THE RELATIONSHIP BETWEEN ASTHMA AND OBESITY AMONG OLDER ADULTS IN THE COMMUNITIES OF THAILAND

PATTHANUNT YOSARAVUTHVARAKUL

A THESIS SUBMITTED IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF PRIMARY HEALTH CARE MANAGEMENT
FACULTY OF GRADUATE STUDIES
MAHIDOL UNIVERSITY
2016

Thesis
entitled

THE RELATIONSHIP BETWEEN ASTHMA AND OBESITY AMONG OLDER ADULTS IN THE COMMUNITIES OF THAILAND

Patthanunt Yosaravuth

Mrs. Patthanunt Yosaravuthvarakul
Candidate

J. Chompikul

Assoc. Prof. Jiraporn Chompikul,
Ph.D. (Biostatistics)
Major advisor

Khongdej Leethochawalit

Asst. Prof. Khongdej Leethochawalit,
M.D., Ph.D. (Medical and social science)
Co-advisor

Aroonsri Mongkolchati

Asst. Prof. Aroonsri Mongkolchati,
Ph.D. (Public Health)
Co-advisor

A-Mutchimwong

Asst. Prof. Auemphorn Mutchimwong,
Ph.D. (Air Quality Assessment)
Acting Dean
Faculty of Graduate Studies
Mahidol University

Aroonsri Mongkolchati

Asst. Prof. Aroonsri Mongkolchati,
Ph.D. (Public Health)
Program Director
Master of Primary Health Care Management
ASEAN Institute for Health Development
Mahidol University

Thesis
entitled

THE RELATIONSHIP BETWEEN ASTHMA AND OBESITY AMONG OLDER ADULTS IN THE COMMUNITIES OF THAILAND

was submitted to the Faculty of Graduate Studies, Mahidol University
for the degree of Master of Primary Health Care Management
on
November 27, 2016

Patthanunt Yosaravuth

Mrs. Patthanunt Yosaravuthvarakul
Candidate

J. Chompikul

Assoc. Prof. Jiraporn Chompikul,
Ph.D. (Biostatistics)
Member

Prof. (Emeritus) Sirikul Isaranurug,
M.D., M.P.H. (Maternal and Child Health)
Chair

Khongdej Leethochawalit

Asst. Prof. Khongdej Leethochawalit,
M.D., Ph.D. (Medical and social science)
Member

Aroonsri Mongkolchati

Asst. Prof. Aroonsri Mongkolchati,
Ph.D. (Public Health)
Member

A. Mutchimwong

Asst. Prof. Auemphorn Mutchimwong,
Ph.D. (Air Quality Assessment)
Acting Dean
Faculty of Graduate Studies
Mahidol University

Prof. Supa Pengpid,
Dr.P.H.
Director
ASEAN Institute for Health Development
Mahidol University

ACKNOWLEDGEMENTS

This thesis would not have been successful without the attentive support from many members.

First, I would like to express my sincere gratitude and deep appreciation to my major advisor, Associate Professor Dr. Jiraporn Chompikul for her guidance, invaluable advice and she had supported since the beginning of the process and help me to solve problems in this research especially statistical problem. My gratitude also expressed for my co-advisers, Asst. Prof. Aroonsri Mongkolchati and Asst. Prof. Khongdej Leethochawalit for their supervision and suggestion that lead to the complete thesis.

Next, I would like to deep thank to Prof. (Emeritus) Sirikul Isaranurug for giving me value comments and suggestion to improve my research, many sincere thanks to all Professors, Lecturers and staff of the Asean Institute for Health Development and Mahidol University for their teaching and support to enhance my skills and knowledge in order to keep the thesis process in right track.

I am grateful to the National Health Security Office (NHSO) for providing scholarship, which gave the opportunity for me to undertake this course. I also grateful to all research investigators and all research assistants for their help and support during long term period of our studies.

Special thanks also appreciated for the entire older adults all regions in Thailand who was the respondent in this study and for their kindness in providing all of information. I would like to thank all health care personnel of Huay Plu hospital and health promoting hospital, Nakhon Pathom Province who participated this study for their help and assistance during data collection period.

Finally, I would like to spend all my heart to my parents and my family for their love, understanding and support. With their encouragement, I had inspiration to complete and finish my research.

Patthanunt Yosaravuthvarakul

THE RELATIONSHIP BETWEEN ASTHMA AND OBESITY AMONG OLDER ADULTS IN THE COMMUNITIES OF THAILAND

PATTHANUNT YOSARAVUTHVARAKUL 5637276 ADPM/M

M.P.H.M.

THESIS ADVISORY COMMITTEE: JIRAPORN CHOMPIKUL, Ph.D., AROONSRI MONGKOLCHATI, Ph.D., KHONGDEJ LEETHOCHAWALIT, Ph.D.

ABSTRACT

This cross-sectional study was conducted to discover the prevalence of asthma and to examine an association between asthma and obesity among older adults in the communities of Thailand. The sample of 3977 older adults aged 50 years and older from six regions participated in this study during the data collection phase between January and March 2016. Face to face questionnaires in Thai language were used to collect data using multi-stage cluster sampling. Chi - square tests and multiple logistic regression were used to examine the association between independent variables and asthma.

The results showed that the prevalence of asthma among older adults in the communities of Thailand was 2.1%. There was no significant association between asthma and obesity among this population. However, asthma was found to be significantly associated with types of residence (Adj. OR=2.01, 95% CI=1.06-3.83), ischemic heart disease (Adj. OR=4.31, 95% CI=1.63-11.42) and low back pain (Adj. OR=4.38, 95% CI=2.50-7.68) among older adults after adjusting with other factors.

In conclusion, there were many aspects about asthma and obesity among older adults in Thailand which need further research and investigation of the unclear problems.

KEY WORDS: ASTHMA / OBESITY / OLDER ADULTS / COMMUNITIES / THAILAND

112 pages

ความสัมพันธ์ระหว่างโรคหืดและความอ้วนในผู้สูงอายุในชุมชนของประเทศไทย
THE RELATIONSHIP BETWEEN ASTHMA AND OBESITY AMONG OLDER ADULTS IN THE COMMUNITIES OF THAILAND

พัทธนันท์ ยศราวุธวรกุล 5637276 ADPM/M

สม.ม.

คณะกรรมการที่ปรึกษาวิทยานิพนธ์: จิราพร ชมพิกุล, Ph.D., อรุณศรี มงคลชาติ, Ph.D.,
คงเดช ลีโทชวลิต, Ph.D.

บทคัดย่อ

การวิจัยนี้เป็นการศึกษาแบบตัดขวาง เพื่อศึกษาความชุกของโรคหืด และเพื่อหาความสัมพันธ์ระหว่างโรคหืดและความอ้วนในผู้สูงอายุในชุมชนของประเทศไทย ตัวอย่างที่ศึกษาเป็นผู้สูงวัยอายุตั้งแต่ 50 ปีขึ้นไปจำนวน 3977 คน เก็บข้อมูลในช่วงเดือนมกราคม ถึงมีนาคม พ.ศ.2559 โดยใช้แบบสอบถามแบบมีผู้สัมภาษณ์ตัวต่อตัวและการสุ่มตัวอย่างแบบหลายขั้นตอน วิเคราะห์ข้อมูลด้วยสถิติไคสแควร์และการวิเคราะห์ถดถอยแบบโลจิสติก เพื่อหาความสัมพันธ์ระหว่างตัวแปรอิสระและโรคหืด

ผลการศึกษาพบว่าความชุกของโรคหืดในผู้สูงอายุในชุมชนของประเทศไทย คือร้อยละ 2.1 ไม่พบความสัมพันธ์อย่างมีนัยสำคัญทางสถิติระหว่างโรคหืดและความอ้วนในประชากรกลุ่มนี้ อย่างไรก็ตามพบว่าโรคหืดมีความสัมพันธ์อย่างมีนัยสำคัญทางสถิติกับชนิดของที่อยู่อาศัย (Adj. OR=2.01, 95% CI=1.06-3.83), โรคกล้ามเนื้อหัวใจขาดเลือด (Adj. OR=4.31, 95% CI=1.63-11.42) และอาการปวดหลังส่วนล่าง (Adj. OR=4.38, 95% CI=2.50-7.68) ในผู้สูงอายุหลังจากการปรับกับปัจจัยอื่นๆแล้ว

สรุปแล้วยังมีหลายประเด็นเกี่ยวกับโรคหืดและความอ้วนในผู้สูงอายุของประเทศไทย ที่ยังไม่ได้รับคำตอบชัดเจนและต้องการการศึกษาเพิ่มเติมต่อไป

112 หน้า

CONTENTS

CONTENTS (cont.)

CONTENTS (cont.)

LIST OF TABLES

LIST OF FIGURE

LIST OF ABBREVIATIONS

AAEHP	The Arab American Environmental Health Project
Adj.OR	Adjustment Odd Ratio
AHR	Airway Hyperresponsiveness
AIHD	ASEAN Institute for Health Development
BHR	Bronchial Hyperresponsiveness
BMI	Body Mass Index
CI	Confident Interval
COPD	Chronic Obstructive Pulmonary Disease
DM II	Diabetes Mellitus Type II
ED/ Urgent	Emergency Department/Urgent Care
ERI	Environmental Risk Index
FEV (1)	Forced Expiratory Volume
FVC	Forced Vital Capacity
GERD	Gastro Esophageal Reflux Disease
HPA	Hypothalamic-Pituitary-Adrenal
HT	Hypertension
IH	Ischemic Heart Disease
kg/m^2	kilogram per meter squared
n	number
NHESII	The National Health Examination Survey II
NHIS	National Health Interview Survey
OR	Odd Ratio
OSA	Obstructive Sleep Apnea
P-value	Probability value
QD	Quartile Deviation

LIST OF ABBREVIATIONS (cont.)

RA	Rheumatoid Arthritis
RR	Relative Risk
SAA	Serum Amyloid-A
SAGE	the Study on global AGEing
SD	Standard Deviation
SDB	Sleep-Disorder Breathing
SPSS	Statistical Package for the Social Science for Windows
SO (2)	Sulfur Dioxide
WHS	World Health Survey
WPRO	Regional Office for the Western Pacific
WHO	World Health Organization
U.S.A.	United State of America
X^2	Chi-square

CHAPTER I
INTRODUCTION

1.1 Rationale and Justification of the study

Asthma is common in the general population worldwide and is a major causes of health morbidities, health resource utilization and poor quality of life among older adults. (1-3) Asthma is a major public health problem because of its high and still rising prevalence in this population. The prevalence seemed to be underestimated because of the difficulty to diagnosis and differential diagnosis from other diseases in the older adults. The patients were underdiagnosed and undertreated in the hospital setting. The use of tobacco and the history of allergy were illustrated the diagnosis and lead to the asthma-COPD overlap syndrome. There are also rising of hospitalization and mortality rate of asthma, especially in the elderly. (2-4)There are many differences with asthma occurring in older adults when compared with younger asthmatics. This includes the frequency of medical comorbidities. (5) The burden of asthma is therefore high in the geriatric population and healthcare utilization and mortality from asthma is excessive in this age group. (6) Asthma is an important cause of morbidity and mortality in the elderly. Moreover, death due to asthma occurs mostly in elderly patients. (7)

The global prevalence of clinical asthma in adults was estimated to 4.3% in 2012 from the World Health Survey (WHS) which employed a standardized methodology to collect information in 70 countries by using a cross –sectional survey and is the largest multicenter survey of asthma in adult 18 years or older. (8) The prevalence of asthma in elderly patients is estimated between 6.5 and 17%. (7) The number of asthma cases has more than doubled since 1980 and rates have increased over the past 20 years. Possible explanations for this increase prevalence of asthma include both lifestyle and environmental hypotheses. Lifestyle changes over the last 30 years are the most likely explanation for the increase in allergic disease over this period. (2-3, 9-10)

Base on the literature review, it is hypothesized that obesity is the risk factors of asthma. (2-3, 7-13). The mechanism of this relationship may be from the interaction between genes and the environment in the pathogenesis of both disorders and involved with more than one biological mechanism. These mechanism leading to inflammatory process that is presented in obesity and new information conclude that asthma is not only the inflammation of airway but also the systemic inflammation of disease. (1-2, 11-12, 18-19) However, the modest information limit to epidemiological data and the association between asthma and obesity is depend on factors such as age and sex. For these reasons, more research is needed to further elucidate these 2 disorders and the multiple interrelationships that exist between them.

In Thailand, research in adult asthma was limited. (20) There were a nationwide cross-sectional survey of respiratory health in adults aged 20 to 44 years during 2001 to 2002, determined the prevalence of asthma in adult Thai population. The prevalence of definite asthma was 2.91% (95% CI, 2.32 to 3.50). The prevalence of asthma among adult Thai population was relatively low as compared with western countries. (20) However, higher prevalence of asthma among adults (11.6%) was presented in a study at Phitsanulok, Thailand in 2010(20)

Obesity is a huge problem in many countries around the world (21) and also a serious health problem in Thailand.(21-23) The National Health Examination Survey II (NHESII) in 2004 reported overweight(BMI>or = 25 kg/m^2) and obesity (BMI > or = 30 kg/m^2) were 28.3% and 6.8% respectively in 3,220 Thai adults aged 20-59 years with a higher prevalence for women than for men (overweight: 33.9% vs 19.2% and obesity: 8.8% vs 3.5%).(22) Using the Asian cut-points, A nationally representative sample of 6,445 Thai adults (18-70 years) was surveyed during 2004-2005 reported 35.0% of men, and 44.9% of women were overweight or obese (BMI $\geq$ 23 kg/m^2). (23) In the period 2005-2007, obesity rates in Thailand increased from 10 million in 2005 to 17 million in 2007. A cross-sectional population survey of 16,596 Thai people in 2010 reported that among adults, using the Regional Office for the Western Pacific(WPRO) standard, 17.1% of adults were classified as overweight (body mass index or BMI 23.0-24.9 kg/m^2), 19.0% as class I obesity (BMI 25.0-29.9 kg/m^2), and 4.8% as class II obesity (BMI $\geq$ 30.0 kg/m^2). Using the World Health Organization (WHO) definition, 19.0% were overweight (BMI 25.0-29.9 kg/m^2), 4.0%

class I obesity (BMI 30.0-34.9 kg/m^2), 0.8% class II obesity (BMI 35.0-39.9 kg/m^2), and 0.1% class III obesity (BMI $\geq$ 40.0 kg/m^2). (23) For the year 2011, overweight prevalence was the second (32.2%) in Southeast Asia for adults of both sexes (BMI of > 25 kg/m^2). (21)

Many studies have shown that asthma in children is caused by genetic factors and influencing of environment. In adult asthma, risk factors were less well recognized. (20) Evidences supported that parallel increases of asthma and obesity are now occurring across many demographic groups, for example, type of resident and lifestyle factors. (20-24) Asthma and obesity are share many comorbidity. The associated risk factors for these two diseases and their mechanism are now unclear and there are limited of literature about this topic. There are some researches in the childhood and adolescent but not enough for defining relationship of asthma and obesity among older adults. (2, 15, 18)

For benefit of health care improvement, management for asthma is more proper and effective if we know the accurate prevalence of these diseases. And moreover if we know the factors that is associated with asthma, we might be decrease this burden chronic disease by modified or improved biological factors of these population. Few previous studies investigating this topic among older adults in large sample sized and in low and middle income countries. Study in community was reasonable, previous study identify the importance of geographic region with prevalence of asthma. Moreover, urban and rural area were associated with asthma in many studies. (22-24) Therefore the aim of this study was to conduct a cross-sectional study to find a relationship between asthma and body mass index(BMI) and will be included other associated factors among older adults, who are aged 50 years and older in the communities of Thailand.

1.2 Research questions

1.2.1 How high was the prevalence of self-reported of physician-diagnosed asthma, among adults aged 50 years and older in the communities of Thailand?

1.2.2 What was the relationship between self-reported of physician-diagnosed asthma and body mass index (BMI) among adults aged 50 years and older in the communities of Thailand?

1.2.3 What were other factors associated with asthma among adults aged 50 years and older in community of Thailand?

1.3 Research objectives

1.3.1 General objectives

To determine prevalence and risk factors of asthma among adults aged 50 years and older who were living in communities in all regions of Thailand.

1.3.2 Specific objectives

1.3.2.1 To estimate the prevalence of asthma among adults aged 50 years and older who were living in communities in all regions of Thailand.

1.3.1.2 To identify factors associated with asthma among adult aged 50 years and older who were living in communities all regions of Thailand.

1.4 Conceptual framework

From the literature review, independent variables which was likely associated with asthma were socio-demographic factors, lifestyle factors as mentioned below and chronic condition factors such as ischemic heart disease, depression and stroke. Obesity is coming an interesting topic in this situation worldwide. However, there has no definite conclusion, especially in Thai and older adults.

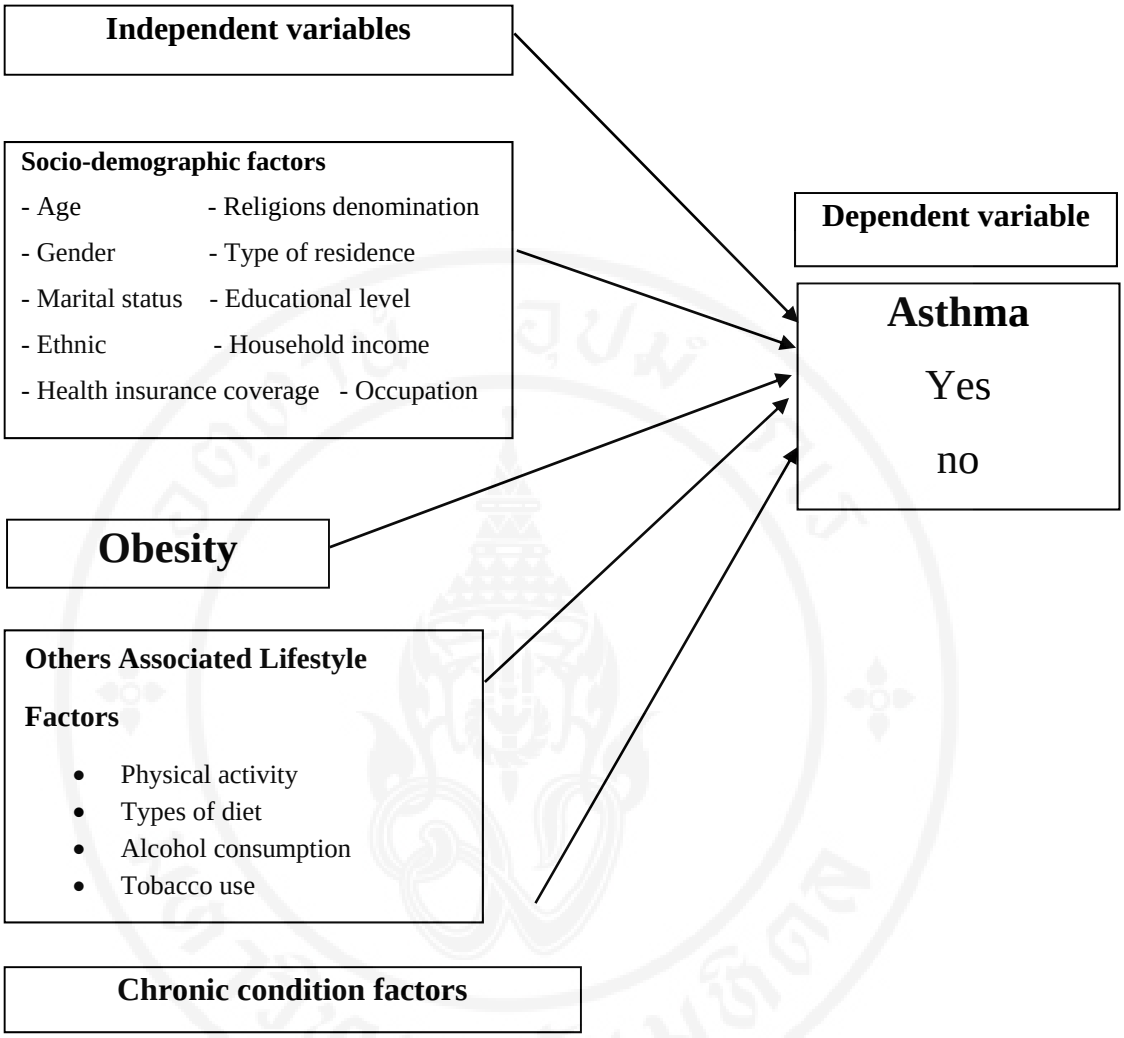


Figure 1.1 Conceptual framework

1.5 Operational definitions

Based on the conceptual framework, the operational definitions of the variables are as follows:

1.5.1 Dependent variable

Asthma: referred to the chronic reversible airway obstruction, respiratory disease among adult aged 50 years and older in Thailand who participated in this study. This research defined asthma as the self-report of physician-diagnosed asthma.

1.5.2 Independent variables

1.5.2.1 Socio-demographic factors

a. **Age:** referred to the age in years at last birthday of the respondents.

b. **Gender:** referred to the respondents' gender; male or female.

c. **Marital status:** referred to current marital status of the respondents; never married, currently married, cohabiting, separated/divorced or widowed.

d. **Health Insurance coverage:** referred to the main type of the health insurance coverage in Thailand health system that divided to universal coverage, social security, public welfare, and voluntary insurance.

e. **Type of residence:** referred to the type of resident that the respondents live in; inside or outside municipality.

f. **Education level:** referred to the highest level of education completed.

g. **Religions denomination:** referred to religious denomination of the respondents.

h. **Ethnic:** referred to background or ethnic group of the respondents

j. **Household income:** referred to total income from all people living in a respondent household. Income refer not only to the salaries and benefits received but refer to income from all sources include salary, bonuses, investment income, rents, royalties, etc.

k. **Occupation**: referred to agricultural or non-agricultural occupation of the respondents.

1.5.2.2 Obesity:

Referred to body mass index (BMI) $\geq$ 30 kg/m^2, body mass index (BMI) was calculated as weight/height^2 (kg/m^2). From World Health Organization (WHO)

recommendation for Asian adults. Body mass index (BMI) 18.5-24.9 kg/m^2 were classified

as normal range, BMI 25.0-29.9 kg/m^2 were classified as overweight and BMI $\geq$ 30.0 kg/m^2

were classified as obesity. (85-87)

1.5.2.3 Other associated lifestyle factors

a. **Physical activity:** refers to 5 different activities in daily living undertaken in a "typical week" for example, the 7 days preceding the interview. Including

1. Vigorous - intensity activity, that causes large increases in breathing or heart rate, like heavy lifting, digging or chopping wood for at least 10 minutes continuously.

2. Moderate-intensity activity such as brisk walking or carrying light loads, cleaning, cooking, washing clothes that causes small increases in breathing or heart rate, for at least 10 minutes continuously.

3. Walk or use a bicycle (pedal cycle) for at least 10 minutes continuously to get to and from places.

4. Vigorous intensity sports, fitness or recreational (leisure) activities that caused large increases in breathing or heart rate.

5. Moderate-intensity sports, fitness or recreational (leisure) activities that caused a small increase in breathing or heart rate.

b**. Types of diet**

Fast-food diet: referred to how often which the participants eat fast-food or junk food per day. Fast food may be the food that contained high carbohydrate and fat and lowering in necessary nutrition.

Sweet Beverage: referred to how often which the participants eat sweet beverage per day. Categorized to never, sometimes and always.

Sweet Food: referred to how often which the participants eat sweet food per day. Categorized to never, sometimes and always.

