# FACTORS RELATED TO LOW BACK PAIN IN FLIGHT ATTENDANTS OF THAI AIRWAYS INTERNATIONAL PUBLIC COMPANY LIMITED

**SUPAWAT FUNGJARUKUL**

**A THESIS SUBMITTED IN PARTIAL FULFILLMENT**
**OF THE REQUIREMENTS FOR**
**THE DEGREE OF MASTER OF SCIENCE**
**(INDUSTRIAL HYGIENE AND SAFETY)**
**FACULTY OF GRADUATE STUDIES**
**MAHIDOL UNIVERSITY**
**2005**

**ISBN 974-04-6351-7**

Thesis
entitled

# FACTORS RELATED WITH LOW BACK PAIN AMONG FLIGHT ATTENDANTS OF THAI AIRWAYS INTERNATIONAL PUBLIC COMPANY LIMITED

.....
Mr. Supawat Fungjarukul,
Candidate

.....
Lect. Suttinun Chantanakul,
M.D.
Major-Advisor

.....
Assoc. Prof Dusit Sujirarat,
M.Sc. (Biostatistics)
Co-Advisor

.....
Mr. Pipat Chumkasian,
M.D., DIP. in Physical Medicine
and Rehabilitation
Co-Advisor

.....
Assoc. Prof. Vajira Singhakajen,
M.A. (Demography)
Co-Advisor

.....
Assoc. Prof. Rassmidara Hoonsawat,
Ph.D.
Dean
Faculty of Graduate Studies

.....
Assoc. Prof. Pornpimol Kongtip,
Ph.D.
Chair
Master of Science Programme in
Industrial Hygiene and Safety
Faculty of Public Health

Thesis
entitled

# FACTORS RELATED WITH LOW BACK PAIN AMONG FLIGHT ATTENDANTS OF THAI AIRWAYS INTERNATIONAL PUBLIC COMPANY LIMITED

was submitted to the Faculty of Graduate Studies, Mahidol University
for the degree of Master of Science (Industrial Hygiene and Safety)
on

June 30, 2005

S. Fungjarukul
.....
Mr. Supawat Fungjarukul,
Candidate

Suttinun Chantanakul
.....
Lect. Suttinun Chantanakul,
M.D.
Chair

S. Taptagaporn
.....
Dr. Sasitorn Taptagaporn,
Ph.D.
Member

Dusit Sujirarat
.....
Assoc. Prof Dusit Sujirarat,
M.Sc. (Biostatistics)
Member

V. Singhakajen
.....
Assoc. Prof. Vajira Singhakajen,
M.A. (Demography)
Member

P. Chumkasian
.....
Mr. Pipat Chumkasian,
M.D., DIP. in Physical Medicine
and Rehabilitation
Member

Rassmidara Hoonsawat
.....
Assoc. Prof. Rassmidara Hoonsawat,
Ph.D.
Dean
Faculty of Graduate Studies
Mahidol University

C. Chaikitiporn
.....
Assoc. Prof. Chalermchai Chaikitiporn,
Dr.P.H. (Epidemiology)
Dean
Faculty of Public Health
Mahidol University

# ACKNOWLEDGEMENT

I would like to thank Lect. Suttinun Chantanakul who was major advisor for his valuable advice and guidance in this research.

I also would like to thank Assoc. Prof. Dusit Sujirarat and Assoc. Prof. Vajira Singhakajen and Dr. Pipat Chumkasian who were co-advisor for their valuable comments and suggestions.

I sincerely thank Dr. Sasitorn Taptagaporn the external examiner for her suggestions and comments.

My sincere appreciation to Thai Airways International Public Company Limited for providing all necessary data in this research.

I am deeply grateful to my late mother for what I am today and if she could learn by any means she would congratulate to my success. My thanks are also for my elder sister and brother and my friends especially to Miss Jantana sutjaritvorakul for encouragement, understanding and moral support at all times.

Supawat Fungjarukul

FACTORS RELATED TO LOW BACK PAIN IN FLIGHT ATTENDANTS OF THAI AIRWAYS INTERNATIONAL PUBLIC COMPANY LIMITED

SUPAWAT FUNGJARUKUL 4437793 PHIH/M

M.Sc. (INDUSTRIAL HYGINE AND SAFETY)

THESIS ADVISORS: SUTTINUN CHANTANAKUL, M.D. DUSIT SUJIRARAT, M.Sc.(BIOSTATISTICS), VAJIRA SINGHAKAJEN, M.A.(DEMOGRAPHY), PIPAT CHUMKASIAN M.D.,DIP. IN PHYSICAL MEDICINE AND REHABILITATION

## ABSTRACT

This study was a case – control study aimed to study the factors which were related to low back pain in flight attendants of Thai Airways International Public Company Limited who reported for sick leaves or claimed for medical expenses from the company between October 1, 2003- September 30, 2004. Data were collected from 140 samples (70 cases and 70 controls) by using questionnaires.

This study showed that flight attendants who had BMI in over weight were at a higher risk of low back pain than normal BMI (OR = 33.48, 95% CI= 4.27-262.69) and flight attendants who had BMI in under weight were at a higher risk of low back pain than normal BMI (OR = 9.85, 95% CI= 3.11-31.18). Flight attendants who were smoker had a higher risk of low back pain than those who were not smoking (OR = 4.00, 95% CI =1.35-11.82). Flight attendants who had previous low back pain had a higher risk of low back pain than those who did not have previous low back pain (OR = 3.76, 95% CI=1.16-12.19). Flight attendants who did not have training for lifting technique had a higher risk of low back pain than those who were trained for lifting technique (OR = 4.08, 95% CI =1.99-8.36). Flight attendants who bent during flight more than 6 times per flight had a higher risk of low back pain (OR = 4.5, 95% CI= 1.57-12.93). Flight attendants who twisted during flight more than 15 times per flight had a higher risk of low back pain (OR = 5.30, 95% CI =1.84-15.27). Flight attendants who reached overhead more than 11 times per flight had a higher risk of low back pain (OR = 2.63, 95% CI =1.18-5.88) and flight attendants who pulled/pushed drawers in and out with difficulty more than 15 times per flight had a higher risk of low back pain(OR=3.56, 95% CI=1.29-9.87).

From the results, it was found that BMI, smoking, previous low back pain, training for lifting techniques, bending more than 6 times per flight, twisting more than 15 times per flight, overhead reaching more than 11 times per flight and pulled/pushed drawer in and out with difficultly more than 15 times were related to low back pain in flight attendants of Thai Airways International Public Company Limited.

KEY WORDS: LOW BACK PAIN/ FLIGHT ATTENDANT

77 P. ISBN 974-04-6351-7

ปัจจัยที่มีผลต่อการเกิดโรคปวดหลังส่วนล่างในพนักงานต้อนรับบนเครื่องบิน บริษัท การบินไทย จำกัด มหาชน

FACTORS RELATED TO LOW BACK PAIN IN FLIGHT ATTENDANTS OF THAI AIRWAYS INTERNATIONAL PUBLIC COMPANY LIMITED

สุภวัตร เฟื่องจารุกุล 4437793 PHIH/M

วท.ม. (สุขศาสตร์อุตสาหกรรมและความปลอดภัย)

คณะกรรมการควบคุมวิทยานิพนธ์ : สุทธินันท์ ฉันท์ธนกุล M.D., ดุสิต สุจิรารัตน์ วท.ม, วชิระ สิงหะคเชนทร์ M.A. (DEMOGRAPHY) พิพัฒน์ ชุมเกษียร M.D. (DIP. IN PHYSICAL MEDICINE AND REHABILITATION)

**บทคัดย่อ**

การศึกษาครั้งนี้เป็นการศึกษาแบบ case-control study เพื่อให้ทราบถึงปัจจัยที่มีผลต่อการเกิดโรคปวดหลังส่วนล่างในพนักงานต้อนรับบนเครื่องบินของ บริษัท การบินไทย จำกัด มหาชน โดยกลุ่มพนังงานตัวอย่าง คือ พนักงานต้อนรับบนเครื่องบินที่ลาหยุดงานหรือเบิกค่ารักษาพยาบาลเนื่องจากโรคปวดหลัง ในช่วงเวลา ระหว่าง 1 ตุลาคม 2546 ถึง 30 กันยายน 2547 ซึ่งมีจำนวนทั้งสิ้น 70 ราย ทำการเก็บรวบรวมข้อมูล โดยใช้แบบสอบถามที่ได้จัดทำขึ้น ให้กลุ่มตัวอย่างตอบแบบสอบถามแล้วนำมาวิเคราะห์ทางสถิติ ผลการวิเคราะห์ทางสถิติพบว่า พนักงานต้อนรับบนเครื่องบินที่มีดัชนีมวลกายสูงกว่ามาตรฐานเสี่ยงต่อการเกิดโรคปวดหลังส่วนล่างมากกว่าพนักงานต้อนรับบนเครื่องบินที่มีดัชนีมวลกายปกติ (OR = 33.48, 95% CI= 4.27-262.69) พนักงานต้อนรับบนเครื่องบินที่มีดัชนีมวลกายต่ำกว่ามาตรฐานเสี่ยงต่อการเกิดโรคปวดหลังส่วนล่างมากกว่าพนักงานต้อนรับบนเครื่องบินที่มีดัชนีมวลกายปกติ(OR = 9.85, 95% CI =3.11-31.18) พนักงานต้อนรับบนเครื่องบินที่สูบบุหรี่ เสี่ยงต่อการเกิดโรคปวดหลังส่วนล่างมากกว่าพนักงานต้อนรับบนเครื่องบินที่ไม่สูบบุหรี่ (OR = 4.00, 95% CI= 1.35-11.82) พนักงานต้อนรับบนเครื่องบินที่มีประวัติการเกิดโรคปวดหลังมาก่อนเสี่ยงต่อการเกิดโรคปวดหลังส่วนล่างมากกว่าพนักงานต้อนรับบนเครื่องบินที่ไม่เคยมีประวัติการปวดหลัง (OR = 3.76, 95% CI =1.16-12.19) พนักงานต้อนรับบนเครื่องบินที่ไม่เคยผ่านการอบรมเรื่อง การยกของหนักที่ถูกวิธี เสี่ยงต่อการเกิดโรคปวดหลังส่วนล่างมากกว่าพนักงานต้อนรับบนเครื่องบินที่เคยผ่านการอบรมเรื่อง การยกของหนักที่ถูกวิธี (OR = 4.08, 95% CI= 1.99-8.36) พนักงานต้อนรับบนเครื่องบินที่ก้มตัว มากกว่า 6 ครั้งต่อเที่ยวบิน เสี่ยงต่อการเกิดโรคปวดหลังส่วนล่างมากกว่าปกติ (OR = 4.5, 95% CI= 1.57-12.93) พนักงานต้อนรับบนเครื่องบิน ที่บิดเอี้ยวตัว มากกว่า 15 ครั้งต่อเที่ยวบินเสี่ยงต่อการเกิดโรคปวดหลังส่วนล่างมากกว่าปกติ (OR = 5.30, 95% CI= 1.84-15.27) พนักงานต้อนรับบนเครื่องบินที่เอื้อมสุดมือมากกว่า 11ครั้งต่อเที่ยวบินเสี่ยงต่อการเกิดโรคปวดหลังส่วนล่างมากกว่าปกติ (OR = 2.63, 95% CI= 1.18-5.88) พนักงานต้อนรับบนเครื่องบินที่ต้องออกแรงจำนวนมากในการดึงหรือดันชั้นวางของมากกว่า 15 ครั้งต่อเที่ยวบินเสี่ยงต่อการเกิดโรคปวดหลังส่วนล่างมากกว่าปกติ(OR=3.56,95% CI=1.29-9.87)

77 หน้า ISBN 974-04-6351-7

# CONTENTS

# CONTENTS (Continued)

# CONTENTS (Continued)

# LIST OF TABLES

# LIST OF FIGURES

# CHAPTER I
# INTRODUCTION

## 1.1 Background and rationale

Back pain is the number one problem facing the workforce in the United States today. To illustrate just how big a problem low back pain is consider these facts:

- Low back pain is the second most common cause of absence from work.
- Low back pain is the leading cause of disability between the ages of 19-45.
- Low back pain is the number one leading impairment in occupational injuries.

It is estimated that over 80 billion dollars was spent because of back pain each year, and the cost is growing. Eight out of ten people will have a problem with back pain at some time during their lives. Back pain is more likely to occur during the ages of 30 to 50, the most productive period of people's lives. Most of low back pain is self limited, meaning that they will resolve no matter what the treatment is. But, in some people low back pain can become chronic low back pain, meaning that it not go away. The back pain continues and causes problems indefinitely. Low back pain is a common problem for all types of people, no matter what their job is.

Low back pain is generally regarded as a loss of ability to perform physical activities. Low back disability is defined as necessitating restricted duty or time away from the job. Although it is not clear which outcome measurement is best suited for determining the causal relationship between low back disorder and work related risk factors.

Most people with low back pain do not simply injure their back suddenly. Over many years back is subjected to repeat stress which may not result in pain at the time of injury to the part of the spine actually occurs. These repeated injuries add up and can slowly degeneration of the parts of the spine and low back pain. Most of low back pain is at least partially the result of degenerative changes that have occurred in the

back over many years. There may be an acute injury that causes the back to begin to hurt. The overall conditions of the spine usually determine how fast the injured recover and the risk of the condition turn to chronic.

Webster and Sanook (3) estimate that 16% of all claims and 33% of all costs were back injury, and the average direct cost of and LBP claim was $8,300 more than twice the average cost of all compensable claims. Using data from the National Health Interview Survey, the annual prevalence of LBP (4) among all U.S. workers was estimated to be 17.6%, resulting in the loss of approximately 149 million man-day. The National Institute for occupational Safety and Health (NIOSH) (5) estimated that in 1993 LBP accounted for 27% of all lost time due to injuries.

Low back pain was one third of total compensation costs and it was about 40 % of absences from work. It was second cause of sick leaves under common cold.

From the total report of sick leaves and medical expenses among flight attendants of Thai Airways International Public Company Limited between October 1, 2001 – September 30, 2002 and October 1, 2002 – September 30, 2003. It has been found that most of injured organ among flight attendants of Thai Airways International Public Company Limited was low back that was a leading cause of sick leaves and working days loss of flight attendants.

Between October 1, 2001-September 30, 2002 total of flight attendants who reported for sick leave or claimed for medical expenses were 340 persons and 99 flight attendants (29.11%) claimed for low back pain. Working days loss from low back pain were 893 days from total working days loss 1923 days that was 46.43% off total and medical expenses were 605,066 baht from total medical expenses 1,355,973 baht that was 44.62% of total.

