

Recognition of Three Common Work-Related Hand Diseases in a Teaching Hospital

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ABSTRACT

OBJECTIVE Musculoskeletal disorders (MSDs) of the hands are increasingly affecting workers in various occupations. They reduce productivity and cause economic loss. In Thailand, work-related MSDs are considered underdiagnosed and under-reported. This study aimed to determine the proportion of three major recognized hand diseases that are work-related and to examine factors associated with that recognition and work-relatedness.

METHODS This is a cross-sectional study, recruiting and interviewing patients with carpal tunnel syndrome (CTS), trigger finger (TF), and de Quervain's tenosynovitis (DQT) aged 18-65 years old who visited the Hand Clinic in the Orthopedics Department, Ramathibodi Hospital between 25 October 2023 and 15 March 2024. Patient medical records were reviewed to determine work-relatedness using NIOSH criteria. Recognition was determined by taking patient work histories. Logistic regression was used to examine the associations between work and MSDs, and between recognition and patients' factors.

RESULTS A total of 270 patients were included: 127 CTS cases, 96 TF cases, and 47 DQT cases. Almost two-thirds (63.0%) of the diseases were attributed to work-related conditions. Factors associated with work-relatedness of the three diseases were: working for 26 or more hours per week (adjusted ORs 3.26-4.63), tool use (ORadj 7.92, 95%CI [2.83, 22.17]), computer use (ORadj 4.72, 95%CI [1.84,12.14]), writing (ORadj 4.88, 95%CI [1.53, 15.61]), and having a single job (ORadj 10.13, 95%CI [2.59,39.57]). The proportion of recognition by physicians of the connection between working history and MSDs was only 13.0%. There were no significant associations between patients' personal/work factors and recognition by doctors.

CONCLUSIONS This study showed that 63.0% three common hand diseases of patients are attributed to work-related conditions, but the recognition by doctors of that relationship was only 13.0%. Factors associated with work-relatedness were mostly aspects of patients' work. The hospital should improve its system for identifying the work-related MSDs to help ensure patients receive appropriate health-related welfare and benefits. Further studies should be conducted to explore means of increasing physician recognition of work-related MSDs.

KEYWORDS work-related hand disease, carpal tunnel syndrome, trigger finger, De Quervain's tenosynovitis

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INTRODUCTION

Musculoskeletal disorders (MSDs) are affecting an increasing number of workers around the world. MSDs are associated with reduced work productivity, resulting in monetary losses both for the patient and businesses. MSDs caused a median of eight sick leave days from work annually in the United States in 2020, longer than the median of five days due to other non-fatal illnesses such as digestive or respiratory problems (1). The global burden of MSDs attributable to occupational factors was 13.7% of disability-adjusted life years (DALYs) according to WHO (2). In the United States, 70 million hospital visits are contributed to by MSDs annually, as well as an estimated 130 million total healthcare encounters, including outpatient, hospital, and emergency room visits (3). The working population accounts for 79.0% of those MSDs cases, and hands are the most frequently affected organ (4, 5).

The three most common work-related hand diseases are carpal tunnel syndrome, radial styloid tenosynovitis (de Quervain's tenosynovitis), and chronic tenosynovitis of the hand and fingers (trigger finger) (6-8). Carpal tunnel syndrome results from compression or entrapment of the median nerve in its passage through the carpal tunnel. The main clinical manifestations are numbness, pain, and tingling in the thumb, index finger, middle finger, and the radial half of the ring finger of the palmar side of the affected hand (9, 10). The global incidence rate is 23 cases per 1,000 person-years (11). De Quervain's tenosynovitis is a painful condition that involves tendon entrapment affecting the first dorsal compartment of the wrist. The main symptom is pain in the anatomical snuffbox which is made worse by abduction and/or thumb extension (12, 13). In 2009 The incidence rate in persons older than 40 was 2.0 per 1,000 person-years (14). Trigger finger symptoms vary from a tender lump at the base of a finger or thumb, stiffness, and popping to a locking sensation with finger or thumb movement (13, 15). The incidence in 2021 was 0.3 per 1,000 person-years, or a lifetime risk of 2.6% in the general population (16).