High Lipid diet: referred to how often which the participants eat high lipid diet per day. Categorized to never, sometimes and always.

Greasy Food: referred to how often which the participants eat oily diet per day. Categorized to never, sometimes and always.

Meat Food: referred to how often which the participants eat meat per day. Categorized to never, sometimes and always.

c. **Alcohol consumption:** referred to the alcohol use status. The questionnaires asked about alcohol consumption in the past 3 month only. For statistic purpose the alcohol consumption divided in term of no current alcohol use and current alcohol use.

d. **Tobacco use:** referred to tobacco use status. The questionnaires included about tobacco use in the past 3 months only. For statistic purpose the tobacco use divided in term of no current tobacco use and current tobacco use.

1.5.2.4 Chronic condition factors

Referred to chronic diseases which the previous literatures suggested that may be associated with asthma. Including ischemic heart disease, hypertension, diabetes mellitus, knee arthritis, stroke, depression, cataract and low back pain which the respondents were self-reported that physician had diagnosed them.

1.6 Expected outcomes

1.6.1 Improvement in management and treatment plan for asthma is more proper and effective if the accurate prevalence of asthma was revealed.

1.6.2 The relationship between body mass index (BMI) and the prevalence of asthma from this study help to proven the hypothesis that obesity is the risk factor of asthma.

1.6.3 In the future, if risk factors associated with asthma were revealed, we might be decrease this burden chronic disease by modified or improved biological factors of these population . The finding of associated factors from this research was useful for initiating in-depth studies about associated factors of asthma in the future.

1.7 Limitation of the study

This study aimed to find the prevalence of asthma among older adult in Thailand and aimed to investigate the relationship between obesity, socio-demographic factors, chronic condition factors and lifestyle factors with asthma. Sample technique was multi-stage cluster systemic sampling. Although we used systemic sampling for enrolled older adults from each communities but the selected 14 communities were derived from suitable and competency of the communities which may not completely represent all distribution area in Thailand. However this research sample was derived from all six regions in Thailand included area in northern, north-eastern, eastern, western, southern and middle of Thailand.

Another limitation of this research was some missing factors which may be associated with the relationship between asthma and obesity such as genetic factors. Because genetic factors was difficult to apply in questionnaire and cross-sectional research, therefore we studied only four factors which powerful association with asthma from literature review.

CHAPTER II
LITERATURE REVIEW

2.1 Asthma in older adults

2.1.1 Burden of asthma in older adults

Asthma has emerged as a major public health problem around the world over the past 20 years. Currently, up to 10% of adults and 35% of children worldwide suffered from asthma. The number of asthma cases has more than doubled since 1980 and rates have increased over the past 20 years, Rates of death, hospitalization, and

emergency department visits are increasing, especially in low income and developing countries. Approximately 5,500 persons die from asthma each year in USA. The costs of asthma have also increased to 12.7 billion dollars in 1998 in USA. (2-3, 9-10) The overall cost increasing for treatment of asthma from 1990 – 2000 in U.S.A. was about 50%. The costs for hospitalization and emergency department were decreased while the costs for medication was increased. (3)

2.1.2 Prevalence of asthma in older adults

Up to 10% of adults and 35% of children worldwide suffered from asthma. (9) Currently, nearly 15 million Americans have asthma, including almost 5 million children. The estimated number of adults with asthma in U.S.A. is about 7.2% or 14.6 million persons. (2, 3)

In German 5.3% (95% CI 5.0% to 5.6%) of adults reported current physician-diagnosed asthma. (25)

The study during the five year period (2007 -2011) was obtained from primary health care, specialist outpatient care and inpatient care in the Swedish capital region (N=2,093,717) to analyze the prevalence of diagnosis of six common diseases. The prevalence of asthma in this Swedish study was 5.9 %. (26)

The prevalence of asthma among students (13-14 years old) from a cross-sectional study at schools in Sao Jose do Rio Preto was 5.6%.(12) Wheezing was found in 29.1% and asthma in 22.8% of children, both conditions being more common in those under 6 years of age and 34% more common in overweight children (prevalence ratio (PR) = 1.34; 95% CI 1.07, 1.67) following adjustment in a cohort of children of 4-12 years of age living in the city of Salvador in 2005.(14)

Possible explanations for this increase prevalence of asthma include both lifestyle and environmental hypotheses. Lifestyle changes over the last 30 years are the most likely explanation for the increase in allergic disease over this period.

The hygiene hypothesis stated that a reduced exposure to allergens in early life is solely implicated in the growing propensity for allergy sensitization. Some studies have found that day care attendance and having older siblings protect against the development of asthma. This observation has led investigators to hypothesize that increased exposure to microbial agents might protect against asthma. Environmental

exposures found to predispose to asthma include house dust mite allergen and environmental tobacco smoke. Important elements of the hypothesis include helminth infection, exposure to endotoxins, exposure to pets and growing up on a farm. Better adherence to current recommendations for medical therapy and environmental management of asthma would reduce the burden of this disease. (27-32)

However, current knowledge does not permit definitive conclusions about the causes of asthma onset. The "hygiene hypothesis", which implicates diminished exposure to microbial pathogens but was recently challenged by new biological and immunological findings. Asthma might result from the interactions between individual and environmental factors (diet, air pollution, etc.), further investigations are needed to understand the precise pathophysiological mechanisms of asthma. Hygiene hypothesis alone does not provide an adequate explanation for the observed increase in allergic disease. For example, in North American inner cities, asthma is increasing among children who live in very poor housing, which might be assumed to be somewhat dirty. In order to explain the increase in asthma, we need to take a broader view and also consider alterations related to the adoption of a western lifestyle. It has been suggested that lifestyle changes related to obesity (e.g. a change in diet) are associated with asthma. Other changes include a progressive decrease in physical activity. This lifestyle factor seems to correlate best with the recent increase in asthma. Clearly, the link between physical activity and asthma needs to be investigated in more detail. (3, 5, 27, 29-32)

2.2 Theoretical background

2.2.1 Obesity

Obesity is an important public health problem. Both asthma and obesity are burden and growing problems which are considerable impact on public health around the world during the two decades. (2, 3, 12) It has been estimated that up to 65% of the adult population of the United States is obese or overweight, whilst in Spain about 15% of the population is obese and 39% is overweight, and these figures have increased progressively in recent years.(29) Currently, the prevalence of asthma

and obesity in children also increased as same as in adult.(3,14) There is accumulating evidence from numerous large cross-sectional and prospective studies performed in adults, adolescents, and children throughout the world supports the hypothesis that obesity is an independent risk factor for asthma. (2-4, 11-17, 28) Over 33 cross-sectional studies since 1999 looking up the relationship between asthma and obesity, 31 0f 34 studies reported increased prevalence of asthma in obese and overweight subjects. 8 prospective studies in adults and 5 in children/adolescent reported greater incidence of asthma in overweight and obese subjects. (30-33)

Several studies have examined the relationship of obesity and asthma and found associations suggesting that obesity predisposes to the development of asthma. With few exceptions, these studies indicate an increased relative risk of asthma in the obese and overweight and demonstrate that obesity antedates asthma. (2-4, 11-17, 28) Most prospective studies show that the risk of asthma increasing between 1.1–fold and 3-fold in obese. In the prospective study with 135,000 Norwegian men and women who were followed for 21 years, the incidence of asthma increased 10% and 7% per unit increase in BMI in men and women. (4) While increases in body mass index (BMI) have been associated with the incidence and prevalence of asthma, the mechanisms behind this association is the interaction between genes and the environment in the pathogenesis of both disorders and involved with more than one biological mechanism. (2-4, 11-17, 28) Obesity appears to be a particularly important issue for severe asthma. Obese asthma patients very often demonstrate increased asthma severity and relative corticosteroid resistance. Some studies suggest showing improvements in asthma in subjects who lose weight, as well as studies showing that obese mice have innate airway hyperresponsiveness (AHR) as well as increased responses to certain asthma triggers also suggest a causal relationship between obesity and asthma. Recently published data suggest that obese asthma patients may represent a distinct phenotype of asthma. In childhood, past asthma levels are positively correlated with changes in BMI and the onset of obesity. However, only new onset asthma is positively correlated with subsequent changes in BMI. The onset of overweight or obesity is not associated with the subsequent onset of asthma. These results suggest that the onset of asthma may be related to subsequent weight gain over time. Overweight was significantly

associated with an increased risk of having a dry night cough without a cold or chest infection and with having had self-reported asthma at some time in boys only in one research. However, in child group age 13-14 years, the evidence did not find any association between increased BMI and the prevalence of asthma. There is a cross sectional analysis reported that BMI is not associated with asthma severity in a population of children with mild to moderate asthma. They found that BMI was generally not associated with symptoms, nor was it associated with atopy. Although the association of FEV(1) and FVC with BMI did not support this hypothesis, the decrease noted in the FEV(1)/FVC ratio has potential relevance in the relationship between BMI and asthma severity.(2, 12-13, 15, 17, 33)

However, the pathogenetic basis for asthma and obesity relationship in humans has not been established. Obesity is capable of reducing pulmonary compliance, lung volumes, and the diameter of peripheral respiratory airways, and may influence on airway hyperresponsiveness. Some evidence showed that obesity and asthma share some common etiology, such as a common genetic predisposition, common effects of in utero conditions, or that obesity and asthma are both the result of some other predisposing factor such as physical activity or diet. However, there are also plausible biological mechanisms whereby obesity could be expected to either cause or worsen asthma. These include co-morbidities such as gastroesophageal reflux, complications from sleep-disordered breathing (SDB), breathing at low lung volume, chronic systemic inflammation, and endocrine factors, including adipokines and reproductive hormones. Understanding the mechanistic basis for the relationship between obesity and asthma may lead to new therapeutic strategies for treatment of this susceptible population. (2, 15, 18)

An increasing body of data supports the hypothesis that obesity and asthma may be linked through inflammatory pathways also involved in insulin resistance from the knowledge that adipose tissue produces inflammatory substances. Asthma is believed to increase the risk for several proinflammatory diseases, epidemiologic studies on asthma in relation to risk of developing type 2 diabetes are sparse and have reported inconsistent results. In Singaporean Chinese adults, they observed a positive association between self-reported, physician-diagnosed asthma and risk of developing type 2 diabetes in adult aged 45-74 years. After adjustment for

potential confounders, asthma was associated with a 31% increased risk of incident diabetes. The asthma-diabetes association looked stronger for adult-diagnosed asthma cases, and for participants who were obese compared to non-obese. It may be conclude that insulin resistance involved in obesity-induced asthma and insulin resistance was associated with an increased risk of developing asthma-like symptoms in adult. From the research, all obesity measures (body mass index, waist circumference, and waist-to-hip ratio) were associated with incident wheezing and asthma-like symptoms. In addition, fasting glucose and insulin were measured for determination of insulin resistance in the research which presented that insulin resistance was associated with incident wheezing and asthma-like symptoms. The effect of insulin resistance was stronger than that of obesity and was independent of sex. (1, 11, 12)

Airway inflammation is a characteristic feature of bronchial asthma. Previous studies have shown an increased local inflammatory activity in the airway mucosa of asthma patients. Now, there is evidence support the hypothesis that not only local, but also systemic, inflammation exist in bronchial asthma. The increase of adipose tissue in obese subjects leads to a systemic inflammatory state, which produces a rise in the serum concentrations of several pro-inflammatory cytokines, chemokines and adipokines. The proinflammatory adipokines (leptin, resistin) and antiinflammatory (adiponectin) may be causally associated with asthma, however human studies are inconclusive. There are information from research show the positively and significantly association between sensitive markers of systemic inflammation such as C-reactive protein, serum amyloid-A (SAA), and plasma fibrinogen with asthma prevalence. The associations were independent of smoking. Further adjustment for waist-to-hip ratio, a marker of central obesity, and symptoms of chronic bronchitis weakened the observed association, but the increasing trend in the association of SAA and fibrinogen with asthma remained highly significant. (2, 18, 19)

In conclusion, obesity hypothesis is coming a current evidence to explain the increasing of asthma prevalence around the world now together with environmental hypothesis because the hygiene hypothesis alone does not enough for explain this situation. However, mechanism of relation between asthma and obesity is

unclear, there is information about inflammatory process which may be associated. Many chronic diseases are common in both asthma and obesity that need further investigation for this problem.

2.2.2 Theoretical construct

Figure 2.1 Theoretical construct of the asthma hypothesis was derived from summarization of literature review that there are some theory explanation for pathophysiology and increasing prevalence of asthma worldwide. The old theory is hygiene hypothesis which cannot identify all distribution of asthma. Another theory is environmental hypothesis which play the important role in the past two decade. Now, especially in older adult, the obesity hypothesis which related to inflammation is coming in attention in this situation because of more evident supported that pathophysiology of asthma in older adult may be not the same as in the younger. However, the mechanism of action is unclear and there are many comorbidities in the elder which may be associated with inflammation and related to asthma in the elder. (3-4, 5-7, 34-44)

Hypothesis about pathophysiology of asthma

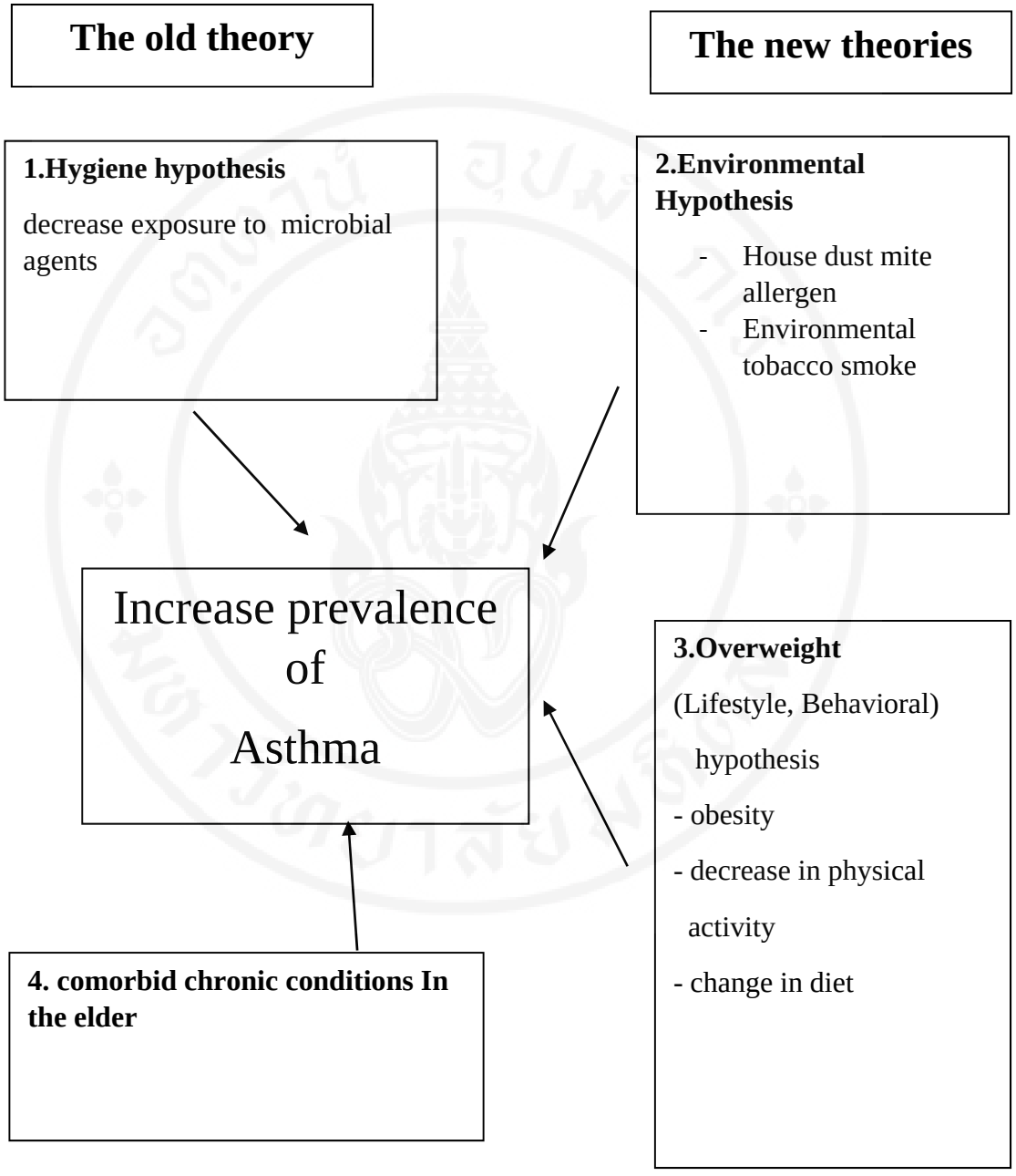


Figure 2.1 Theoretical construct of the asthma hypothesis

Theoretical Framework

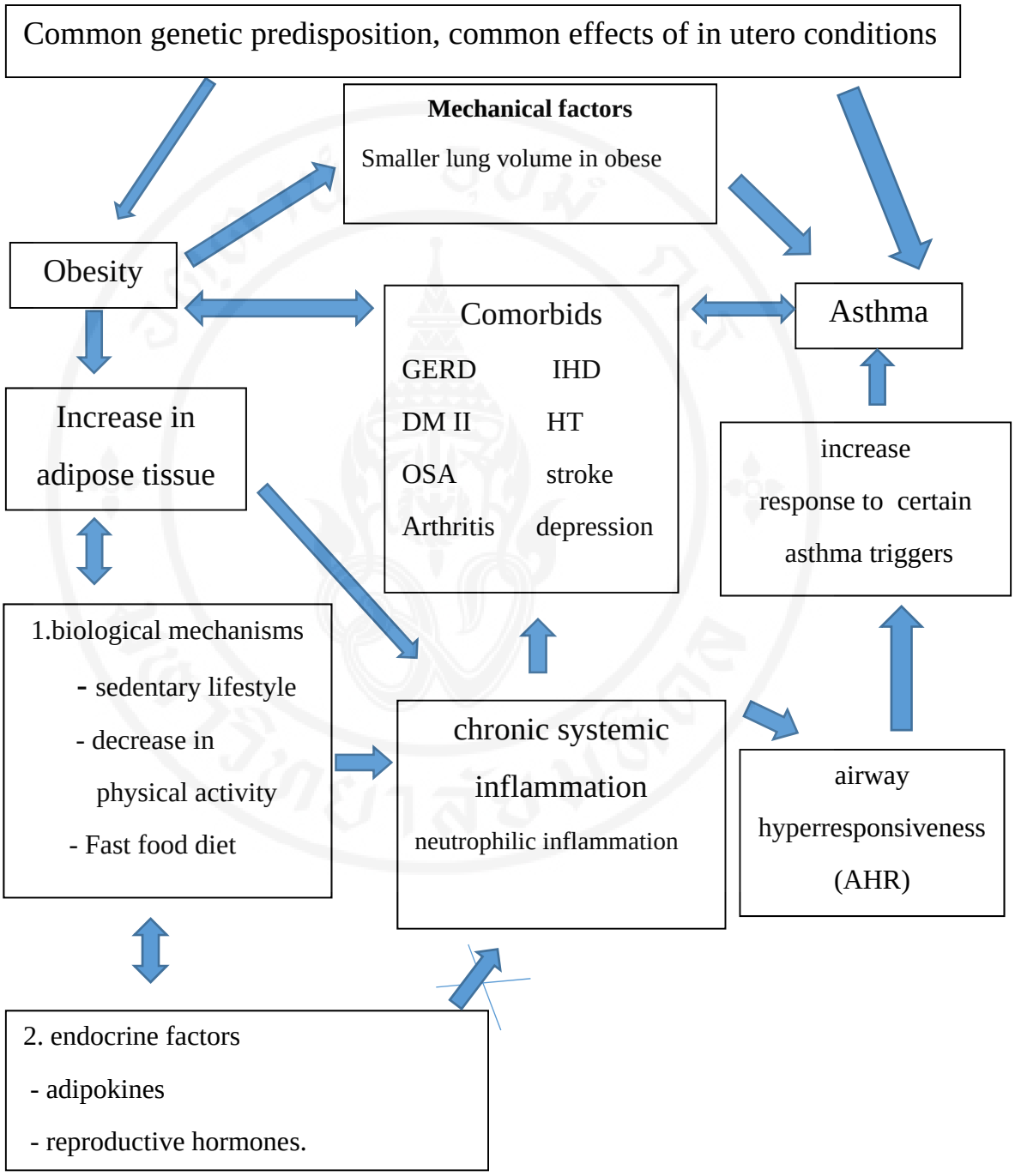


Figure 2.2 Theoretical framework of the asthma hypothesis

2.2.3 Theoretical framework

From figure 3, the Behavioral theory was the theoretical framework used in this study. The Obesity theory or Lifestyle / Behavioral / Physical activity theory is now mentioned worldwide and used to explain the increasing of asthma prevalence in the past 20 years all over the world because the old theory such as hygiene hypothesis alone is not enough for explain the increasing rate of this disease. There are many researches support the hypothesis that obesity is the risk factor of asthma, especially in older adult who has many comorbidities. The mechanism of this relationship is unclear and may be associated with systemic inflammation. Because of this reason, study in this area will be required in the near future and there are limited studies in low income and developing country include Thailand. Other lifestyle factors associated with prevalence of asthma among adult 50 years and older in Thailand from this theory are decrease in physical activity and fast food diet consumption. Tobacco use is well known for a long time to contribute asthma symptom and will stimulate asthma symptoms. According to the inflammation etiology of disease, chronic inflammatory diseases such as diabetes and alcohol consumption may associated with onset of asthma and there are many researches defined the relationship between asthma and obesity by the mechanism of insulin resistant. In conclusion, the obesity theory used in this study include physical activity, fast food and chronic inflammatory disease are the new interesting topics in this current situation for explain the rapid rising of asthma prevalence around the world.(3-7, 15, 34-44)

2.3 Other Associated Factors

2.3.1 Socio-demographic risk factors

1) Association between age and asthma

From literature reviews, prevalence of asthma was varies between age groups.Most studies worldwide, children had more prevalence of asthma than adults and the rates were lower at advanced ages (> 85 years) for both males and females. (45) However, extreme age may be had high prevalence of asthma in some

studies. Age, sex, education and smoking showed different and sometimes opposite associations with asthma (1).

2) Association between gender and asthma

Many previous studies suggested that women are at increased risk of developing adult-onset asthma and also suffer from more severe disease than men. (2, 16, 46) However, there were some studies had the results consistent with this research that no difference between both sex. (47) For example, the study from Iran and Europe in 1989, the prevalence of physician – diagnosed asthma among adults was 2.0, being similar in men and women. There were some studies reported the opposite result that asthma in males (14.1%, 11.9%) were significantly higher than in females (11.2%, 8.9%) ($p = 0.044$ and 0.018, respectively). (48) Age, sex, education and smoking showed different and sometimes opposite associations with asthma (1).

3) Association between asthma and marital status

There was no evidence mention about this topic.

