

# FACTORS RELATED TO NECK AND SHOULDER PAIN AMONG THE ROYAL THAI AIR FORCE PILOTS, BANGKOK, THAILAND

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**ABSTRACT:** The purpose of this study was to find out factors related to neck and shoulder pain among The Royal Thai Air Force pilots Bangkok Thailand and find the association between personal characteristic, job characteristic and musculoskeletal disorder (neck and shoulder pain). A total of 126 pilots were recruited in April 2014. The structured questionnaire was used to assess personal characteristic, job characteristic and musculoskeletal disorder (Nordic Musculoskeletal Questionnaire). The result showed that prevalence of neck and shoulder pains among these pilots in the past 12 months were 62.7% and 56.3%, respectively. For personal characteristics factors, only often drinking alcohol more than one time per week factor was associated with neck pain among the Royal Thai Air Force pilots Bangkok, Thailand (p-value = .004) Besides, drinking alcohol more than one time per week was associated with shoulder pain (p-value = .042). From this study, it suggested that exercising program and reducing drinking alcohol behaviors were recommended for the pilots to enhance their work performance and health.

**Keywords:** Neck pain, Shoulder pain, The Royal Thai Air Force Pilots, Thailand

## INTRODUCTION

Musculoskeletal disorders are obvious problems in many occupations. A report from the northeastern Thailand construction workers found that lower back pain is the first problem (33.5%), followed by knee (19.5%) and shoulder pain (14%) [1]. Neck and shoulder pain are common problem especially in worker today and necessary to receive health care [2]. It affects physical, mental well-being and quality of life, including the cost of medical care [3]. From epidemiological studies have found that the prevalence of neck pain within one year in the Scandinavian countries (36%) is higher than most European countries (26%) and in Asian countries (13%) [4]. From a United Kingdom study found that the prevalence of neck pain among English population found that the reported neck pain in the past 12 months were 11% and reported in the past 7 days 20% [5]. In Asian countries, a Hong Kong study found that neck pain in workers was 46.7% [6]. In Thailand, the prevalence of neck pain in the past 7 days was 23.6% and in the past 12 months

was 20.9% of worker in sewing clothes at Banphai district, Khon Kaen province [7]. Neck and shoulder pain are the main problem associated with the work, especially working in a sitting position [8] and doing repetitive work [9].

Neck and shoulder pain is a problem among pilots flying high-performance aircraft. Many studies had been investigated on the prevalence of neck and shoulder pain among aircraft pilot in different countries [10-12]. In United States, the 1 year prevalence of neck pain among F-16 pilots was 85.4%. For every 100 hours in the F-16 flight, the risk of injury increased by 6.9% [10]. In addition, 18.9% of F-16 pilots of the Belgian Air Force and the Royal Netherlands Air Force had neck pain [12]. The prevalence of neck pain among air craft pilots was higher than general population because of dynamic working environment which affect to the pilot's cervical spine [10].

From medical record in Aviation Medicine of Thailand, it had found that most of pilots in transport aircraft had symptoms neck and shoulder pain. However, few studies have been conducted on prevalence and factors associated between neck and shoulder pain among pilot. Pilots may be affected by

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neck and shoulder pain because of sitting position when controlling the airplane for a long time in each flight. From previous study Walters [13] found positive association between neck pain and sitting posture more than 95% of working time.

Nonetheless, the prevalence of neck and shoulder pain among the Royal Thai Air Force Pilots has not yet been investigated. Therefore, this study aimed to estimate the prevalence of neck and shoulder pain and to identify factors associated with these pains among the Royal Thai Air Force pilots in transport aircraft.

## MATERIALS AND METHODS

### Study design and study population

The study was a cross-sectional survey study conducted during one month in April 2014. The study population was Thai Royal Air Force pilots in Squadron 6 in Bangkok, Thailand. There were 174 pilots on active flying duty during the data collection period. The sample size was determined by Yamane formula [14]. In this study, a 95% confidence level was assumed so the level of precision ( $e$ ) in the formula was equaled 0.05. One hundred and thirty one pilots were derived from the calculation. They were randomly selected from the active flying pilots in Squadron 6.