Between October 1, 2002- September 30, 2003 total of flight attendants who reported for sick leave or claimed for medical expenses were 323 persons and 80 flight attendants (24.77%) claimed for low back pain. Working day loss from low back pain were 653 days from total working days loss 1700 days that was 38.41% off total and medical expenses were 628239 baht from total medical expenses 1,988,136 baht that was 31.6% of total. (see the statistic in appendix).

## 1.2 Research objective

To study what factors (individual, physical and psychological factors) were related to low back pain among flight attendants of Thai Airways International Public Company Limited that reported for low back pain sick leaves or claimed for medical expenses between October 1, 2002 – September 30, 2003

## 1.3 Research hypothesis

There were relationships between factors (individual, physical and psychological factors) of flight attendants and low back pain.

## 1.4 Scope of the research

The subjects were flight attendants of Thai Airways International Public Company Limited with Thai nationality who reported for low back pain sick leaves or claimed for medical expenses between October 1, 2002- September 30, 2003. The subjects answered the questionnaire about personal data and working detail and then the data was analyzed to determine what factors were related to low back pain among flight attendants of Thai Airways International Public Company Limited.

## 1.5 Variables of the study

### 1.5.1 Independent factors

**1. Individual factors**

- Age (year)
  - Less than 30
  - Between 30 – 40
  - More than 40

- Body mass index
  - Under weight
  - Normal weight
  - Over weight

- Alcoholic use
  - Yes
  - No

- Smoking habits
  - Yes
  - No

- Previous low back pain
  - Yes
  - No

**2 Physical factors**

- Working posture
  - Handling heavy carry on baggage into overhead bin
  - Pulling/Pushing meal or drink carts
  - Handling heavy loads
  - Overhead reaching
  - Pulling/pushing drawer in and out with difficulty
  - Bending
  - Twisting

- Training for lifting technique
  - Yes
  - No

- Back exercise for low back pain prevention
  - Yes
  - No

**3 Psychological factors**

- Marital status
  - Single
  - Married
  - Divorce

- Satisfaction at work
  - Low
  - Medium
  - High

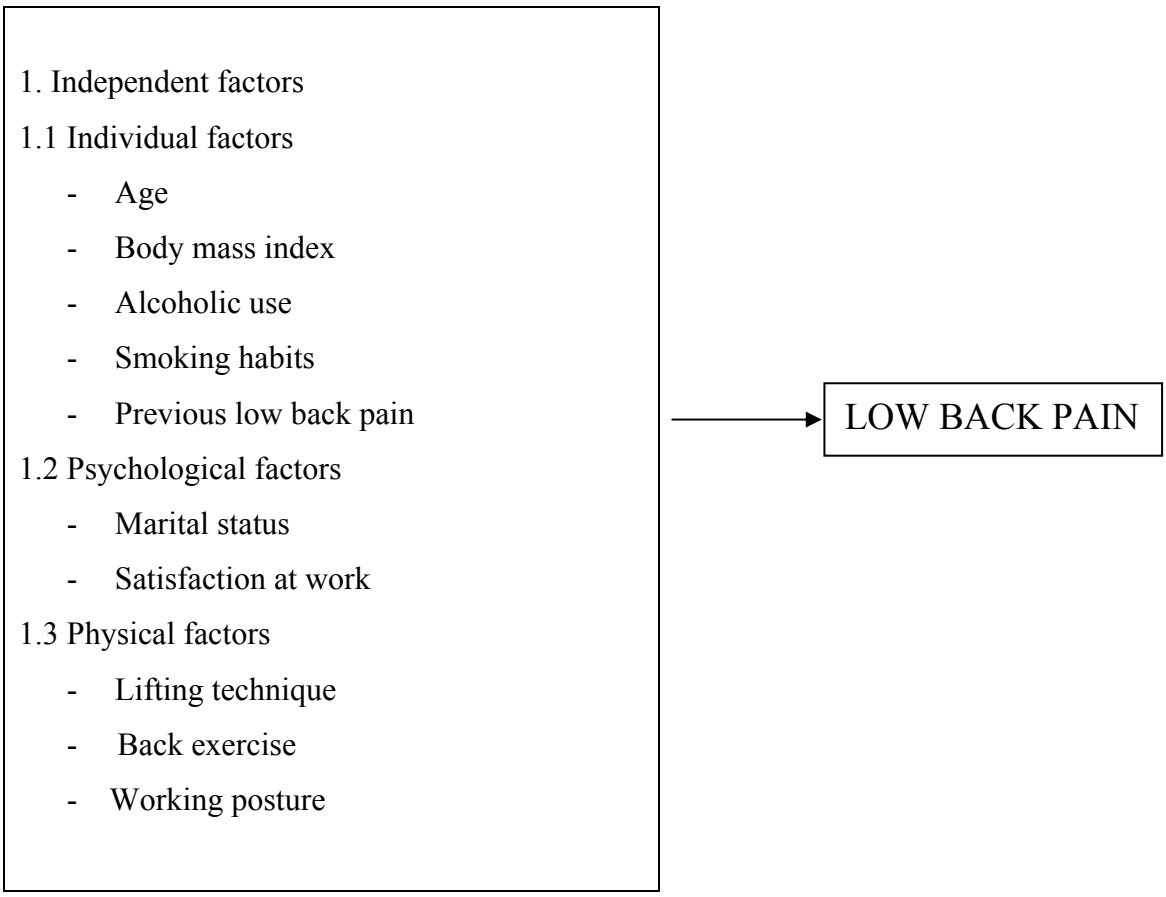
### 1.5.2 Control factors

- Sex
- Years on job
- Aircraft type
- Climate
- Vibration
- Total flight time

### 1.5.3 Dependent variables

- LOW BACK PAIN

## 1.6 Conceptual of framework



## 1.7 Definition

**Low back pain**

George E. Byrns et al suggested that low back pain is a symptom and not a disease. An accurate history and physical examination are useful tools in making a diagnosis of pathological conditions; however these have limitations in predictions of low back pain.

Jurgen; 1981 low back pain is a pain limited only to the lumbar region.

Kuorinka et al, 1987; 233-237 defines low back as ache, pain or discomfort in low back

Wadded and Fry Moyer in 1991 defined that low back pain is typically located from the rip cage to the glutei and extend to the posterior of the thing. It is frequently found that back pain is associated with radiate to the thighs and the level of the knee and sometimes to the low leg

Garg and moore 1992; Back disorder is multifactor in origin and may be associated with both occupation and non work-related. The latter may include age, gender, cigarette smoking status, physical fitness level, anthropometric measures, lumbar mobility, strength, medical history, and structural abnormalities.

Chilliest in 1993 mentioned that the duration of six months was originally considered being the estimated point in time when acute pain becomes chronic pain. In stead, currently continuation of pain for six weeks was considered to fall into the category of chronic pain

Bornstein et al in 1993 categorized that low back pain includes acute, sub acute and chronic periods. Discomfort is localized to the anatomic area below the posterior low ribs and above the low margin of buttock. Discomfort may be associated with the extension of pain to the anterior aspect of abdomen, groin, legs or thoracic aspect of the back. It may be involve tenderness point, neurological abnormalities or exacerbation.

Freedman; 2001 low back pain is a pain in the spine or low back muscles

Kathleen D Write (2002) (16) divided low back pain by using cause and symptom criteria as following;

- Acute pain

Acute pain in the low part of the back does not extend to the leg is most commonly caused by a sprain or muscle tear, usually occurring with in 24 hours of heavy lifting or overuse of the back muscle. The pain is usually localized. The patient usually feels better after resting.

- Chronic pain

Chronic low back pain has several different possible causes such as job-related mechanical, stooping, bending or other stressful posture; malignancy, ankylosing spondylitis, spondylosis.

**Body mass index status**

The weight and height measurement can be used to calculate the person body mass index status, a value used in clinical assessment; weight (kg) divided by height (meter) squared. This ratio is commonly used to evaluate obesity status in relation to risk factors.

**Classification of weight by BMI in Asians adult** (18)

| Classification | BMI (kg/m²) | Risk of co-morbidities |
|---|---|---|
| Under weight | <18.5 | Low (but increased risk of other clinical problems) |
| Normal weight | 18.5 – 22.9 | Average |
| Over weight | ≥ 23.0 | |
| At risk | 23.0 - 24.9 | Increased |
| Obese 1 | 25.0 - 29.9 | Moderate |
| Obese 2 | ≥ 30.0 | Severe |

# CHAPTER II

# LITERATURE REVIEW

Thai Airways International Public Company Limited is the national carrier of The Kingdom of Thailand. It operates domestic, regional and intercontinental flights radiating from its home base in Bangkok to key destinations within Thailand and around the world. Thai Airways International Public Company Limited is a commercial airline.

## 2.1 Number of flight attendants

Thai Airways International employs 4724 flight attendants which were categorized according to job description (31 Dec 02) (1)

| | | |
|---|---|---|
| 1. In-flight Manager (admin) (IMV) | 63 | Person |
| 2. In-flight Manager (IM) | 151 | Person |
| 3. Air Pursers Intercontinental (AP1) | 200 | Person |
| 4. Air Pursers Regional (APR) | 132 | Person |
| 5. Air Steward First class (ASF) | 237 | Person |
| 6. Air Steward Business class (ASE) | 621 | Person |
| 7. Air Steward Business class Regional (ASR) | 255 | Person |
| 8. Air Steward Economy Class (ASY+AST) | 314 | Person |
| 9. Air Hostess First class (AHF) | 241 | Person |
| 10. Air Hostess Business class (AHE) | 1147 | Person |
| 11. Air Hostess Business class Regional (AHR) | 307 | Person |
| 12. Air Hostess Economy class (AHY+AHT) | 1056 | Person |
| 13. Foreigner Air Hostess | 154 | Person |

## 2.2 JOB DESCRIPTION

1. In-flight Manager (IMV) is an administrator who performs flight duty as In-flight manager on flight operate with aircraft Boeing 747-300,747-400, MD11, Boeing 777-200,777-300 and Airbus A330-300
2. In-flight Manager (IM) is a manager on flight operates with aircraft Boeing 747-300, 747-400, MD11, Boeing 777-200,777-300 and Airbus A330-300
3. Air Purser Intercontinental (AP1) is a chief flight attendant on flight operate with aircraft Boeing 747-300,747-400,MD11, Boeing 777-200, 777-300
4. Air Purser Regional (APR) is a chief flight attendant on flight operate with aircraft Airbus A300-600, Airbus 330-300, Boeing 737-400
5. Air Steward First class (ASF) is an air steward who works in First class and Business class on flight operates with aircraft Boeing 747-300,747-400, MD11 ,Boeing 777-200,777-300
6. Air Steward Business class (ASE) is an air steward who works in Business class and Economy class on flight operates with aircraft Boeing 747-300, 747-400, MD11, Boeing 777-200,777-300
7. Air Steward Business class Regional (ASR) is an air steward who works in Business class and Economy class on flight operates with aircraft Airbus A300-600, Airbus 330-300, Boeing 737-400, Boeing 777-200, 777-300
8. Air Steward Economy Class (ASY+AST) is an air steward who works in Economy class on flight operates with aircraft Airbus A300-600,Airbus 330-300, Boeing 737-400
9. Air Hostess First class (AHF) is an air hostess who works in First class and Business class on flight operate with aircraft Boeing 747-300, 747-400, MD11, Boeing 777-200,777-300
10. Air Hostess Business class (AHE) is an air hostage who works in Business class and Economy class on flight operate with aircraft Boeing 747-300, 747-400, MD11, Boeing 777-200,777-300
11. Air Hostess Business class Regional (AHR) is an air hostage who works in Business class and Economy class on flight operate with aircraft Airbus A300-600, Airbus 330-300, Boeing 737-400, Boeing 777-200, 777-300

12. Air Hostess Economy class (AHY+AHT) is an air hostage who works in Economy class on flight operate with aircraft Airbus A300-600, Airbus 330-300, Boeing 737-400

## 2.3 Flight attendants work tasks (2)

Flight Attendants perform some or all of the following activities:

- Prepare aircraft for boarding and service.
- Boarding passengers.
- Assist with carry-on baggage into overhead bin.
- Explain and demonstrate safety procedure ( when necessary )
- Prepare aircraft for take off
- Prepare food and beverage service (differs between flight and aircraft)
- Respond to pilot/copilot requests
- Offer reading material and respond to passenger requests (Through out the flight)
- Serve food and beverage and collect refuse
- Lavatory equipment
- Prepare for landing
- Assist with off-loading passengers
- Prepare for next flight (if necessary)

## 2.4 Summery of actual job demands for flight attendants

(Base on the US Department of Labor guidelines and Canadian National Classification) (17)

Frequency classification:

0 – not required: not performed

1 – Seldom: not daily

2 – Occasionally < 1 hour/day, 0-33% of shift, 1 repetition/30 min

3 – Frequently 1-3 hour, 34-66% of shift, 1 repetition/2 min

4 – Constantly >3 hour daily, 67-100% of shift, 1 reptition/30 sec

| Physical Demand of work | | | | | |
|---|---|---|---|---|---|
| Description | 0 | 1 | 2 | 3 | Comments |
| VISION (V3) | | | | - | Near and far vision is required |
| COLOUR DISCRIMINATION (C0) | - | | | | Not relevant to job tasks |
| SMELLING (S0) | - | | | | Useful but not relevant to job tasks |
| Hearing (H3) | | | | - | Other sound discrimination is required |

| Description | Frequency | | | | | Comment |
|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | |
| BODY POSITION | | | | | | |
| Standing | | | | | - | Constant standing for majority of tasks |
| Walking | | | | | - | Constant walking for majority of tasks |
| Sitting | | | - | | | Occasional sitting, usually during take off and landing |
| Bending | | | | - | | Frequent bending to perform many tasks |
| Stooping | | | | - | | Frequent stooping to perform many tasks |
| Squatting | | | - | | | Occasional squatting is required |
| Twisting | | | - | | | Occasional twisting is required |
| Neck postures | | | | - | | Frequent neck flexion, extension and rotation is required |
| LIMB COORDINATION | | | | | | |
| Upper limbs and Low limbs | | | | | - | Multiple limb coordination requiring simultaneous movement upper limbs with low limbs is required. Constant grasping, holding, twisting, reaching is required. |
| Reaching: | | | | | | |
| Above shoulder | | | | - | | Frequent reaching above shoulders is required |
| Below shoulder | | | | - | | Frequent reaching below shoulder is required. |
| Noise | | | | | - | Constant aircraft noise. |
| Vibration | | | | | - | Constant whole body vibration from aircraft. |
| Pushing / Pulling | | | | - | | Frequent pushing and pulling of trolley is required. |

| Description | Frequency | | | | | Comment |
|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | |
| ENVIRONMENTAL CONDITIONS (L1,3,4) | | - | | - | - | Work in a regulated inside climate and a vehicle with occasional work performed in outside environment |
| HAZARDS<br>This indicates the type of hazard most likely to be present in the work environment. Unable to determine frequency, duration or degree of exposure, only presence of a particular hazard. | | | | | | |
| Biological agents | | | | | | Potential airborne viral or bacterial exposure via passengers |
| Flying particles, falling objects | | | | | | Potential for flying/falling objects during turbulence, take off and landing |
| Fire, steam, hot surfaces | | | | | | Work near or with hot food |
| Dangerous locations | | | | | | Work in aircraft with risk of turbulence and hazard related to flight, take off and landing. |
| DISCOMFORTS<br>This is indicates working condition that may creates disturbances but are not usually hazards In extreme instances, these conditions may cause injury. | | | | | | |
| STRENGTH (light to medium)<br>- Handing loads between 5-10 kg. is occasionally required<br>- Handing loads between 10-25 kg. is frequently required. | | | | | | |

JOB DEMAND ANALYSIS – FLIGHT ATTENDANTS

The following was a determination of the physical activity of a flight attendant on the described method of analysis and the National Occupational Classification (NOCed**)** description, Department of Labor guidelines and frequency classifications. Flight data was timed and analyzed using observation notes. Unless otherwise noted, these activities are the same on all aircraft.

