Prevalence and Associated Factors of Musculoskeletal Pain among the Dental Personnel in a Dental School

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Objective: To study the prevalence and associated factors of musculoskeletal (MS) pain among the dental personnel. In addition, impacts and treatment of MS pain were reported.
Material and Method: Random sampling of 390 participants from the name lists of dental personnel working in each department. Self-administered questionnaires were equally distributed to three groups of dental personnel namely clinical instructors, postgraduate students, and dental assistants. The present study was conducted as a survey in the Faculty of Dentistry, Mahidol University, Bangkok between December 2008 and January 2009.
Results: Three hundred and ninety questionnaires were delivered and 164 questionnaires were returned (response rate 42.5%). The participants with MS pain were 32 clinical instructors (20.3%), 52 postgraduate students (32.9%), and 74 dental assistants (46.8%). Their mean age was 33.0 ± 9.1 years old. The MS pain found respectively was shoulder pain 72.2% (n = 114), neck pain 70.3% (n = 111), and low back pain 50.6% (n = 80). The participants with shoulder and neck pain were combined and defined as cervicobrachial pain. The associated factor of cervicobrachial pain was working status. Being a clinical instructor and postgraduate student were associated with cervicobrachial pain with OR being 4.7 [1.3, 7.1] and 4.6 [1.6, 13.4], respectively. The impacts of MS pain among the dental personnel included usage of pain relieving medication (34.8%), seeking medical evaluation (32.3%), reduction in working hours (27.2%), difficulty sleeping (22.8%), and work absence (10.8%), respectively. The treatments of MS pain utilized to alleviate those impacts were Thai traditional massage (51.9%), medication (28.5%), physical therapy (15.8%), acupuncture (7.6%), and alternative medicine (4.4%), respectively.
Conclusion: Cervicobrachial pain was the most prevalent MS pain among the dental personnel and working status was associated with their MS pain problems. The impact of MS pain was predominantly usage of pain relieving medication. Thai traditional massage was the most utilized treatment.

Keywords: Prevalence, Musculoskeletal, Pain, Dentist, Dental assistant

Dental personnel are at risk to develop occupational health problems. These include percutaneous exposure incidents; exposure to infectious diseases, radiation, dental materials, noise; musculoskeletal disorders; dermatitis; respiratory disorders; eye injuries; and psychological problems[1]. Chowanadisai had studied occupational health problems of dentists in southern Thailand in 1997 and found that musculoskeletal (MS) pain was the most common problem[2]. When compared to the office employees, the dental professionals had a significantly higher risk of MS complaints[3]. The common sites of MS complaints among the dental personnel were neck, shoulder, and low back with diverse prevalence reported in different studies[4-6]. However, these studies were carried out as surveys in a general setting. Only a few studies were conducted in the dental schools where teaching and services were provided together[7]. The dentists in a dental school were clinical instructors and postgraduate students who had various years of working duration as well as years of experience. Besides the variety of dentists, a dental school is a place where you can find a number of dental assistants. In order to design the health promotion program for the dental personnel in a dental school, the prevalence and impacts of MS pain are vital information. Currently there is very little information about the MS pain problems among the dental personnel in dental schools.

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Therefore, the objectives of the present study were to study the one-year prevalence and associated factors of musculoskeletal pain among the dentists and the dental assistants in a dental school. In addition, the impact and treatment of musculoskeletal pain were also explored.

Material and Method

A survey by self-administered questionnaire was conducted in the Faculty of Dentistry, Mahidol University, Bangkok, Thailand between December 2008 and January 2009. The questionnaire consisted of two parts, namely, demographic data and MS pain related data. The demographic data included age, gender, educational level, working status, weekly normal working hours, weekly overtime working hours, duration of dental work, income, and frequency of exercise. Happiness in work was rated on a visual analogue scale. Concerning the MS pain related data, the participants were asked to locate their sites of pain within the past 12 months on a body diagram (Fig. 1). The duration of MS pain was also obtained. The impacts of pain regarding taking pain relieving medication, seeking medical evaluation, difficulty sleeping, lessen the work hours, and taking sick leave were asked to designate. In addition, the treatment of pain such as taking analgesics, Thai traditional massage, physical therapy, acupuncture, and other forms of alternative medicine were also explored.