### Materials

The questionnaire was developed from previous researches [12, 13, 15, 16] and standard questionnaire [17]. It composed of 4 parts which were personal characteristic, job characteristics, previous history of neck and shoulder pain and Nordic Musculoskeletal Questionnaire (NMQ). The personal characteristic and job characteristics part was related to the general information of pilots' personality and working characteristic. The previous history of neck and shoulder pain which modified from previous study [13] was focused on previous experiences related to neck and shoulder pain. The last part was developed from the NMQ standard questionnaire [17] which was used for analysis of musculoskeletal symptoms in an ergonomic or occupational health. This part was focused only on previous history of neck and shoulder trouble in the last 12 months and last 7 days.

To standardize the developed questionnaire, validity and reliability were tested. For validity, three experts, who were an occupational health nurse at Bhumibol Adulyadej Hospital, Bangkok and two trainer from flight training school at Kamphansan Nakornpathom province, were asked to valid the content of questionnaire. Index of Item Objective Congruence (IOC) was used. The total IOC score was 0.95. For reliability, the pilot test

was used. 30 pilots working at another squadron (Suratthani province) in the Royal Thai Air Force were asked to do the same questionnaire for testing reliability. Only Job Characteristic and Previous history of neck and shoulder pain parts were tested for reliability because the NMQ was the standard questionnaire which was not required to do. The Cronbach's Alpha coefficient value for job characteristic part and previous history of neck and shoulder pain parts were 0.83 and 0.75 respectively.

This study protocol and questionnaire were approved by the Ethics Review Committee for Research Involving Human Research Subjects, Health Sciences Group, Chulalongkorn University with the certified (COA No.050/2557)

### Data collection

The self-reported questionnaire procedure was applied for data collection. Structured questionnaires were distributed to 131 the Royal Thai Air Force pilots at Squadron 6 in Bangkok, Thailand. One hundred and twenty six questionnaires were returned. The respond rate was 96.18%.

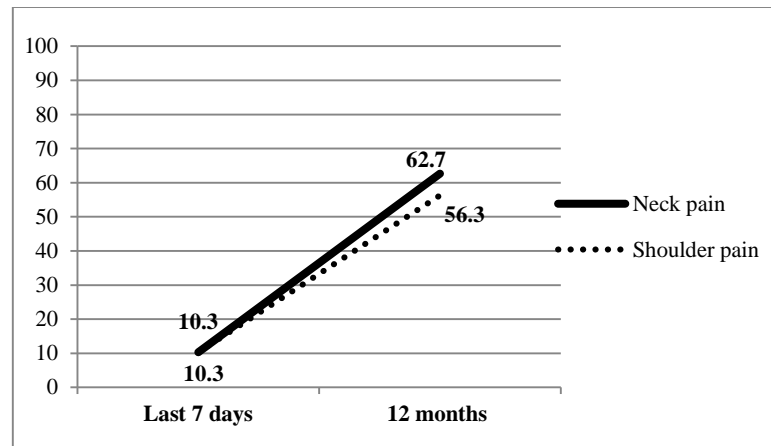
### Statistical analysis

The data were analyzed by using the Statistical Package for the Social Science, version 17.0 (Chulalongkorn University license); Normal distribution was tested by using the Kolmogorov-Smirnov Test. If the significant value of the Kolmogorov-Smirnov Test greater than 0.05, the data is considered as the normality distribution. To describe personal characteristics and job characteristics, descriptive statistic (mean, standard deviation (SD) and percentage) was used. Chi-square test was used to find an association between Personal characteristic - neck and shoulder pain, Job characteristic - neck and shoulder pain. The level of significant value was considered at 0.05.

## RESULTS

This study found that prevalence of neck and shoulder pain among the Royal Thai Air Force pilots Squadron 6 in the past 12 months were 62.7% and 56.3% respectively. The prevalence of neck pain in the past 7 days was 10.3% and prevalence of shoulder pain in the past 7 days was 10.3% of this study shown in the Figure 1.

Table 1 showed age of participants was less than or equal to 30 years (74.6%) (Mean ( $\pm$ SD) = 29.2 ( $\pm$ 3.47)). Weight of participants had more than or equal to 70 kilograms (69%). Height of participants ranged 170-179 centimeters (61.1%). About 80.2% of pilots were not married. Most of participants (89.7%) completed their bachelor



**Figure 1** Prevalence of neck and shoulder pain among the Royal Thai Air Force Pilots (n=126) last 7 days and last 12 months