These three diseases can often result from hand-using job tasks such as those involving extensive hand use (grasping/pinching) and repeated hand/arm movements (6, 17-19). These

work-related MSDs (WRMSDs) have become more prominent as more people work with computers and other electronic devices (6, 20-22). These three common WRMSDs have been included on the List of Occupational Diseases by the International Labor Organization since 2010 (23) and in Thai laws since 2023 (24). Recognition of the work-relatedness by physicians is important for detecting and reporting work-related and occupational disease cases, which could help determine the extent of the disease burden. However, presently under-reporting of WRMSDs makes it difficult to determine the extent of the problem (3, 25). This study aimed to determine the proportion of physician's recognition of these three work-related hand diseases among patients age 18-65 years at Ramathibodi Hospital and to examine factors associated with these work-related cases, e.g., demographic and socio-economic status, working conditions, and job descriptions.

METHODS

Research design and setting

This cross-sectional analytical study recruited patients with one or more of three major musculoskeletal hand diseases: carpal tunnel syndrome, trigger finger, and de Quervain's tenosynovitis.

Participants

The target population was patients aged 18-65 years who visited the Hand Clinic in the Orthopedics OPD, Ramathibodi Hospital between 25 October 2023 and 15 March 2024. Patients with selected ICD-10 diagnosis code G56.0 (carpal tunnel syndrome; CTS), M65.3 (trigger finger; TF) and/or M65.4 (de Quervain's tenosynovitis; DQT) were included in this study.

Definition of work-related disease

The diseases were determined to be work-related using NIOSH's six-step approach (26, 27). The criteria included six factors: 1) evidence of disease, 2) epidemiology, 3) evidence of individual exposure, 4) consideration of other relevant factors, 5) validity of testimony, and 6) conclusions. Diseases of patients who satisfied two or more criteria were considered work-related. The work-relatedness determination of the cases included in this study was made by a doctor certified with basic occupational medicine training.

Definition of recognition of work-related conditions

A case with a work-related cause was defined as “recognized” if the doctor recorded any notes about work-related details in the patient’s medical record, e.g., job titles, job descriptions, work processes, and working environment.

Data collection

Patients with MSDs of interest based on ICD-10 diagnoses who had visited the Orthopedics OPD between October 25, 2023 and March 15, 2024 were asked to complete interviews using a modified repetitive strain injury questionnaire adapted from the Strain Index and ACGIH TLV for HAL. (28, 29) The questionnaire consisted of two components: 1) personal history (smoking history and postpartum/pregnancy history), working history (job position, job description, workplace, working years, working days per week, working hours per day), and 2) details of hand motions during work (hand position, hand use time, computer use, tool use, etc.). In addition, the demographic data included age, sex, weight, height and body mass index (BMI). Evidence of exposure to repetitive hand motion before the onset of the disease was also documented. Data retrieved from electronic medical records from the Informatics Division included underlying diseases, patient health benefit schemes, and doctors’ notes. The primary investigator reviewed all medical records and marked them as “recognition of work-relatedness” if the patients’ records contained work-related details documented by the physician.

Outcome variables were the three MSDs (CTS, TF, DQT), WRMSDs, and the recognition of work-relatedness. Independent variables were divided into sociodemographic variables (age, sex, BMI, educational level, underlying disease), work-related variables (job group, hand use, dominant hand, working hours, workplace), and other variables (leisure activities, smoking).

Statistical analysis

The outcome variables were calculated as percentages for each of the three MSDs, WRMSDs, and the physician’s recognition of work-relatedness. Differences were tested using Pearson’s chi-square test with a $p < 0.05$ indicating statistical significance.

Associations between outcomes and the independent variables were tested by logistic regression using univariate and multivariate models. The odds ratios and 95% confidence intervals (CI) were used to quantify the strength of associations. The multiple logistic regression model included independent variables with a $p \leq 0.1$ in the univariate model. Data was analyzed using STATA version 17.