Vision (V3)

V3 indicates that near and far vision is required to perform many of the work activities. e.g. observe full length of aircraft, during food and beverage preparation, reading boarding pass, labels, written orders, observing passengers for signs of distress and to respond to requests, observe all safety requirements.

Color Discrimination (Co)

Co indicates that color discrimination is not relevant to the occupational of flight attendant.

Smelling

Sense of smell would be useful for the flight attendant for the detection of odors (e.g. fuel, fire) from a safety perspective but is otherwise not required to perform the duties of the job.

Hearing (H3)

H3 indicates that other sound discrimination is required for a combination of tasks related to short verbal indications, communication with coworker or passengers and auditory signals from the cockpit. Hearing is used by flight attendant to assess sounds related to aircraft function, e.g. engine sound identify descent and signals the flight attendant to prepare for take off and landing or adjust for turbulence.

Body Position (B4)

Standing and walking (B3) are constantly required to perform the majority of tasks. (Frequency classification- 4) Sitting is occasionally required take off and landing. (Frequency classification-2). B4 indicates that other body position involve body postures other than ,or in addition to, sitting, standing and/or walking and include bending ,stooping, squatting, or twisting.

Bending is frequently required during food and beverage preparation and service, while attending passengers, stowing carry-on baggage. (Frequency classification-3)

Stooping is frequently required during food and beverage preparation and service. (Frequency classification-2)

Squatting is occasionally required during food and beverage preparation and when speaking with passengers. (Frequency classification-2)

Twisting of the back and neck is occasionally required during food and beverage service and working in the galley. (Frequency classification 2)

Neck mobility of extension, flexion, and rotation is frequently required when placing or retrieving from overhead bins, speaking with passengers, preparing and service food and beverage (Frequency classification-2)

Limb Coordination (L2)

Multiple limb coordination required simultaneous movements of the upper limbs with the low limbs and dexterity are constantly required to move hands and arms easily and skillfully. The flight attendants must coordinate eyes, hand, fingers and feet to operate or manipulate safety equipment, trolleys, trays, and during food and beverage preparation and service. The flight attendants is required to hold, grasp, turn and otherwise work with one or two hand to serve food and beverage, access supplies, and open latches and locks. (Frequency classification-4)

Reaching above and below shoulders is required with one or both arms to complete work activities. The flight attendants frequently reach above the shoulder to access overhead bins when assisting passengers or storage areas within the galley. The flight attendants frequently reaches below the shoulder to access galley storage, hander the trolley, distributes and collects trays, beverage and snack; papers etc. and assist with bag stowage under the seats. (Frequency classification-4)

## 2.5 Medical expenses welfare for flight attendants of Thai Airways International Public Company Limited

Thai Airways International Public Company Limited provides medical welfare for flight attendants. They can report sick both on and off duties. They can go to see doctor at hospital or clinic which have contract with Thai Airways International Public Company Limited. Doctor is required to fill in the medical expenses claim form with diagnostics detailed.

## 2.6 Structure of back

Commonly known as the vertebral column, the spine provides the structural support and integrity of the human body. The spine is made up of five components: the cervical spine consisting of seven vertebral segments; the thoracic spine consisting of twelve thoracic vertebral bodies; the lumbar spine consisting of five lumbar vertebral bodies; the sacrum; and the coccyx.

The function of the spinal column is to support the muscles, discs, nerves, and spine. The spine can be thought of as a stack of building blocks, stacked one on top of another with a soft, gelatinous cushion, an intervertebral disc (which serves as a shock absorber), in between each vertebral body or spine segment. The discs provide a cushion and allow flexibility in the spine, allowing room for the nerves to exit the spinal canal.

The transverse processes of the vertebrae also provide attachments for muscles to the spine and provide support and structure to the body. In figure 2.1 you can see the segments of the spine (cervical, thoracic, lumbar, sacrum, coccyx) as well as the bony attachments for muscles. Also, the disc and its relationship to the spinal nerves and spinal cord are illustrated.

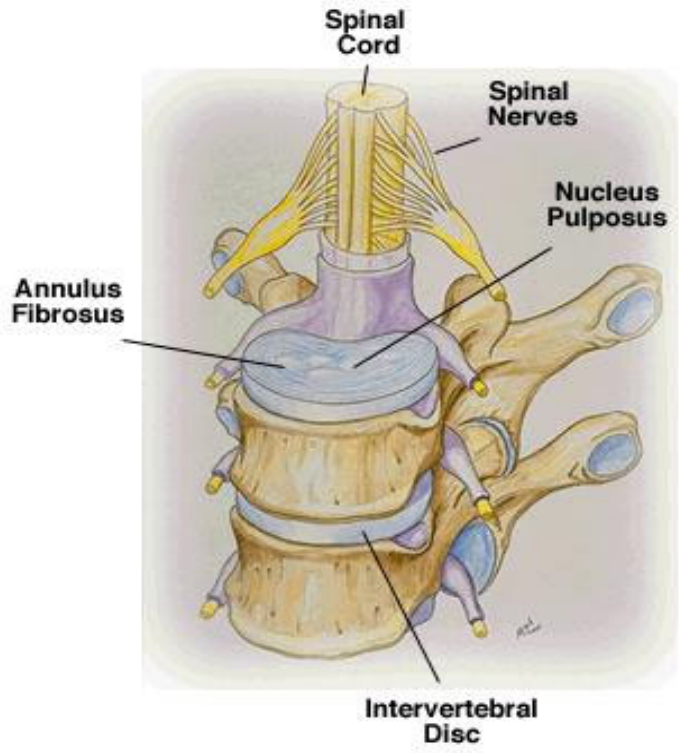



Figure 2.1 SPINAL CORDS, DISCS & NERVES

The spinal cord branches into many nerves that go into the arms, legs, hands and feet. The spinal nerves exit the spinal cord very close and proximate to the intervertebral discs. This is why a herniated disc can sometimes cause a pinched nerve.

The intervertebral disc is a jelly-like substance consisting of the annulus fibrosis and the nucleus pulposus. The nucleus pulposus is the inner core of the disc, which consists of a gelatinous material. The annulus fibrosis is the outer layer of the disc, which is the strongest portion of the disc and providestrength to prevent disc herniations.

Figure 2.2 the muscles of the low back serve to support the spine, and attach to the spinal column, pelvis, and extremities. These muscles may become injured, and contribute to low back pain.

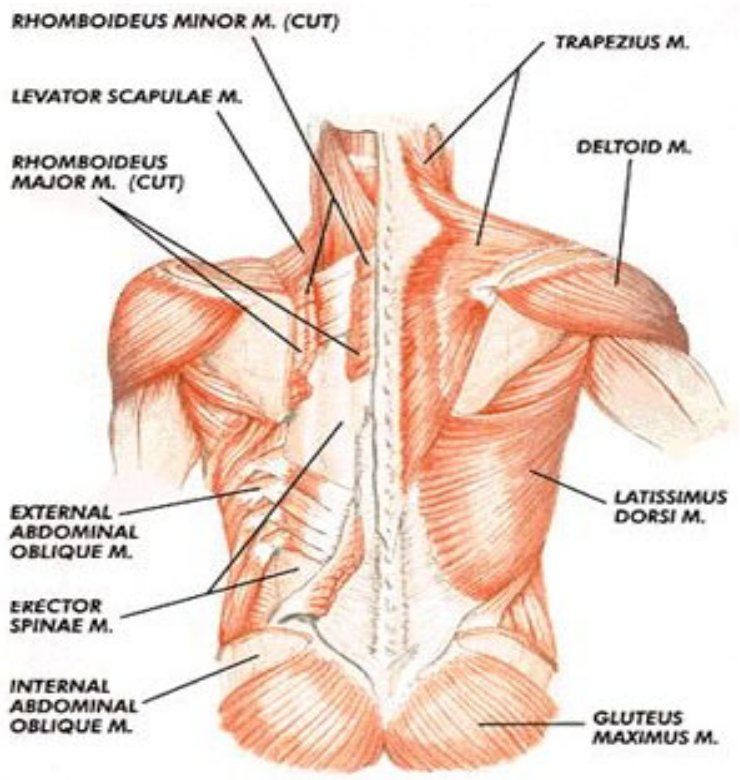



Figure 2 2 BACK MUSCLE STRUCTURE

The natural effects of normal aging on the body decreased amount of bone; decrease in strength and elasticity of muscles; and decrease in elasticity and strength of ligaments. Although you cannot totally halt the progress of these effects, they can be slowed by regular exercise, knowing the proper way to lift and move objects, proper nutrition, and avoidance of smoking.

Age is factors will cause degenerative changes in the discs, called degenerative disc disease, and arthritic changes in the small joints. These changes occur to some degree in everyone. When severe, they can cause low back stiffness and pain. Arthritic bone spurs and inflamed joints can cause nerve irritation and leg pain. Almost everyone develops changes in their low back as their age, although for most people it causes little pain or loss of function.

Osteoporosis and Fractures - All bones lose bone strength over time and the lumbar vertebrae, particularly in postmenopausal women, can be fractured or compressed from a fall or even from the stress of lifting or everyday activities.

The disc is composed of a soft center or nucleus, which, in children and young adults, is jelly-like. The nucleus is surrounded by a tougher outer portion called the anulus. With normal aging, the nucleus begins to resemble the anulus. During middle-age, fissures or cracks may occur in the disk. These may be the source of back pain. If the crack extends out of the disk, material from the disk may push out or rupture. This often is referred to as a herniated or slipped disc. (Figure 2.3 Protruding Disk) If the protruded disc presses a nerve, it may cause pain in the leg.

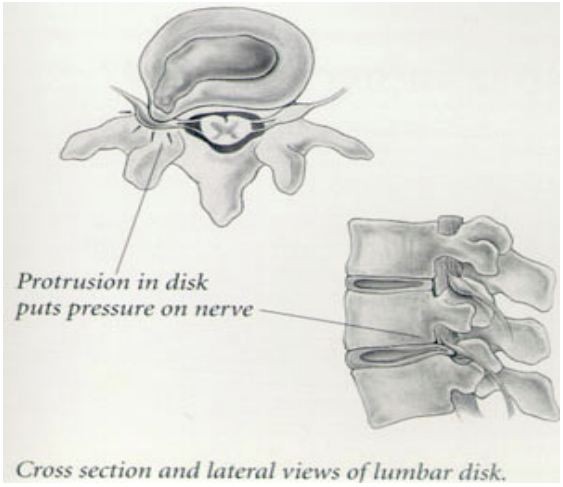



Figure 2.3 Lumbar disk

## 2.7 The studies related with low back pain

The stressful nature of flight attendants work and biomechanical issues have been pointed out, including specific tasks such as waiting on passengers, unnatural working postures and manual handing of heavy materials (Mareda et al.,1983). It has also been report that complaint rates of fatigue and work stress related disorders including low back pain are very high in flight attendant (Cameron, 1969; Preston et al., 1973; Smolensky et al., 1982; Watanabe et al., 1984).

Some of risk factors of musculoskeletal injury in flight attendants as the followings (Alter and Mohler, 1980; Iglesias et al, 1989; One et al, 1991; Rosekind et al, 1994; Smolensky et al, 1982). (7-11)

- In-flight cabin vibration
- Progressively earlier report times on multiple layovers
- Long duty day
- Early report times
- Multiple flight legs
- Increased snacking
- Performing service while walking on an incline or uphill
- Increased G-Force during turns, increasing stress on joints
- Mild turbulence while standing causing increased muscular effort to maintain stand
- Heavy turbulence causing shocks to the body
- Highly irregular time schedule
- Standing, bending, walking and pushing or pulling requirement
- Lack of adequate rest facilities
- Rush service
- Difficulty in handling carry-on luggage due to overhead bin height

Flight attendants were considered at risk for musculoskeletal injuries related to shoulder, neck and low back. The risk is primarily related to amount of overhead reaching, lifting, pushing, pulling, bending and twisting. (White and Anderson, 1991; Schnebel et al., 1989; Nachemson, et al, 1970) (15) They classified risk of musculoskeletal injuries into

- effort and stain exceeding recommended guidelines when pulling, pushing and maneuvering trolleys
- difficulty in sliding drawers in and out
- bending and squatting required to reach items within the trolleys and galley
- overhead reaching required to reach items within the galley and to access the overhead bins
- poor seating for the flight attendants
- higher work rate on duration shorter flights
- service while on an incline or decline
- turbulence
- awkward handles and latches that are small and sharp
- frequent neck flexion, back flexion, back extension and upper limb movements

The muscles of the low back provide power and strength for activities such as standing, walking and lifting. A strain of the muscle can occur when the muscle is poorly conditioned or overworked. The ligaments of the low back act to interconnect the five vertebral bones and provide support or stability for the low back. A sprain of the low back can occur when a sudden, forceful movement injures a ligament which has become stiff or weak through poor conditioning or overuse.