4) Association between asthma and ethnic groups

There were rarely studies about this topic. A study in Chicago in 2010 reported that asthmatic patients with a higher BMI was more likely to be African American ($p < .001$) (49). Many studies found no different between any race with asthma prevalence. (47) A study showed that rate of hospitalization and death rate was higher in African Americans than in white Americans and also with Hispanic Americans in the northeast whose had elevated in death rate more than white Americans. Rates of death, hospitalization , and emergency department visits were 2-3 times higher among African Americans than among white Americans. (3)

5) Associated between Asthma and type of resident

The previous studies in U.S. and French reported that farm worker who lived in rural area were more likely to have asthma. (45, 50) However, there was a study in Arab Americans mentioned that asthma and obesity-related health problems disproportionately impact low-income ethnic minority communities residing in urban areas (28)

6) Association between asthma and household income

Some previous studies suggested that asthma and obesity was common in low-income communities. (16, 28, 51) Previous study in 6,919 children in Seoul in 2012 explored that the potential risk factors for asthma symptoms included household income. According to this previous study, household income and asthma symptoms were associated after adjusting for other potential risk factors ($p = 0.03$). (52)

7) Association between asthma and education levels

Founding that age, sex, education and smoking showed different and sometimes opposite associations with asthma (1). In conclusion, socio-demographic factors are factors which influencing asthma in many domains therefore study about socio-demographic and asthma is necessary.

8) Association between asthma and occupation

A study in Finland concluded that occupational factors impact in the inception of adult-onset persistent asthma. (53) This conclusion was relevant to another study in Europe. (54) At the same time, a study in America presented the effects of sulfur dioxide (SO(2)) exposure on the airways of the workers involved in acute attack of asthma in agricultural environment.(55)

2.3.2 Lifestyle risk factors

From previous study, asthma prevalence, severity and outcomes are associated with various patient characteristics and lifestyle. (56)

1) Association between tobacco use and asthma

Many previous studies found that smoking habit was significantly associated with asthma. (56-59) Some previous studies found that smoking was associated with poor asthma outcomes in primary care setting. (56, 60) Some studies indicated that this association limited with only female (61). There were some previous study reported controversial that asthma was no significant association with second hand smoker exposure. (62) However, most researches study in young population.This topic involved with information that oxidative stress is a cardinal feature of bronchial asthma but the role of interactions between environmental oxidant /antioxidant exposures and antioxidant genes in asthma etiology has yet to be determined. There was the hypothesis that the asthma

risk attributed to genotypes could be dependent on both oxidant (tobacco smoking) and antioxidant (fruit and vegetable intake) exposures. (58)

The empirical literature on the association between asthma and cigarette smoking had the conclusion that

1.smoking is more prevalent among individuals with asthma than those without;

2.smoking is a risk candidate for the development of asthma;

3. smoking is associated with decreased asthma control and increased risk of mortality and asthma attacks and exacerbations;

4.smokers with and without asthma may have different risk factors for smoking onset as well as different smoking motives and outcome expectancies; and

5.smoking cessation is associated with improvements in lung functioning and asthma symptoms.(63)

6.lifetime history of daily smoking and nicotine dependence were both significantly associated with asthma diagnosis

7. nicotine dependence may maintain a stronger relation with asthma than smoking.(64)

2) Association between alcohol consumption and asthma

There were limited studies defined associated between asthma and alcohol. However, from the mechanism of inflammatory process, it is suspected that alcohol may be one of the risk factor of asthma. From literature reviews, it is controversy that alcohol is the risk factor of diabetes or not while diabetes has increasing evidence that it was associated with asthma by the mechanism of inflammatory process and insulin resistance.

Previous study found that alcohol intake is associated with new-onset asthma in adults which was association between amount of alcohol intake and the risk of asthma. (65) Mechanism for this relation may be from alcohol elevates blood acetaldehyde levels, which leading to degranulation of mast cells (or basophils) leading to release of chemical mediators, such as histamine, induces asthma.(66)

Some researches mentioned that alcohol consumption was a major contributing factor for the occurrence of hypertension, anxiety, worsening

of chronic illnesses such as insomnia, depression, and less social support. Other research studied asthma during childhood which notify association of asthma with an increased risk of hospitalization in alcohol use disorder among males (67) and reported that current drinkers in the symptomatic group were more likely to drink alcohol and to have experienced severe intoxication than those in the asymptomatic group. (68)

3) Association between asthma and diets

There were some studies explained that some kinds of diets such as fast food play associated role in asthma in older adults. From the obesity hypothesis, some references showed that fast food was associated with obesity and observation that consumption of fast food was related to the prevalence of asthma and allergy. There was an evidence that frequent consumption of hamburgers showed a dose-dependent association with having history of wheezing and frequent takeaway consumption showed a similar association with BHR. (3, 10, 15, 27)

Several diets have been reported influencing the prevalence of asthma in adults and children. However, it is important to highlight that the studies on diet and asthma were carried out in patients already diagnosed with asthma. (4)

4) Association between asthma and physical activities

There were a study in Taiwan in 2016 reported that the middle-aged and elders who had moderate exercise" tend to have low probabilities and less number of visits of utilizing asthma outpatient services. (69) Another study in U.S.A.in 2015 found that low levels of physical activity is common and associated with poor asthma outcomes in a sample of primary care patients.(53) There is a study in female adult more than 85,000 participants, follow up 4 years and found that asthma prevalence increase in persons who had decreased in physical activities. (3)

2.3.3 Chronic condition factors

Asthmatics have unique characteristics that may influence cardiovascular morbidity. (70) There is increasing evidence to suggest a link between obesity-related health problems and asthma. (28)The prevalence of diabetes

and hypertension has increased significantly in the United States in the last two decades as same as the prevalence of asthma in this country (3, 71) Asthma is one of six common disease in Sweden. The prevalence of asthma was 5.9% whereas HT which is the highest five-year prevalence is12.2%, followed by depression (6.6%), diabetes mellitus (6.2%) and anxiety disorders/phobia (4.8%). (26)

1) Association between hypertension and asthma

An increased prevalence of hypertension has been described in adult asthmatic patients. However, there is no information regarding the interaction of hypertension as a comorbidity with asthma severity. (72-73) Some previous studies identified that hypertension was associated with an increased odds of asthma after adjusting for potential confounders but there was no consistent results for age of onset of asthma with high blood pressure. (72-73) Finding that asthmatic subjects with comorbid hypertension display evidence of enhanced of asthma morbidity.(73) However, more studies were needed for explained the relationship between hypertension and asthma in older adults.

The Arab American Environmental Health Project (AAEHP) was examined whether Hypertension significantly modified the relationship between environmental risk factors (ERI) and asthma among Arab Americans in metro Detroit. An environmental risk index (ERI) was used to quantify household environmental risk factors associated with asthma. Physician diagnosed hypertension was self-reported, and asthma status was determined using responses to a validated symptoms checklist and self-reported diagnosis by a physician. The positive association between household environmental risk factors and asthma was stronger among participants who diagnosed with hypertension. They suggested that further research is needed to elucidate the relationships between hypertension, environmental risk factors, and asthma.(28)

2) Association between diabetes mellitus and asthma

There are limited data on the risk of pulmonary disease in patients with diabetes. (74) Asthma was believed increasing the risk for several proinflammatory diseases, epidemiologic studies on asthma in relation to risk of

developing type 2 diabetes are sparse and had reported inconsistent results. In Chinese study, investigated the hypothesis that asthma is associated with an increased risk of incident type 2 diabetes in adults.(1) Previous studies found that the incidence of asthma was significantly higher in those patients with diagnosis of diabetes and this finding remained significant in regression models after adjusted for age, sex, race/ethnicity, smoking, BMI, education, alcohol consumption, and outpatient visits. (75)

Asthma, type 2 diabetes and increased BMI are strongly associated in Adults, particularly in women.(76) This increased risk may be a consequence of declining lung function in patients with diabetes (75) or suggested the aetiology from metabolic syndrome. (76)

3) Association between ischemic heart disease and asthma

Asthma was associated with atherosclerotic disease in several studies in America and Canada (72, 77-78) but there was rarely study about this topics in Asia. Some study found that this association may be limited to women. (77) In conclusion, coronary heart disease was associated with asthma. However, need further investigation and more studies about relationship between asthma onset and coronary heart disease, especially in developing country. (72, 77)

4) Association between stroke and asthma

Asthma was associated with atherosclerotic disease in several studies (72, 77), with evidence that this association may be limited to women. (77) In some study presented that adult-onset asthma may be a significant risk factor for stroke in women, but not men. (77) A previous study in Canada reported that there was no consistent results for age of asthma onset with stroke. (72)

5) Association between depression and asthma

Asthma and depression are common health problems in primary care. (79) Previous studies have suggested that asthmatic patients often had comorbidity with depression. There was a study reported that adults with asthma had significantly higher body mass index and higher levels of stress than adults without asthma. (80) Depressiveness, symptoms of anxiety and cognitive dysfunctions in patients with asthma possible associations with inflammation markers. There is a pilot study in mild to moderate asthma with

depressive symptoms in 59 participants. In conclusion, patients with mild to moderate asthma exhibit significantly higher levels of depressive and anxiety symptoms as well as cognitive dysfunctions than controls. The prevalence of these symptoms is related to the amount of exposure to tobacco smoke and the severity of airflow obstruction. (81) However, evidence of a relationship between asthma and depression is remain unclear.(79, 82)

A systematic review in 2015 found that six studies reported that depression predicted incident adult-onset asthma, including 83684 participants and 2334 incident cases followed for 8 to 20 years. Conversely, two studies reported that asthma predicted incident depression. These studies involved 25566 participants and 2655 incident cases followed for 10 and 20 years, respectively. The pooled adjusted relative risks (RRs) of acquiring asthma associated with baseline depression was 1.43 (95% CI, 1.28-1.61) (P<0.001). The adjusted RRs for acquiring depression associated with baseline asthma was 1.23 (95% CI, 0.72-2.10) (P = 0.45). Depression was associated with a 43% increased risk of developing adult-onset asthma. However, asthma did not increase the risk of depression based on limited studies. (82)

6) Association between cataract and asthma

Previous studies found that compared with daily oral corticosteroid use, inhaled corticosteroids decrease the risk of cataract formation in patients with steroid-dependent asthma. The addition of oral corticosteroids as pulse therapy or in any pattern of regular use can increase the risk of cataract development. More researches were needed on the relationship between asthma and cataract without steroid treatment. (83)

7) Association between low back pain and asthma

There was rarely study investigated about this association. There was evidence that the effects of pro-inflammatory cytokines on the hypothalamic-pituitary-adrenal (HPA) axis lead to the hypothesis that allergic reactions, as markers for inflammation-associated activation of the HPA axis, result in aberrant responses to subsequent stressors. Data from 6,836 US adults 20-39 years old from the Third National Health and Nutrition Examination Survey (1988-1994). Low back pain in the past 12 months and history of asthma were performed.

Subjects with a history of any allergy were more likely to report low-back pain (odds ratio = 1.51; 95% confidence interval: 1.16, 1.96). (84)

8) Association between knee arthritis and asthma

There were studies discussed the relations between asthma and rheumatoid arthritis (RA) but the results were controversial. A cohort study in Taiwan examined the risk of asthma among RA patients in a nationwide population, included 27,602 patients between 1998 and 2008. The study found that patients with RA had a significant higher risk of developing asthma than healthy people in all sex and age subgroups. Stratified analyses indicated that there was a higher risk in women with RA than in men with RA (77)

Regarding to chronic condition factors reviews, asthma was strong associated with diabetes mellitus, hypertension, depression, osteoarthritis, stroke and coronary heart disease and founding that 18% of persons with asthma had three or more co-morbidities. (25)

CHAPTER III
RESEARCH METHODOLOGY

3.1 Study design

This study was one domain of the main project which studied many domains about Thai older people named "The WHO study on global ageing and adult health (SAGE) : Thailand study". The objective of the main study was to obtain reliable, valid and comparable data on levels of health on a range of key domains for older adult out-patients who are 50 years and older in different regions in Thailand.

This study was a cross sectional study, designed to estimate the prevalence of asthma from the self-report of physician-diagnosed asthma and to evaluate the relationship of body mass index (BMI) and other associated factors with asthma among population aged 50 years and older in community all regions of Thailand. The data were be collected through a face to face questionnaire with permission of all respondents.

The study was done in 3,977 randomly selected participants aged 50 year and older to determine the prevalence of self-report of physician-diagnosed asthma and then focus on the target samples (asthmatics) from the received information. Finally, evaluation the hypothesis of an association between obesity measured by the body mass index (BMI) and asthma. The results from this study also included other associated risk factors, for example, socio-demographic details, lifestyle factors, chronic condition factors which were reviewed and concluded that may be associated with asthma.

3.2 Target population and study area

3.2.1 Target population

The target population for this study was the older adults aged 50 years and older in communities all regions of Thailand. The following statements describe the selection criteria.

Inclusion Criteria

1. Thai citizen: both males and females.
2. All persons aged 50 years and older who were living in the community.
3. Respondents who had the ability to communicate.

Exclusion Criteria

1. Respondents who did not live in site study's catchment area.
2. Respondents who did not want to continue or co-operate the research.

3.2.2 Study sites

The study sites are fourteen communities from twelve provinces in all six regions of Thailand.

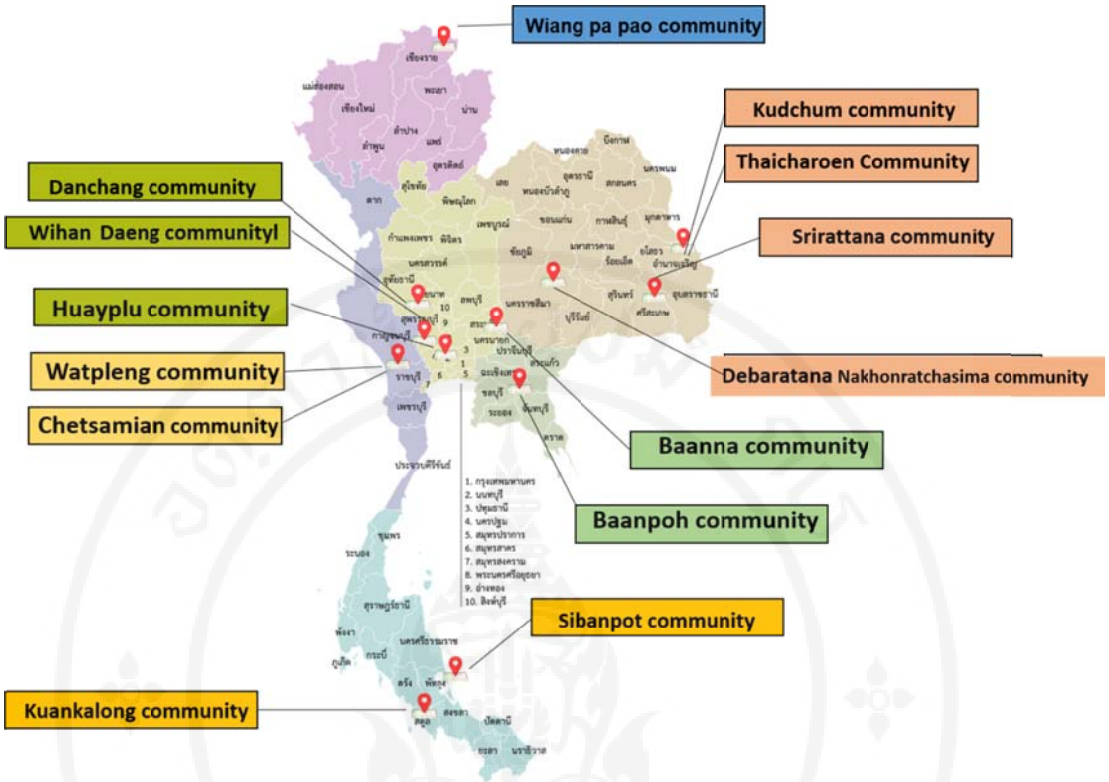


Figure 3.1: Location of the study sites, fourteen communities from twelve provinces in all six regions of Thailand were selected.

3.3 Sample size determination

For each of the 14 communities, the sample of this study was systemic sampling from adults aged 50 years and older who were living in fourteen communities from twelve provinces in all six regions of Thailand which represented in Table 3.1 below.

Table 3.1 The study area by regions of Thailand.

Regions	Provinces	Communities (Districts)
Northern	Chiang rai	Wiang Pa Pao district
North Eastern	Nakhonratchasima	Meuang Nakhonratchasima district
	Sisaket	Srirattana district
	Yasothorn	Thaicharoen district
	Yasothorn	Kudchum district
Regions	**Provinces**	**Communities (Districts)**
Central	Saraburi	Wihan Daeng district
	Nakhonpathom	Huay Plu sub-district
	Supanburi	Danchang district
Eastern	Chachoengsao	Baanpoh district
	Nakhonnayok	Baanna district
Western	Ratchaburi	Chetsamian district
	Ratchaburi	Watpleng district
Southern	Pattalung	Sibanpot district
	Satun	Kuankalong district

Sample size was calculated using the global prevalence of clinical asthma in adults was estimated to 4.3% in 2012 from the world Health Survey (WHS) which employed a standardized methodology to collect information in 70 countries by using cross –sectional survey and is the largest multicenter survey of asthma in adult 18 years or older. (1) The prevalence of asthma in Thai adult was 5-9 %.[85]

The calculation of the sample size is described below.

$$n = \frac{Z^2 (p (1-p))}{d^2}$$

$$\text{Thus } n = \frac{1.96^2 (0.043) (1-0.043)}{0.006^2}$$

$$= 0.1581/0.006^2$$

$$= 4{,}392$$

Z = standard normal score, 1.96 in case of 95% confidence interval.

p = the prevalence of clinical asthma in adults was estimated to 4.3% in 2012 from the world Health Survey (WHS). (1)

d = acceptance error set at 0.006

Replacement procedure if subjects withdraw from the study 20% of the sample size is added into sample size since there is possibility that some participants will withdraw from this study. The sample size will increase to 5,271 persons.

This study was one domain of the studies in overall SAGE Thailand research which studied in many domains about Thai older people so we collected information from the sample in fourteen communities which had the competency and readiness for research. Each site collected about 345 participants per community which was proper for management and for concluded health problems of each area.

3.4 Sampling technique

The overall sample size required from 14 communities hospitals was 5,271 persons. Each community will be randomly selected 330 participants aged 50 years and older from each community.

A three stage cluster techniques was used to draw a sample which represented below;

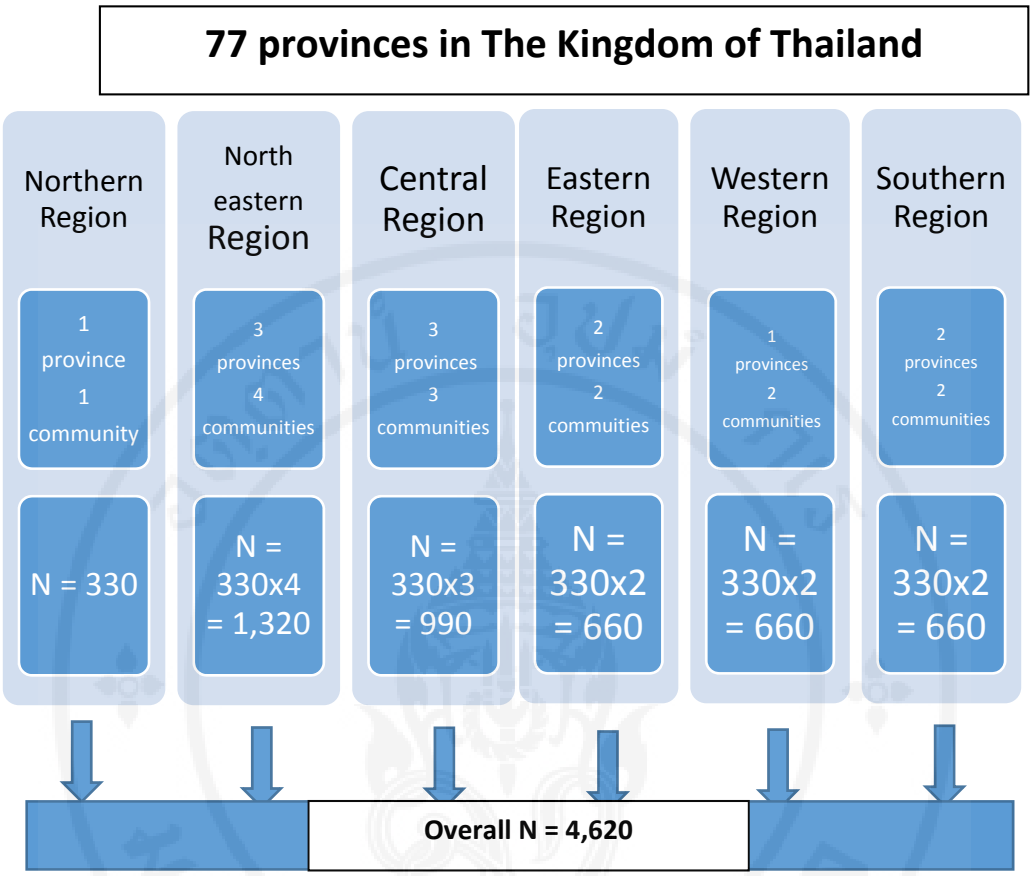


Figure 3.2 Multi-stage cluster sampling: shows the three-stage sampling. In the first stage, purposive sampling technique was used to select twelve provinces across six different regions from the kingdom of Thailand. Secondly, fourteen communities was selected by purposive sampling technique from the twelve provinces. Lastly, systematic sampling was used to select the 330 participant aged 50 years and older from each communities. The participants was also enrolled according to inclusion and exclusion criteria.

For example, Huay Plu community had the older adults aged 50 years and older about 15,000 persons therefore the population in this site was 15,000 who enrolled for systemic sampling in further step. Each community already had the list of name and other information about the older adults in its area, we used this list for systemic sampling and included 345 participants from overall older adults in the community.

3.5 Study instrument

A face-to-face individual questionnaire was performed to collect the data as a research instrument. In general, the questionnaire contains closed ended questions to generate quantitative data. Established questionnaire from the study on Global ageing (SAGE) was modified according to variable in the study. The questionnaire was translated into Thai by all researchers of this main study and then pilot studies in all communities was done to initiate Thai questionnaire for this study. The questionnaire consisted of six sections. There was introduction part, socio-demographic factors, body mass index, other lifestyles factors, chronic condition factors and asthma diagnosis. The details was given below:

Introduction part: This section consisted of 5 questions to provide information on the cognitive ability of the respondent in order to determine whether they were able to participate directly in the SAGE questionnaire or whether a proxy respondent should be sought. First question was a subjective opinion of the interviewer. If the selected respondent aged 50 years or older was mentally incapacitated or had obvious memory problems, the interviewer decided to select a proxy respondent for this interview. The second and third questions would be used to help with the decision.

Section 1: Socio-demographic factors: This part consisted of 10 questions regarding socio-demographic characteristics of the respondents, included age, gender, marital status, health insurance coverage, type of residents, education level, religions, ethnic, and household income.

a. **Age:** was classified into the age in years at last birthday of the respondents.

b. **Gender:** was categorized into 2 groups: male and female.

c. **Marital status:** was categorized into 5 groups: never married, currently married, cohabiting, separated/divorced, and widowed.

d. **Health Insurances coverage:** was categorized into 5 groups: universal coverage, social security, public welfare, voluntary insurance, and none.

e. **Type of residence:** was categorized into 2 groups: non-municipal area and municipal area.

f. **Education level:** was categorized into 7 groups: never been to school, less than primary school, primary school completed, secondary school completed, high school or equivalent completed, college/pre-university/university completed, and post graduate degree completed.

g. **Religions denomination:** was categorized into 5 groups: none, Buddhism, Christianity, Islam, and other.

h. **Ethnic:** was categorized into 2 groups: country specific or Thai, and others.

j. **Household income:** was categorized into 4 groups: less than 10000 baht/month, 10001-20000 baht/month, 20001-30000 baht/month, and more than 30000 baht/month.

