พบในอัตราที่สูง โดยโรคระบบการหายใจที่พบนั้นมีอาการทางระบบการหายใจที่คาบเกี่ยวกัน อีกทั้งยังพบในระดับความรุนแรงของโรคที่แตกต่างกันอย่างมีนัยสำคัญด้วย นอกจากนี้แล้วโรคจมูกอักเสบเรื้อรังยังมีความสัมพันธ์กับโรคหอบหืดแต่ไม่พบความสัมพันธ์กับโรคปอดอุดกั้นเรื้อรัง*