**Table 1** Personal characteristics between air force pilot with and without air force pilots neck pain (n=126)

	Total(n) (%)	Neck pain (%)			Shoulder pain (%)		
		Pain	No pain	<i>p-value</i> <sup>a</sup>	Pain	No pain	<i>p-value</i> <sup>a</sup>
<b>Age (years)</b>							
≤ 30	94 (74.6)	58(61.7)	36(38.3)	.692	51(54.3)	43(45.7)	.417
> 30	32(25.4)	21(65.6)	11(34.4)		20(62.5)	12(37.5)	
Mean(SD) = 29.2(3.47)							
<b>Weight</b>							
< 70 kgs	39(31)	23(59.0)	16(41.0)	.563	19(48.7)	20(51.3)	.248
≥ 70 kgs	87(69)	56(64.4)	31(35.6)		52(59.8)	35(40.2)	
Mean(SD) = 73.3(9.42)							
<b>Height</b>							
160-169 cms	28(22.2)	18(64.3)	10(35.7)	.289	18(64.3)	12(35.7)	.681
170-179 cms	77(61.1)	51(66.2)	26(33.8)		42(54.5)	35(45.5)	
180-189 cms	21(16.7)	10(47.6)	11(52.4)		13(61.9)	8(38.1)	
Mean(SD) = 173(4.90)							
<b>Status</b>							
Single	101(80.2)	67(66.3)	34(33.7)	.090	56(55.4)	45(44.5)	.681
Married	25(19.8)	12(48.0)	13(52.0)		15(60.0)	10(40.0)	
<b>Graduated</b>							
Bachelor degree	113(89.7)	73(64.6)	40(35.4)	.193	65(57.8)	48(42.5)	.434
≥ Master's degree	13(10.3)	6(46.2)	7(53.8)		6(46.2)	7(53.8)	
<b>Income</b>							
≤ 50,000 baht	106(84.1)	66(62.3)	40(37.7)	.816	59(57.5)	47(44.3)	.720
> 50,000 baht	20(15.9)	13(65.0)	7(35.0)		12(60.0)	8(40.0)	
<b>Health status</b>							
Good	107(84.9)	65(60.7)	42(39.3)	.283	57(53.3)	50(46.7)	.098
Not too bad	19(15.1)	14(73.7)	5(26.3)		14(73.7)	5(26.3)	
<b>Exercise (n= 125)</b>							
< 3 times/week	74(58.7)	51(68.9)	23(31.1)	.070	43(58.1)	31(41.9)	.722
≥ 3 times/week	51(40.5)	27(52.9)	24(47.1)		28(54.9)	23(45.1)	
<b>Alcohol drinking</b>							
Yes	118(93.7)	76(64.4)	42(35.6)	.148 <sup>b</sup>	65(55.0)	53(45.0)	.464 <sup>b</sup>
No	8(6.3)	3(37.5)	5(62.5)		6(75.0)	2(25.0)	
<b>Often drinking alcohol</b>							
Never to < Weekly	47(37.0)	22(47.0)	25(53.0)	.004 <sup>c</sup>	21(45.0)	26(55.0)	.042 <sup>c</sup>
≥ Weekly	79(63.0)	57(72.0)	22(28.0)		50(63.0)	29(37.0)	
<b>Smoked cigarette</b>							
Yes	23(18.3)	17(73.9)	6(26.1)	.219	13(56.5)	10(43.5)	.985
No	103(81.7)	62(60.2)	41(39.8)		58(73.4)	45(26.6)	
<b>Drive to work everyday</b>							
Yes	126(100)	79(62.7)	47(37.8)	-	71(56.3)	55(43.7)	-
No	0(0)	0(0)	0(0)		0(0)	0(0)	
<b>Distance from home</b>							
≤ 5 kms	62(49.2)	39(62.9)	23(37.1)	.963	33(53.2)	29(46.8)	.487
> 5kms	64(50.8)	40(62.5)	24(37.5)		38(59.4)	26(40.6)	

<sup>a</sup> Chi-Square Test, <sup>b</sup> Fisher's Exact Test, <sup>c</sup> *p-value* < .05