Ethics approval and consent

This study was approved by the Ethical Review Committee of the Faculty of Medicine, Ramathibodi Hospital, Mahidol University, Bangkok, Thailand (COA. No. MURA2023/771), and all participants gave written consent.

RESULTS

The total of 270 cases included 127 cases of carpal tunnel syndrome (CTS) (47.0%), 96 cases of trigger finger (TF) (36.0%), and 47 cases of de Quervain’s tenosynovitis (DQT) (17.0%). Most were female (84.4%) and half the participants (52.2%) were in the age group 41–59 years. Obese patients (BMI > 24.9) were the largest group at 48.9%. In addition, 63.0% of the participants had a Civil Servant Medical Benefits Scheme (CSMBS) and 52.5% had educational levels of university graduate or above. Most received a monthly income of either less than 30,000 baht (46.3%) or between 30,000–69,999 baht (40.1%). Patient characteristics were similar among the three MSDs, with the exception of postpartum and smoking conditions. Details are shown in [Table 1](#).

Work characteristics

[Table 2](#) shows that skilled labor had the highest percentage of cases (46.7%), followed by educated skilled labor (33.0%). The industries with the highest number of cases were sales and manufacturing (46.7%), followed by services (33.0%). Most workers performed a single job (93.3%) and most had a break time of more than 10 minutes per day (93.3%).

Regarding the participants’ hand usage, most used their hands during 50.0% or more of their work time (84.4%) and most made repetitive hand movements six or more times per minute (63.3%). The largest proportion used tools or other equipment in their jobs (37.4%), followed by computer

Table 1. Demographic characteristics of participants

Demographic characteristics	CTS n = 127 (%)	TF n = 96 (%)	DQT n = 47 (%)	Total N = 270 (%)	p-value
Age (year): Median (IQR) 58 (50,62), Min 20, Max 65					0.013*
20–40	15 (11.8)	5 (5.2)	7 (14.9)	27 (10.0)	
41–59	76 (59.8)	44 (45.8)	21 (44.7)	141 (52.2)	
60–65	36 (28.4)	47 (49.0)	19 (40.4)	102 (37.8)	0.544
Sex: female	110 (86.6)	78 (81.3)	40 (85.1)	228 (84.4)	
BMI: Median (IQR) 24.8 (22.1,28.8), Min 16.6, Max 41.4					0.996
<23	40 (31.5)	32 (33.3)	15 (31.9)	87 (32.2)	
23–<25	25 (19.7)	17 (17.7)	9 (19.2)	51 (18.9)	
≥25	62 (48.8)	47 (49.0)	23 (48.9)	132 (48.9)	
Health scheme					0.385
CSMBS	88 (69.3)	54 (56.2)	28 (59.5)	170 (63.0)	
SSS	10 (7.9)	14 (14.6)	7 (14.9)	31 (11.5)	
UC	11 (8.6)	9 (9.4)	6 (12.8)	26 (9.6)	
Out-of-pocket	18 (14.2)	19 (19.8)	6 (12.8)	43 (15.9)	
Educational level					0.371
Middle and lower	48 (37.8)	26 (27.1)	12 (25.5)	86 (31.8)	
High school	21 (16.5)	16 (16.7)	8 (17.0)	45 (16.7)	
Higher education	58 (45.7)	54 (56.2)	27 (57.5)	139 (51.5)	
Income level (month)					0.459
<30,000	55 (43.3)	50 (52.1)	20 (42.5)	125 (46.3)	
30,000–69,999	62 (48.8)	36 (37.5)	21 (44.7)	119 (40.1)	
≥70,000	10 (7.8)	10 (10.4)	6 (12.7)	26 (9.6)	
Underlying conditions					
DM	17 (13.4)	18 (18.7)	10 (21.3)	45 (16.7)	0.367
Hypothyroidism	4 (3.2)	2 (2.1)	2 (4.3)	8 (3.0)	0.761
Post-partum	0 (0.0)	0 (0.0)	3 (6.4)	3 (1.1)	0.001
Smoking	0 (0.0)	0 (0.0)	4 (8.5)	4 (1.5)	0.000