These injuries, sprain or strain, are the most common causes of low back pain. Frequently, a combination of other factors may increase the risk of injury or disease:

- poor conditioning
- improper use
- obesity
- smoking

Khalil (1993:28) (13) summarized risk factors leading to low back pain injury as follows

1. Physical factors include posture, strength, flexibility, body build, reflexes and aerobic capacity
2. Individual factors include age, weight, previous injury, nutrition, fitness level, education, income, alcoholic use, medication history, degeneration, smoking, gender and height
3. Psychological factors include depression, marital discord, family problems, anxiety, job dissatisfaction, personality traits and attitudes toward work
4. Environmental factors include prolong sitting, years on job, climate, accidents, driving, lifting(amount of weight, frequency, twisting), vibration, slips and falls

National Institute for the Improvement of working condition and environment classified risk factors by the cause of injuries into 3 groups

1. Physical factors
2. Individual factors
3. Environmental factors

Nation Institute of Occupational Safety and Health (NIOSH) (1997) (6) classified work related Musculoskeletal Disorders of low back into 5 groups

1. heavy physical work
2. lifting and forceful movements
3. bending and twisting (awkward postures)
4. whole-body vibration(WBV)
5. static work posture

1. Heavy physical work

Heavy physical work has been defined as work that has high energy demands or requires some measure of physical strength. Some biomechanical studies interpret heavy work as jobs that impose large compressive forces on the spine [Marras et al. 1995]. In this review, the definition for heavy physical work includes these concepts,

along with investigators' perceptions of heavy physical workload, which range from heavy tiring tasks, manual materials handling tasks, and heavy, dynamic, or intense work. In several studies, evaluation of this risk factor was subjective on the part of participant or investigator, and in many cases, "heavy physical work" appeared to include other potential risk factors for back disorder, particularly lifting and awkward postures.

2. Lifting and forceful movements

Lifting is defined as moving or bringing something from a low level to a higher one. The concept encompasses stresses resulting from work done in transferring objects from one plane to another as well as the effects of varying techniques of patient handling and transfer. Forceful movements include movement of objects in other ways, such as pulling, pushing, or other efforts. Several studies included in this review used indices of physical workload that combined lifting/forceful movements with other work-related risk factors (particularly heavy physical work and awkward postures). Some studies had definitions for lifting which include criteria for number of lifts per day or average amount of weight lifted.

3. Bending and twisting (awkward postures)

Bending is defined as flexion of the trunk, usually in the forward or lateral direction. Twisting refers to trunk rotation or torsion. Awkward postures include non-neutral trunk postures (related to bending and twisting) in extreme positions or at extreme angles. Several studies focus on substantial changes from non-neutral postures. Risk is likely related to speed or changes and degree or deviation from non-neutral position. For the purposes of this review, awkward postures also included kneeling, squatting, and stooping. In most of the studies included in this review, awkward postures were measured concurrently with other work-related risk factors for back disorder.

4. Whole body vibration (WBV)

WBV refers to mechanical energy oscillations which are transferred to the body as a whole (in contrast to specific body regions), usually through a supporting system such as a seat or platform. Typical exposures include driving automobiles and trucks, and operating industrial vehicles.

5. Static work postures

Static work postures include isometric positions where very little movement occurs, along with cramped or inactive postures that cause static loading on the muscles. In the studies reviewed, these included prolonged standing or sitting and sedentary work. In many cases, the exposure was defined subjectively and/or in combination with other work-related risk factors

Bergenudd and nilsson (1988) studied in Swedish population form 1942 onward. The results demonstrated that those with moderate or heavy physical demands in their jobs had more back pain than those with light physical demands (OR =1.83, 95% CI= 1.2-2.7). When consider by gender, the relationship was slightly strong for females (OR =2.03, 95% CI =1.1-3.7) than males.

The National Health Interview Survey (NHIS) in 1988 and Ontario Health Survey in 1990 study with heavy work, such as nursing, personal care and air transportations found increased back pain or long-term problems with exposure to factors such as lifting, pulling, and physical pushing.

Florence Tubach,et al study risk factor for sick leave due to back pain in French national electricity and gas Company in 1989 they found that sex, BMI, heavy smoking are factor for sick leave due to low back pain.

Burdorf and Zondervan (1990) studied worker in Dutch steel plant who operated cranes (a job that frequent twisting, bending, stooping, static sedentary posture and wbv) and worker who did not operate cranes. Cranes operators were significantly more likely to experience low back pain (OR 3.6, 95% CI 1.2-10.6).

Kanjanopas F. (1994) had study in worker of soft drink factory found that workers who had proper lifting training had back strain less than worker who didn't have proper lifting training.

Workers need special health and safety training in recognizing traumagens and understanding the role of biological and behavioral factors for musculoskeletal injuries. Phillips and Brown (1996) have an opinion that workers who have experienced back pain injury should attend series of classes to learn how to manage their pain and prevent re-injury.

National Institute of Occupational Safety and Health reviewed literature and evidences about cause of work-related to low back pain found that heavy physical work, lifting and forceful movement, bending and twisting into awkward position and whole body vibration and static work posture related to low back pain (Bernard, 1997 cited by Mekhora,2000)

The cause of low back pain revealed that psychosocial factors, social support and stress management are related with low back pain including heavy lifting especially while bending or twisting; static work posture or heavy physical work; inappropriate break; repetitive lift and operating vibrating machinery (Torp; 2001; Ariens, et al,2001 Hellsing and Bryngelssom,2000; Phillips, et al 1996 ) (12)(14)

Grimmer et.al. Study the relation between sex, age and low back pain in teenagers found that girls had low back pain more than boys.

# CHAPTER III

# MATERIALS AND METHODS

## 3.1 The study design

This study was designed as a case - control study. The propose of this study is to examine what factors are related to low back pain in flight attendants of Thai Airways International Public Company Limited who reported for low back pain sick leaves or claimed for medical expenses during October 1, 2002 – September 30, 2003.

## 3.2 Population

The populations were Thai nationality flight attendants of Thai Airways International Public Company Limited in the year 2003.

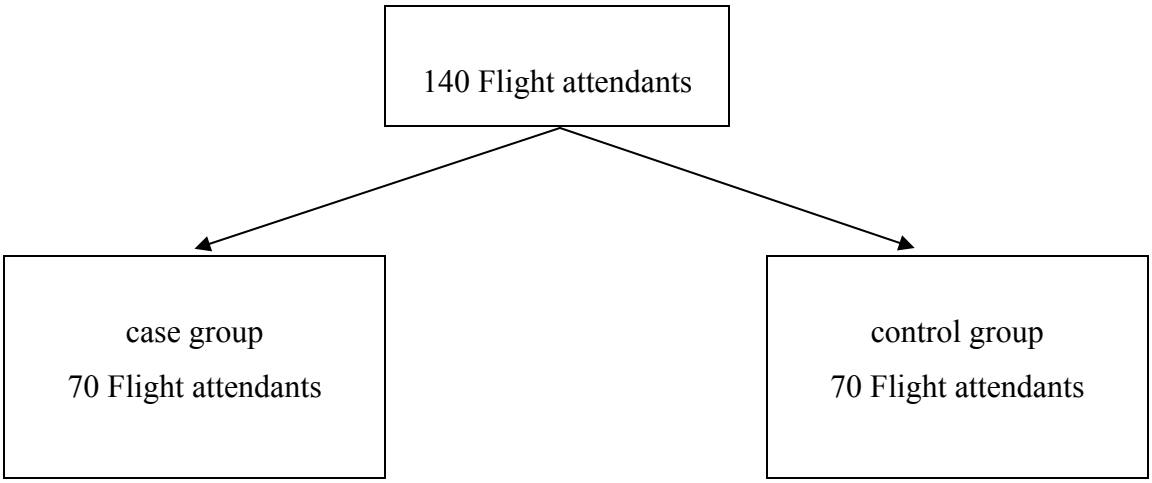
## 3.3 The study sample

**Case group**

The cases of this study were flight attendants of Thai Airways International Public Company Limited with Thai nationality who reported for low back pain sick leaves or claimed for medical expenses from Thai Airways International Public Company Limited between October 1, 2002 – September 30, 2003. Data from Cabin Crew Welfare and In-flight Occupational Health Department.

**Control group**

The controls of this study were flight attendants of Thai Airways International Public Company Limited with Thai nationality who did not report for low back pain sick leaves or claimed for medical expenses during October 1, 2002 – September 30, 2003 and they must have the same sex, working in the same category, and has personal number before or next from flight attendants and have year of work close to flight attendants who reported for low back pain sick leaves or claimed for medical expenses.




### 3.4 Sample size formula in case control study

The formula for calculating the required number of case for a case control study is

$$n = [Z\alpha/2\sqrt{2pq} + Z(1-\beta)\sqrt{p1q1 + p1q2)^2}]/(p1-q2)^2$$

$$p = (p1+p2)/2$$

$$q = 1-p$$

$$p2 = [p1(OR)] / [1+p1(OR-1)]$$

OR = Odds ratio worth detecting

$Z_{\alpha/2}$ = alpha risk

$Z_{(1-\beta)}$ = power

p1 = proportion exposure among population

From the study of Florence Tubach, MD; Risk Factors for Sick Leave Due to Low back pain. He found that the factors for low back pain sick leave were previous low back pain (OR = 7.2, 95% CI= 4.1-13), heavy smoking (OR = 5.5, 95% CI= 2.3-13), bending at work repetitively (OR = 7.4, 95% CI= 2.3-23)

From pilot study, it found that percentage of flight attendants was smoking 7 %, previous low back pain 6 % and bending at work repetitively 61%

### 3.5 Number of sample size calculate by the formula

- Smoking OR = 5.5 , percentage of control 7.0 %
  Sample size calculation by formula

  - Number of case = 55 and number of control = 55
- History of low back pain OR = 7.2, percentage of control 6 %.
  Sample size calculation by formula
  - Number of case = 44 and number of control = 44

- Bending OR = 7.4, percentage of control 61%
  sample size calculation by formula
  - Number of case= 35 and number of control = 35

### 3.6 Data instrument

Designed questionnaires consisted of individual factors, physical factors and psychological factors.

### 3.7 Method of data collection

It was done by distributing questionnaires to the study sample group and allowing them to complete the questionnaires and return questionnaires to the researcher.

### 3.8 Data analysis

1. Descriptive statistics
   - Mean
   - SD
   - Percentage
   - Frequencies
2. Analytic statistic
   - Chi-squares test
   - Odds ratio
   - 95% CI of OR

# CHAPTER IV

# RESULTS

The objective of this research was to study what factors related to low back pain in flight attendants of Thai Airways International Public Company Limited.

The results of this study were divided into

**Part I Individual factors**

- Age (year)
- Body mass index
- Alcohol use
- Smoking habits
- Previous low back pain

**Part II Physical factors**

- Working posture
- Training for lifting technique
- Back exercise for low back pain prevention

**Part III Psychological factors**

- Marital status
- Satisfaction at work

-

From data report of Cabin Crew Welfare and In-flight Occupational Health Department during October 1, 2002 – September 30, 2003. There were 70 flight attendants reported for low back pain sick leave or claimed for medical expenses.

Table 4.1 Numbers and percentage of flight attendants that reported for low back pain sick leaves or claimed for medical expenses between October 1, 2002 – September 30, 2003

| Working position | Number | % |
|---|---|---|
| AP1 | 1 | 1.4 |
| AP2 | 2 | 2.9 |
| ASF | 3 | 4.3 |
| ASE | 12 | 16.8 |
| ASR | 6 | 8.4 |
| ASY | 2 | 2.9 |
| AHF | 2 | 2.9 |
| AHE | 25 | 35.7 |
| AHR | 4 | 5.7 |
| AHY | 13 | 18.6 |

From database between October 1, 2002 – September 30, 2003. There were 70 flight attendants reported for low back pain sick leaves or claimed for medical expenses. Most of them were air hostages in AHE category (35.7%), air hostages in AHY category (18.6%) and air stewards in ASE category (16.8%).

Table 4.2 Numbers and percentage; cause of low back pain that reported by flight attendants

| Cause of low back pain | No | % |
|---|---|---|
| 1.Handling heavy carry on baggage into overhead bin | 25 | 35.7 |
| 2.Handling service equipments | 8 | 11.4 |
| 3.Pulling/pushing meal cart or drink cart | 17 | 24.3 |
| 4.Turbulence | 2 | 2.9 |
| 5.Sliping | 1 | 1.4 |
| 6.Impact | 13 | 18.6 |
| 7.Falling | 1 | 1.4 |
| 8.Close aircraft door | 3 | 4.3 |

This table showed causes of low back pain that flight attendants reported in the accidents report or sick leaved report. The most cause of low back pain was handling heavy carry on baggage into overhead bin 35.7%, followed by pulling or pushing meal cart or drink cart at 24.3%, 18.6 % was the impact to the back while working and handling service equipments 11.45 %.

Table 4.3 Health care professionals that flight attendants were consulted

| Health care professionals | No | % |
|---|---|---|
| Orthopedics | 38 | 58.6 |
| Orthopedics/ Physiotherapist | 17 | 26.6 |
| Orthopedics/Acupuncturist/Physiotherapist | 1 | 1.4 |
| Orthopedics/Thai massage | 2 | 2.9 |
| Orthopedics/Thai massage / Physiotherapist | 3 | 4.3 |
| Orthopedics/Acupuncturist /Physiotherapist /Thai massage | 3 | 4.3 |
| Orthopedics/Chiropractor/ Physiotherapist | 5 | 7.8 |
| Orthopedics/ Chiropractor/ Physiotherapist /Thai massage | 1 | 1.4 |

Table. 4.4 How to diagnosis low back pain by health professionals

| Diagnosis low back pain by health professionals | No | % |
|---|---|---|
| Interview/Body check | 36 | 51.4 |
| Interview/Body check / X-ray | 20 | 28.6 |
| Interview/Body check /Ultrasound | 5 | 7.1 |
| Interview/Body check /MRI | 1 | 1.4 |
| Interview/Body check / X-ray/MRI | 8 | 11.5 |

Table. 4.5 How to treatment low back pain by health professional

| Treatment low back pain by health professional | N0 | % |
|---|---|---|
| Medicine | 30 | 42.9 |
| Medicine/ Physiotherapist | 26 | 40.6 |
| Medicine / Acupuncturist | 1 | 1.4 |
| Medicine /Surgery | 1 | 1.4 |
| Medicine / Chiropractor | 2 | 2.8 |
| Medicine / Physiotherapist / Chiropractor | 6 | 8.6 |
| Medicine / Chiropractor / Thai massage | 1 | 1.4 |
| Medicine/ Physiotherapist / Thai massage | 1 | 1.4 |
| Medicine / Physiotherapist / Acupuncturist / Thai massage | 1 | 1.4 |
| Medicine / Physiotherapist/ Chiropractor/ Acupuncturist /Thai massage | 1 | 1.4 |

Most of health professionals that flight attendants had consulted were Orthopedics 58.6% and some flight attendants did not consult only Orthopedics but also Physiotherapist, Chiropractor, Acupuncturist or Thai massage. The health professionals diagnosed flight attendants by interview and body check 44.4% and some flight attendants were diagnosis by X-ray, Ultrasound or MRI. Most of flight attendants were given by medicine 58.6% and some of flight attendants were recovered by Physiotherapist.