Section 2: Body mass index (BMI): calculated from weight in kilograms divided by height in meters squared. Using the World Health Organization (WHO) recommendation for Asian adults, body mass index (BMI) 18.5-24.9 kg/m² were classified as normal range, BMI 25.0-29.9 kg/m² were classified as overweight and BMI $\geq$ 30.0 kg/m² were classified as obesity. (86 - 87)

Session 3: Associated Behavioral factors: This section consisted of physical activity, fast food, diet consumption and some questions of alcohol, smoking and substance involvement Screening Test which ask about current alcohol and tobacco use in the past 3 months.

a. physical activity: In this questionnaire used the questions asking about 5 types of physical activities included heavy-intensity activity, moderate-intensity activity, walk or bite , heavy-intensity exercise, moderate-intensity exercise which the participants did it or not in 1 week.

b. Diet: For example, fast food diet: there were 6 questions in this section asked about frequency eating junk food per day of the participants, which also include the sweet diet.

c. **Alcohol consumption**: There was 1 question in this section. The question consisted options “Yes” or “No”

d. **Tobacco use:** There was 1 questions in this section. Each question consisted options “Yes” or “No”

Section 4: Chronic condition factors: This section consisted of 8 questions regarding to common chronic condition factors which had the evidence associated with asthma from the literature review. All 8 questions assessed about common chronic conditions which may be presented in the respondents. The questions were “Have you ever been diagnosed with……?” (Chronic condition included diabetes, hypertension, ischemic heart disease, knee arthritis, stroke, depression, low back pain and cataract. Response items were “Yes” or “No”.

Most questions measured by “yes” or “no” answers. “Yes” referred to agreement with question and “No” referred to disagree with question.

Section 5: Obesity factors: There was a section of body mass index (BMI) because of many previous researches suggested that obesity was likely to be the risk factor of asthma. Both asthma and obesity are rapid growing in this decade and share multiple chronic condition together. Weight and height of the participants were measured for calculated BMI According to the obesity hypothesis, we used many associated factors from prior studies assessing relationship with asthma in the older population.

Section 6: self-report of physician-diagnosed asthma:

Dependent variable: There was a question in this topic for finding asthma prevalence and other associations. This study investigated physician-diagnosed asthma from self-reported of the participants.

3.6 Data collection procedure

After getting the permission from the Ethics Committee of Mahidol University, the data collection was undertaken as followed;

1. A formal letter from researcher was sent to the associated directors of the community health centers to obtain permission to collect the data in this study.

2. Research assistants was recruited from all sixteen communities. They was trained in 1 day course in AIHD for ensuring the confident to fill the questionnaire and for appropriate anthropometric measurements. One day training was organized to introduce the questionnaire and ethical issues to them.

3. Data were collected independently from the community area following the inclusion and exclusion criteria after systemic sampling from the name list.

4. A written informed consent form was introduced to the respondents to read; the form explained by research assistants before the respondents was asked to make any decision as to whether to participate in the study. However, for the face-to-face questionnaire, those individuals agreeing to participate in the study was asked to sign a formal written consent. For those who could not write, their right thumbprint was took as a symbol that they were willing to participate in the study.

5. Face-to-face interview method and anthropometric measurement was used to fill up the questionnaire.

6. Approximately 60 minutes was taken to fill up the whole questionnaire and if the research assistants could not complete the questionnaire in that day, they can did it later.

7. Data collection was collected from January to March of 2016 with the collection period lasting a maximum of 3 months.

3.7 Validity and reliability of the instruments

For validity and reliability, three experts from AIHD Mahidol University was examined the questionnaire. The researcher was revised and improved the weakness area regarding to these experts comments and inputs. After revised according to experts, the questionnaire was translated in “Thai” language. Before handling the research process, the Thai translation questionnaire was conducted to 30 adults aged 50 years and older in all selected communities. The purpose of conducting the pre-test was to detect any unclear statement, or misleading or highly sensitive questions in the research instrument, and to check the questions to ensure the validity and reliability of the questionnaire before it was used on the target respondents.

3.8 Data management and statistical analysis

Data monitoring was done throughout the data collection process by well-trained research assistants. Co-research investigators checked hardcopies for missing data and skip patterns. Data entry staff was check missing and do consistency and range checks. Online Medical Research Tools was used for data entering from all study sites. Analysis was undertaken by using the Statistical Package for the Social Sciences (SPSS). Analysis was three-fold based on the research objectives as describe below.

Firstly, descriptive univariate analysis was conducted to calculate mean, standard deviation (SD), median, quartile deviation (QD), minimum and maximum, numbers and percentage to determine the prevalence of self-report of physician-diagnosed asthma and each independent variable among older adults in Thailand community.

Secondly, computed estimates and a two-tailed p-value of 0.05 was used as the cut-off point for statistical significance. The researcher thoroughly checked the assumptions of the Chi-square test to obtain the valid results. The Chi-square test provides the valid result if the proportion of cells that have expected frequencies less than 5 was less than 0.2 in large tables. If the proportion was larger than 0.2, cells were combined to reduce the number of expected frequencies that were less than 5. For 2x2 Tables, if one of the expected frequencies was more than 5, Fisher's exact test was used instead of the Ci-square test.

After that bivariate regression analysis was applied for the associations between each independent variable and self-report of physician-diagnosed asthma, odds ratios was reported with 95% confidence intervals. Finally, multiple logistic regression analysis was used to determine the significant predictors related to self-report of physician-diagnosed asthma among older adults in Thailand community. All variables statistically significant at p-value < 0.05 in the Chi-square test and regression analysis was included in the multiple logistic regression.

3.9 Ethical consideration

Ethical issues of the survey instrument existed with regards to the nature of the questions, the timing of the survey, and its administration. The survey instrument had been pilot tested and preliminary analysis conducted to determine the extent of some of these ethical considerations and what modifications are necessary to improve the questions and instrument structure to obtain the best quality data while minimizing burden and discomfort to the respondent. In particular, interviewer feedback on problematic areas from their experience implementing in the field had been considered.

Some of the survey questions may be deemed "sensitive" or very "personal" and pose potential ethical considerations to respondents. The respondent may feel uncomfortable answering certain questions either to the interviewer and/or in front of other household members that maybe present. Interviewers was trained to ensure to respondents the confidentiality of information, to help respondents feel at ease, and to communicate the respondents right not to answer questions they don't want to answer. Furthermore, interviewers gave respondents the option of conducting the interview in private if they so wish, and if this is not feasible to return on a day it is. All these considerations was communicated in the informed consent form.

Similar issues existed with the performance measurements. Respondents may feel embarrassed, tired or physically uncomfortable with any of the measurements. Interviewers was trained extensively in the administration of each of the measures to minimize discomfort to respondents. Further, respondents were explained before signing the consent form, the details of the measures to be taken, any potential discomforts, any potential risks, as well as the benefits and the usefulness of the information obtained. They was told of their right to refuse to take any of the measures. The proposal was approved by the Committee for Research Ethics of Mahidol University. No individual level identifiers was included in any public data set - and no individual identifiers was sent to AIHD.

CHAPTER IV
RESULTS

The aim of this research was to determine the prevalence of asthma among older adults aged 50 years and older in the communities of Thailand and to examine the relationship between the body mass index, socio - demographic factors, chronic condition factors and other associated lifestyle factors with asthma. A total of 3,977 face to face interview in Thai language were completed and returned to the study in January to March, 2016 in 14 communities, all regions of Thailand.

This research was a cross - sectional study. The quantitative data was presented in the form of number and percentage with median, quartile deviation (QD), minimum and maximum. Chi – square tests and multiple logistic regression were used to examine the relationship between the independent variables and asthma. The research results are presented as follows.

In this chapter, the results were presented in 10 parts as follow:

4.1 Prevalence of asthma among older adults in Thailand

4.2 Socio-demographic characteristics

4.3 Body mass index

4.4 Chronic condition factors

4.5 Lifestyle factors

4.6 Association between socio-demographic factors and asthma

4.7 Association between obesity and asthma

4.8 Association between chronic condition factors and asthma

4.9 Association between lifestyle factors and asthma

4.10 Association between all independent variables and asthma

4.1 Prevalence of asthma among older adults

This study defined asthma as self-reported of patient-diagnosed asthma in the communities of Thailand. Table 4.1 shows that 2.1% of the older adults reported asthma in this study.

Table 4.1 Prevalence of asthma among older adults

Asthma	Number (n = 3977)	Percent
Yes	74	2.1
No	3390	97.9

(Missing = 513)

Figure 4.1 show prevalence of asthma by regions of Thailand. The prevalence of asthma in the Northern was 1%, in the North-eastern was 2.2%, in the Eastern was 2.4%, in the Southern was 3.4%, in the Western was 1.1% and in the Middle was 4.5%.

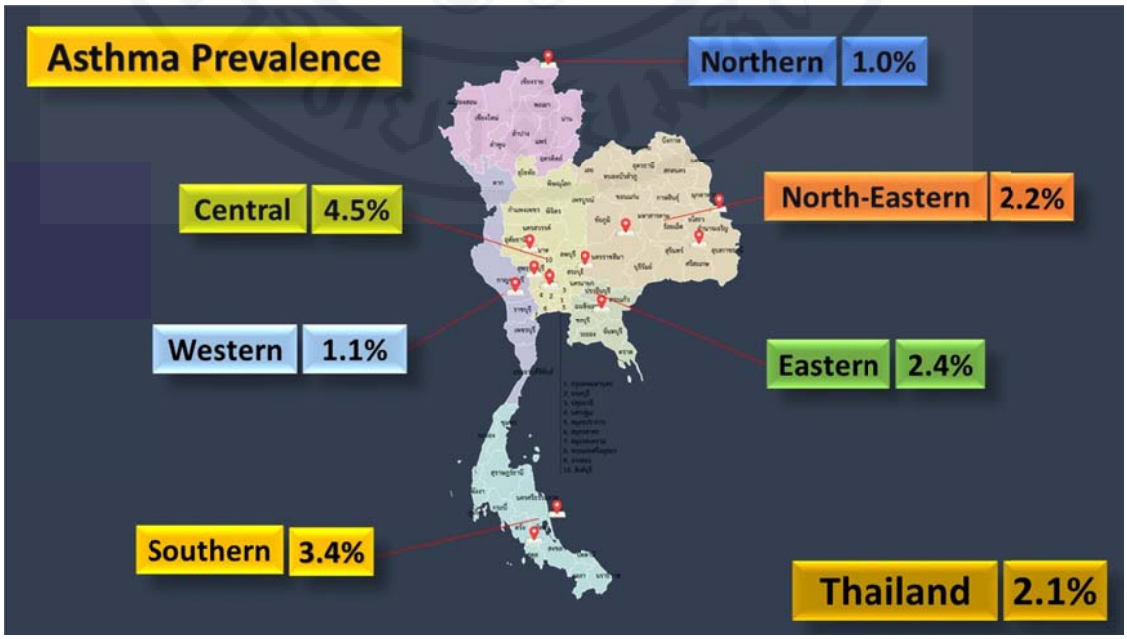


Figure 4.1 Prevalence of asthma by regions of Thailand

4.2 Socio – demographic characteristic

The study was conducted in 14 communities all regions of Thailand. Total of 3977 older adults aged 50 years and older were included in the study. Table 4.2 below shows that more than half of the respondents were female (63.1%) and around one third of the respondents aged 50-59 years and 60-69 years (37.6 and 35.9 % respectively). The median age was 62 years old. With regard to marital status, majority were married (70.3%), mainly graduated primary school (63.9%) and live outside municipal area (69.4%). For health insurance coverage, most respondents had universal coverage (84.4%) and nearly all respondents were Thai people (99.1%). Most of religion denomination were Buddhism (92.9). With regard to current family income, 52.7% had family income less than 10,000 baht/month followed by family income between 10,001 – 20,000 baht/month with 32.2% during data collection period.

Table 4.2 Number and percentage of respondents by socio-demographic characteristics

Personal characteristics	Number	Percent
Gender	**3977**	
Male	1466	36.9
Female	2511	63.1
Age group (years)	**3768**	
50 - 59	1418	37.6
60 - 69	1353	35.9
70 - 79	712	18.9
80 - 89	260	6.9
90 - 100	25	0.7
Median = 62 , QD = 7, Min = 50 , Max = 97, (missing 209)		

Table 4.2 Number and percentage of respondents by socio-demographic characteristics (cont.)

Personal characteristics	Number	Percent
Marital status	**3894**	
Single	230	5.9
Married	2738	70.3
Divorced/Separate	159	4.1
Widow	767	19.7
	(missing 209)	
Educational level	**3932**	
Lower than Primary school	797	20.2
Primary school	2511	63.9
Secondary school	427	10.9
Vocational - Bachelor	177	4.5
Higher than bachelor	20	0.5
	(missing 45)	
Health insurance coverage	**3929**	
Universal coverage	3314	84.4
Social Security	78	1.9
Government Enterprise	517	13.2
	(missing 48)	
Type of residence	**3906**	
Inside municipal area	1197	30.6
Outside municipal area	2709	69.4
	(missing 84)	
Religion denomination	**3934**	
Buddhist	3656	92.9
Christian	79	2.0
Muslim	191	4.9
Others	8	0.2
	(missing 43)	

Table 4.2 Number and percentage of respondents by socio-demographic characteristics (cont.)

Personal characteristics	Number	Percent
Current family income (Baht/month)	**3689**	
Less than 10,000	1943	52.7
10,001 – 20,000	1189	32.2
20,001 – 30,000	332	9.0
Less than 10,000	1943	52.7
Occupation	**3517**	
Agriculturist	2019	57.4
Non-Agriculturist	1498	42.6
	(missing 460)	

4.3 Body mass index

The respondents' body mass index was categorized into four levels. When the body mass index of the respondents was equal or less than 18.49 kg/m^2, it was considered less than optimum level. If their BMI was between 18.50 and 24.99 kg/m^2, they were considered normal. Older adults in Asia with body mass index between 25.00 - 29.99 kg / m^2 were diagnosed obesity. The body mass index more than or equal to 30 kg / m^2 were considered to have a morbid obesity. In this study, Table 4.3 shows that more than half (58.7%) of the respondents (n = 3817) had normal body mass index and more than one third (25.8% and 6.7%) were obesity and morbid obesity.

Table 4.3 Percentage of respondents by body mass index (BMI)

Status	BMI (kg/m^2)	Number	Percent
Less than optimal	$\leq$ 18.49	338	8.8
Normal	18.50 - 24.99	2239	58.7
Obesity	25.00 - 29.99	984	25.8
Morbid Obesity	$\geq$30	256	6.7

Missing = 160

4.4 Chronic condition factors

According to chronic condition factors, the prevalence of hypertension was 65.9% while the prevalence of diabetes was 22%. About stroke, 3.6% correctly answered that was stroke. About 2.3% knew that they had ischemic heart disease. The prevalence of depression was 2.3% and more than one third (34.1%) of respondents had low back pain. For knee arthritis, the prevalence was 8.8% and the prevalence of cataract was 7.2 %. (Table 4.4)

Table 4.4 Number and percentage of respondents by chronic diseases

Chronic Diseases	Number	Percent
Hypertension	**3667**	
Yes	2415	65.9
N0	1252	34.1
	(missing 310)	
Diabetes Mellitus	**3152**	
Yes	693	22.0
No	2459	78.0
	(missing 825)	
Stroke	**3499**	
Yes	127	3.6
No	3372	96.4
	(missing 478)	
Ischemic Heart Disease	**3499**)	
Yes	81	2.3
No	3418	97.7
	(missing 478	
Depression	**3710**	
Yes	85	2.3
No	3625	97.7
	(missing 267)	

Table 4.4 Number and percentage of respondents by chronic diseases (cont.)

Chronic Diseases	Number	Percent
Low Back Pain	**3806**	
Yes	1299	34.1
No	2507	65.9
	(missing 171)	
Knee Arthritis	**3853**	
Yes	340	8.8
No	3513	91.2
	(missing 124)	
Cataract	**3644**	
Yes	262	7.2
No	3382	92.8
	(missing 333)	

4.5 Lifestyle Factors

Lifestyle factors were categorized into three parts

4.5.1 Substance used

4.5.2 Diets

4.5.3 Physical activities and exercise

Regarding to substance use, tobacco use and alcohol consumption were included, Table 4.5 showed the percentage of the respondents' substance uses. Approximately 11 percent of older adults addressed that they use tobacco (11.4%) and had alcohol consumption (10.8%).

Table 4.5 Number and percentage of respondents by lifestyle (substance use)

	Number	**Percent**
Tobacco use	**3925**	
Yes	447	11.4
No	3478	88.6
	(missing 52)	
Alcohol consumption	**3939**	
Yes	425	10.8
No	3514	89.2
	(missing 38)	

Table 4.6 showed that most of the older adults (92.6%) never had fast food, less than half (44.2% and 47.3% respectively) never had sweet beverages and sweet food in one week while 13.5% and 6.1% always took them in recent 4 weeks. However, more than one third (34.2 %) accepted that they sometimes had high lipid diet and only 1.6 % always had high lipid diet. More than half of the respondents (61.6%) never ate greasy diet in one week, more than one third (35%) sometimes ate greasy food. About meat diet, less than half (49.1%) of the respondents sometimes had meat diet and 16.2% always ate them.

Table 4.6 Number and percentage of respondents by lifestyle (diets)

Type of diets	**Number**	**Never**	**Sometimes**	**always**
		N (%)	**N (%)**	**N (%)**
Fast food	3932 (missing45)	3640 (92.6)	264 (6.7)	28 (0.7)
Sweet Beverage	3931 (missing46)	1736 (44.2)	1663 (42.3)	532 (13.5)
Sweet food	3924 (missing53)	1853 (47.2)	1832 (46.7)	239 (6.1)
High lipid diet	3926 (missing51)	2521 (64.2)	1341 (34.2)	64 (1.6)
Greasy food	3921 (missing56)	2414 (61.6)	1374 (35.0)	133 (3.4)
Meat Food	3911 (missing66)	1359 (34.7)	1919 (49.1)	633 (16.2)

From Table 4.7 Regarding to the respondents' physical activities, there was less than 10 percent of the respondents had heavy physical activity (8.9%) and about one fifth had moderate physical activity in one week. Interesting that more than one third (36%) of the respondents rode bicycle continuous more than 10 min in 1 week. Most of respondents (94.1%) did not had heavy exercise in one week while near one fourth continuous had moderate exercise (23.7%).

Table 4.7 Number and percentage of respondents by lifestyle (physical activities)

Lifestyle	Number	No (%)	Yes (%)
Heavy Physical activities	3924	3576 (91.1)	348 (8.9)
Moderate Physical activities	3918	3226 (79.5)	802 (20.5)
Walk or Bicycle	3901	2496 (64.0)	1405 (36.0)
Heavy Exercise	3891	3663 (94.1)	228 (5.9)
Moderate Exercise	3834	2924 (76.3)	910 (23.7)

(missing45)

Association between asthma and Independent variables

4.6 Association between asthma and older adults' socio – demographic factors

Table 4.8 and 4.9 describes the relationship between asthma and the socio – demographic factors by Chi-square test and regression analysis respectively. There was a significant association between types of residence with asthma (P-value = 0.048) in Chi-square test (Table 4.8). Living outside municipal area was 1.8 times more likely to have asthma than those living inside municipal area. No significant association between asthma and other socio-demographic factors. (Table 4.9)

Table 4.8 Association between socio-demographic factors and asthma by chi-square test

Socio-demographic factors	Total	Asthma		X^2 (df)	P-value
	n	Yes (%)	No (%)		
Gender	**3464**			0.130 (1)	0.718
Male	1288	2.3	97.7		
Female	2176	2.1	97.9		
Age group (years)	**3295**			4.810 (4)	0.307
50 - 59	1256	2.1	97.9		
60 - 69	1181	2.2	97.8		
70 - 79	617	1.3	98.7		
80 - 89	223	3.6	96.4		
90 - 100	18	0.0	100		
Marital status	**3399**			0.980 (2)	0.613
Single	202	2.5	97.5		
Married	2383	1.9	98.1		
Divorced/Separate/ Widow	814	2.5	97.5		
Educational level	**3430**			2.833 (2)	0.243
Lower than Primary school	674	1.3	98.7		
Primary school	2211	2.4	97.6		
Higher than Primary school	545	2.0	98.0		
Health insurance coverage	**3417**			0.417 (1)	0.519
Universal coverage	2900	2.1	97.9		
Non-UC	517	2.5	97.5		

Table 4.8 Association between socio-demographic factors and asthma by chi-square test (cont.)

Socio-demographic factors	Total	Asthma		X^2 (df)	P-value
	n	Yes (%)	No (%)		
Type of residence	**3408**			3.907 (1)	0.048
Inside municipal area	1075	1.4	98.6		
Outside municipal area	2333	2.4	97.6		
Current family income(Baht/month)	**3221**			1.377 (3)	0.711
Less than 10,000	1729	2.3	97.7		
10,001 – 20,000	1010	1.8	98.2		
20,001 – 30,000	289	2.8	97.2		
More than 30,000	193	2.1	97.9		
Occupation	**3074**			0.001 (1)	0.970
Agriculturist	1763	2.2	97.8		
Non-Agriculturist	1311	2.1	97.9		

Table 4.9 Association between socio-demographic factors and asthma by regression analysis

Socio-demographic		Asthma		Crude OR	P-value
	n	Yes (%)	No (%)	(95% CI)	
Gender	**3464**	**74**	**3390**		
Female	2511	2.1	97.9	1	
Male	1466	2.3	97.7	1.091 (0.680-1.749)	0.718
Age group (years)	**3295**	**74**	**3390**		
50 - 59	1256	2.1	97.9	1	
60 - 100	2039	2.1	97.9	1.045 (0.641 –1.703)	0.861
Marital status	**3399**	**71**	**3328**		
Married	2383	1.9	98.1	1	
Single/ Widow Divorced/Separate	1016	2.5	97.5	1.282 (0.783 – 2.098)	0.324
Educational level	**3430**	**73**	**3357**		
Lower than Primary school	674	1.3	98.7	1	
Primary school and higher	2756	2.3	97.7	1.757 (0.870 – 3.548)	0.116
Health insurance coverage	**3417**	**73**	**3344**		
Universal coverage	2900	2.1	97.9	1	
Non-UC	517	2.5	97.5	1.221 (0.665 – 2.240)	0.519
Type of residence	**3408**	**72**	**3336**		
Inside municipal area	1075	1.4	98.6	1	
Outside municipal area	2333	2.4	97.6	1.770 (0.997 – 3.140)	0.051

Table 4.9 Association between socio-demographic factors and asthma by regression analysis (cont.)