The sample size calculation was based on the results from previous studies about MS pain in dental personnel. The expected prevalence was approximated at least 50% ± 10% of 95% confidence interval. The number needed in each group of dental personnel was 130. Then the questionnaires were equally distributed to three groups of dental personnel, namely, clinical instructors, postgraduate dental students, and dental assistants by random sampling from the name lists of dental personnel in each department. The personal delivery method was used in the current survey.

The present study was approved by the IRB of the Faculty of Medicine Siriraj Hospital and the Faculty of Dentistry, Mahidol University according to the Helsinki declaration. The informed consent was also obtained from every participant.

Statistical analysis

The prevalence of MS pain was reported as a percentage of participants with pain in each region of the body diagram. The impact and treatment of MS pain were reported as percentage of participants who had those impacts as well as those who utilized those methods of treatment. The multiple comparisons of prevalence of pain in each region between professional were performed by Chi-square and Bon Ferroni method. The Chi-square was used to explore the relationship between MS pain and the qualitative data namely gender, educational level, working status, income, and frequency of exercise. The Independent Sample t-test was used to explore the relationship between MS pain and the quantitative data namely weekly normal working hours, weekly overtime working hours, duration dental work, happiness in work, and duration of MS pain. The statistical significant factors from univariate analysis were then entered into the multivariate forward stepwise logistic regression in order to find the associated factors and odd ratios with 95% confidence interval with the MS pain. The p-value < 0.05 was considered statistical significance.

Results

Three hundred and ninety questionnaires were delivered and 164 questionnaires were returned (response rate 42.5%). Among these, one questionnaire was incomplete. There were 158 participants reporting pain at least one site (97%) and five participants reporting no pain (3%). The participants with MS pain were 32 clinical instructors (20.3%), 52 postgraduate students (32.9%), and 74 dental assistants (46.8%). Their mean age was 33.0 ± 9.1 years old. The mean working duration was nine years and working hours were 33.6 ± 15 hours/week. About half of the participants reported four sites of MS pain. The median duration of MS pain was three years. The prevalence of MS pain found in descending order was shoulder pain, neck pain, and low back pain (Table 1). Since the
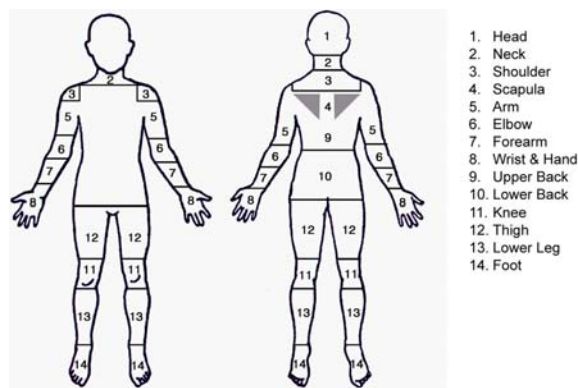

Fig. 1 Body diagram

1. Head
2. Neck
3. Shoulder
4. Scapula
5. Arm
6. Elbow
7. Forearm
8. Wrist & Hand
9. Upper Back
10. Lower Back
11. Knee
12. Thigh
13. Lower Leg
14. Foot

prevalence of shoulder and neck pain were rather close and pathology in the shoulder might be caused from the shoulder itself or from the neck referring to the shoulder, the authors then combined participants with neck and shoulder pain together and defined them as having cervicobrachial pain. The demographic data of participants with and without cervicobrachial pain is presented (Table 2). After stepwise logistic regression analysis with work time adjusted, being a clinical instructor or a postgraduate student were associated with cervicobrachial pain with OR [95% confidence interval] being 4.7 [1.3, 17.1] and 4.6 [1.6, 13.4],

respectively (Table 3). Regarding MS pain in different working status, the clinical instructors had MS pain in the shoulder, neck and low back regions in descending orders. The postgraduate students had prevalence of MS pain similarly to the clinical instructors. For the dental assistants, pain in the leg was the most prevalent followed by shoulder and neck pain. When comparing the pain sites among working status, the postgraduate students reported pain in the shoulder and scapula significantly more prevalent than the dental assistants. Meanwhile the dental assistants reported pain in the knee, leg, and foot significantly more often than the dentists (Table 4). The authors then combined participants with knee, leg, and foot pain together and defined as lower leg pain group. Focusing on pain in the lower leg, the characteristics of participants with and without lower leg pain are presented (Table 5). After stepwise logistic regression analysis, the factors associated with lower leg pain were educational level lower than bachelor degree and insufficient income with the odds ratio being 9.6 [3.7, 25.2] and 2.9 [1.1, 7.6] respectively (Table 5, 6). The impacts of MS pain among