**Table 2** Job Characteristics between air force pilot with and without air force pilot neck and shoulder pain

	Total(n) (%)	Neck pain (%)			Shoulder pain (%)		
		Pain	No pain	<i>p-value</i> <sup>a</sup>	Pain	No pain	<i>p-value</i> <sup>a</sup>
<b>Job position</b>							
Captain	40(31.7)	26(65.0)	14(35)	.716	22(55.0)	18(45.0)	.835
Co-pilot	86(68.3)	53(61.6)	33(38.4)		49(57.0)	37(43.0)	
<b>Total of your work</b>							
1- 9 years	115(91.3)	71(61.7)	44(38.3)	.536 <sup>b</sup>	63(57.8)	52(45.2)	.346 <sup>b</sup>
10- 19 years	11(8.7)	8(72.7)	3(27.3)		3(27.3)	8(72.7)	
Mean(SD) = 5(3.08)							
<b>Total hours</b>							
≤ 800 hours	67(53.2)	39(58.2)	28(41.8)	.267	38(56.7)	29(43.3)	.929
> 800 hours	59(46.8)	40(67.8)	19(32.2)		33(55.9)	26(44.1)	
<b>Total hours per week (average)</b>							
1-10 hours	119(94.4)	75(63.0)	44(37.0)	1.0 <sup>b</sup>	68(57.1)	51(42.9)	.698 <sup>b</sup>
11-20 hours	7(5.6)	4(57.1)	3(42.9)		3(42.9)	4(57.1)	
Mean(SD) = 6(3.38)							
<b>Total days per week (average)</b>							
1-3 days	102(81.0)	65(63.7)	37(36.3)	.623	58(56.9)	44(43.1)	.811
4-6 days	24(19.0)	14(58.3)	10(41.7)		13(54.2)	11(45.8)	
Mean(SD) = 2.87(0.94)							
<b>Total hours in each flight</b>							
≤ 2hours	88(69.8)	58(65.9)	30(34.1)	.257	51(58.0)	37(42.0)	.580
>2 hours	38(30.2)	21(55.3)	17(44.7)		20(52.6)	18(47.4)	
Mean(SD) = 2.09(0.87)							

<sup>a</sup> Chi-Square Test, <sup>b</sup> Fisher's Exact Test, <sup>c</sup> *p-value* < .05

**Table 3** Factors associated with neck and shoulder pain among the Royal Thai Air Force pilots

	Total(n) (%)	Neck pain (%)			Shoulder pain (%)		
		Pain	No pain	<i>p-value</i> <sup>a</sup>	Pain	No pain	<i>p-value</i> <sup>a</sup>
<b>Treatment</b>							
Yes	55(43.7)	50(90.9)	5(9.1)	.000 <sup>c</sup>	40(72.7)	15(27.3)	.001 <sup>c</sup>
No	71(56.3)	29(40.8)	42(59.2)		31(43.7)	40(56.3)	
<b>Neck and shoulder pain come from another cause (except job task)</b>							
Yes	64(50.8)	58(90.6)	6(9.4)	.000 <sup>c</sup>	44(69.75)	20(31.25)	.004 <sup>c</sup>
No	62(48.2)	21(33.9)	41(66.1)		27(43.5)	35(56.5)	
<b>Causes of neck and shoulder pain (exclude job task)</b>							
Sleeping pillow fall	71(56.3)	42(59.2)	29(40.8)	.312	39(54.9)	32(45.1)	.524
Lift heavy	31(24.6)	23(74.2)	8(25.8)		20(64.5)	11(35.5)	
Others	24(19.0)	14(58.3)	10(41.7)		12(50.0)	12(50.0)	
<b>Neck and shoulder pain reduce your work ability</b>							
Yes	49(51.6)	46(48.4)		.000 <sup>b,c</sup>	49(47.1)	55(52.9)	.000 <sup>b,c</sup>
No	30(96.8)	1(3.2)			22(100)	0(0)	

<sup>a</sup> Chi-Square Test, <sup>b</sup> Fisher's Exact Test, <sup>c</sup> *p-value* < .05

degree. 61.1% of participants had income ranged 40,000 - 50,000 baht per month. The result found that most of participants had good health and exercise less than three times within a week. The majority of participants reported that they drank alcohol more than once a week. Drinking alcohol was found statistically significant with neck pain (*p-value* = .004) and more often drinking alcohol was associated with shoulder pain (*p-value* = .042). However, most of them were not smoker (81.7%). The most of participants reported that they drive a car to work (100%) and half of them drive a car

had distance from home more than 5 kilometers (50.8%).