Socio-demographic		Asthma		Crude OR	P-value
	n	**Yes (%)**	**No (%)**	**(95% CI)**	
Race	**3393**	**31**	**3321**		
Thai	3361	2.1	97.9	1	
others	32	3.1	96.9	1.495 (0.201 -11.102)	0.694
Religions denomination	**3430**	**73**	**3357**		
Buddhism	3201	2.1	97.9	1	
Others	229	2.6	97.4	1.259 (0.540 – 2.933)	0.594
Current family income(Baht/month)	**3221**	**70**	**3151**		
Less than 20,000	2739	2.1	97.9	1	
More than 20,001	482	2.5	97.5	1.180 (0.629 – 2.214)	0.606
Occupation	**3074**	**66**	**3008**		
Agriculturist	1763	2.2	97.8	1.009 (0.616-1.653)	0.970
Non-Agriculturist	1311	2.1	97.9	1	

4.7 Association between body mass index and asthma

Body mass index of the respondents were categorized in to four groups. Association between asthma and body mass index was analysed by Chi-square test. Although no statistically significant between body mass index and asthma, the normal group (body mass index 18.50 - 24.99) was most associated with asthma. (Table 4.10)

Table 4.10 Association between body mass index and asthma (N=3977)

			Asthma		X^2	P value
Status	**BMI (kg/m^2)**	**n**	**Yes (%)**	**No (%)**	4.633	0.201
Less than optimal	≤18.49	291	1.7	98.3		
Normal	18.50 - 24.99	1959	2.5	97.5		
Obesity	25.00 - 29.99	859	1.9	98.1		
Morbid Obesity	≥30	226	0.4	99.6		

Missing = 642

When summarized the body mass index of the older adults into two groups overweight and non-overweight then analysed the association between asthma and overweight by using logistic regression, there was found that no statistically significant between overweight and asthma, Overweight older adults who had the body mass index more than 25 kg/m^2 were nearly 0.7 times less likely to report asthma than those who were non-overweight. (Table 4.11)

Table 4.11 Association between overweight and asthma

BMI (kg/m^2)	n	Asthma		Crude OR (95% CI)	P-value
		Yes (%)	No (%)		
	3338	**70**	**3268**		
Non-overweight BMI < 25	2251	2.4	97.6	1	
Overweight BMI ≥ 25	1087	1.6	98.4	0.659 (0.380 – 1.143)	0.138

When summarized the body mass index of the older adults into two groups obesity and non-obesity then analysed the association between asthma and obesity by using logistic regression, there was found that no statistically significant between obesity and asthma, Obesity older adults who had the body mass index more than 30 kg/m^2 were 0.4 times less likely to report asthma than those who were non-overweight. (Table 4.12)

Table 4.12 Association between obesity and asthma

BMI (kg/m^2)	n	Asthma		Crude OR (95% CI)	P-value
		Yes (%)	No (%)		
	3349	**71**	**3278**		
Non-obesity BMI < 30	3123	2.2	97.8	1	
Obesity BMI ≥ 30	226	0.4	99.6	0.194 (0.027 – 1.402)	0.104

4.8 Association between chronic condition factors and asthma

Regarding chronic condition factors, there were statistically significant associations between asthma and ischemic heart disease, low back pain, knee arthritis and cataract. The older adults who had ischemic heart disease were about five times

more likely to report asthma than who did not have. Older adults who had low back pain were nearly 3.5 times more likely to report asthma than those who did not have. According to cataract, older adults who had cataract were nearly three times more likely to report asthma than those who did not have. Older adults who had knee arthritis which around two times more likely to report asthma compare with those who did not have knee arthritis. There was no statistically significant association between hypertension, diabetes, stroke, depression and asthma from this study. (Table 4.13).

Table 4.13 Association between chronic condition factors and asthma

Chronic diseases	**n**	**Asthma**		**Crude OR (95% CI)**	**P-value**
		Yes (%)	**No (%)**		
Hypertension	**3298**	**71**	**3227**		
Yes	1136	2.3	97.7	1.10 (0.68 -1.80)	0.697
No	2162	2.1	97.9	1	
Diabetes mellitus	**2923**	**70**	**2853**		
Yes	634	2.7	97.3	1.16 (0.67 – 2.02)	0.594
No	2289	2.3	97.7	1	
Stroke	**3219**	**67**	**3152**		
Yes	107	2.8	104	1.37 (0.43 – 4.45)	0.596
No	3112	2.1	97.9	1	
Ischemic Heart Disease	**3224**	**65**	**3159**		
Yes	67	9.0	91	5.17 (2.15– 12.42)	<0.001
No	3157	1.9	98.1	1	
Depression	**3272**	**66**	**3206**		
Yes	70	4.3	95.7	2.23 (0.68 – 7.28)	0.184
No	3202	2.0	98.0	1	

** = p < 0.001, * = p < 0.05

Table 4.13 Association between chronic condition factors and asthma (cont.)

Chronic diseases	n	Asthma		Crude OR (95% CI)	P-value
		Yes (%)	No (%)		
Low Back Pain	**3353**	**72**	**3281**		
Yes	1169	3.9	96.1	3.40 (2.09 – 5.53)	<0.001
No	2184	1.2	98.8	1	
Cataract	**3262**	**67**	**3195**		
Yes	228	4.8	95.2	2.70 (1.39 – 5.22)	0.003
No	3034	1.8	98.2	1	
Knee Arthritis	**3392**	**73**	**3319**		
Yes	311	4.2	95.8	2.20 (1.19 – 4.05)	0.012
No	3081	1.9	98.1	1	

4.9 Association between lifestyle factors and asthma

Lifestyle factors in this study included substance use, diets and physical activities. According to substance use, Tobacco use and alcohol consumption were associated with asthma from literature reviews. Table 4.14 showed that there was no statistically significant between asthma and substance use (P- value = 0.545 and 0.405 for alcohol consumption and tobacco use respectively). The older adults who had alcohol consumption were 1.23 times more likely to be asthma than those who did not. For the associated between tobacco use and asthma, older adults who used tobacco were nearly 1.33 times more likely to report asthma than those who did not use.

Table 4.14 Association between substance use and asthma

Substance Use	n	Asthma		Crude OR (95% CI)	P-value
		Yes (%)	No (%)		
Alcohol consumption	**3424**	**72**	**3352**		
Yes	3026	2.5	97.5	1.23 (0.63– 2.42)	0.545
No	398	2.0	98.0	1	
Tobacco Use	**3437**	**73**	**3364**		
Yes	368	2.7	97.3	1.33 (0.68 – 2.62)	0.405
No	3069	2.1	97.9	1	

One of other lifestyle factor was diets, table 4.15 presented many types of diets which no one had statistically significant associated with asthma in this study.

Table 4.15 Association between diets and asthma

Type of Diets	n	Asthma		Crude OR (95% CI)	P-value
		Yes (%)	No (%)		
Fast food	**3427**	**74**	**3353**		
Never/Sometimes	3400	2.1	97.9	1	
Often	27	3.7	96.3	1.75 (0.24 -13.10)	0.584
Sweet beverage	**3426**	**74**	**3352**		
Never/Sometimes	2953	2.0	98.0	1	
Often	473	3.2	96.8	1.61 (0.90 -2.86)	0.106
Sweet diets	**3421**	**74**	**3347**		
Never/Sometimes	3215	2.2	97.8	1.53 (0.48 -4.89)	0.475
Often	206	1.5	98.5	1	
Greasy food	**3416**	**74**	**3342**		
Never/Sometimes	3307	2.2	97.8	2.44 (0.33-17.70)	0.378
Often	109	0.9	99.1	1	

Table 4.15 Association between diets and asthma (cont.)

Type of Diets	n	Asthma		Crude OR (95% CI)	P-value
		Yes (%)	No (%)		
Meats food	**3408**	**74**	**3334**		
Never/Sometimes	2856	2.2	97.8	1.00 (0.54-1.87)	0.996
Often	552	2.2	97.8	1	

Physical activities were defined as one of lifestyle factors that may be associated with asthma. According to this study, no statistically significant association between physical activities and asthma as showed in Table 4.16

Table 4.16 Association between physical activities and asthma

Physical Activities	n	Asthma		Crude OR (95% CI)	P-value
		Yes (%)	No (%)		
Heavy-intensity activity continuously at least 10 minutes					
	3420	**74**	**3346**		
Yes	313	2.9	97.1	1.39 (0.68 – 2.81)	0.366
No	3107	2.1	97.9	1	
Moderate-intensity activity continuously at least 10 minutes					
	3415	**73**	**3342**		
Yes	717	1.7	98.3	1	
No	2698	2.3	97.7	1.36 (0.73 – 2.54)	0.336
Walk/Use bicycle continuously at least 10 minutes					
	3406	**71**	**3335**		
Yes	1233	1.9	98.1	1	
No	2173	2.2	97.8	1.11 (0.68 – 1.83)	0.671
Vigorous intensity exercises that cause large increases in heart rate					
	3394	**71**	**3126**		
Yes	197	1.0	99.0	1	
No	3197	2.2	97.8	2.21 (0.54 – 9.10)	0.270

Table 4.16 Association between physical activities and asthma

Physical Activities	n	Asthma		Crude OR (95% CI)	P-value
		Yes (%)	No (%)		
Moderate intensity exercises that cause large increases in heart rate					
	3350	**72**	**3278**		
Yes	815	2.0	98	1	
No	2535	2.2	97.8	1.13 (0.64 – 1.98)	0.674

4.10 Association between independent variables and asthma

All significant independent variables that had a relationship with asthma in the Chi-square tests and logistic regression analysis were included in the full model and then analysed with multiple logistic regression. Low back pain and ischemic heart disease were found to be significant associated with asthma after adjusted with other factors. (Table 4.17)

Table 4.17 Full model of multiple logistic regression

Independent Variables	Adj. OR	95% C.I. for OR		P-value
		Lower	Upper	
Types of Residence				
Outside municipal area	1.71	0.89	3.29	0.11
Inside municipal area	1			
Ischemic Heart Disease				
Yes	3.39	1.16	9.97	0.026*
No	1			
Low Back Pain				
Yes	3.75	2.07	6.79	<0.001**
No	1			
Cataract				
Yes	1.72	0.77	3.85	0.190
No	1			

Table 4.17 Full model of multiple logistic regression (cont.)

Independent Variables	Adj. OR	95% C.I. for OR		P-value
		Lower	Upper	
Knee Arthritis				
Yes	1.54	0.74	3.21	0.247
No	1			
Body Mass Index (kg/m^2)				
<30(Non-obese)	0.26	0.04	1.91	0.186
≥30 (Obese)	1			

** = p < 0.001, * = p < 0.05

Finally, from multiple logistic regression among older adults aged 50 years and older in Thailand, asthma was statistically associated with type of residence, ischemic heart disease and low back pain after adjusted for other factors. Regarding to type of residence, the older adult who lived outside municipal area were about two time to report asthma than another group. The respondents who were ischemic heart disease reported asthma about 4.5 times when compare to who not had ischemic heart disease. For low back pain, it was presented that the participants who had low back pain were about 4.5 times more likely to report asthma than who did not have. (Table 4.18)

Table 4.18 Final model of multiple logistic regression

Variables	Adj. OR	95% C.I. for OR		P-value
		Lower	Upper	
Type of Residence				
Outside municipal area	2.01	1.06	3.83	0.033*
Inside municipal area	1			
Ischemic heart disease				
Yes	4.31	1.63	11.42	0.003**
No	1			
Low back pain				
Yes	4.38	2.50	7.68	<0.001**
No	1			
Body Mass Index (kg/m^2)				
<30	1			
≥30	0.23	0.03	1.65	0.142

*p-value < 0.05, ** p-value < 0.001

Chapter summary

The total of 3977 older adults in 14 communities, all regions of Thailand was enrolled in this study. Finding that the prevalence of asthma among older adults aged 50 years and older in communities of Thailand was 2.1 percent. There was no association between asthma and overweight or obesity among this population group. The analysis results presented that the association between asthma with type of resident, ischemic heart disease and low back pain were statistically significant after adjusted with other factors.

CHAPTER V
DISCUSSION

The findings from the study of relationship between obesity and asthma among older adults in Thailand was discussed as follow:

- Discussion of the research results
- Discussion of the research methodology

Discussion of the research results

This study was a cross-sectional study, conducted in 14 communities across all regions of Thailand using face to face questionnaires. The aim of this study was to find out the prevalence of asthma among older adults aged 50 years and older in Thailand and to examine the association between asthma and obesity. Other study factors were also investigated the relationship between asthma and the following independent variables: socio – demographic factors, chronic disease and lifestyle factors. A total of 3977 respondents were included in this study.

5.1 Prevalence of asthma among older adults

From this study, prevalence of self-reported of physician-diagnosed asthma among older adults aged 50 years and over in communities of Thailand was 2.1% which was lower than the previous study. There were few studies in Thai about prevalence of asthma in older adult population. (48) A previous study in Thai people aged 17-53 years (mean 20.0 +/- 3.2 years) which 97.2% were less than 30 years old, two thousand six hundred and ninety-three participants (835 males and 1,858 females) reported prevalence of wheeze within the past 12 months and of diagnosed asthma were 12.1% and 9.8%. (48)

Asthma is a chronic condition which the prevalence has increasing worldwide (88-89, 90-91), ranging from 10% in East Africa to 49% in Northern Europe. (88-89) The USA National data showed increase in prevalence of asthma in all age, race and ethnic groups and among both males and females.(3)

The study during the five year period (2007 -2011) (N=2,093,717) was obtained from primary health care, specialist outpatient care and inpatient care in the Swedish capital region , the prevalence of asthma was 6.4% in women and 5.4% in men in Sweden while a large amount of information about the epidemiology of asthma and respiratory symptoms are available from developed countries, the information about this disease in developing countries and South-East Asia are rarely. (92)

In Asia, from population-based studies in Iran between 1990 and 2015, the prevalence of asthma was 7.95% (93). A cross-sectional analysis included 994 participants, aged 65 years and older in Korean defined asthma by using questionnaires, spirometry and chest radiography to exclude asthma-mimicking conditions reported that prevalence of asthma was 5.4%. (27)

Compared with prevalence of asthma in America and Europe, finding that most prevalence were higher than this study results. A cross-sectional study on 5524 subjects aged 18 years and older who were interviewed by telephone between 1996 and 1997 showed that the prevalence of asthma was 4.6% (CI: 3.6-5.5%) among men and 8.1% (CI: 7.1-9.1%) among women. (88) In 2007, a telephone health survey of asthma in Michigan, included 1,748 participants whose mean age was 54.7 (SD = 15.69); 15% of the population reported being diagnosed with asthma. (80) From National Health Interview Survey (NHIS) between 2001-2010, the prevalence of asthma among the elders aged 65 Years and older was 6.3-7% (50, 94). In America, the prevalence of asthma among low-income, urban, minority population community - based studies were more higher (15.8%). (94)

In 1996, a study conducted in Franch was reported a prevalence of 2.2-2.8% for current asthma and 5.2-7.3% for cumulative asthma (45). In Finland, a study described a prevalence of asthma (2.9-3.8%) among older adults aged 64 years and older. (93).

In conclusion, the prevalence of asthma was large vary in range due to geographic area or different region around the world. The developing countries have less information about asthma compare with developing countries. Another influence factors was age and sex of the respondent, the elderly people worldwide were under-diagnosed of asthma from evidence of the literature reviews.

Moreover, diagnosis of asthma from many ways were important and influence prevalence of asthma, for example diagnosis of asthma from sign and symptoms of asthma, diagnosis asthma according to prevalence of wheeze within the past 12 months, diagnosis of asthma from self-reported of the physician-diagnose asthma and diagnosis of asthma from the records of hospitals. All of these methods were influence to the prevalence of asthma.

In addition, methodology and study area are important factors. Including sample from out-patient department, community –based or population based were important and contribute to the prevalence of asthma.

The explaination for the low prevalence of asthma in this study was under - diagnosed of asthmatic patients in the communities of Thailand or may be from other reasons as described above. As a result, since low reporting rate of asthma (2.1%) in this study, older adults in communities should more screened for asthma.

5.2 The association between asthma and body mass index (BMI)

With regard to the association between asthma and obesity, the result from this study showed that the older adults who had body mass index less than 30 kg/m^2 were more likely to have asthma than the older adults with obesity and this associated pattern was as same as the older adults with overweight or body mass index 25 kg/m^2 or greater. However, there was no statistically significant association. This result is against with many previous studies which found that obesity was associated with asthma. On the other hand, some study reported that asthma was not associated with asthma as same as this study.

5.2.1 The association between asthma and obesity in older adults

Because the increasing prevalence of asthma has coincided with an increase of body mass index (BMI) in both children and adults worldwide. (90-91, 96) Obesity is consider associated with asthma. Some studies documented that obesity is a risk factor for asthma. (90-91) Asthma with relation to body mass index (BMI) in older adults has rarely been studied. (97)

Results from this study was inconsistent with many previous studies. For example , previous study in rural area in Japan included 3096 residents (men: 1520, women: 1576) age from 18 to 81. Obesity was significantly associated with asthma. (54) Other community health survey in Michigan in 2007, the telephone survey of 1,748 respondents who aged over 18 years which mean age of the participants was 54.7 (SD = 15.69), 15% of the population reported being diagnosed with asthma. Adults with asthma had significantly higher body mass index than adults without asthma. (98)

From literature reviews, conclusion that not only body mass index which related to asthma, gender , ethnics, economics and other factors were influenced to the relationship between asthma and body mass index. Some studies investigated that obesity was associated with asthma severity and health care utilization of asthmatic patients. For example, a c cross-sectional analysis of 352 adult subjects (age 30.9 +/- 6.1, 77.8% females) with physician-diagnosed asthma from a community-based Chicago cohort found that Obese participants were more likely to have received ED/urgent care for asthma than non-obese subjects and obesity was related to worse asthma-specific quality of life (99)

It is interesting that there were many studies worldwide reported that asthma was associated with obesity only in women. (90, 97, 100-102) This findings support the hypothesis of hormonal factors involved in the severity of asthma.

There were results from many studies consistent with this study that asthma was not associated with obesity.(51, 101, 103) Asthma and obesity, although both common in a low-income community, were not associated with one another. Nevertheless, adipokines were associated with asthma status and with markers of oxidative stress in the lungs, providing some support for an adipokine- inflammatory mechanistic link between the two conditions. (51, 104)

In conclusion, the relationship between obesity and asthma in older adults may be not from the same mechanism in children. From literature reviews, asthma in older adults may not only atopic or may be not atopic (100) but suggested the involvement of different pathophysiological mechanisms with multiple factors such as metabolic syndrome (100), inflammation, oxidative substance (51), hormonal change(97) and genetic involvement. (91) The causal pathway is remained unknown and required further investigation. (100)

5.3 Socio – demographic factors and asthma

5.3.1 Association between age and asthma

From this study, no significant association between asthma and age group of the older adults. The result showed that the prevalence of asthma among older adults aged between 50 and 59 years was as same as (2.1%) the prevalence of asthma among the older adults aged 60 years and older (Table 4.6.1, 4.6.2). From literature reviews, prevalence of asthma was varies between age groups. Most studies worldwide, children had more prevalence of asthma than adults and the rates were lower at advanced ages (> 85 years) for both males and females. (45) However, extreme age may be had high prevalence of asthma in some studies.

5.3.2 Association between gender and asthma

From this study, female was 63.1% (consistent with the population in Thailand which women more than men) and the prevalence of asthma was higher among male (2.3%) than female older adult (2.1%). Diagnosis asthma among older adults was difficult because of confounding with many comorbidities such as congestive heart failure, chronic obstructive pulmonary disease and asthma-COPD overlap syndrome. However, no statistically significant association between asthma and gender of the older adults. (Table 4.6.1-2)

This result was inconsistent with many previous studies which suggested that women are at increased risk of developing adult-onset asthma and also suffer from more severe disease than men. (46, 49) However, there were some studies

had the results consistent with this research that no difference between both sex. (47, 74) For example, the study from Iran and Europe in 1989, the prevalence of physician -diagnosed asthma among adults was 2.0%, being similar in men and women. (74) There were some studies reported the opposite result that asthma in males (14.1%, 11.9%) were significantly higher than in females (11.2%, 8.9%) ($p = 0.044$ and 0.018, respectively). (48)

5.3.3 Association between asthma and marital status

With regard to marital status, interesting that the prevalence of asthma lowest in married group (1.9%). However, there was no significant association between asthma and marital status. (Table 4.6.1, 4.6.2)

5.3.4 Association between asthma and ethnic groups

From this study, no significant association between asthma and ethnic groups. There were rarely studies about this topic. A study in Chicago in 2010 reported that asthmatic patients with a higher BMI was more likely to be African American ($p < .001$) (49). Many studies found no different between any race in asthma prevalence. (47)

5.3.5 Associated between Asthma and type of residence

With regard to types of resident where older adults lived during this study, there was a significant association between types of resident with asthma (p-value < 0.05). The older adult who lived outside municipal area or rural area had the highest percentage of asthma (2.4%), about 2 times more likely to have asthma than those living inside municipal area. (Table 4.6.1, 4.6.2) This is consistent with the previous studies in U.S. and French that farm worker who lived in rural area were more likely to have asthma. (45, 50) This was may be the results of many allergens from plants in rural area affected asthma which compatible with the hygiene hypothesis. This finding represented that the old hypothesis such as hygiene hypothesis was remained explained some aspect of asthma in older adult.

5.3.6 Association between asthma and household income

From this study, there was no significant association between asthma and household income. (Table 4.6.1, 4.6.2) Some previous studies suggested that asthma and obesity was common in low-income communities. (51, 102) Previous study in 6,919 children in Seoul in 2012 explored that the potential risk factors for asthma symptoms included household income. According to this previous study, household income and asthma symptoms were associated after adjusting for other potential risk factors ($p = 0.03$). (52)

5.3.7 Association between asthma and education

From this study, there was no significant association between asthma and education level.(Table 4.6.1, 4.6.2) Previous study was found that the association between education level and asthma was inconsistency. (1).

5.3.8 Association between asthma and occupation

From this study, there was no significant association between asthma and occupation. (Table 4.6.1, 4.6.2) This result was relevant to previous studies. For example, in Franch, the prevalence of asthma among the elderly was high in farm workers.(105)

Another study found that occupational asthma is frequent among farmers in rural area. The authors discussed that may be depended on the main allergens (plants, animals and chemical substances) they have met among farmers. (106)

5.4 Association between chronic condition factors and asthma.

5.4.1 Association between hypertension and asthma

An increased prevalence of hypertension has been described in adult asthmatic patients. However, there is no information regarding the interaction of hypertension as a comorbidity with asthma severity. (72-73) From this study asthma had no significant association with hypertension. This result was inconsistent with some previous studies which identified that hypertension was associated with an

increased odds of asthma after adjusting for potential confounders.(72-73) There were no consistent results for age of onset of asthma with high blood pressure. (72)

Moreover, finding that asthmatic subjects with comorbid hypertension display evidence of enhanced of asthma morbidity. (73) However, more studies wereneeded for explained the relationship between hypertension and asthma in older adults.

5.4.2 Association between diabetes mellitus and asthma

There are limited data on the risk of pulmonary disease in patients with diabetes. (C-6) From this study, there was no significant association between asthma and diabetes mellitus. (Table 4.8) This was inconsistent with previous studies which found that the incidence of asthma was significantly higher in those patients with a diagnosis of diabetes and this finding remained significant in regression models adjusted for age, sex, race/ethnicity, smoking, BMI, education, alcohol consumption, and outpatient visits. Asthma, type 2 diabetes and increased BMI are strongly associated in adults, particularly in women. This increased risk may be a consequence of declining lung function in patients with diabetes or suggested the aetiology from metabolic syndrome. (75-76, 107-108)

5.4.3 Association between ischemic heart disease and asthma

From this study, there was significant association between asthma and ischemic heart disease after adjusted with potential confounders. The older adults who had ischemic heart disease were nearly 4.5 times more likely to report asthma than older adults who did not have ischemic heart disease. (P-value = 0.003, OR = 4.31). This result was consistent with many previous studies.