Table. 4.6 General information

| General information | No | % |
|---|---|---|
| Following treatment | | |
| • Yes | 34 | 48.6 |
| • No | 36 | 51.4 |
| Absence from work | | |
| • Yes | 55 | 78.6 |
| • No | 15 | 21.4 |
| Recovery program | | |
| • Yes | 23 | 32.9 |
| • No | 47 | 67.1 |
| Physical check up before get back to work | | |
| • Yes | 18 | 25.7 |
| • No | 52 | 74.3 |
| Still have low back pain | | |
| • Yes | 48 | 68.6 |
| • No | 22 | 31.4 |

A total of 48.6% of flight attendants who reported for sick leaves or claimed for medical expenses had following treatment by health professionals and 32.9 % had recovered program to treatment low back pain and 25.7 % had physical check up before get back to work. Most of sick flight attendants (68.6%) still had low back pain that might be chronic low back pain. Mostly of flight attendants (78.6%) who reported for low back pain sick leaves or medical expenses were absence form working.

Table 4.7 Numbers and percentage of case and control classified by individual factors

| Individual factors | case | | control | |
|---|---|---|---|---|
| | No | % | No | % |
| Age (year) | | | | |
| • More than 40 | 19 | 27.1 | 12 | 17.1 |
| • Between 30-40 | 33 | 47.1 | 40 | 57.1 |
| • Less than 30 | 18 | 25.7 | 18 | 25.7 |
| Mean | | 35.2 | | 34.8 |
| S.D | | 5.9 | | 5.7 |
| Body mass index(BMI) | | | | |
| • Under weight < 18.5 | 20 | 28.6 | 4 | 5.7 |
| • Normal weight 18.5-22.9 | 33 | 47.1 | 65 | 92.9 |
| • Over weight ≥ 23 | 17 | 24.3 | 1 | 1.4 |
| Mean | | 19.8 | | 19.9 |
| S.D. | | 2.8 | | 1.9 |
| Alcohol use | | | | |
| • yes | 20 | 28.6 | 15 | 21.4 |
| • No | 50 | 71.4 | 55 | 78.6 |
| Smoking habits | | | | |
| • Smoking | 15 | 21.4 | 5 | 7.1 |
| • No smoking | 45 | 64.3 | 60 | 85.8 |
| • Stop smoking | 10 | 14.3 | 5 | 7.1 |
| Previous low back pain | | | | |
| • Yes | 13 | 18.6 | 4 | 5.7 |
| • No | 57 | 81.4 | 66 | 94.3 |

Table 4.8 Numbers and percentage of case and control classified by psychological factors

| Psychological factors | case | | control | |
|---|---|---|---|---|
| | No | % | No | % |
| Marital status | | | | |
| • Divorce | 5 | 7.1 | 1 | 1.4 |
| • Married | 17 | 24.3 | 26 | 37.2 |
| • Single | 48 | 68.6 | 43 | 61.4 |
| Satisfaction at work | | | | |
| • Medium | 19 | 27.1 | 12 | 17.1 |
| • High | 51 | 72.9 | 58 | 82.9 |

Table 4.9 Numbers and percentage of case and control classified by physical factors

| Physical factors | case | | control | |
|---|---|---|---|---|
| | No | % | No | % |
| Training for lifting technique | | | | |
| • Yes | 29 | 41.4 | 52 | 74.3 |
| • No | 41 | 58.6 | 18 | 25.7 |
| Back exercise for low back pain prevention | | | | |
| • Yes | 32 | 45.7 | 42 | 60.0 |
| • No | 38 | 54.3 | 28 | 40.0 |

## 4.1 General information of study sample

Case group

In case group with 70 flight attendants, mostly of flight attendants (67.1%) who claimed for low back pain were female. They were age between 30-40 years (47.1%), (27.1%) age more than 40 years and (25.7%) age less than 30 years. The mean age of case group was 35.19 years with the standard deviation of 5.94. Most of case were single (68.6%), (24.3%) were married and (7.1%) divorce. Most of case group had body mass index in normal weight (47.1%), (28.6%) under weight and (24.3%) over weight. A mean of BMI was 19.81 and standard deviation was 2.80. Most of case group did not drink alcohol (71.4%), only (28.6%) drink alcohol, mostly are not smoking (64.3%), (2.4%) stop smoking and (14.3%) smoking. Most of case group reported that they did not have previous low back pain (81.4%) and (18.6%) had previous low back pain. Most of case group has satisfaction at work in high level (72.9%), and (27.1%) in medium. Trained for lifting techniques (41.4%) and (58.6%) didn't train for lifting techniques. Most of case group did not have back exercise for low back pain prevention (54.3 %), only (45.7%) had back exercise.

Control group

In the control group with 70 flight attendants, (45.7%) were female. (57.1%) age between 30-40 years, (17.1%) age more than 40 years, (25.7%) age less than 30 years. The mean age of control group was 34.82 years with the standard deviation 5.71. Most of control group were single (61.4%) and (37.1%) married, (1.4%) divorce and had body mass index in normal weight (92.9%), (5.7%) under weight and (1.4%) over weight. Most of control group were not drink alcohol (78.6%), only 21.4% drink alcohol and mostly were not smoking (85.7%), (7.1%) stop smoking and (7.1%) smoking. Most of control group also reported that they did not have previous low back pain (94.3 %) and (5.7%) had previous low back pain. Mostly had satisfaction at work in high level (82.9%), (17.1%) in medium and trained for lifting techniques (74.3%) and (25.7%) didn't train for lifting techniques. Most of control group had back exercise for low back pain prevention (60%) and (40%) didn't have.

In term of flight attendants duty their main task is to assure safety for passengers during flight. Then they are provide drink and meal service for passengers. During drink or meal service for passengers flight attendants have to work with many working postures that might lead to low back pain.

The working postures that flight attendants doing on every flight are

- Handling heavy carry on baggage into overhead bin
- Pulling/pushing meal cart or drink cart
- Handling heavy loads
- Overhead reaching
- Pulling/pushing drawers in and out with difficulty
- Bending
- Twisting

The working postures, as mentioned earlier, were average postures that flight attendants doing per flight. The totally of working postures that flight attendants doing depend on years working, flight performs and personal habits.

Table 4.10 Average working postures that flight attendants doing per flight

| Average working posture per flight | case | | control | |
|---|---|---|---|---|
| | No | % | No | % |
| Handling heavy carry on baggage into overhead bin | | | | |
| • < 5 Times | 35 | 50.0 | 46 | 65.7 |
| • 6-10 Times | 22 | 31.4 | 17 | 24.3 |
| • 11-15 Times | 9 | 12.9 | 4 | 5.7 |
| • > 15 Times | 4 | 05.7 | 3 | 4.3 |

Table 4.10 Average working postures that flight attendants doing per flight (cont.)

| Average working posture per flight | case | | control | |
|---|---|---|---|---|
| | No | % | No | % |
| Pulling/pushing meal cart or drink cart | | | | |
| • < 5 Times | 8 | 11.4 | 14 | 20.0 |
| • 6-10 Times | 17 | 24.3 | 14 | 20.0 |
| • 11-15 Times | 14 | 20.0 | 22 | 31.5 |
| • > 15 Times | 31 | 44.3 | 20 | 28.5 |
| Handling heavy loads | | | | |
| • < 5 Times | 11 | 15.7 | 21 | 30.0 |
| • 6-10 Times | 19 | 27.1 | 17 | 24.3 |
| • 11-15 Times | 26 | 37.1 | 20 | 28.6 |
| • > 15 Times | 14 | 20.1 | 12 | 17.1 |
| Overhead reaching | | | | |
| • < 5 Times | 15 | 21.4 | 27 | 38.6 |
| • 6-10 Times | 17 | 24.3 | 17 | 24.2 |
| • 11-15 Times | 23 | 32.9 | 13 | 18.6 |
| • > 15 Times | 15 | 21.4 | 13 | 18.6 |
| Pulling/pushing drawers in and out with difficulty | | | | |
| • < 5 Times | 8 | 11.4 | 19 | 27.1 |
| • 6-10 Times | 12 | 17.1 | 12 | 17.1 |
| • 11-15 Times | 23 | 32.9 | 21 | 30.1 |
| • > 15 Times | 27 | 38.6 | 18 | 25.7 |

Table 4.10 Average working postures that flight attendants doing per flight (cont.)

| Average working posture per flight | case | | control | |
|---|---|---|---|---|
| | No | % | No | % |
| Bending | | | | |
| • < 5 Times | 5 | 7.1 | 18 | 25.7 |
| • 6-10 Times | 12 | 17.1 | 10 | 14.3 |
| • 11-15 Times | 26 | 37.2 | 17 | 24.3 |
| • >15 Times | 27 | 38.6 | 25 | 35.7 |
| Twisting | | | | |
| • < 5 Times | 7 | 10.0 | 18 | 25.7 |
| • 6-10 Times | 9 | 12.9 | 14 | 20.0 |
| • 11-15 Times | 21 | 30.0 | 22 | 31.4 |
| • > 15 Times | 33 | 47.1 | 16 | 22.9 |

4.2 Average working posture that flight attendants doing per flight

Case group

This table showed number of average working posture that they done per flight; 50% was handling heavy carry on baggage in to overhead bin 1-5 times and 50% handling heavy carry on baggage in to overhead bin more than 6 times, 44.3% pulling/pushing meal cart or drink cart more than 15 times and 24.3% pulling/pushing meal cart or drink cart more than 6-10 times, 37.1% handling heavy loads 11-15 times and 27.1% handling heavy loads 6-10 times. 32.9% overhead reaching 11-15 times, 24.3% overhead reaching 6-10 times, 38.6% pulling/pushing drawers in and out with difficulty more than 15 times, 34.3% pulling/pushing drawers in and out with difficulty 11-15 times, 38.6% bending during service times more than 15 times and 30.0% bending during service times 11-16 times, 47.1% twisting more than 15 times and 30.0% twisting 11-15 times.

Control group

This table showed number of average working posture that they done per flight; 64.3% handling heavy carry on baggage into overhead bin 1-5 times and 24.3% handling heavy carry on baggage into overhead bin 6-10 times, 31.45 pulling/pushing meal cart or drink cart 11-15 times. 27.1% pulling/pushing meal cart or drink cart more than 15 times, 28.6% handling heavy loads 11-15 times and 24.3% handling heavy loads 6-10 times, 38.6% overhead reaching 1-5 times and 24.3% overhead reaching 6-10 times, 35.7% pulling/pushing drawers in and out with difficulty more than 15 times, 25.7% pulling/pushing drawers in and out with difficulty 11-15 times, 30.0% bending during service times 11-15 times and 27.1% bending during service times 1- 5 times, 21.4% twisting more than 15 times and 31.4% twisting 11-15 times.

Table 4.11 Individual factors results

| Individual factors | OR | 95% CI | p-value |
|---|---|---|---|
| Age (year) | | | |
| • More than 40 | 1.58 | 0.60-4.19 | 0.354 |
| • Between 30-40 | 0.83 | 0.37-1.84 | 0.637 |
| • Less than 30 | 1.00 | | |
| Body mass index(BMI) | | | |
| • Under weight | 9.85 | 3.11-31.18 | <0.001 |
| • Overweight | 33.48 | 4.27-262.69 | <0.001 |
| • Normal weight | 1.00 | | |
| Alcohol use | | | |
| • Yes | 1.47 | 0.68-3.17 | 0.329 |
| • No | 1.00 | | |

Table 4.11 Individual factors results (continued.)

| Individual factors | OR | 95% CI | p-value |
|---|---|---|---|
| Smoking habit | | | |
| • Smoking | 4.00 | 1.35-11.82 | 0.008 |
| • Stop smoking | 2.67 | 0.85-8.35 | 0.083 |
| • No smoking | 1.00 | | |
| Previous low back pain | | | |
| • Yes | 3.76 | 1.16-12.19 | 0.019 |
| • No | 1.00 | | |

Table 4.12 Psychological factors results

| Psychological factors | OR | 95% CI | p-value |
|---|---|---|---|
| Marital status | | | |
| • Divorce | 4.48 | 0.50-39.87 | 0.144 |
| • Married | 0.59 | 0.28-1.22 | 0.153 |
| • Single | 1.00 | | |
| Satisfaction at work | | | |
| • Medium | 1.80 | 0.80-4.07 | 0.154 |
| • High | 1.00 | | |

Table 4.13 Physical factors results

| Physical factors | OR | 95% CI | p-value |
|---|---|---|---|
| Training for lifting techniques | | | |
| • No | 4.08 | 1.99-8.36 | <0.001 |
| • Yes | 1.00 | | |
| Back exercise for low back pain prevention | | | |
| • No | 1.78 | 0.091-3.48 | 0.090 |
| • Yes | 1.00 | | |

Table 4.14 Working postures per flight

| Working postures per flight | OR | 95% CI | p-value |
|---|---|---|---|
| Handling heavy carry on baggage into overhead bin | | | |
| • < 5 Times | 1.00 | | |
| • 6-10 Times | 1.70 | 0.79-3.68 | 0.175 |
| • 11-15 Times | 2.96 | 0.84-10.40 | 0.080 |
| • > 15 Times | 1.75 | 0.037-8.34 | 0.476 |
| Pulling/pushing meal cart or drink cart | | | |
| • < 5 Times | 1.00 | | |
| • 6-10 Times | 2.13 | 0.69-6.51 | 0.184 |
| • 11-15 Times | 1.11 | 0.37-3.34 | 0.847 |
| • > 15 Times | 2.71 | 0.96-6.44 | 0.055 |

Table 4.14 Working postures per flight (cont.)

| Working postures per flight | OR | 95% CI | p-value |
|---|---|---|---|
| Handling heavy loads | | | |
| • < 5 Times | 1.00 | | |
| • 6-10 Times | 2.13 | 0.80-5.68 | 0.127 |
| • 11-15 Times | 2.48 | 0.98-6.31 | 0.054 |
| • > 15 Times | 2.23 | 0.77-6.44 | 0.136 |
| Overhead reaching | | | |
| • < 5 Times | 1.00 | | |
| • 6-10 Times | 1.80 | 0.72-4.53 | 0.209 |
| • (>11 Times) | 2.63 | 1.18-5.88 | 0.017 |
| Pulling/pushing drawers in and out with difficulty | | | |
| • < 5 Times | 1.00 | | |
| • 6-10 Times | 2.38 | 0.75-7.50 | 0.136 |
| • 11-15 Times | 2.60 | 0.94-7.19 | 0.061 |
| • > 15 Times | 3.56 | 1.29-9.87 | 0.012 |
| Bending | | | |
| • < 5 Times | 1.00 | | |
| • 6-10 Times | 4.32 | 1.18-15.83 | 0.023 |
| • < 11 Times | 5.51 | 1.72-17.64 | 0.002 |
| Twisting | | | |
| • < 5 Times | 1.00 | | |
| • 6-10 Times | 1.65 | 0.49-5.54 | 0.413 |
| • 11-15 Times | 2.45 | 0.85-7.07 | 0.092 |
| • > 15 Times | 5.30 | 1.84-15.27 | 0.001 |