Table 2 showed most of participants (68.3%) worked as co-pilots and 31.7% of them worked as captain. About 91% of participants had total years of work ranged from 1 to 9 years. The average working years was 5 years (SD= 3.08). For their flying experience, 36% of them had flying hours ranged from 401 to 800 hours. Most of them had total hours of flying per week ranged from 1 to 10 hours. (Mean (±SD) = 6 (±3.38) hours). Most of pilots (81.0%) worked 1 to 3 days a week. Around

70 % of pilots reported that they spend around 1 to 2 hours in each flight. Nevertheless, the job characteristic of participants among the Royal Thai Air Force pilots was not associated with neck and shoulder pain among the Royal Thai Air Force pilots Squadron 6 ( $p\text{-value} > 0.05$ ).

Table 3 showed some factors related to neck and shoulder pain among the Royal Thai Air Force pilots Squadron 6. Most of participants preferred to have a treatment when neck and shoulder pain occurred. This study also found that shoulder and neck pain treatment was associated with their experience on neck and shoulder pain symptom ( $p\text{-value} < 0.05$ ). Some of them reported that their neck and shoulder pain did not come from their tasks. It was occurred from sleeping pillow fall (56.3%) and lift heavy (24.6%). Considering of their working ability, around 60% of participants, who reported that their ability was reduced because of neck pain, had neck pain. However, a half of them who reported that their working ability reduced by shoulder pain, had not have shoulder pain. In addition, the association between neck and shoulder pain and their working ability was found ( $p\text{-value} < 0.05$ ).

## DISCUSSION

The prevalence of neck and shoulder pain of the pilots at the Royal Thai Air Force Squadron 6 in the past 12 months was 62.7% and 56.3% respectively. For the last 7 days, the prevalence of neck and shoulder pain among these was reported equally (10.3%). The findings are consistent with previous study [10] which found that the prevalence of neck pain in the past 12 months was 57% and shoulder pain in the past 12 months was 35% among the fighter pilots in the United States. Moreover, Ang [18] found that the prevalence of neck pain in the past 12 months was 57% among helicopter pilots in Sweden. In this current study and previous study [10] the prevalence of neck pain was higher than shoulder pain. The United States Army Aeromedical Research Laboratory [13] suggested that neck pain was significant with high force airplane required for sitting a long time in flight, frequently holding the neck in a forward posture and bent position, especially among helicopter aircrew.

This study found that age of participants was not associate with neck and shoulder pain among the Royal Thai Air Force pilots, but previous study De Loose [12] found that the pilots whose age between 30 and 39 years old were more likely to have symptoms of neck and shoulder pain. Walters et al. [13] found that pilots who have age older than

55 years had a neck pain during their flying a flight. The current study did not found an association between age and neck/shoulder pain among the Royal Thai Air Force pilots because the subjects' age was lower than previous study. Current study also found drinking alcohol more than one time per week was significant with neck pain ( $p\text{-value} = .004$ ) and significant with shoulder pain ( $p\text{-value} = .042$ ). Drinking alcohol is a general risk factors that increase pain in the neck and shoulders [19]. Similar with the previous study [20] found that the adolescence between 16 and 18 years old with alcohol consumption associated higher pain of musculoskeletal pain. Moreover, exercise behavior was not significant with neck and shoulder pain among the Royal Thai Air Force pilots because exercise could reduce the pain and positive prevention of muscle. Similarly, the study among air force helicopter pilots in Sweden also found the effectiveness of exercise was reduced neck pain [21].

Regarding the job characteristic among the Royal Thai Air Force pilots, neck and shoulder pain was not associated with a total of flying hours. In contrast, the previous study [13] found that pilots who have flying hours more than 3,000 hours was contributed to neck and shoulder pain among aircrew of the United States. Pilots participating in this current study had less experience on flying hours than previous study so the association could not be found.

However, some limitations of this current study should be noticed. Using self-report questionnaire as the measurable tool may be affected to the results in the term of recall bias of participants. The association between some general characteristics factors, such as drinking alcohol behavior, and neck/shoulder pain was still not explicit. Thus, the further study should be clarified the relationship between alcohol consumption and the musculoskeletal disorder among air force pilots.

## CONCLUSION

Neck pain was the most common musculoskeletal disorder among the Royal Thai Air Force pilots. The prevalence of neck and shoulder pain in the past 12 months was 62.7% and 56.3% respectively. For the last 7 days, the prevalence of neck and shoulder pain among air force pilots was reported equally. Frequently drinking alcohol was associated with both neck and shoulder pain. Job characteristic factors including job position and flying experience were not significant with neck and shoulder pain. This study recommended that Air Force pilots should be aware of their health.

Exercising program and reducing drinking alcohol behaviors were suggested to the pilots for enhancing their work performance and health.

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