Table 1. Prevalence of the musculoskeletal pain among the dental personnel

Sites of pain	Numbers of participants	Prevalence
Shoulder	114	72.2
Neck	111	70.3
Low back	80	50.6

Table 2. The characteristics of dental personnel with and without cervicobrachial pain

Variables	Cervicobrachial pain n = 135 (%)	Noncervicobrachial pain n = 23 (%)	p-value
Gender			
Male	18 (13.3)	3 (13)	1.00
Female	117 (86.7)	20 (87)	
Age (yo)	33.0 ± 9.3	32.9 ± 8.5	0.29
Education			
Lower than bachelor degree	36 (27.5)	10 (47.7)	0.11
Bachelor degree & higher	95 (72.5)	11 (52.3)	
Working status			
Clinical instructor	29 (21.5)	3 (13.0)	0.02*
Postgraduate student	49 (36.3)	3 (13.0)	
Dental assistant	57 (42.2)	17 (73.9)	
Duration of dental work (yrs)	10.4 ± 9.1	11.4 ± 8.4	0.28
Weekly normal working hours	33.2 ± 17.4	36.6 ± 14.9	0.66
Weekly overtime working hours	17 ± 12.7	13.8 ± 8.4	0.35
Duration of MS pain (yrs)	2.5 [0.5, 20]**	3 [0.5, 15]**	0.77
Income			
Sufficient	106 (80.3)	17 (80.9)	1.00
Insufficient	26 (19.7)	4 (19.1)	
Happiness in work	6.8 ± 1.7	7.5 ± 1.3	0.09
Exercise			
Regular	44 (32.5)	5 (22.8)	
Irregular	50 (37.1)	15 (65.2)	0.71
No exercise	41 (30.4)	3 (13)	

* Significant at p-value < 0.05, ** Median [min, max]

Table 3. The associated factors of MS pain calculated by forward stepwise logistic regression analysis with working time adjusted

Variables	Working status	Crude OR (95% confidence interval)	p-value	Adjusted OR (95% confidence interval)	p-value
Cervicobrachial pain	Dental assistant	1.0		1	
	Clinical instructor	2.6 [0.9, 7.6]	0.08	4.7 [1.3, 17.1]	0.017*
	Postgraduate student	3.1 [1.2, 7.8]	0.018*	4.6 [1.6, 13.4]	0.005*

* Significant at p-value < 0.05

Table 4. The various sites of musculoskeletal pain among the dental personnel

Site of pain	Clinical instructors (%)	Postgraduate students (%)	Dental assistants (%)	p-value
Head	12 (37.5)	18 (34.6)	40 (54.1)	0.07
Neck	25 (78.1)	41 (78.8)	45 (60.8)	0.05
Shoulder	26 (81.3)	43 (82.7)**	45 (60.8)**	0.012*
Scapula	10 (31.3)	24 (46.2)**	18 (24.3)**	0.036*
Arm	6 (18.8)	9 (17.3)	13 (17.6)	0.97
Elbow	3 (9.4)	2 (3.8)	5 (6.8)	0.59
Forearm	6 (18.8)	7 (13.5)	14 (18.9)	0.69
Wrist & Hand	12 (37.5)	23 (44.2)	28 (36.7)	0.32
Upper Back	7 (21.9)	19 (36.5	21 (28.4)	0.34
Lower Back	16 (50)	24 (46.2)	40 (54.1)	0.68
Thigh	2 (6.3)	4 (7.7)	12 (16.2)	0.19
Knee	5 (15.6)**	6 (11.5)***	32 (43.2)**,***	<0.001*
Leg	3 (9.4)**	10 (19.2)***	46 (62.2)**,***	<0.001*
Foot	5 (15.6)**	6 (11.5)***	36 (48.6)**,***	<0.001*

* Significant at p-value < 0.05
,* Statistical significance between each pair of working status

the dental personnel included usage of pain relieving medication (34.8%), seeking medical evaluation (32.3%), reduction in working hours (27.2%), difficulty sleeping (22.8%), and work absence (10.8%), respectively. The treatments of MS pain utilized to alleviate those impacts were Thai traditional massage (51.9%), medication (28.5%), physical therapy (15.8%), acupuncture (7.6%), and alternative medicine (4.4%), respectively.