## 4.3 Statistic analysis results

### 4.3.1 AGE

- Flight attendants who had age more than 40 years had more chance for low back pain than flight attendants who had age less than 30 years 1.58 times (OR = 1.58, 95% CI= 0.60-4.19)

- The statistic analysis showed that age more than 40 years and low back pain were not significant with p-value = 0.354

- Flight attendants who had age between 30-40 years had more chance for low back pain than flight attendants who had age less than 30 years 0.83 times (OR = 0.83, 95% CI = 0.37-1.84)

- The statistic analysis showed age between 30-40 years and low back pain were not significant with p-value = 0.637

### 4.3.2 BMI

- Flight attendants who had BMI in over weight had more chance for low back pain than flight attendants who had BMI in normal weight 33.48 times (OR = 33.48, 95% CI= 4.27-262.69)

- The statistic analysis showed that BMI in over weight and low back pain were significant with p-value $\leq$ 0.001

- Flight attendants who had BMI in under weight had more chance for low back pain than flight attendants who had BMI in normal level 9.85 times. (OR = 9.85, 95% CI=3.11-31.18)

- The statistic analysis showed that BMI in under weight and low back pain were significant with p-value $\leq$ 0.001

4.3.3 Alcohol used

- Flight attendants who drink alcohol had more chance for low back pain than flight attendants who were not drink alcohol 1.47 times. (OR = 1.47, 95% CI=0.68-3.17)

- The statistic analysis showed that alcohol used and low back pain were not significant with p-value = 0.329

4.3.4 Smoking habits

- Flight attendants who were smoking had more chance for low back pain than flight attendants who were not smoking 4.0 times (OR = 4.0, 95% CI=1.35-11.82)

- The statistic analysis showed that smoking and low back pain were significant with p-value = 0.008

- Flight attendants who were stop smoking had more change for low back pain than flight attendants who were not smoking 2.67 times (OR = 2.67, 95% CI= 0.85-8.35)

- The statistic analysis showed that stop smoking and low back pain were not significant with p-value = 0.083

4.3.5 Previous low back pain

- Flight attendants who had previous low back pain had more chance for low back pain than flight attendants who didn't has previous low back pain 3.76 times (OR = 3.76, 95% CI=1.16-12.19)

- The statistic analysis showed that previous low back pain and low back pain were significant with p-value = 0.018

### 4.3.6 Marital status

- Flight attendants who married had more chance for low back pain than flight attendants who were single 0.59 times
  (OR = 0.59, 95% CI=0.28-1.22)

- The statistic analysis showed that married and low back pain were not significant with p-value = 0.153

- Flight attendants who were divorce had more chance for low back pain than flight attendants who were single 4.48 times
  (OR = 4.48, 95% CI=0.5-39.87)

- The statistic analysis showed that divorce and low back pain were not significant with p-value = 0.637

### 4.3.7 Satisfaction at work

- Flight attendants who had satisfaction at work in medium level had more chance for low back pain than flight attendants who had satisfaction at work in high level 1.80 times (OR = 1.80, 95% CI=0.8-4.07)

- The statistic analysis showed that satisfaction at work and low back pain were not significant with p-value = 0.154

4.3.8 Training for lifting techniques

- Flight attendants who didn't train for lifting techniques had more chance for low back pain than flight attendants who had train for lifting techniques 4.08 times (OR = 4.08, 95% CI=1.99-8.36)

- The statistic analysis showed that trained for lifting techniques and low back pain were significant with p-value ≤ 0.001

4.3.9 Back exercises for low back pain prevention

- Flight attendants who didn't have back exercise had a chance for low back pain more than flight attendants who had back exercise 1.78 times (OR = 1.78, 95% CI=0.91-3.48)

- The statistic analysis showed that back exercise for low back pain prevention and low back pain were not significant with p-value = 0.090

4.3.10 working posture

Handling heavy carry on baggage into overhead bin

- Handling heavy carry on baggage into overhead bin 6-10 times per flight and low back pain were not significant with p-value = 0.175

- Handling heavy carry on baggage into overhead bin 11-15 times per flight and low back pain were not significant with p-value = 0.080

- Handling heavy carry on baggage into overhead bin > 15 times per flight and low back pain were not significant with p-value = 0.476

Pulling/pushing meal cart or drink cart

- Pulling/pushing meal cart or drink cart 6-10 times per flight and low back pain were not significant with p-value = 0.184
- Pulling/pushing meal cart or drink cart 11-15 times per flight and low back pain were not significant with p-value = 0.847
- Pulling/pushing meal cart or drink cart > 15 times per flight and low back pain were not significant with p-value = 0.055

Handling heavy loads

- Handling heavy loads 6-10 times per flight and low back pain were not significant with p-value = 0.127
- Handling heavy loads 11-15 times per flight and low back pain were not significant with p-value = 0.054
- Handling heavy loads > 15 times per flight and low back pain were not significant with p-value = 0.136

Overhead reaching

- Overhead reaching 6-10 times per flight and low back pain were not significant with p-value = 0.209
- Overhead reaching >11times per flight and low back pain were significant with p-value = 0.017

Pulling/pushing drawers in and out with difficulty

- Pulling/pushing drawers in and out with difficulty 6-10 times per flight and low back pain were not significant with p-value = 0.136

- Pulling/pushing drawers in and out with difficulty 11-15 times per flight and low back pain were not significant with p-value = 0.061

- Pulling/pushing drawers in and out with difficulty > 15 times per flight and low back pain were significant with p-value = 0.012

Bending

- Bending 6-10 times per flight and low back pain were significant with p-value = 0.023

- Bending 11-15 times per flight and low back pain were significant with p-value = 0.002

- Bending > 15 times per flight and low back pain were significant with p-value = 0.014

Twisting

- Twisting 6-10 times per flight and low back pain were not significant with p-value = 0.413

- Twisting 11-15 times per flight and low back pain were not significant with p-value = 0.092

- Twisting > 15 times per flight and low back pain were significant with p-value $\leq$ 0.001

# CHAPTER V

# DISCUSSION

Discussion was divided in two parts as follows;

Part I Discussion of study design
Part II Discussion of study results

Part I; Discussion of study design

This research design was case – control study. The aim of this study what factors are related to low back pain in flight attendants of Thai Airways International Public Company Limited. In this study it may have some error in process of study such as selection bias, personal bias, method bias, instrument bias, information bias and confounding bias. Anyways this study tried to control the error to reduce bias and get the best results.

## 5.1 Selection bias

This study design is case – control study. The cases of this study were selected from the reported of sick leaves or claimed for medical expenses.

### 5.1.1 Bias in case group

It may be some flight attendants in case group might not present low back pain but they complain it for working days off.

5.1.2 Bias in control group

The method to select control group, it can not select control person with exactly the same in control factor such as flight times, number of flight performed , vibration and climate but they have it nearly.

Some flight attendants in control group had low back pain but they didn't report for sick leaves or claim for medical expenses that make them in the wrong group.

## 5.2 Method error

5.2.1 Questionnaire

Some flight attendants might misinterpretation the questionnaire which giving the wrong answers.

## 5.3 Personal error

Some of flight attendants submitted lately claims for sick leaves or medical expenses (they can claim for medical expenses within 6 month from issued date of medical expenses bill) that some details had been overlooked.

# Part II Discussion of study results

1. The relationships between age and low back pain

- The result from this study showed that there was not significant between age and low back pain of flight attendants who reported for sick leaves or claimed for medical expenses with p-value = 0.324.

- Khalil (1993:28), Garg and Moore 1992 found age was an individual factor leading to low back pain.

2. The relationships between body mass index(BMI) and low back pain

    - From the study, there was significant between body mass index and low back pain of flight attendants who reported for sick leaves or claimed for medical expenses with p-value <0.001.

    - Florence Tubach, et al study of worker in French national electricity and gas company in 1989 for risk factor for sick leave due to low back pain they found association between BMI and low back pain

3. The relationships between alcohol uses and low back pain

    - From the study, there was not significant between alcoholic used and low back pain of flight attendants who reported for sick leaves or claimed for medical expenses with p-value = 0.218.

    - Khalil (1993:28) found alcohol was a factor leading to low back pain.

4. The relationships between marital status and low back pain

    - From the study, there was not significant between marital status and low back pain of flight attendants who claimed for sick leaves or claimed for medical expenses with p-value = 0.090.

    - Khalil (1993:28) found marital discord was a psychological factor leading to low back pain.

5. The relationships between smoking habits and low back pain

    - From the study, there was significant between smoking and low back pain of flight attendants who reported for sick leaves or claimed for medical expenses with p-value = 0.012.

    - From the study of factor for back injury by Apts Dw, Blankship KL smoking was a factor for back injury.

    - Florence Tubach, et al study worker in French national electricity and gas company in 1989 for risk factor for sick leave due to low back pain they found association between heavy smoking and low back pain (OR = 5.5, 95% CI 2.3-13)

6. The relationships between trained for lifting technique and low back pain

    - Form the study, there was significant between trained for lifting techniques and low back pain of flight attendants who reported for sick leaves or claimed for medical expenses with p-value <0.001.

    - Kanjanopas F. (1994) found that worker who had proper lifting training had back strain less than worker who didn't have proper lifting training.

7. The relationships between previous low back pain and present low back pain

    - From the study, there was significant between previous low back pain and present low back pain of flight attendants who reported for sick leaves or claimed for medical expenses with p-value = 0.018.

    - Khalil (1993:28) summarized that previous injury was a factor leading to present low back pain. Phillips and Brown (1996) had an opinion that workers who had experienced back pain injury should attend to learn how to manage their pain and prevent reinjury.

8. The relationships between satisfaction at work and low back pain

    - From the study, there was not significant between satisfaction at work and low back pain of flight attendants who reported for sick leaves or claimed for medical expenses with p-value = 0.111

    - Khalil (1993:28) found job dissatisfaction was a risk factors leading to low back pain.

9. The relationships between back exercise and low back pain

    - From the study, there was not significant between back exercise and low back pain of flight attendants who claimed for sick leaves or claimed for medical expenses with p-value = 0.064.

    - Garg and Moore 1992 found physical fitness level associated with back disorder.

    - Khalil (1993:28) found that strength, flexibility, body build were physical factors associated with low back pain.

10. The relationships between working posture and low back pain

    - working posture;
      Bending more than 6 times per flight, twisting more than 15 times per flight, overhead reaching more than 11 times per flight, Pulling/pushing drawer in and out with difficultly more than 15 times per flight were significant with low back pain of flight attendants who reported for sick leaves or claimed for medical expenses.

    - Trop;2001, Ariends et al 2001,Hellsing and Bryngelssom, 2000; Phillips,et al 1996 found that heavy lifting while bending and twisting(static work posture) were related with low back pain.

# CHAPTER VI

# CONCLUSION AND RECOMMENDATION

## 6.1 Research summary

From the study factors related with low back pain were divided into;

1. Individual factors

    - BMI
    - smoking habits,
    - previous low back pain

2. Physical factors

    - trained for lifting technique
    - bending
    - twisting
    - pulling/pushing drawers in and out with difficulty
    - overhead reaching

## 6.2 Factors related to low back pain in flight attendants of Thai Airways International Public Company Limited

### 6.2.1 BMI

- The statistic analysis showed that BMI in over weight and low back pain were significant with p-value <0.001
- The statistic analysis showed that BMI in under weight and low back pain were significant with p-value <0.001

### 6.2.2 Smoking habits

- The statistic analysis showed that smoking and low back pain were significant with p-value = 0.008
- The statistic analysis showed that stop smoking and low back pain were not significant with p-value = 0.083

### 6.2.3 Previous low back pain

- The statistic analysis showed previous low back pain and present low back pain were significant with p-value = 0.018

### 6.2.4 Trained for lifting techniques

- The statistic analysis showed that trained for lifting techniques and low back pain were significant with p-value < 0.001

6.2.5 Working posture

- Overhead reaching

  - Overhead reaching >11times per flight and low back pain were significant with p-value = 0.017

- Pulling/pushing drawer in and out with difficultly

  - Pulling/pushing drawers in and out with difficulty more than 15 times per flight and low back pain were significant with p-value = 0.012

- Bending

  - Bending 6-10 times per flight and low back pain were significant with p-value = 0.023

  - Bending more than 11 times per flight and low back pain were significant with p-value = 0.002

- Twisting

  - Twisting more than 15 times per flight and low back pain were significant with p-value ≤ 0.001

## 6.3 Recommendation for flight attendants to protect themselves from low back pain

The main issue to protect flight attendants from low back pain is training and health education of low back pain, low back pain prevention, back exercise and lifting technique.

6.3.1 Individual factors

Body mass index, smoking habit, trained for lifting techniques and previous low back pain were related to low back pain in flight attendants of Thai Airways International Limited Company. The following is recommended by each factor;

Body mass index (BMI)

Flight attendants are requiring having an annual physical check up on their month of birth. In case of that their BMI over standard range they must reduce and control their weight in WHO's BMI standard otherwise they will be grounded.

Smoking

Smoking flight attendants are recommended to attend the course of stop smoking for their health.

Previous low back pain

Previous low back pain related with present back pain that mean when any flight attendants of Thai Airways International Limited Company who had low back pain they have a chance for low back pain again. It mean that they get chronic low back pain (From data it showed that only 32.9% of flight attendants Thai Airways International Limited Company who claimed for low back pain sick leaves have back recovery program and 25.7% have physical check before come back to work and 68.6 % are still have low back pain.)

The recommendation is any flight attendants who suffering from low back pain before they get back to work, they must consult with health profession again to check low back pain symptom and should have permission from health profession that they can come back to work.

### 6.3.2 Physical factors

Lifting technique

Trained for lifting technique was significant with low back pain in flight attendants of Thai Airways International Public Company Limited (just only 41.4% of flight attendants of Thai Airways International Public Company Limited had trained for lifting techniques).

It means that flight attendants who trained for lifting technique had a chance for low back pain less than flight attendants who didn't train for lifting technique. It recommends that management of Thai Airways International Public Company Limited

should provide lifting training course for all of flight attendants especially new flight attendants.

Working posture

- bending more than 6 times
- twisting more than 15 times per flight
- pulling/pushing drawers in and out with difficulty more than 15 times per flight
- overhead reaching more than 11 times per flight

Because of the limit of working space on aircrafts, during time of drink and meal service for passengers, flight attendants must do such as bending and twisting their body during drink and meal service to passenger that might lead to have low back pain.