Asthma was associated with atherosclerotic disease in several studies in America and Canada (72, 77-78) but there was rarely study about this topics in Asia. Some study found that this association may be limited to women. (77)

In conclusion, coronary heart disease was associated with asthma but need further investigation and more studies about relationship between asthma onset and coronary heart disease, especially in developing country. (72, 77-78)

5.4.4 Association between stroke and asthma

Asthma was associated with atherosclerotic disease in several studies (72, 77), with evidence that this association may be limited to women. (77) From this study, asthma was no significant associated with asthma in older adults. In some study presented that adult-onset asthma may be a significant risk factor for stroke in women, but not men.(77) A previous study in Canada reported that there was no consistent results for age of asthma onset with stroke. (72)

5.4.5 Association between depression and asthma

Asthma and depression are common health problems in primary care. (79) Previous studies have suggested that asthmatic patients often have comorbid depression and adults with asthma had significantly higher body mass index and higher levels of stress than adults without asthma. (80) However, evidence of a relationship between asthma and depression is remain unclear.(79, 82, 109)

A systematic review in 2015 found that six studies reported that depression predicted incident adult-onset asthma, including 83684 participants and 2334 incident cases followed for 8 to 20 years. Conversely, two studies reported that asthma predicted incident depression. These studies involved 25566 participants and 2655 incident cases followed for 10 and 20 years, respectively. The pooled adjusted relative risks (RRs) of acquiring asthma associated with baseline depression was 1.43 (95% CI, 1.28-1.61) ($P<0.001$). The adjusted RRs for acquiring depression associated with baseline asthma was 1.23 (95% CI, 0.72-2.10) ($P = 0.45$). Depression was associated with a 43% increased risk of developing adult-onset asthma. However, asthma did not increase the risk of depression based on limited studies. (82, 109)

There was no significant between asthma and depression from this research. The explanation for this result may be as likely as found from previous study that asthma was associated with depression but this was not related to asthma severity or oral corticosteroid use but was related to service use which related to health seeking behaviour in patients with asthma. The cause of this needs further exploration. Consideration should be given to case-finding for depression in this population. (79)

5.4.6 Association between cataract and asthma

From this study, cataract was significant associated with asthma when analysed with regression analysis alone. (OR = 2.70, p=0.003) (Table4.8) But after adjusted with other factors, there was no significant association. (Table 4.10.1)

Previous studies found that compared with daily oral corticosteroid use, inhaled corticosteroids decrease the risk of cataract formation in patients with steroid-dependent asthma. The addition of oral corticosteroids as pulse therapy or in any pattern of regular use can increase the risk of cataract development. More research and more data were needed on the relationship between asthma and cataract without steroid treatment. (83)

5.4.7 Association between low back pain and asthma

From this study, asthma was significant associated with low back pain after adjusted with other factors. Older adults who had low back pain were nearly 4.5 times more likely to report asthma than those who did not have (OR = 4.38, p = 0.00). (Table 4.10.2) This result was consistent with previous study.

There was rarely study investigated about this association. There was evidence that the effects of pro-inflammatory cytokines on the hypothalamic-pituitary-adrenal (HPA) axis lead to the hypothesis that allergic reactions, as markers for inflammation-associated activation of the HPA axis, result in aberrant responses to subsequent stressors. Data from 6,836 US adults 20-39 years old from the Third National Health and Nutrition Examination Survey (1988-1994). Low back pain in the past 12 months and history of asthma were performed. Subjects with a history of any allergy were more likely to report low-back pain (odds ratio = 1.51; 95% confidence interval: 1.16, 1.96). (84)

5.4.8 Association between knee arthritis and asthma

From this study, knee arthritis was significant associated with asthma when analysed with regression analysis alone. (OR = 2.20, p=0.012) (Table4.8) But after adjusted with other factors, there was no significant association. (Table 4.10.1)

There were studies discussed the relations between asthma and rheumatoid arthritis (RA) but the results were controversial. A cohort study in

Taiwan examined the risk of asthma among RA patients in a nationwide population, included 27,602 patients between 1998 and 2008. The study found that patients with RA had a significant higher risk of developing asthma than healthy people in all sex and age subgroups. Stratified analyses indicated that there was a higher risk in women with RA than in men with RA. (110)

5.5 Associated between lifestyle factors and asthma

From previous study, asthma prevalence, severity and outcomes are associated with various patient characteristics and lifestyle. (56)

5.5.1 Association between substance use and asthma

With regard to the association between asthma and lifestyle factors in this study, the older adults with substance use were reported asthma more likely than the older adults who did not use substance. However, there was no statistically significant association between asthma and substance use,

5.5.1.1 Association between tobacco use and asthma

From this study, there was no significant association between asthma and tobacco use. This result was inconsistent with most previous study which found that smoking habit was significantly associated with asthma(56-59) Some previous studies found that smoking was associated with poor asthma outcomes in primary care setting. (56, 60) Some studies indicated that this association limited with only female (61). However, most researches study in young population.

Some previous study was consistent with results from this study that asthma was no significant association with second hand smoker exposure. (62)

This topic involved with information that oxidative stress is a cardinal feature of bronchial asthma but the role of interactions between environmental oxidant / antioxidant exposures and antioxidant genes in asthma aetiology has yet to be determined. There was the hypothesis that the asthma risk attributed to genotypes could be dependent on both oxidant (tobacco smoking) and antioxidant (fruit and vegetable intake) exposures. (58)

5.5.1.2 Association between alcohol consumption and asthma

From this study, there was no significant association between asthma and alcohol consumption. This result was inconsistent with some previous study which found that alcohol intake is associated with new-onset asthma in adults which was association between amount of alcohol intake and the risk of asthma. (65) Mechanism for this relation may be from alcohol elevates blood acetaldehyde levels, which leads to degranulation of mast cells (or basophils) leading to release of chemical mediators, such as histamine, induces asthma.(66)

There were rarely studies about this topic, some associated studies was hospitalizations for asthma during childhood were associated with an increased risk of alcohol use disorder hospitalization among males(67) and current drinkers in the symptomatic group were more likely to drink alcohol and to have experienced severe intoxication than those in the asymptomatic group. (68)

5.5.2 Association between asthma and diets

From this study, there was no significant association between asthma and any type of diets. There were rarely studies about diets with asthma in older adults.

5.5.3 Association between asthma and physical activities

From this study, there was no significant association between asthma and any type of physical activities. There were a study in Taiwan in 2016 reported that the middle-aged and elders who had moderate exercise" tend to have low probabilities and less number of visits of utilizing asthma outpatient services. (69) Another study in U.S.A.in 2015 found that low levels of physical activity is common and associated with poor asthma outcomes in a sample of primary care patients.(53)

Discussion of the research methodology

This study was a cross-sectional analytic study to find out the prevalence of asthma among older adults in community of Thailand and search the relationship between asthma and obesity, socio-demographic characteristic, chronic condition factors and lifestyle factors. This study design was appropriate for the study because it could provide the requirement outcomes. However, it could not distinguish either asthma or other factors to be happened firstly because the measurement of exposure and outcome was carried in this study. From this reason, we could not mention that asthma was the risk factor of other conditions or other conditions was the risk factor of asthma.

This community based study was suitable for the objective of this study because the sample size from systemic random sampling derived from name list all of older adults in community could be represent the population of older adults in Thailand more accurate than searching the sample size from hospital-based. However, collection of data in community was difficult and take much time than collected from specific place. Moreover, the questionnaire which composed of many questions was not appropriate for the elder, therefore we use face to face technique and gave the opportunity to complete questionnaire later. This method could not be success if we not had the well-trained and co-operated research assistant. Finally, the participants in this study was 3,977 persons which less than the expected sample size. However, this was not interfere the reliability of this research because we had set the precision error at 0.006 which was very high significant level.

CHAPTER VI
CONCLUSION AND RECOMMENDATION

6.1 Conclusion

This study was a cross-sectional analytic study, conducted in 14 communities all regions of Thailand, performed between January and March, 2016. A total of 3977 respondents were included in this study and completed face to face questionnaires. This study reported the prevalence of asthma among older adults aged 50 years and older and investigated the relationship of obesity, socio-demographic factors, chronic condition factors, lifestyle factors and asthma among older adults in the communities of Thailand. The results were as follow:

1. Using assisted self - administered questionnaires. The prevalence of asthma among older adults aged 50 years and older in Thailand was 2.1%.

2. There was no statistically significant relationship between asthma and obesity among older adults in community of Thailand.

3. According to socio-demographic factors, there was only type of residence which had statistically significant relationship with asthma among older adults in community of Thailand. Older adults who lived outside municipal area were more likely to report asthma than those who lived outside municipal area.

4. According to chronic condition factors, ischemic heart disease and low back pain had statistically significant relationship with asthma among older adults in community of Thailand. Older adults who had diagnosed ischemic heart disease or low back pain were more likely to report asthma than those who had not.

5. According to lifestyle factors which composed of substance use, diets and physical activity, no any factors had statistically significant relationship with asthma among older adults in community of Thailand.

In conclusion, three independent variables compose of ischemic heart disease , low back pain and type of resident associated with asthma from this study after adjusted with others factors.

6.2 Recommendations

From the results of the study, recommendations are as follows;

6.2.1 Recommendations for managerial practices

1. The prevalence of asthma from this study and many previous studies in Thailand were lower than other countries and under the estimated level. Therefore, we should initiate system for searching asthmatic patients in the community, especially in older adult group.

2. The results showed that ischemic heart disease and low back pain were chronic condition factors which associated with asthma in older adult. For this reasons, we should screening asthma in this group.

3. This study was found that type of residence was statistically significant associated with asthma in older adult. This may be from many plant allergens which much more in rural area than urban area. This result was benefit for managing the suspected allergen which may be decrease asthma outcome in Thailand.

4. There was an interested founding from this research that many chronic conditions in Thailand was high prevalence in older adults. For examples, Hypertension (65.9%), Diabetes mellitus (22%), Low back pain (34%) and also with summary of obesity and morbid obesity (32.5%). These prevalence was higher than the prevalence of overall population and the prevalence from previous information in Thailand. Lifestyle behavior including eating pattern and physical activity play the important role in this topic. Health care organization and public health should initiate strategies for solving this problem.

6.2.2 Recommendations for further research

1. Further research should be conducted to explore what are the factors influence relationship between asthma and body mass index in Thai older population, this research should focus to asthmatic patients for include sufficient participants for analysis.

2. In depth research should be applied for finding that why low back pain has the relationship with asthma in older adults. Now, there was rarely research for this topic, especially in Thai and Asia.

3. It is interesting that what is the factors induce asthma outside municipal area, allergen from plants? Because from this research, living outside municipal area in Thailand was more likely to report asthma than living inside municipal area.

4. This study was found that type of residence was statistically significant associated with asthma in older adult. This may be from many plant allergens which much more in rural area than urban area. However, this result was may be from other factors in the rural area, therefore study in this topic is required. Results from further research will benefit for managing the suspected allergen or other factors leading to decrease asthma prevalence in Thailand.

5. Meta-analysis is recommended for further research about this topic.

REFERENCES

1.Mueller NT, Koh WP, Odegaard AO, Gross MD, Yuan JM, Pereira MA. Asthma and the risk of type 2 diabetes in the Singapore Chinese Health Study. Diabetes research and clinical practice. 2013 Feb;99(2):192-9. PubMed: 23260853. Pubmed Central PMCID: 3615124.

2. Ziora D, Sitek P, Machura E, Ziora K. [Bronchial asthma in obesity--a distinct phenotype of asthma?]. Pneumonologia i alergologia polska. 2012:80(5): 454-62. PubMed PMID: 22926907. Otylosc a astma oskrzelowa—czy istnieje odrebny fenotyp astmy?

3. Redd SC. Asthma in the United States: burden and current theories. Environmental health perspectives. 2002 Aug;110 Suppl 4:557-60. PubMed PMID: 12194886 Pubmed Central PMCID: 1241205

4. J Delgado, P Barranco, S Quirce . Obesity and as asthma. J Investig Allergol Clin Immunology 2008; Vol. 18(6): 420-425.

5. Braman SS. Growing old with asthma: what are the changes and challenges? Expert review of respiratory medicine. 2010 Apr;4(2):239-48. PubMed PMID: 20406090.

6. King MJ, Hanania NA. Asthma in the elderly: current knowledge and future directions. Current opinion in pulmonary medicine. 2010 Jan;16(1):55-9. PubMed PMID : 19844181.

7. Lindner K, Panaszek B, Machaj Z.[Asthma in the elderly]. Polskie Archiwum Medycyny Wewnetrznej. 2007 Aug;117(8):350-4. PubMed PMID: 18018382. Astmau osob starszych.

8. P, Kahn K, Ng N, Naidoo N, Abdullah S, Bawah A, et al. Ageing and adult health status in eight lower-income countries : the INDEPTH WHO - SAGE collaboration. Global health action. 2010;3. PubMed PMID: 20959878. Pubmed Central PMCID: 2957285. Epub 2010/10/21. eng.

9. Aubier M, Neukirch F, Annesi-Maesano I [Epidemiology of asthma and allergies. Theprevalence of allergies increases worldwide, and asthma has reached his highest-ever prevalence in Europe: why?] . Bulletin de l'Academie nationale de medecine. 2005 Oct;189(7):1419-34; discussion 34. PubMed PMID: 16669142. Epidemiologie de l'asthme et des allergies. La frequence des allergies augmente partout dans le monde, l'asthme a atteint sa prevalence maximale en Europe: quelles explications?

10. Wickens K, Barry D, Friezema A, Rhodius R, Bone N, Purdie G, et al. Fast foods - are they a risk factor for asthma? Allergy. 2005 Dec;60(12):1537-41. PubMed PMID:16266387.

11. Thuesen BH, Husemoen LL, Hersoug LG, Pisinger C, Linneberg A. Insulin resistance as a predictor of incident asthma-like symptoms in adults. Clinical and experimental allergy : journal of the British Society for Allergy and Clinicalmmunology. 2009 May;39(5):700-7. PubMed PMID: 19260867

12. Babor T, Rehm J, Jernigan D, Vaeth P, Monteiro M Lehman H. Alcohol, diabetes,And public health in the Americas. Revista panamericana de salud publica = Pan American journal of public health. 2012 Aug;32(2):151-5. PubMed PMID: 23099877.

13. Green TL. Examining the temporal relationships between childhood obesity and asthma. Economics and human biology. 2014 Jul;14:92-102. PubMed PMID:23159323.

14. .Matos SM, Jesus SR, Saldiva SR, Prado MS, D'Innocenzo S, Assis AM, et al. Overweight, asthma symptoms, atopy and pulmonary function in children of 4-12 years of age: findings from the SCAALA cohort in Salvador, Bahia,Brazil. Public health nutrition. 2011 Jul;14(7):1270-8. PubMed PMID: 21486522.

15. Shore SA, Johnston RA. Obesity and asthma. Pharmacology & therapeutics. 2006 Apr; 110(1) :83-102. PubMed PMID: 16297979.

16. Mai XM, Bottcher: official publication of the European Society of Pediatric Allergy and Immunology. 2004 Dec;15(6):523-30. PubMed PMID: 15610366. MF , Leijon I. Leptin and asthma in overweight children at years of age. Pediatric allergy and immunology.

17. Tantisira KG, Litonjua AA, Weiss ST, Fuhlbrigge AL, Childhood Asthma Management Program Research G. Association of body mass with pulmonary function in theChildhood Asthma Management Program (CAMP). Thorax. 2003 Dec: 58 (12):1036-41. PubMed PMID: 14645968. Pubmed Central PMCID: 1746552.

18. . Michelson PH, Williams LW, Benjamin DK, Barnato AE. Obesity, inflammation, and asthma severity in childhood: data from the National Health and Nutrition Examination Survey 2001-2004. Annals of allergy, asthma & immunology : Official publication of the American College of Allergy, Asthma, &Immunology. 2009 Nov;103(5):381-5. PubMed PMID: 19927535.

19. Jousilahti P, Salomaa V, Hakala K, Rasi V, Vahtera E, Palosuo T. The association of sensitive systemic inflammation markers with bronchial asthma. Annals of allergy, asthma & immunology : official publication of the American College ofAllergy, Asthma, & Immunology. 2002 Oct; 89(4):381-5. PubMed PMID: 12392382.

20. Uthaisangsook S. Risk factors for development of asthma in Thai adults in Phitsanulok: a university-based study. Asian Pacific journal of allergy and immunology/ launched by the Allergy and Immunology Society of Thailand. 2010 Mar; 28(1):23-8. PubMed PMID: 20527512.

21. World Health Organisation 'Noncommunicable Diseases in the South-East Asia Region, 2011, http://www.swaro.who.int/entity/noncommunicable diseases/documents/9789290224136/en/index.html

22. Aekplakorn W, Chaiyapong Y, Neal B, Chariyalertsak S, Kunanusont C, Phoolcharoen W, et al. Prevalence and determinants of overweight and obesity in Thai adults:results of the Second National Health Examination Survey. Journal of the Medical Association of Thailand

= Chotmaihet thangphaet. 2004 Jun;87(6) :685-93. PubMed PMID: 15279350.

23.Jitnarin N, Kosulwat V, Rojroongwasinkul N, Boonpraderm A, Haddock CK, Poston WS. Risk factors for overweight and obesity among Thai adults: results of the National Thai Food Consumption Survey. Nutrients. 2010 Jan:2(1):60-74. PubMed PMID: 22253992. Pubmed Central PMCID: 3257614.

24.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 Mar:129(3): 602-9. PubMed PMID: 16537857.

25. Steppuhn H, Langen U, Keil T, Scheidt-Nave C. Chronic disease co-morbidity of asthma and asthma care among adults: results of the national telephone healthinterview survey German Health Update (GEDA) 2009 and 2010. Primary care respiratory journal : journal of the General Practice Airways Group. 2014 Mar;23(1):22-9. PubMed PMID: 24346826.

26. Carlsson AC, Wandell P, Osby U, Zarrinkoub R, Wettermark B, Ljunggren G. High prevalence of diagnosis of diabetes, depression, anxiety, hypertension, asthma and COPD in the total population of Stockholm, Sweden - a challenge for public health. BMC public health. 2013;13(1):670. PubMed PMID: 23866784. Pubmed Central PMCID: 3724714.

27. Platts-Mills TA, Erwin E, Heymann P, Woodfolk J. Is the hygiene hypothesis still a viable explanation for the increased prevalence of asthma? Allergy. 2005:60 Suppl 79:25-31. PubMed PMID: 15842230.

28. Johnson M, Nriagu J, Hammad A, Savoie K, Jamil H. Asthma, environmental risk factors, and hypertension among Arab Americans in metro Detroit. Journal of immigrant and minority health / Center for Minority Public Health. 2010 Oct;12(5):640-51. PubMed PMID: 18998210.

29. Liu AH. Hygiene theory and allergy and asthma prevention. Paediatric and perinatal epidemiology. 2007 Nov;21 Suppl 3:2-7. PubMed PMID: 17935569.

30. Al-Durra M, Torio MB, Cafazzo JA. The use of behavior change theory in Internet-Based asthma self-management interventions: a systematic review. Journal of medical Internet research. 2015;17(4):e89. PubMed PMID: 25835564. Pubmed Central PMCID: 4400315.

31.Rashidian A, Russell I. General practitioners' intentions and prescribing for asthma: using the theory of planned behavior to explain guideline implementation. International journal of preventive medicine. 2012 Jan;3(1):17-28. Pubmed PMID: 22355473. Pubmed Central PMCID: 3278865.

32.Hahn DL. A theory explaining time trends in asthma prevalence. The European respiratory journal. 2006 Feb;27(2):434-5; author reply 5-6. PubMed PMID:16452603.

33. Vlaski E, Stavric K, Isjanovska R, Seckova L, Kimovska M. Overweight hypothesis in asthma and eczema in young adolescents. Allergologia et immune- pathologia.2006 Sep-Oct;34(5):199-205. PubMed PMID: 17064649.

34. Killeen K, Skora E. Pathophysiology, diagnosis, and clinical assessment of asthma in the adult. The Nursing clinics of North America. 2013 Mar; 48(1) :11-23. PubMed PMID: 23465443.

35. Song WJ, Sintobin I, Sohn KH, Kang MG, Park HK,Jo EJ,et al. Staphylococcal enterotoxin IgE sensitization in late-onset severe eosinophilic asthma in the elderly. Clinical and experimental allergy : journal of the British Society for Allergy and Clinical Immunology. 2016 Mar;46(3):411-21. PubMed PMID: 26436720.

36. Scichilone N, Benfante A, Morandi L, Bellini F, Papi A. Impact of extrafine formulations of inhaled corticosteroids / long-acting beta-2 agonist combinations on patient-related outcomes in asthma and COPD. Patient related outcome measures. 2014;5:153-62 PubMed PMID: 25473323. Pubmed Central PMCID:4251568.

37. Abramson MJ,Perret JL, Dharmage SC, McDonald VM, McDonald CF. Distinguishing adult-onset asthma from COPD: a review and a new approachInternational journal of chronic obstructive pulmonary disease.

2014;9:945-62. PubMed PMID: 25246782. Pubmed Central PMCID: 4166213.

38. Madeo J, Li Z, Frieri M. Asthma in the geriatric population. Allergy and asthma proceedings : the official journal of regional and state allergy societies. 2013Sep Oct;34(5) :427-33. PubMed PMID: 23998239.
39. Kanazawa H, Tochino Y, Kyoh S, Ichimaru Y, Asai K, Hirata K. Potential roles of pentosidine in age-related and disease-related impairment of pulmonary functions in patients with asthma.The Journal of allergy and clinicalimmunology. 2011Apr;127(4):899-904. PubMed PMID: 21215998.
40. Braman SS. Growing old with asthma: what are the changes and challenges? Expert review of respiratory medicine. 2010 Apr;4(2):239-48. PubMed PMID: 20406090.
41. King MJ, Hanania NA. Asthma in the elderly: current knowledge and future directions. Current opinion in pulmonary medicine. 2010 Jan;16(1):55-9. PubMed PMID: 19844181.
42. Lindner K, Panaszek B, Machaj Z. [Asthma in the elderly].Polskie Archiwum MedycynWewnetrznej. 2007 Aug;117(8):350-4. PubMed PMID: 18018382. Asthmauosob starszych.
43. Mitsunobu F, Mifune T, Hosaki Y, Ashida K, Tsugeno H, Okamoto M, et al. IgE-mediated and age-related bronchial hyperresponsiveness in patients with asthma. relationship to family history of the disease.Age and ageing. 2000 May;29(3) :215-20. PubMed PMID: 10855902.
44. Sherman CB. Late-onset asthma: making the diagnosis, choosing drug therapy. Geriatrics.1995 Dec;50(12):24-6, 9-30, 3. PubMed PMID: 7498799
45. Nejjari C, Tessier JF, Letenneur L, Dartigues JF, Barberger-Gateau P, Salamon R. Prevalence of self-reported asthma symptoms in a French elderly sample. Respiratory medicine. 1996 Aug;90(7):401-8. PubMed PMID: 8796232.
46. Melgert BN, Ray A, Hylkema MN, Timens W, Postma DS. Are there reasons why adult asthma is more common in females? Current allergy and asthma reports. 2007May;7(2):143-50. PubMed PMID: 17437685.

47. Jannus-Pruljan L, Meren M, Polluste J, Loit HM, Kiviloog J, Baburin A, et al. Postal Survey on asthma, chronic bronchitis and respiratory symptoms among adultEstonians and non-Estonians (FinEsS-study). European journal of public health. 2004 Jun;14(2):114-9. PubMed PMID: 15230493.