Discussion

The MS health of dentists has been studied in many regions of the world. It is a common cause of work related disability among dentists with substantial functional consequences. The importance of MS pain lies in its cumulative physiological damage, which can lead to injury or a career ending disability[8]. The present study was the first study that examined the one-year prevalence of MS pain among the dental personnel in a dental school in Bangkok. The present

study focused on the dental personnel involved in dental work. Therefore, both dentists and dental assistants were recruited into the present study. The group of dentists, clinical instructors, and post-graduate students reported high prevalence of MS pain in the shoulder region. The dental assistants, however, reported high prevalence of pain in the lower extremities.

Hayes had performed a systematic review of MS disorders among dental professionals and reported that the prevalence of MS pain ranges between 64-93%. The most prevalent regions for pain in dentists have been shown to be back (36.3-60.1%) and neck (19.8-85%)[9]. Shoulder pain was found to be highest in a few studies[10-12]. In the present study, shoulder pain was also found highest whilst the prevalence of neck pain was quite close to that of shoulder pain. Westgarrd[13] and Lehto et al[14] attributed work-related MS pain as being of multifactorial origin. Prolonged

Table 5. The characteristics of participants with and without pain in the lower leg

Variables	Lower leg pain n = 87 (%)	No lower leg pain n = 71 (%)	p-value
Gender			
Male	9 (10.3)	12 (16.9)	0.33
Female	78 (89.7)	59 (83.1)	
Age (yrs)	33 ± 9.6	33 ± 8.7	0.96
Education			
Lower than Bachelor degree	39 (47.6)	7 (10.0)	<0.001*
Bachelor degree & higher	43 (52.4)	63 (90)	
Working status			
Clinical instructor	11 (34.4)	21 (65.6)	
Postgraduate student	17 (32.7)	35 (67.3)	<0.001*
Dental assistant	59 (79.7)	15 (20.3)	
Duration of dental work (yrs)	10.4 ± 9.1	11.4 ± 8.4	0.62
Weekly normal working hours	37.1 ± 14.9	29.5 ± 14.6	0.002*
Weekly overtime working hours	18.4 ± 14.0	14.2 ± 9.2	0.35
Duration of MS pain (yrs)	3.6 ± 3.3	3.0 ± 2.8	0.35
Income			
Sufficient	60 (73.2)	63 (88.7)	0.03*
Insufficient	22 (26.8)	8 (11.3)	
Happiness in work	7.2 ± 1.5	6.5 ± 1.8	0.02*
Exercise			
Regular	24 (33.8)	25 (28.7)	
Irregular	27 (38.0)	38 (43.7)	0.63
No exercise	20 (28.2)	24 (27.6)	

* Significant at p-value < 0.05

Table 6. The associated factors of lower leg pain calculated by forward stepwise logistic regression analysis

Variables	Working status	Crude OR (95% confidence interval)	p-value	Adjusted OR (95% confidence interval)	p-value
Education	Bachelor degree & higher	1.0			
	Lower than bachelor degree	8.2 [3.3,19.9]	<0.001*	9.6 [3.7, 25.2]	<0.001*
Income	Sufficient	1.0			
	Insufficient	2.88 [1.19,6.9]	0.01*	2.9 [1.1, 7.6]	0.03*