- It recommends that during drink service or meal service, flight attendants should avoid from bending or twisting during service times. When service to passenger flight attendants should move whole body facing to passenger and bend their knee when they want to get something below.
- Place frequently used items in space that does not require overhead reaching or frequent bending.
- Sliding drawer should be easy to sliding in and out
- Asia anthropometry should be incorporated into design for interior, equipment and galley design.

## 6.4 Preventing low back pain

The following are recommendation by Stabley R. Mohler, M.D. for avoiding low back pain;

- Exercise. A reasonable physical-conditioning program, along with flexibility exercises, will help strengthen the low back.
- Maintain a weight that is in proportion to height.
- When lifting an object, keep the spine in a vertical position and squat near the object being lifted. Raise the object slowly, using the power of legs not the back to accomplish the task. Before lifting an especially heavy object, stretch and flex the back muscles
- When sitting, keep the spine relatively straight. Sit in a straight-backed chair that offers firm back support.
- When standing, place the feet as far apart as the shoulder. Periodically shift the weight from one foot to another
- Sleep on a firm, flat mattress, on your side with legs bent and with a small pillow between the knees
- When leaning forward, lean from the hips, not the waist, and keep the back and neck straight.
- If pain is experienced during lifting or some other movement stop the activity.

## 6.5 Lifting technique

The American Academy of Orthopedics Surgeons has developed tips to help you reduce the risk of back pain. Whether you are lifting and moving a person or a heavy object, the guidelines are the same.

- Plan ahead what you want to do and don't be in a hurry.
- Spread your feet shoulder-width apart to give yourself a solid base of support.
- Bend your knees.
- Tighten your stomach muscles.
- Position the person or object close to your body before lifting.
- Lift with your leg muscles. Never lift an object by keeping your legs stiff, while bending over it.
- Avoid twisting your body; instead, point your toes in the direction you want to move and pivot in that direction.
- When placing an object on a high shelf, move close to the shelf. Do not stand far away and extend your arms with the object in your hands.
- Maintain the natural curve of your spine; don't bend at your waist.
- When appropriate, use an assistive device such as a transfer belt, sliding board or draw sheet to move a person.
- Do not try to lift by yourself something that is too heavy or an awkward shape. Get help.

# REFERENCE

1. Thai Airways International Public Company Limited
http//www. thaiairways.com
2. Ms.Anne Logie, Ms. Lisa Vanderdoe and Ms. Andrea Ryan; Musculoskeletal injury Prevention Project Report on the flight attendant group;1150-20A 1997
3. Webster B S and Snook S H; The cost of workers' compensation low back pain claims. Spine 19;1111-1115 (1994)
4. Guo, H R S Tanaka, W.E. Halperin and L.L. Cameron; Back pain prevalence in U.S. industry and estimates of loss workdays AM.J. Public Health 89;1029-1035 (1999)
5. National Institute for Occupation Safety and Health (NIOSH); National Occupational Research Agenda Publication No 96-115 Cincinati Ohio NIOSH, 1996
6. National Institute for Occupation Safety and Health (NIOSH); Musculoskeletal Disorder and Workplace Factors; A critical revive of epidemiologic evidence for work-related musculoskeletal disorders of the neck, upper extremity and low back ,Cincinnati, Ohio; NIOSH,1997
7. Alter J D and Mohler S R, (1980) Prevention medicine aspects and health promotion programs for flight attendants. Aviat. Space, Environ.Med.,51(2); 168-175

8. Iglesias R, Gonzalez G and Morales S T ; Occupational Injuries Suffered by Flight attendants while on Board. Aviat. Space. Environ, Med; 60;1109-1111 (1980)
9. Ono Y, Watanabe S, Kaneko S, Matsumoto k, and Miyao M; Working hours and fatigue of japaness flight attendants. J.Human Ergol. 20;155-164 (1991)
10. Rosekind M R, Gander P H, Miller D L, Gregory K B, Smith R M, Weldom K J, Co E L, Mcnally K L and lebacqz J V ; Fatigue in operation settings; examples from the aviation environment. Human Factoers 36(2);327-338 (1994)
11. Smolensky M H, Lee E, Mott D and Colligan M; A health profile of Amerrican flight attendants. J. Human Ergol.11, Suppl; 103-119 (1982)
12. Phillips J A, Forrester B and Brown K C; Low back pain; Prevention and Management. AAOHN Journal, 44; 40-49 (1996)
13. Khalil M T, Abdel-Moty E M, Rosomoff R S, Rosomoff H L; Ergonomics in back pain; A Guide to Prevention and Rehabilitation. US; van Nostrand Reinhold. (1993:28)
14. Torp S, Riise T, Moen B E; The Impact of psychosocial work factors on musculoskeletal pain; a prospective study. Occup Environ, 43,120-126 (2001)
15. White A and Anderson R ; conservative management of low back pain ; Effect of posture on lumber disc pressure; Baltimore William and Wilkins 1991
16. Kathleen D, Wright; Low Back Pain(2002); http//www. findarticles.com/cf-dls/article.jhtml

17. The US Department of Labor guidelines and Canadian National Classification

18. The Asia-Pacific perspective Redefining Obesity and its Treatment

19. Florence Tubach et al; a study risk factor for sick leave due to back pain in French national electricity and company in 1989

# APPENDIX

**Please answer these questions**

1. Name-Surname_____ Personnel number_____
2. Sex

   ❑ Male ❑ Female
3. Date of birth _____
4. Date of employment _____
5. Marital status

   ❑ Single ❑ Married ❑ Divorce ❑ Other
6. Number of children _____
7. Weight _____kg.
8. Height_____meters
9. Are you drinking alcoholic?

   ❑ yes ❑ no
10. Are you smoking?

    ❑ yes ❑ no ❑ stopping
11. If you are smoking:how many cigarette per day_____
12. How long have you been working for flight attendant? _____years
13. What is your present category?

| | | | | | |
|---|---|---|---|---|---|
| ❑ IMV | ❑ IM | ❑ AP1 | ❑ AP2 | ❑ASF | ❑ASE |
| ❑ ASR | ❑ ASY | ❑ AHF | ❑ AHE | ❑AHR | ❑AHY |

14. Can you rate your satisfaction of being flight attendant?

    ❑ Very low ❑ low ❑ medium ❑ high ❑ Very high
15. From October 1, 2002 to September 30, 2003, Had you report for sick leaves or claimed for medical expenses due to low back pain?

    ❑ yes ❑ no

    If yes, when _____

    If no go to question no. 29

16. Please mark area that you had pain

17.What is a cause of low back pain

- ❑Handling heavy carry on baggage
- ❑Handling service equipment
- ❑ Push/Pull CART
- ❑ Turbulence
- ❑ Falling object
- ❑ Slipping
- ❑ Impact
- ❑ Falling
- ❑ Other

18. Please mark level of your sickness

- ❑ few(fell pain but not go to see health profession)
- ❑ medium (go to see health profession but not stop working)
- ❑ high ( go to see health profession and have day off)
- ❑ highest (go to see health profession with surgery)

19. Did you report for sick leaves due to low back pain?

❑ yes ❑ no

20. If yes, how many day? _____

21. Did you go to see health professional?

❑ yes ❑ no

22. If yes which health professional that you visit.

❑ Orthopedic ❑ Chiropractor(หมอจัดกระดูก)

❑ Acupuncturist(ฝังเข็ม) ❑ Physiotherapist(นักกายภาพบำบัด)

❑ Thai massage ❑ other

23. How were you diagnosed by the health professional?
(you can mark more than one)

❑ Interview ❑body check ❑ X-ray

❑ ultrasound ❑ MRI ❑other

24. How did the health professional treatment you?

❑ Medicine ❑ Physiotherapist ❑ Chiropractor

❑ Acupuncturist ❑ Thai massage ❑ other_____

25. Did you continue to see health professional?

❑ yes ❑ no

If yes how often that you go to see.....

26. Did you have any recovery program?

❑ yes ❑ no

27. Did you have physical check up before come back to work?

❑ yes ❑ no

28. Do you still have low back pain?

❑ yes ❑ no

29. Did you have train for lifting technique?

❑ yes ❑ no

30. IF no, do you want to have training for lifting technique?

❑ yes ❑ no

31. Do you have back exercise to prevent low back pain?

❑ yes ❑ no

32. Please mark average frequency of the following working posture that you are doing per flight

**Frequency Classification:**

| | | |
|---|---|---|
| 0 | Never | |
| 1 | Seldom | 1-5 ครั้ง |
| 2 | Occasionally | 6-10 ครั้ง |
| 3 | Frequently | 11-15 ครั้ง |
| 4 | Constantly | > 15 ครั้ง |

| WORKING POSTURES | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| Handling heavy carry on baggage into overhead bin | ❑ | ❑ | ❑ | ❑ | ❑ |
| Pulling/pushing meal cart or drink cart | ❑ | ❑ | ❑ | ❑ | ❑ |
| Handling heavy loads | ❑ | ❑ | ❑ | ❑ | ❑ |
| Overhead reaching | ❑ | ❑ | ❑ | ❑ | ❑ |
| Pulling/pushing drawers in and out with difficulty | ❑ | ❑ | ❑ | ❑ | ❑ |
| Bending | ❑ | ❑ | ❑ | ❑ | ❑ |
| Twisting | ❑ | ❑ | ❑ | ❑ | ❑ |

Thank you

**STATISTIC: Sick leaves reported in flight attendants of Thai Airways International during year 2001-2002 and 2002-2003**

| Number of flight attendants who reported for sick leaves or claimed for medical expenses classified by injured organ | Oct 01-Sep02 (number) | Oct 02-Sep03 (number) |
|---|---|---|
| 1 Back | 87 | 71 |
| 2 Neck/shoulder/back | 12 | 9 |
| 3 Neck/shoulder | 21 | 30 |
| 4 Hand/arm | 55 | 73 |
| 5 Foot/leg | 34 | 32 |
| 6 Ear | 29 | 20 |
| 7 Face | 14 | 11 |
| 8 Head | 2 | 2 |
| 9 Other | 86 | 75 |
| Total | 340 | 323 |

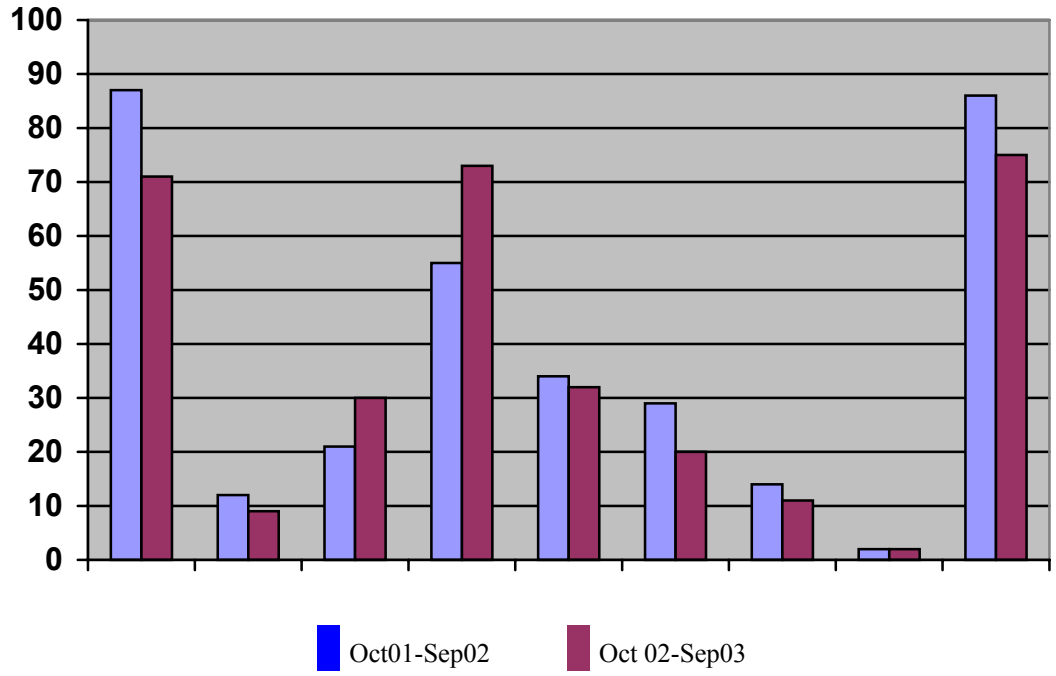



Figure 1 Number of flight attendants who reported for sick leaves or claimed for medical expenses classified by injured organs

| Number of flight attendants who reported for sick leaves or claimed for medical expenses classified by cause of accidents | Oct01-Sep02 (number) | Oct02-Sep03 (number) |
|---|---|---|
| 1 Handling heavy carry on baggage into overhead bin | 70 | 49 |
| 2 Handling service equipment | 24 | 24 |
| 3 Pushing/pulling meal cart or drink cart | 31 | 36 |
| 4 Cutting | 4 | 4 |
| 5 Turbulence | 19 | 19 |
| 6 Falling objects | 8 | 9 |
| 7 Heating | 3 | 5 |
| 8 Slipping | 7 | 3 |
| 9 Impact | 31 | 50 |
| 10 Falling | 8 | 2 |
| 11 Ear block | 28 | 20 |
| 12 Illness | 107 | 102 |
| Total | 340 | 323 |

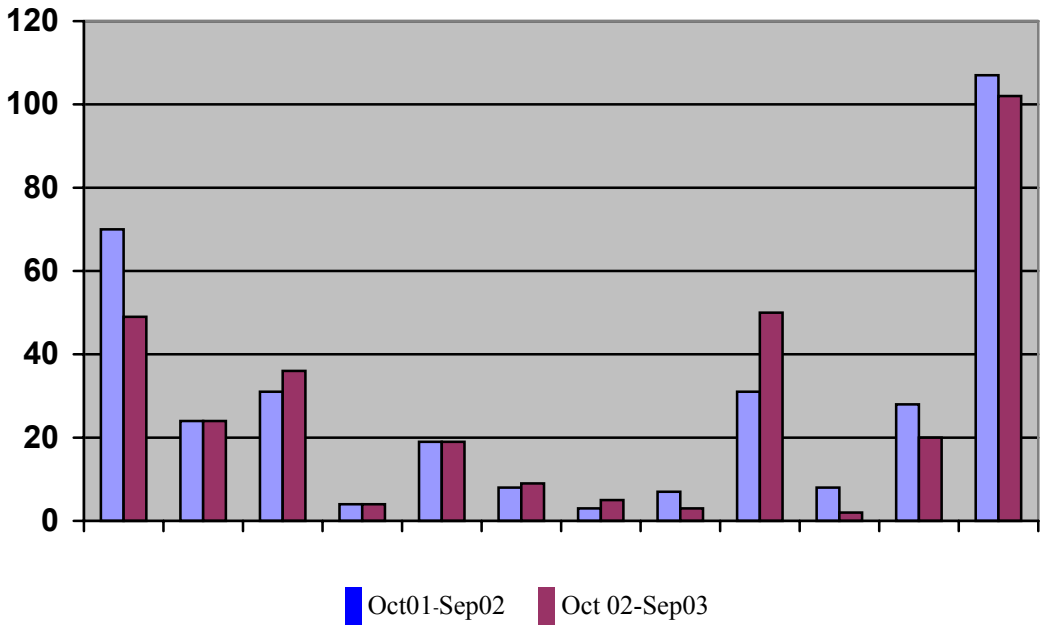



Figure 2 Number of flight attendants who reported for sick leavese or claimed for medical expenses classified by cause of accidents

| Man day loss classified by cause of accidents | Oct01-Sep02 (day) | Oct02-Sep03 (day) |
|---|---|---|
| 1 Handling heavy carry on baggage into overhead bin | 440 | 215 |
| 2 Handling service equipments | 124 | 94 |
| 3 Pushing/pulling meal cart or drink cart | 132 | 163 |
| 4 Cutting | 13 | 10 |
| 5 Turbulence | 92 | 101 |
| 6 Falling objects | 55 | 29 |
| 7 Heating | 30 | 41 |
| 8 Slipping | 136 | 24 |
| 9 Impact | 183 | 410 |
| 10 Falling | 197 | 11 |
| 11 Ear bock | 197 | 114 |
| 12 Illness | 325 | 488 |
| Total | 1923 | 1700 |