48. Uthaisangsook S. Prevalence of asthma, rhinitis, and eczema in the university population of Phitsanulok, Thailand.Asian Pacific journal of allergy and immunology / launched by the Allergy and Immunology Society of Thailand. 2007 Jun-Sep;25(2-3):127-32. PubMed PMID: 18035799.

49. Grammer LC, Weiss KB, Pedicano JB, Kimmel LG, Curtis LS, Catrambone CD, et al. Obesity and asthma morbidity in a community-based adult cohort in a largeurban area: the Chicago Initiative to Raise Asthma Health Equity (CHIRAH). The Journal of asthma :official journal of the Association for the Care of asthma2010 Jun;47(5):491-5. PubMed PMID: 20560823. Pubmed Central PMCID: 3509187.

50. Arif AA, Rohrer JE, Delclos GL. A population-based study of asthma, quality of life,and occupation among elderly Hispanic and non-Hispanic whites: a cross- sectional investigation. BMC public health. 2005;5:97. PubMed PMID: 16176583. Pubmed Central PMCID: 1249583.

51. Dorevitch S, Conroy L,Karadkhele A, Rosul L,Stacewicz-Sapuntzakis M, Fantuzzi G.Associations between obesity and asthma in a low-income,urban, minority population. Annals of allergy, asthma & immunology : official publication of the American College of Allergy, Asthma, & Immunology. 2013 May; 110(5):340-6. PubMed PMID: 23622004.

52. Choi WJ, Um IY, Hong S, Yum HY, Kim H, Kwon H. Association between Household Income and Asthma Symptoms among Elementary School Children in Seoul Environmental health and toxicology. 2012;27:e2012020. PubMed PMID: 23256089. Pubmed Central PMCID: 3524452.

53. Karjalainen A, Kurppa K, Martikainen R, Klaukka T, Karjalainen J. Work is related to a substantial portion of adult-onset asthma incidence in the

Finnish population. American journal of respiratory and critical care medicine. 2001 Aug 15 ; 164(4) : 565-8. PubMed PMID: 11520716.

54. Kogevinas M, Anto JM, Sunyer J, Tobias A, Kromhout H, Burney P. Occupational asthma in Europe and other industrialised areas: a population-based study. European Community Respiratory Health SurveyStudy Group.Lancet.1999May 22;353(9166):1750-4. PubMed PMID: 10347988.

55. Koksal N, Hasanoglu HC, Gokirmak M, Yildirim Z, Gultek A. Apricot sulfurization:an occupation that induces an asthma-like syndrome in agricultural environments. American journal of industrial medicine. 2003 Apr:43(4): 447-53. PubMed PMID: 12645101.

56. Yawn BP, Rank MA, Bertram SL, Wollan PC. Obesity, low levels of physical activity and smoking present opportunities for primary care asthma interventions: an analysis of baseline data from The Asthma Tools Study. NPJ primary care respiratory medicine.2015;25:15058.PubMed PMID:26426429.Pubmed Central PMCID: 4590305.

57. Mitchell EA, Beasley R, Keil U, Montefort S, Odhiambo J, Group IPTS. The association between tobacco and the risk of asthma, rhinoconjunctivitis and eczema inchildren and adolescents: analyses from Phase Three of the ISAAC programme. Thorax.2012 Nov;67(11):941-9. PubMed PMID: 22693180.

58. Polonikov AV, Ivanov VP, Solodilova MA, Kozhuhov MA, Panfilov VI. Tobacco smoking,fruit and vegetable intake modify association between-21A>T polymorphism of catalase gene and risk of bronchial asthma. The Journal of asthma :official journal of the Association for the Care of Asthma. 2009 Apr:46 (3):217-24. PubMed PMID: 19373626.

59. Xepapadaki P, Manios Y, Liarigkovinos T, Grammatikaki E, Douladiris N, Kortsalioudaki C,\et al.Association of passive exposure of pregnant women to environmental tobacco smoke with asthma symptoms in children. Pediatric allergy and immunology : official publication of the European Society of ediatric Allergy and Immunology. 2009 Aug:20(5): 423-9 PubMed PMID: 19674350.

60. Chilmonczyk BA, Salmun LM, Megathlin KN, Neveux LM, Palomaki GE, Knight GJ, et al. Association between exposure to environmental tobacco smoke and exacerbations of asthma in children. The New England journal of medicine. 1993 Jun 10;328(23):1665-9. PubMed PMID: 8487825.

61. Guo SE, Ratner PA, Okoli CT, Johnson JL. The gender-specific association between asthma and the need to smoke tobacco. Heart & lung : the journal of criticalcare. 2014 Jan-Feb;43(1):77-83. PubMed PMID: 24238774.

62. Ciaccio CE, DiDonna A, Kennedy K, Barnes CS, Portnoy JM, Rosenwasser LJ. Secondhand tobacco smoke exposure in low-income children and its association with asthma.Allergy and asthma proceedings : the official journal of regional and state allergy societies.2014 Nov-Dec;35(6): 462-6. PubMed PMID: 25584913. Pubmed Central PMCID: 4210654.

63. McLeish AC, Zvolensky MJ. Asthma and cigarette smoking: a review of the empirical literature. The Journal of asthma : official journal of the Association for the Careof Asthma. 2010 May;47(4):345-61. PubMed PMID: 20528586.

64. McLeish AC, Cougle JR, Zvolensky MJ. Asthma and cigarette smoking in a representative sample of adults. Journal of health psychology. 2011 May; 16 (4): 643-52. PubMed PMID: 21346012.

65. Lieberoth S, Backer V, Kyvik KO, Skadhauge LR, Tolstrup JS, Gronbaek M, et al. Intake of alcohol and risk of adult-onset asthma. Respiratory medicine.2012 Feb; 106 (2):184-8. PubMed PMID: 22129491.

66. Shimoda T, Kohno S, Takao A, Fujiwara C, Matsuse H, Sakai H, et al. Investigation of The mechanism of alcohol-induced bronchial asthma. The Journal of allergy nd clinical immunology. 1996 Jan;97(1 Pt 1):74-84. PubMed PMID: 8568140.

67. Xepapadaki P, Manios Y, Liarigkovinos T, Grammatikaki E, Douladiris N, Kortsalioudaki C,et al.Association of passive exposure of pregnant women to environmental tobacco smoke with asthma symptoms in children. Pediatric allergy and immunology :official publication of the European

Society of Pediatric Allergy and Immunology. 2009 Aug:20(5): 423-9. PubMed PMID: :19674350.

68. Gupta D, Aggarwal AN, Kumar R, Jindal SK. Prevalence of bronchial asthma and association with environmental tobacco smoke exposure in adolescent schoolchildren in Chandigarh, north India The Journal of asthma : official journal of the Association for the Care of Asthma. 2001 Sep:38(6) :501-7. PubMed PMID: 11642417.

69. Tian WH, Liu LF, Wang JY. Obesity risk class and asthma outpatient service utilization by the middle aged and elderly in Taiwan. Health policy. 2016 May:120 (5):552-60. PubMed PMID: 27017050.

70. Ferguson S, Teodorescu MC, Gangnon RE, Peterson AG, Consens FB, Chervin RD, et al. Factors associated with systemic hypertension in asthma.Lung. 2014 Oct: 192 (5):675-83. PubMed PMID: 24920421.

71. Jia H, Zack MM, Thompson WW. The effects of diabetes, hypertension, asthma, heart disease, and stroke on quality-adjusted life expectancy. Value in health : the journal of the International Society for Pharmacoeconomics and Outcomes Research.2013Jan-Feb;16(1):140-7.PubMed PMID: 23337225.

72. Dogra S, Ardern CI, Baker J. The relationship between age of asthma onset and cardiovascular disease in Canadians. The Journal of asthma : official journal of the Association for the Care of Asthma. 2007 Dec;44(10):849-54. PubMed PMID: 18097862.

73. Christiansen SC, Schatz M, Yang SJ, Ngor E, Chen W, Zuraw BL. Hypertension and sthma: A Comorbid Relationship. The journal of allergy and clinical immunology In practice. 2016 Jan-Feb;4(1):76-81. PubMed PMID: 26342745.

74. Fisherman EW, Cohen GN.Intrinsic asthma associated with diabetes mellitus; abnormal vascular response and glucose tolerance tests. Annals of allergy. 1975 Mar; 34 (3):161-9. PubMed PMID: 1124856.

75. Ehrlich SF, Quesenberry CP, Jr., Van Den Eeden SK, Shan J, Ferrara A. Patients diagnosed with diabetes are at increased risk for asthma,chronic obstructive pulmonary disease, pulmonary fibrosis, and pneumonia but not

lung cancer. Diabetes care. 2010 Jan;33(1):55-60. PubMed PMID:19808918. Pubmed Central PMCID: 2797986.

76. Thomsen SF, Duffy DL, Kyvik KO, Skytthe A, Backer V. Risk of asthma in adult twins with type 2 diabetes and increased body mass index. Allergy. 2011 Apr:66(4):562-8. PubMed PMID: 21083567.

77. Onufrak SJ, Abramson JL, Austin HD, Holguin F, McClellan WM, Vaccarino LV. Relation of adult-onset asthma to coronary heart disease and stroke. The American journal of cardiology. 2008 May 1;101(9):1247-52. PubMed PMID: 18435952. Pubmed Central PMCID: 2396340.

78. Sumino K, O'Brian K, Bartle B, Au DH, Castro M, Lee TA. Coexisting chronic conditions associated with mortality and morbidity in adult patients with asthma. The Journal of asthma : official journal of the Association for the Care of Asthma. 2014 Apr;51(3):306-14. PubMed PMID: 24432868. Pubmed Central PMCID: 4067514.

79. Walters P, Schofield P, Howard L, Ashworth M, Tylee A. The relationship between asthma and depression in primary care patients: a historical cohort and nested case control study. PloS one. 2011;6(6):e20750 PubMed PMID: 21698276. Pubmed Central PMCID: 3115938.

80. Kruger DJ, Valerio MA. Association between psychosocial factors and asthma in a demographically representative adult sample. The Journal of asthma : official journal of the Association for the Care of Asthma. 2009 Sep;46(7) :708-11. PubMed PMID: 19728210.

81. Bratek A, Zawada K, Beil-Gawelczyk J, Beil S, Sozanska E, Krysta K, et al. Depressiveness, symptoms of anxiety and cognitive dysfunctions in patientswith asthma and chronic obstructive pulmonary disease (COPD): possible associations with inflammation markers: a pilot study. Journal of neural transmission. 2014 Feb 15. PubMed PMID: 24532256.

82. Gao YH, Zhao HS, Zhang FR, Gao Y, Shen P, Chen RC, et al. The Relationship between Depression and Asthma: A Meta-Analysis of Prospective Studies. PloS one. 2015;10(7):e0132424. PubMed PMID: 26197472. Pubmed Central PMCID: 4510436.

83. Barenholtz H. Effect of inhaled corticosteroids on the risk of cataract formation in patients with steroid-dependent asthma. The Annals of pharmacotherapy. 1996Nov; 30(11):1324-7. PubMed PMID: 8913417.

84. Hurwitz EL, Morgenstern H.Cross-sectional associations of asthma, hay fever, and other allergies with major depression and low-back pain among adults aged20-39 years in the United States. American journal of epidemiology. 1999 Nov15; 150(10):1107-16. PubMed PMID: 10568627.

85.Priyanut Sirimai. Assessment of Quality of Care and Outcomes for Adult Asthmatic Patients in Thailand. Health System research Institute Research Reports (2006), Article ID 1646, 91 pages.

86. Chittaranjan S Yajnik,John S Yudkin. Appropriate body-mass Index for Asian Populations and its Implications for policy and intervention strategies. The LANCET. 2004 vol 363,Jan 10:157-163.

87. World Health Organization . World Health Organization; Geneva: 2009. Global Health Risks: Mortality and Burden of Disease Attributable to Selected Major Risks.

88. Luder E, Ehrlich RI, Lou WY, Melnik TA, Kattan M. Body mass index and the risk of asthma in adults.Respiratory medicine. 2004 Jan;98(1):29-37. PubMed PMID:14959811.

89. Gonzalez JR, Caceres A, Esko T, Cusco I, Puig M, Esnaola M, et al. A common 16p11.2 inversion underlies the joint susceptibility to asthma and obesity. American journal of human genetics. 2014 Mar 6;94(3) : 361-72. PubMed PMID: 24560518. Pubmed Central PMCID: 3951940.

90. Mishra V. Effect of obesity on asthma among adult Indian women. International Journal of obesity and related metabolic disorders : journal of the International Association for the Study of Obesity. 2004 Aug;28(8): 1048-58. PubMed PMID: 15197412.

91. Gonzalez JR, Caceres A, Esko T, Cusco I, Puig M, Esnaola M, et al. A common 16p11.2 inversion underlies the joint susceptibility to asthma and obesity. American journal of human genetics. 2014 Mar 6;94(3) : 361-72. PubMed PMID: 24560518. Pubmed Central PMCID: 3951940.

92. Lam HT, Ronmark E, Tu'o'ng NV, Ekerljung L, Chuc NT, Lundback B. Increase in asthma and a high prevalence of bronchitis: results from a population study among adults in urban and rural Vietnam. Respiratory medicine. 2011 Feb;105 (2):177-85. PubMed PMID: 21030231.

93. Isoaho R, Puolijoki H, Huhti E, Kivela SL, Tala E.Prevalence of asthma in elderly Finns. Journal of clinical epidemiology. 1994 Oct;47(10):1109-18. PubMed PMID: 7722544.

94. Oraka E, Kim HJ, King ME, Callahan DB.Asthma prevalence among US elderly by age groups: age still matters. The Journal of asthma : official journal of the Association for the Care of Asthma.2012 Aug;49(6):593-9.PubMed PMID: 22765313.

95. Dorevitch S, Conroy L, Karadkhele A, Rosul L, Stacewicz - Sapuntzakis M, Fantuzzi G.Associations between obesity and asthma in a low-income, urban,minority population. Annals of allergy, asthma & immunology : official publication of the American College of Allergy, Asthma, & Immunology. 2013 May;110(5) :340-6. PubMed PMID: 23622004.

96. Gunnbjornsdottir MI, Omenaas E, Gislason T, Norrman E, Olin AC, Jogi R, et al. Obesity and nocturnal gastro-oesophageal reflux are related to onset of asthmaand respiratory symptoms.The European respiratory journal. 2004 Jul; 24(1) :116-21. PubMed PMID: 15293613

97. Varraso R, Siroux V, Maccario J, Pin I, Kauffmann F, Epidemiological Study on the G, et al. Asthma severity is associated with body mass index and early menarche in women. American journal of respiratory and critical care medicine. 2005 Feb 15;171(4):334-9. PubMed PMID: 15557134.

98. Kruger DJ, Valerio MA. Association between psychosocial factors and asthma in a demographically representative adult sample. The Journal of asthma : official journal of the Association for the Care of Asthma. 2009 Sep:46(7) :708-11. PubMed PMID: 19728210.

99. Grammer LC, Weiss KB, Pedicano JB, Kimmel LG, Curtis LS, Catrambone CD, et al. Obesity and asthma morbidity in a community-based adult cohort in a Large urban area: the Chicago Initiative to Raise Asthma Health Equity (CHIRAH). The Journal of asthma : official journal of the

Association for the Care of Asthma. 2010 Jun;47(5) : 491-5. PubMed PMID: 20560823. Pubmed Central PMCID: 3509187.

100. Dorevitch S, Conroy L, Karadkhele A, Rosul L, Stacewicz-Sapuntzakis M, Fantuzzi G. Associations between obesity and asthma in a low-income,urban, minority population. Annals of allergy, asthma & immunology : official publication of the American College of Allergy, Asthma, & Immunology. 2013 May;110(5) :340-6. PubMed PMID: 23622004.

101. Forte GC, Grutcki DM, Menegotto SM,Pereira RP, Dalcin Pde T. Prevalence of obesity in asthma and its relations with asthma severity and control. da Associacao Medica Brasileira. 2013 Nov-Dec;59(6):594-9. PubMed PMID:24182891.

102. Grammer LC, Weiss KB, Pedicano JB, Kimmel LG, Curtis LS, Catrambone CD, et al. Obesity and asthma morbidity in a community-based adult cohort in alarge urban area: the Chicago Initiative to Raise Asthma Health Equity (CHIRAH). The Journal of asthma : official journal of the Association for the Care of Asthma. 2010 Jun;47(5):491-5. PubMed PMID: 20560823. Pubmed Central PMCID: 3509187.

103. Loerbroks A, Apfelbacher CJ, Amelang M, Sturmer T. Obesity and adult asthma: potential effect modification by gender, but not by hay fever. Annals of epidemiology. 2008 Apr;18(4):283-9. PubMed PMID: 18083546.

104. Song WJ, Kim SH, Lim S, Park YJ, Kim MH, Lee SM, et aAssociation between obesity and asthma in the elderly population: potential roles of abdominal subcutaneous adiposity and sarcopenia. Annals of allergy, asthma & immunology : official publication of the American College of Allergy, Asthma, & Immunology. 2012 Oct;109(4):243-8. PubMed PMID: 23010229.

105. Nejjari C, Tessier JF, Letenneur L, Dartigues JF, Barberger-Gateau P, Salamon R. Prevalence of self-reported asthma symptoms in a French elderly sample. Respiratory medicine. 1996 Aug;90(7):401-8. PubMed PMID: 8796232.

106. Underner M, Cazenave F, Patte F [Occupational asthma in the rural environment]. Revue de pneumologie clinique. 1987;43(1):26-35. PubMed PMID: 3296107. L'asthme professionnal en milieu rural.

107. Liang W, Chikritzhs T. Alcohol consumption during adolescence and risk of diabetes in young adulthood. BioMed research nternational. 2014;2014:795741. PubMed PMID: 24757678. Pubmed Central PMCID: 3976876. Metcalf PA,

108. Scragg RK, Jackson R. Light to moderate alcohol consumption is Protective for type 2 diabetes mellitus in normal weight and overweightindividuals but not the obese. Journal of obesity 2014;2014:634587. Pubmed PMID: 25140249. Pubmed Central PMCID: 4130120.

109. Gao YH, Zhao HS, Zhang FR, Gao Y, Shen P, Chen RC, et al. The Relationship Between Depression and Asthma: A Meta-Analysis of Prospective Studies. PloS one. 2015;10(7):e0132424. PubMed PMID: 26197472. Pubmed CentralPMCID: 4510436.

110. Shen TC, Lin CL, Wei CC, Tu CY, Li YF. The risk of asthma in rheumatoid arthritis: a population – based cohort study. QJM: monthly journal of the Associationof Physicians. 2014 Jun;107(6):435-42. PubMed PMID: 24448376.

APPENDICES

APPENDIX A

QUESTIONNAIRE

THE RELATIONSHIP BETWEEN OBESITY AND ASTHMA AMONG OLDER ADULT IN THAILAND

Individual Questionnaire

Table of Contents

Section 0 : **COGNITIVE AND MEMORY OF THE RESPONDENT**		
Q0001 INTERVIEWER: Does the respondent have obvious cognitive limitations that prevent him/her from being interviewed?	1. Yes ……➔ 2. No	Q0005

Q0002	How would you best describe your memory at present? Is it very good, good, moderate, bad or very bad?	1. Very good 2. Good 3. Moderate 4. Bad 5. Very bad	
Section 0 : **COGNITIVE AND MEMORY OF THE RESPONDENT (CONT.)**			
Q0003	Compared to 12 months ago, would you say your memory is now better, the same or worse than it was then?	1. Better 2. Same 3. Worse	
Q0004	INTERVIEWER:	1. No reason to think Respondent has any cognitive limitations …...…➔ 2. Cognitive limitations or health problems, proxy……..…➔	Individual consent form and individual Q Q0005
Q0005	Interviewer: We would like to ask someone who knows the respondent a few questions about the respondent's memory and health. Who is the proxy?	1. Spouse …..➔ 2. Non-spouse.➔	Proxy Q Proxy Q
	INTERVIEWER: GO TO PROXY CONSENT & QUESTIONNAIRE		

SECTION 1: SOCIO-DEMOGRAPHIC FACTORS		
Q1001	*INTERVIEWER:* *Record sex of the respondent*	1. Male 2. Female
Q1002	How old are you now? *INTERVIEWER: This would be age at last birthday. If don't know - probe.*	☐☐☐ Age in years

Q1003	What is your <u>current</u> marital status?	1. Never married 2. Currently married 3. Cohabiting 4. Separated/divorced 5. Widowed
SECTION 1: SOCIO-DEMOGRAPHIC FACTORS (CONT.)		
Q1004	Do you have health insurance coverage?	1. = Yes, Universal coverage 2. = Yes, Social security 3. = Yes, Public welfare 4. = Yes, voluntary insurance 5. = No, none.
Q1005	What is the type of resident that you live in?	1. Non-municipal area 2. Municipal area
Q1006	What is the <u>highest level</u> of education that you have <u>completed</u>?	1. Never been to school 2. Less than primary school 3. Primary school completed 4. Secondary school completed 5. High school(or equivalent) completed 6. College/Pre-university/University completed 7. Post graduate degree completed
Q1007	Do you belong to a <u>religious denomination</u>? *INTERVIEWER: allow the respondent to reply without reading categories. Clarify as needed.*	1. No, none 2. Buddhism 3. Christianity 4. Islam 87. Other, specify: …….. 97. Refused
Q1008	What is your <u>background or ethnic group</u>?	1. Country specific 87. Other, specify: ……..
Q1009	What is your total household monthly income?	1. Less than 10000 baht 2. 10001-20000 baht 3. 20001-30000 baht 4. More than 30000 baht
Q1010	What is your main occupation in the past year ?	1. Agricultural 2. Non-agricultural

Section 2 : Asthma		
Q2001	Have you ever been diagnosed with asthma (an allergic respiratory disease)?	*1 YES* *2 NO*

Section 3 : Body Mass Index (BMI)		
Q3001	*Measured height in centimetres*	□□□.□ ***centimetres*** ***997 Refused*** ***998 Not able***
Q3002	*Measured weight In kilograms*	□□□.□ ***kilograms*** ***997 Refused*** ***998 Not able***

SECTION 4: LIFESTYLE FACTORS: ALCOHOL CONSUMPTION BEHAVIOR AND TOBACCO USE		
Interviewer**:* *These questions ask about psychoactive substances in the **PAST 3** **MONTHS		
Q4001	Did you have a drink containing alcohol?	Yes [1] No [0]
Q4002	Did you smoke a cigarette containing tobacco?	Yes [1] No [0]

SECTION 4 (CONT.): **LIFESTYLE FACTORS ; DIETS**		
Q4003	How many times do you eat <u>fast food</u> per week	1 0 times (Never) 2 1-2 times (Sometimes) 3 3 or more times (often)
Q4004	How many times do you consume <u>desserts or sweets</u> per week	1 0 times (Never) 2 1-2 times (Sometimes) 3 3 or more times (often)

SECTION 4 : **LIFESTYLE FACTORS ; DIETS** (CONT.)		
Q4005	How many times do you eat sweet beverage per week	1 0 times (Never) 2 1-2 times (Sometimes) 3 3 or more times (often)
Q4006	How many times do you eat greasy food per week	1 0 times (Never) 2 1-2 times (Sometimes) 3 3 or more times (often)
Q4007	How many times do you eat high lipid diets per week	1 0 times (Never) 2 1-2 times (Sometimes) 3 3 or more times (often)
Q4007	How many times do you eat meat food per week	1 0 times (Never) 2 1-2 times (Sometimes) 3 3 or more times (often)