* Significant at p-value < 0.05

static posture, repetitive movement, suboptimal lighting, poor positioning[15], genetic predisposition, mental stress, and age[16] were claimed to be causative factors. In the present study, the participants with shoulder pain and neck pain were combined and defined as cervicobrachial pain since the pathology in these areas could be related. Concerning pain in the shoulder region, prolonged shoulder elevation and abduction were common working postures[17]. Positions of bilateral shoulders were abduction and flexion ≥ 30 degree more than 30% and 4% of the work time, respectively, with no side differences. Meanwhile, the upper trapezius muscle, which helps elevate the shoulder, had high activity as shown from surface EMG recording[4]. Muscle imbalances can develop between the muscles that stabilize and move the shoulder blades. In addition, continual work in front of and below the operator's eye level lead to a forward head and rounded shoulder posture. This posture could increase forces on the upper trapezius and levator scapulae muscles. This

stress can result in ischemia and pain in the overworked muscles[17]. The neck pain problem could be explained by the prolonged neck flexion required in order to gain more exposure to the structures in the oral cavity during the procedure[4]. Neck flexion of more than 15 degrees and 30 degrees was found for 97% and 82% of the work time, respectively[4]. Most right-handed dentists repeatedly rotate the neck to the left with side bending to the right[18]. These combinations of postures could contribute to a higher load on the cervical spine, which was a probable risk factor for development of symptoms in the neck region. The happiness in work of participants with cervicobrachial pain was quite comparable to those without cervicobrachial pain. Additionally the problem of cervicobrachial pain did not prohibit the participants from exercising. Most of them performed exercise but not regularly. Possibly, they recognized the benefit of exercise and attempted to engage in an exercise program as time allowed. As for the dental assistants, they had to assist the dentists with similar tasks. Therefore, they also reported pain in similar regions to those of the dentists. Some of the dental assistants also had to do the mobile tasks very often and that resulted in the report of leg pain as the highest prevalence. Moreover, the dental assistants had pain in the knee, leg, and foot significantly more than the dentists. This finding is quite different from the study of Lalumandier et al[19]. They found that the dental assistants and dentists had a quite similar MS pain pattern. Probably the dental assistants had poor ergonomic sitting posture. During the dental work, their seat was higher than the dentists' and this causes neck flexion. In addition, their feet would not rest on the floor but in plantar flexion posture. This results in continuous contraction of Gastrocnemius muscle leading to muscle strain finally.

Concerning the impact of pain, about one third of the participants took pain-relieving medication and one third sought medical evaluation. These numbers were comparable to those in other studies[20,21]. In addition, the severity of pain was enough to have an impact on the participants' life style. About one fourth reported difficulty sleeping. Moreover, one fourth had to reduce their work hours and one tenth had to take sick leave because of pain. Likewise, 8.4% of Queensland's dentists took sick leave because of the MS disorders[10]. According to the treatment of MS pain, Thai traditional massage was the most utilized treatment to alleviate pain followed by medication, physical therapy, acupuncture, and other forms of alternative medicine. Thus, it could be assumed that MS pain among the dental personnel may not be severe in nature and the participants had a tendency to use non-pharmacologic treatment. Overall, the MS pain among the dental personnel is mostly related to the ergonomic and biomechanics aspects of the musculoskeletal system, especially the spine and shoulder regions. These MS symptoms have occurred and probably had been accumulated since the participants became dental personnel[22,23]. The prevalence and distributions of MS pain among the dental students were not different from that of the dental practitioners[24]. In 1998, 79.5% of dental students in this school reported MS pain involving right hand, back, shoulder, and neck, respectively[25]. Therefore, the knowledge about biomechanics of related joints and muscles as well as the initiation and implementation of workshops to practice ergonomic skills in daily work and tasks should be a part of the curriculum for the dental and dental assistant students. Regular health promotion programs should also be carried out among the postgraduate students and the dental personnel in order to minimize the MS pain problem. Positioning the patients properly, sitting correctly, and encouraging the dental personnel to use dental equipment efficiently should be reminded and practiced every day. Periodic breaks, alternating between sitting and standing positions, and frequent muscle stretching should be designated as parts of the working schedule. A regular strengthening exercise of the affected muscles is helpful in preventing repetitive injuries. These strategies should be recognized by the faculty and staff and set as a policy to reduce the ongoing problems and promote healthy behaviors throughout the school.

Conclusion

Cervicobrachial pain was the most prevalent MS pain among the dental personnel and working status was associated with their MS pain problems. The impact of MS pain was predominantly the usage of pain relieving medication. Thai traditional massage was the most utilized treatment.

Limitation of the study

The participants in the present study might not well represent the dental personnel in dental schools due to the low response rate. However, the present study could identify the common regions of MS pain, which might be useful information for the further studies of MS pain in a specific group of dental personnel in more detail.