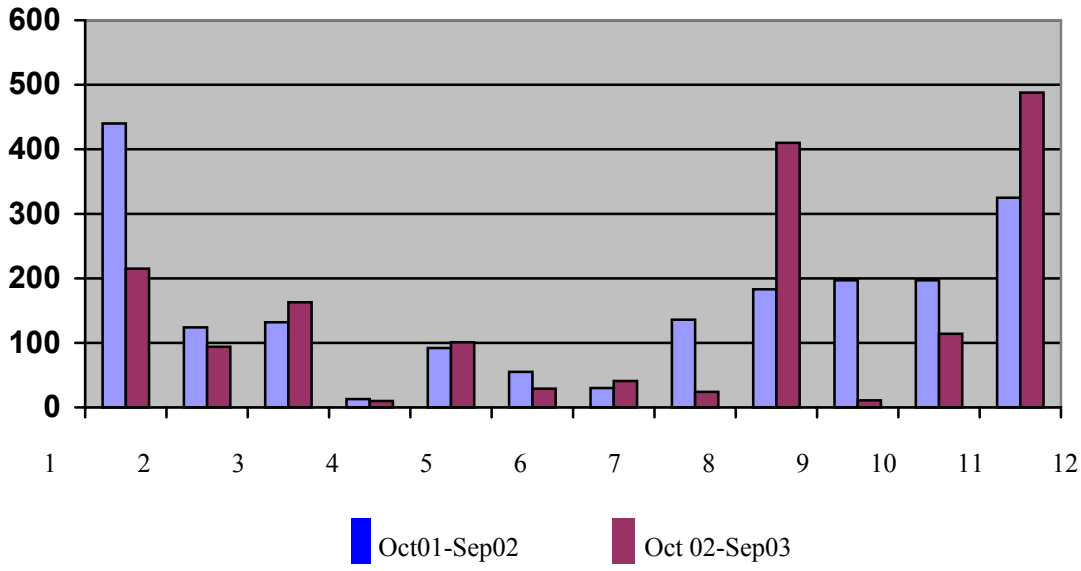



Figure 3 Man day loss classified by cause of accidents

| Man day loss classified by injury's organ | Oct01-Sep02 (day) | Oct02-Sep03 (day) |
|---|---|---|
| 1.Back | 630 | 603 |
| 2.Neck/shoulder/back | 263 | 50 |
| 3.Neck/shoulder | 87 | 119 |
| 4.Hand/arm | 342 | 196 |
| 5.Foot/leg | 340 | 274 |
| 6.Ear | 197 | 114 |
| 7.Face | 18 | 37 |
| 8.Head | 3 | 8 |
| 9.Other | 43 | 291 |
| Total | 1923 | 1700 |

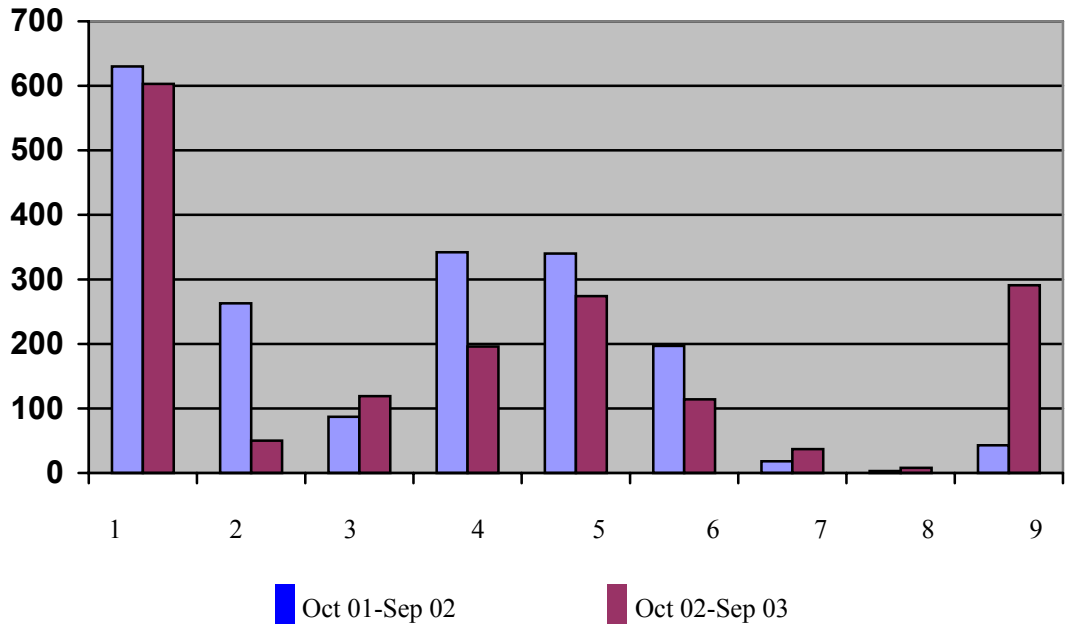



Figure 4 Man day loss classified by injury's organs

| Medical expenses classified by cause of injury | Oct01-Sep02 (baht) | Oct02-Sep03 (baht) |
|---|---|---|
| 1.Handling heavy carry on baggage into overhead bin | 294811.50 | 283691.10 |
| 2.Handling service equipments | 104031.60 | 66334.90 |
| 3.Pushing/pulling meal cart or drink cart | 100423.10 | 131107.70 |
| 4.Cutting | 2942.00 | 4353.00 |
| 5.Turbulence | 55501.60 | 60481.80 |
| 6.Falling objects | 33228.90 | 10611.80 |
| 7.Heating | 2502.00 | 17730.20 |
| 8.Slipping | 19024.00 | 15445.30 |
| 9.Impact | 103598.30 | 243204.60 |
| 10.Falling | 113283.00 | 567.00 |
| 11.Ear block | 39603.00 | 43372.00 |
| 12. Illness | 487064.00 | 114093652 |
| Total | 355973.00 | 1988136.00 |

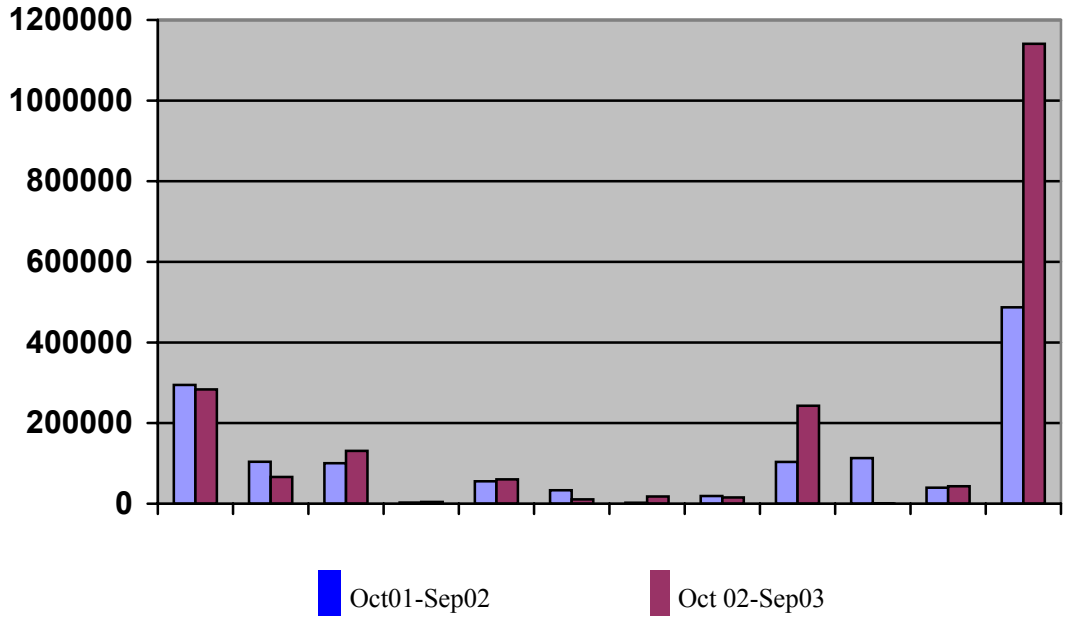



Figure 5 Medical expenses classified by cause of injury

| Medical expenses classified by injury's organ | Oct01-Sep02 (baht) | Oct02-Sep03 (baht) |
|---|---|---|
| 1.Back | 487103.60 | 597657.00 |
| 2.Neck/shoulder/back | 117963.90 | 30582.20 |
| 3.Neck/shoulder | 69422.80 | 85647.10 |
| 4.Hand/arm | 144479.30 | 131864.40 |
| 5.Foot/leg | 93202.20 | 83233.60 |
| 6.Ear | 39602.90 | 43372.20 |
| 7.Face | 10634.70 | 22225.80 |
| 8.Head | 6482.40 | 4955.00 |
| 9.Not complete report | 21304.70 | 6255.70 |
| 10.Other | 387081.20 | 988568.62 |
| Total | 1355973.00 | 1988136.00 |

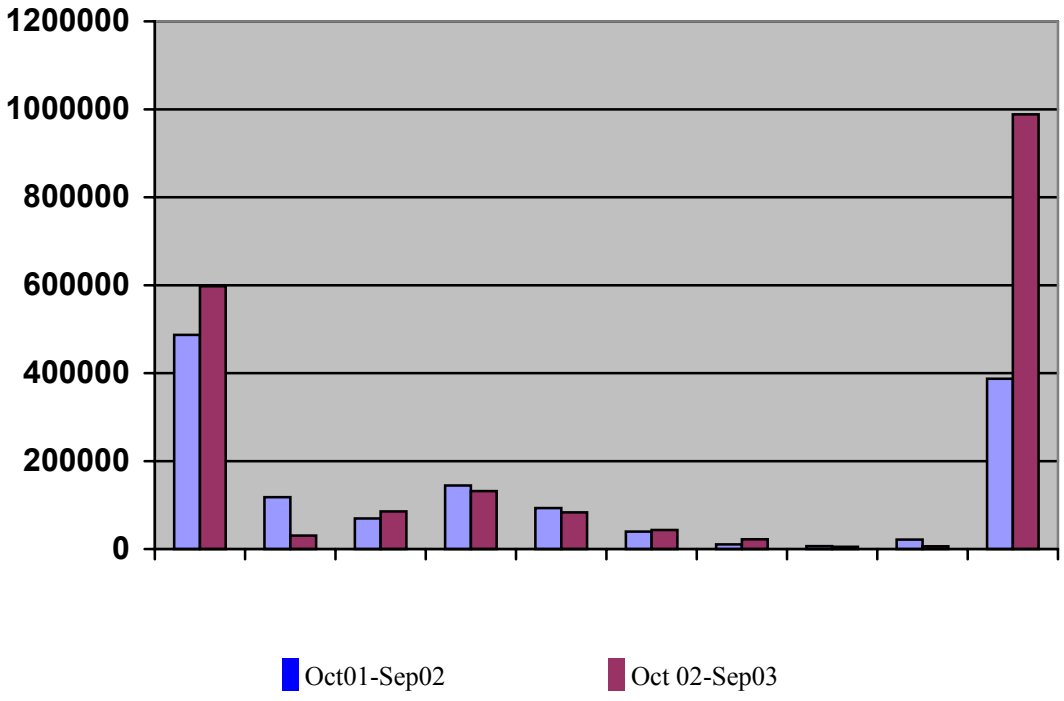



Figure 6 Medical expenses classified by injury's organds

| Total number of flight attendants who were reported for sick leaves or claimed for medical expenses | Oct 01-Sep02 (number) | Oct 02-Sep03 (number) |
|---|---|---|
| | 340 | 323 |

| Number of flight attendants who were reported for sick leaves or claimed for medical expenses classified by sex | Oct01-Sep02 (case) | Oct02-Sep03 (case) |
|---|---|---|
| Male | 114 | 118 |
| Female | 226 | 205 |
| Total | 340 | 323 |

| Total number of flight attendants who were reported for sick leaves or claimed for medical expenses classified by low back pain | Oct 01-Sep02 (number) | Oct 02-Sep03 (number) |
|---|---|---|
| | 99 (29.11%) | 323 (27.86%) |

| Total man days loss | Oct01-Sep02 (day) | Oct02-Sep03 (day) |
|---|---|---|
| | 1923 | 1700 |

| Man days loss by low back pain | Oct01-Sep02 (day) | Oct02-Sep03 (day) |
|---|---|---|
| | 893 (46.43 %) | 650 (38.24%) |

| Total medical expenses | Oct01-Sep02 (baht) | Oct02-Sep03 (baht) |
|---|---|---|
| | 1355973.00 | 1988136.00 |

| medical expenses by low back pain | Oct01-Sep02 (baht) | Oct02-Sep03 (baht) |
|---|---|---|
| | 605066.9 (44.62%) | 628239.2 (31.60%) |

# BIOGRAPHY

**NAME** Ms. Supawat Fungjarukul

**DATH OF BIRTH** Jun 30, 1963

**PLACE OF BIRTH** Suphan buri Thailand

**INSTITUTION ATTENDED** Mahidol University, 1981-1984
Bachelor of Science
(Public Health)
Mahidol University, 2001-2004
Master of Science
(Industrial Hygiene and Safety)

**HOME ADDRESS** 67/235 Toothsonghong
Laksi Bangkok 10210
Thailand
supawat_tg@hotmail.com