SECTION 4 (CONT.): **LIFESTYLE FACTORS ; PHYSICAL ACTIVITIES**		
Q4008	Does your work involve vigorous- intensity activity, that causes large increases in breathing or heart rate, [like heavy lifting, digging or chopping wood] for at least 10 minutes continuously?	Yes [1] No [0]
Q4009	Does your work involve moderate-intensity activity, that causes small increases in breathing or heart rate, for at least 10 minutes continuously?	Yes [1] No [0]
Q4010	Do you walk or use a bicycle (pedal cycle) for at least 10 minutes continuously to get to and from places?	Yes [1] No [0]
Q4011	Do you do any vigorous intensity sports, fitness or recreational (leisure) activities that cause large increases in breathing or heart rate?	Yes [1] No [0]

SECTION 4 (CONT.): **LIFESTYLE FACTORS ; PHYSICAL ACTIVITIES**		
Q4012	Do you do any moderate-intensity sports, fitness or recreational (leisure) activities that causes a small increase in breathing or heart rate?	Yes [1] No [0]

SECTION 5 : CHRONIC CONDITION FACTORS		
Q5001	Have you ever been diagnosed with cataract	1. Yes 2. No
Q5002	Have you ever been diagnosed with knee arthritis?	3. Yes 4. No
Q5003	Have you ever been told by a health professional that you have had a stroke?	1. Yes 2. No
Q5004	Have you ever been diagnosed with angina or angina pectoris (a heart disease)?	1. Yes 2. No
Q5005	Have you ever been diagnosed with diabetes (high blood sugar)? (Not including diabetes associated with a pregnancy)	1. Yes 2. No
Q5006	Have you ever been diagnosed with depression?	1. Yes 2. No
Q5007	Have you ever been diagnosed with high blood pressure (hypertension)?	5. Yes 6. No
Q5008	Have you ever been diagnosed with low back pain	1. Yes 2. No

APPENDIX B

แบบสอบถามเฉพาะบุคคล
ความสัมพันธ์ระหว่างดัชนีมวลกายและโรคหืด
ในประชากรไทยอายุ 50 ปีขึ้นไป

Q0001	ผู้สัมภาษณ์: *ผู้ให้สัมภาษณ์มีลักษณะของการบกพร่องด้านความจำอย่างชัดเจน ที่อาจเป็นข้อจำกัดต่อการตอบคำถาม หรือไม่?*	1. ใช่ .....➔ 2. ไม่ใช่	Q0005
Q0002	คุณคิดว่าระดับความจำของคุณในปัจจุบัน ดีแค่ไหน? ดีมาก ดี ปานกลาง แย่ หรือแย่มาก?	1. แย่มาก 2. แย่ 3. ปานกลาง 4. ดี 5. ดีมาก	
Q0003	เมื่อเปรียบเทียบกับปีที่แล้ว คุณคิดว่าระดับความจำของคุณ ณ ขณะนี้ ดีขึ้น เหมือนเดิม หรือแย่ลง?	1. แย่ลง 2. เหมือนเดิม 3. ดีขึ้น	
Q0004	สำหรับผู้สัมภาษณ์:	1 ผู้ให้สัมภาษณ์ ไม่มีลักษณะการบกพร่องของความจำ .....➔ 2 ผู้ให้สัมภาษณ์ มีลักษณะการบกพร่องของความจำ .....➔	หนังสือแสดงความยินยอมเข้าร่วมวิจัยและแบบสอบถาม Q1001
Q0005	ผู้สัมภาษณ์: เราขอสอบถามคนใกล้ชิดของคุณเกี่ยวกับความจำและสุขภาพของคุณ *ใครคือ ตัวแทนที่เราจะสอบถาม?*	1. คู่สมรส 2. ไม่ใช่คู่สมรส	
ผู้สัมภาษณ์: ใช้หนังสือแสดงความยินยอมเข้าร่วมวิจัยสำหรับตัวแทน และแบบสอบถามสำหรับการวิจัย			

SECTION 1: **ลักษณะประชากรและสังคม**		
Q1001	*ผู้สัมภาษณ์:* *บันทึกเพศของผู้ให้สัมภาษณ์*	1. เพศชาย 2. เพศหญิง
Q1002	<u>ปัจจุบัน</u> คุณอายุกี่ปี? *ผู้สัมภาษณ์: อายุเต็มในหน่วยปี ของวันเกิดครั้งล่าสุด ถ้าไม่ทราบ มีความจำเป็นต้องค้นหาข้อมูลเพิ่มเติม*	☐☐☐ อายุในหน่วยปี
SECTION 1: **ลักษณะประชากรและสังคม (ต่อ)**		
Q1003	<u>สถานภาพสมรส</u> ปัจจุบันของคุณคือ ?	1. โสด 2. สมรส 3. อยู่กินด้วยกันแต่ไม่ได้จดทะเบียนสมรส 4. แยกกันอยู่หรือหย่าร้าง 5. หม้าย
Q1004	สิทธิการรักษาหลัก ตามระบบการประกันสุขภาพของคุณ คืออะไร?	1. ประกันสุขภาพถ้วนหน้า (30บาทรักษาทุกโรค) 2. ประกันสังคม 3. สวัสดิการข้าราชการ และพนักงานรัฐวิสาหกิจ 4. ประกันสุขภาพบริษัทเอกชน 5. ไม่มีสิทธิการรักษา และไม่ได้ซื้อประกันสุขภาพ
Q1005	ลักษณะชุมชนที่คุณอาศัยอยู่ปัจจุบัน เป็นเขตเทศบาล หรือนอกเขตเทศบาล?	1. เขตเทศบาล 2. นอกเขตเทศบาล
Q1006	<u>ระดับการศึกษาสูงสุด</u> ของคุณคือ?	1. ไม่เคยเข้ารับการศึกษาภาคบังคับในโรงเรียน 2. ต่ำกว่าระดับประถมศึกษา 3. ระดับประถมศึกษา 4. ระดับมัธยมศึกษาตอนต้น 5. ระดับมัธยมศึกษาตอนปลาย หรือเทียบเท่า 6. อนุปริญญา ปริญญาตรี หรือเทียบเท่า 7. สูงกว่าระดับปริญญาตรี
SECTION 1: **ลักษณะประชากรและสังคม (ต่อ)**		
Q1007	<u>ศาสนา</u> ที่คุณนับถือ คือ? *ผู้สัมภาษณ์: อนุญาตให้ผู้ให้สัมภาษณ์*	1. ไม่นับถือศาสนา 2. ศาสนาพุทธ

	ตอบคำถามโดยผู้สัมภาษณ์ไม่ต้องอ่านคำตอบหรือชี้แจงโดยละเอียด	3. ศาสนาคริสต์ 4. ศาสนาอิสลาม 87. อื่นๆ โปรดระบุ..... 97. ปฏิเสธไม่ตอบ
Q1008	เชื้อชาติ ของคุณคือ ?	1. เชื้อชาติไทย 87. อื่นๆ โปรดระบุ.....
Q1009	ใน ช่วง 12 เดือนที่ผ่านมา ครัวเรือนของท่านมีรายได้รวมกันทั้งหมดโดยเฉลี่ย ประมาณกี่บาทต่อเดือน?	1. น้อยกว่า 10000 บาทต่อเดือน 2. 10001-20000 บาทต่อเดือน 3. 20001-30000 บาทต่อเดือน 4. มากกว่า 30000 บาทต่อเดือน
Q1010	ในช่วง 1 ปีที่ผ่านมา อาชีพหลักของคุณคืออะไร?	1. เกษตรกร 2. อื่นๆ

	SECTION 2: **โรคหืด**	
Q2001	คุณเคยได้รับการวินิจฉัยว่าเป็นโรคหืดหรือไม่? (โรคระบบทางเดินหายใจจากภูมิแพ้)	1. ใช่ 2. ไม่ใช่

SECTION 3 : **ดัชนีมวลกาย**	
Q3001 **ตรวจวัดความสูง หน่วยเซนติเมตร** *997 ปฏิเสธการตรวจวัด* ***สามารถตรวจวัดได้***	□□□.□ *998 ไม่*
Q3002 **น้ำหนัก หน่วยกิโลกรัม**	□□□.□ **กิโลกรัม** *997 ปฏิเสธการตรวจวัด* *998 ไม่สามารถตรวจวัดได้*

SECTION 4: **ปัจจัยทางพฤติกรรมสุขภาพ ; การใช้สารเสพติด**		
ผู้สอบถาม: คำถามต่อไปนี้เกี่ยวกับประสบการณ์ของคุณในการใช้เครื่องดื่มแอลกอฮอล์ และผลิตภัณฑ์ยาสูบ **<u>ภายในช่วงสามเดือนที่ผ่านมาเท่านั้น</u>** โปรดมั่นใจว่า เราจะเก็บข้อมูลที่เกี่ยวกับการใช้สารเสพติดของคุณเป็นความลับที่สุด		
Q4001	คุณดื่มเครื่องดื่มแอลกอฮอล์ใช่หรือไม่?	ใช่ [1] ไม่ใช่ [0]
Q4002	คุณใช้ผลิตภัณฑ์ยาสูบ (บุหรี่ ยาเส้นแบบเคี้ยว ซิการ์ ฯลฯ) ใช่หรือไม่?	ใช่ [1] ไม่ใช่ [0]

SECTION 4: **ปัจจัยทางพฤติกรรมสุขภาพ;อาหาร**		
Q4003	<u>ในช่วง 1 สัปดาห์ที่ผ่านมา</u> คุณทานอาหารประเภทจานด่วน เช่น พิซซ่า เฟรนช์ฟราย แฮมเบเกอร์ บ่อยแค่ไหน?	1 0 ครั้ง (ไม่มีเลย) 2 1-2 ครั้งในหนึ่งสัปดาห์ (บางครั้ง) 3 <u>≥</u> 3 ครั้งในหนึ่งสัปดาห์(มาก)
Q4004	<u>ในช่วง 1 สัปดาห์ที่ผ่านมา</u> คุณทานขนมหวาน หรือเค้ก บ่อยแค่ไหน?	1 0 ครั้ง (ไม่มีเลย) 2 1-2 ครั้งในหนึ่งสัปดาห์ (บางครั้ง) 3 <u>≥</u> 3 ครั้งในหนึ่งสัปดาห์(มาก)
Q4005	<u>ในช่วง 1 สัปดาห์ที่ผ่านมา</u> คุณดื่มน้ำหวาน น้ำอัดลม ชาหรือกาแฟ บ่อยแค่ไหน?	1 0 ครั้ง (ไม่มีเลย) 2 1-2 ครั้งในหนึ่งสัปดาห์ (บางครั้ง) 3 <u>≥</u> 3 ครั้งในหนึ่งสัปดาห์(มาก)
Q4006	<u>ในช่วง 1 สัปดาห์ที่ผ่านมา</u> คุณทานอาหารที่มีไขมันสูง เช่น ข้าวขาหมู ข้าวมันไก่ บ่อยแค่ไหน?	1 0 ครั้ง (ไม่มีเลย) 2 1-2 ครั้งในหนึ่งสัปดาห์ (บางครั้ง)\ 3 <u>≥</u> 3 ครั้งในหนึ่งสัปดาห์(มาก)
SECTION 4: **ปัจจัยทางพฤติกรรมสุขภาพอาหาร (ต่อ)**		
Q4007	<u>ในช่วง 1 สัปดาห์ที่ผ่านมา</u> คุณทานอาหารพวกเนยเนยเทียม ไขมันสัตว์ น้ำมันหมู น้ำมันไก่ บ่อยแค่ไหน?	1 0 ครั้ง (ไม่มีเลย) 2 1-2 ครั้งในหนึ่งสัปดาห์ (บางครั้ง) 3 <u>≥</u> 3 ครั้งในหนึ่งสัปดาห์(มาก)

Q4008	ในช่วง 1 สัปดาห์ที่ผ่านมา คุณทานอาหารประเภทเนื้อสัตว์ไม่ติดมัน บ่อยแค่ไหน?	1 0 ครั้ง (ไม่มีเลย) 2 1-2 ครั้งในหนึ่งสัปดาห์ (บางครั้ง) 3 ≥ 3 ครั้งในหนึ่งสัปดาห์(มาก)
Q4009	ในช่วง 1 สัปดาห์ที่ผ่านมา คุณทำงานที่เป็นกิจกรรมทางกายแบบหนัก (จนรู้สึกหัวใจเต้นเร็ว แรง และหายใจหอบเหนื่อย) ต่อเนื่องอย่างน้อย 10 นาทีขึ้นไป ใช่หรือไม่?	ใช่ [1] ไม่ใช่ [0]
Q4010	ในช่วง 1 สัปดาห์ที่ผ่านมา คุณทำงานที่เป็นกิจกรรมทางกายแบบปานกลาง (จนรู้สึกหัวใจเต้นเร็ว แรง และหายใจหอบเหนื่อย) ต่อเนื่องอย่างน้อย 10 นาทีขึ้นไป ใช่หรือไม่?	ใช่ [1] ไม่ใช่ [0]

SECTION 4: **ปัจจัยทางพฤติกรรมสุขภาพอาหาร (ต่อ)**		
Q4011	ในช่วง 1 สัปดาห์ที่ผ่านมา คุณเดินหรือปั่นจักรยานจากที่หนึ่งไปยังอีกที่หนึ่ง โดยใช้เวลาอย่างน้อย 10 นาทีอย่างต่อเนื่อง ใช่หรือไม่?	ใช่ [1] ไม่ใช่ [0]
Q4012	ในช่วง 1 สัปดาห์ที่ผ่านมา คุณใช้เวลาว่างออกกำลังกายแบบหนัก โดยใช้เวลาต่อเนื่องอย่างน้อย 10 นาทีขึ้นไป ใช่หรือไม่?	ใช่ [1] ไม่ใช่ [0]
Q4013	ในช่วง 1 สัปดาห์ที่ผ่านมา คุณใช้เวลาว่างออกกำลังกายแบบปานกลาง โดยใช้เวลาต่อเนื่องอย่างน้อย 10 นาทีขึ้นไป ใช่หรือไม่?	ใช่ [1] ไม่ใช่ [0]

SECTION 5: **ปัจจัยทางโรคเรื้อรังที่เกี่ยวข้อง**		
Q5001	คุณเคยได้รับการวินิจฉัยว่าเป็น โรคต้อกระจก หรือไม่ ?	1. เคย 1. ไม่เคย
Q5002	คุณเคยได้รับการวินิจฉัยว่าเป็น โรคข้อเข่าอักเสบ หรือไม่ ?	2. เคย 3. ไม่เคย
Q5003	คุณเคยได้รับการวินิจฉัยว่าเป็น โรคหลอดเลือดสมอง (โรค	1. เคย

	อัมพฤกษ์ หรืออัมพาต) โดยแพทย์หรือบุคลากรสุขภาพ หรือไม่?	2. ไม่เคย
Q5004	คุณเคยได้รับการวินิจฉัยว่าเป็น โรคหลอดเลือดหัวใจตีบ หรือไม่?	1. เคย 2. ไม่เคย
SECTION 5: **ปัจจัยทางโรคเรื้อรังที่เกี่ยวข้อง (ต่อ)**		
Q5005	คุณเคยได้รับการวินิจฉัยว่าเป็นโรคเบาหวาน (ระดับน้ำตาลในเลือดสูง) หรือไม่?(ไม่รวมถึงเบาหวานขณะตั้งครรภ์)	1. เคย 2. ไม่เคย
Q5006	คุณเคยได้รับการวินิจฉัยว่าเป็นโรคซึมเศร้า หรือไม่?	1. เคย 2. ไม่เคย
Q5007	คุณเคยได้รับการวินิจฉัยว่าเป็นโรคความดันโลหิตสูง หรือไม่?	1. เคย 2. ไม่เคย
Q5008	คุณเคยได้รับการวินิจฉัยว่าเป็นโรคปวดหลังส่วนล่าง หรือไม่?	1. เคย 2. ไม่เคย

APPENDIX C

Independent variables and questions in the individual questionnaire

VARIABLES	QUESTIONS
Dependent Variables	
self-report of physician-diagosed asthma	"Have you ever been diagnosed with asthma?"
Independent Variables	
Socio-demographic Factors	
Age	"How old are you now?"
Gender	Record sex of the respondent
Marital status	"What is your current marital status?"
Health insurances coverage	"Do you have health insurance coverage?"
Type of resident	"What is the type of resident that you live in?"
Education level	"What is the highest level of education that you have completed?"
Religions denomination	"Do you belong to a religious denomination?"
Ethnic	"What is your background or ethnic group?"
Household income	"What is your total household monthly income?"
Occupation	What is your main occupation in the past year ?
Obesity : Evaluate from Body Mass Index (BMI) (measurement by interviewer) $BMI = Bodyweight(kg)/Height(m)^2$ The current WHO BMI cut-off points	

	<16 kg/m2 (severe underweight), 16·0–16·9 kg/m2 (moderate underweight), 17·0–18·49 kg/m2 (mild underweight), 18·5–24·9 kg/m2 (normal range), >25 (overweight), 25–29·9 kg/m2 (pre-obese), >30 kg/m2 (obesity). 30–39·9 kg/m2 (obese class I), 35–39·9 kg/m2 (obese class II), >40 kg/m2 (obese class III)
Other associated lifestyle factors	
Physical activities	Does your work involve vigorous- intensity activity, that causes large increases in breathing or heart rate, [like heavy lifting, digging or chopping wood] for at least 10 minutes continuously?
	Does your work involve moderate-intensity activity, that causes small increases in breathing or heart rate, for at least 10 minutes continuously?
	Do you walk or use a bicycle (pedal cycle) for at least 10 minutes continuously to get to and from places?
	Do you do any vigorous intensity sports, fitness or recreational (leisure) activities that cause large increases in breathing or heart rate?
	Do you do any moderate-intensity sports, fitness or recreational (leisure) activities that causes a small increase in breathing or heart rate?
Diets	How many times do you eat fast food per week
	How many times do you consume desserts or sweets per week
	How many times do you eat sweet beverage per week
	How many times do you eat greasy food per week
	How many times do you eat high lipid diets per week
	How many times do you eat meat food per week
Substance use	Alcohol consumption "Did you have a drink containing alcohol?" Tobacco use "Did you smoke a cigarette containing tobacco?"

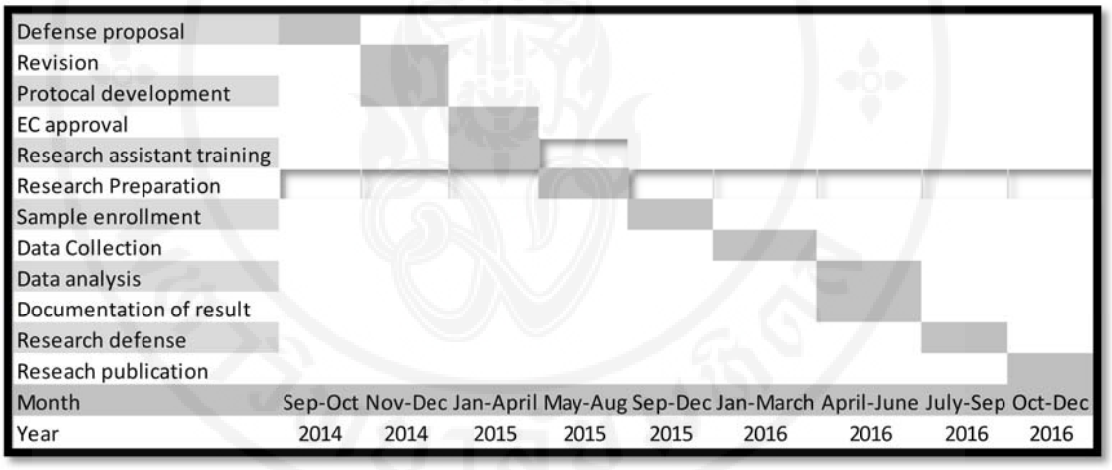
Chronic condition factors	"Have you ever been diagnosed with/told you have knee arthritis?" "Have you ever been told by a health professional that you have had a stroke?" "Have you ever been diagnosed with… (angina or angina pectoris, diabetes, high blood pressure, cataract, low back pain, depression)?"

APPENDIX D

TIMETABLE RESEARCH PLAN

Student name : Patthanunt Yosaravuthvarakul, MD.

Program : Master of Primary Health Care Management.



APPENDIX E
LIST OF STUDY SITES

Table List of Main researcher and Co-research investigator in fourteen study sites.

Region	Province	Community	Co-research investigator
Northern	Chiang rai	Wiang Pa Pao District	Dr.Torranong Philalai
North Eastern	Nakhonratchasima	Debaratana Nakhonratchasima District	Dr.Krittika Hongphokhaphan
	Sisaket	Srirattana hospital	Dr.Surachai Kampakdee
	Yasothorn	Thaicharoen district	Dr.Kanyapak Srila
	Yasothorn	Kudchum district	Dr.Nunthiya Khemphet
Central	Saraburi	Wihan Daeng district	Dr.Tanakorn Saranyapinyo
	Nakhonpathom	Huayplu sub-district	*Dr.Patthanunt Yosaravuthvarakul
	Supanburi	Danchang district	Dr.Decha Pongsuphan
Eastern	Chachoengsao	Baanpoh district	Dr.Sirinapa Siriporn Na Ratchaseema
	Nakhonnayok	Baanna district	Dr. Phayao Sikarasuwan
Western	Ratchaburi	Chetsamian district	Dr.Pajaree Areerop
	Ratchaburi	Watpleng district	Dr.Chawanon Imarb
Southern	Pattalung	Sibanpot district	Dr.Apinya Kuasuk
	Satun	Kuankalong district	Dr.Orawan Jetwarapong

Note: *Main researcher

APPENDIX F
CERTIFICATION

The 6th Asia-Pacific Conference on Public Health (APCPH) August 23 – 26, 2016
(certificate of oral presentation award)

CERTIFICATE OF ORAL PRESENTATION AWARD
The 6th Asia - Pacific Conference on Public Health (APCPH)

hereby certifies that

Patthanunt Yosaravuthvarakul

has presented an outstanding work entitled

The Relationship between asthma and obesity among older adults in the communities of Thailand
on 23 – 26 August 2016
Awarded on the 25 August 2016

Prof. Supa Pengpid, M.Sc., Dr.PH., MBA
Conference Chair
6th Asia-Pacific Conference on Public Health (APCPH)
1st ASEAN Health Promotion Conference | 1st District Health System Management Learning Conference

BIOGRAPHY

NAME	Mrs. Patthanunt Yosaravuthvarakul
DATE OF BIRTH	15 June 1976
PLACE OF BIRTH	Nakhon Pathom, Thailand
INSTITITIONS ATTENDED	Mahidol University, 2003-2009 Bachelor degree on Medical Doctor Navamindradhiraj University, 2013-2015 Diploma of the Thai Board of Family Medicine
RESEARCH GRANTS	National Health Security Office (NHSO)
HOME ADDRESS	30 Moo 1, Thung Khwang, Kamphaeng Saen District, Nakhon Pathom Province, Thailand 73140 Tel 089-6141409 E-mail: yoputth2012@gmail.com
EMPLOYMENT ADDRESS	Huay Plu Hospital, Nakhon Chai Si District Nakhon Pathom Province, Thailand 73120
PUBLICATION / PRESENTATION	The 6th Asia-Pacific Conference on Public Health (APCPH) August 23 – 26, 2016 (certificate of oral presentation award) Journal of Public Health and Development Vol. 15 No.1 January-April 2017