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ความชุกของอาการปวดกล้ามเนื้อของบุคลากรด้านทันตกรรมในคณะทันตแพทยศาสตร์

ปิยะภัทร เดชพระธรรม, ธีรดา พลอยเพชร, ศิริชัย เกียรติถาวรเจริญ, เกียรติอนันต์ บุญศิริเศรษฐ์

วัตถุประสงค์: *เพื่อศึกษาความชุกและปัจจัยที่สัมพันธ์กับอาการปวดกล้ามเนื้อของบุคลากรด้านทันตกรรม รวมทั้งศึกษาผลกระทบของอาการปวดและการรักษาอาการปวด*

วัสดุและวิธีการ: *ทำการสุ่มผู้เข้าร่วมศึกษาจากรายชื่อบุคลากรด้านทันตกรรมของแต่ละภาควิชา ในคณะทันตแพทยศาสตร์ มหาวิทยาลัยมหิดล กรุงเทพฯ จำนวน 390 คน แล้วแจกแบบสอบถามแบบตอบเอง ให้บุคลากรดังกล่าวทำการตอบ ระยะเวลาเก็บข้อมูล ตั้งแต่เดือนธันวาคม พ.ศ. 2551 ถึง มกราคม พ.ศ. 2552*

ผลการศึกษา: *แจกแบบสอบถาม 390 ชุด ได้รับการตอบกลับ 164 ชุด (อัตราการตอบกลับร้อยละ 42.5) ผู้ตอบแบบสอบถามที่มีอาการปวดกระดูกและกล้ามเนื้อ ได้แก่ อาจารย์ทันตแพทย์ 32 คน (ร้อยละ 20.3) นักศึกษาทันตแพทย์หลังปริญญา 52 คน (ร้อยละ 32.9) และผู้ช่วยทันตแพทย์ 74 คน (ร้อยละ 46.8) อายุเฉลี่ย 33.0 ± 9.1 ปี ความชุกของอาการปวดกล้ามเนื้อที่พบจากมากไปน้อย คือ บ่าไหล่ ร้อยละ 72.2 (114 คน) คอ ร้อยละ 70.3 (111 คน) และหลังส่วนล่างร้อยละ 50.6 (80 คน) ทำการรวมผู้เข้าร่วมศึกษาที่มีอาการปวดบ่าไหล่และคอเข้าด้วยกันเรียกว่ากลุ่มปวด cervicobrachial พบปัจจัยที่สัมพันธ์กับอาการปวดบริเวณ cervicobrachial คือ สถานภาพการทำงาน โดยการทำงานในฐานะอาจารย์ทันตแพทย์และนักศึกษาทันตแพทย์หลังปริญญา จะสัมพันธ์กับอาการปวดบริเวณ cervicobrachial ด้วยค่า OR 4.7 [1.6,7.1] และ 4.6 [1.6, 13.4] ตามลำดับ ผลกระทบของอาการปวดกล้ามเนื้อในบุคลากรด้านทันตกรรม ได้แก่ การใช้ยาแก้ปวด (ร้อยละ 34.8) พบแพทย์เพื่อตรวจวินิจฉัย (ร้อยละ 32.3) ลดชั่วโมงการทำงานลง (ร้อยละ 27.2) นอนไม่หลับ (ร้อยละ 22.8) และหยุดงานจากอาการปวด (ร้อยละ 10.8) การรักษาอาการปวดที่ใช้ตามลำดับ คือการนวดแผนไทย (ร้อยละ 52.9) การใช้ยาแก้ปวด (ร้อยละ 28.5) การทำกายภาพบำบัด (ร้อยละ 15.8) การฝังเข็ม (ร้อยละ 7.6) และ การแพทย์ทางเลือก (ร้อยละ 4.4) ตามลำดับ*

สรุป: *บุคลากรด้านทันตกรรมในคณะทันตแพทยศาสตร์มีอาการปวดกระดูกกล้ามเนื้อบริเวณ cervicobrachial มากที่สุด และปัจจัยที่สัมพันธ์กับอาการปวดคือ สถานภาพการทำงาน ผลกระทบจากอาการปวดที่พบมากที่สุด คือ การใช้ยาแก้ปวด และการนวดแผนไทยเป็นการรักษาที่ใช้บ่อยที่สุด*