*p < 0.05

IQR, interquartile range; BMI, body mass index; CSMBS, Civil Servant Medical Benefit Scheme; SSS, Social Security Scheme; UC, Universal Coverage; DM, diabetes mellitus; CTS, carpal tunnel syndrome; TF, trigger finger; DQT, de Quervain's tenosynovitis

use (27.8%). Computer-using participants used their hands mostly for mouse clicking/scrolling more than 6 times per minute or keyboard typing more than 18 times per minute. The patient's illness mainly affected the dominant hand (94.4%), but only 41.1% had limited use of that hand. A total of 63.3% of the cases were determined to be work-related. There were no significant differences in work-relatedness among the three MSDs.

Work-related musculoskeletal diseases

Of the 171 cases that were determined to be work-related, 81 cases (63.8%) had CTS, 65 (67.7%) had TF, and 25 (53.2%) had DQT. Statistically significant factors identified by univariate analysis were female sex, having no related underlying diseases (DM, hypothyroidism), work time per week of more than 20 hours, hand-using other than general use, repetitively doing a single job, and repeated hand-use related to a hobby. Smoking

and postpartum factors were not included because the limited number of participants led to not applicable (N/A) results. When the statistically significant variables were tested for collinearity, hand-use in a hobby was found to be correlated with that single job; therefore, it was removed from the multivariate model. The multivariate model found significant associations in patients without related underlying diseases (DM, hypothyroidism), work time per week of 26 hours and above, hand-using other than general use, and doing a single job.

Patients with longer work hours per week had higher adjusted odds of a work-related cause: 3.26 (1.35,7.89) in the '26–29 hours per week' group and 4.48 (1.65,12.18) in the '30 or more hours per week' group. Additionally, tool-using had higher adjusted odds compared to computer use and writing, 7.92 (2.83,22.17), 4.72 (1.84,12.14), and 4.88 (1.53,15.61), respectively. Details are shown in Table 3.

Table 2. Work-related characteristics of participants

Working characteristics	CTS n = 127 (%)	TF n = 96 (%)	DQT n = 47 (%)	Total N = 270 (%)	p-value
Job group (ISCO-08)					
Educated skilled labor	43 (33.9)	29 (30.2)	17 (36.2)	89 (33.0)	0.752
Skilled labor	62 (48.8)	44 (45.8)	20 (42.5)	126 (46.7)	
General labor	22 (17.3)	23 (24.0)	10 (21.3)	55 (20.3)	
Workplace (TSIC)					
Services	40 (31.5)	29 (30.2)	17 (36.2)	89 (33.0)	0.752
Sales & manufacturing	36 (28.3)	44 (45.8)	20 (42.5)	126 (46.7)	
Supportive organization	51 (40.2)	23 (24.0)	10 (21.3)	55 (20.3)	
Hand-using					
Tool-use	41 (32.3)	45 (46.9)	15 (31.9)	101 (37.4)	0.342
Computer-use	37 (29.1)	23 (24.0)	15 (31.9)	75 (27.8)	
Writing	23 (18.1)	11 (11.4)	6 (12.8)	40 (12.8)	
General use	26 (20.5)	17 (17.7)	11 (23.4)	54 (20.0)	
Hand-using work time					
≥50.0%	108 (85.0)	82 (85.4)	38 (80.8)	228 (84.4)	0.754
<50.0%	19 (15.0)	14 (14.6)	9 (19.2)	42 (15.6)	
Computer-using					
≥50.0%	48 (37.8)	28 (29.1)	16 (34.0)	92 (34.1)	0.765
<50.0%	27 (21.3)	23 (24.0)	11 (23.4)	61 (22.6)	
None	52 (40.9)	45 (46.9)	20 (42.5)	117 (43.3)	
Mouse click/scroll					
≥6/min	48 (37.8)	28 (29.1)	16 (34.0)	92 (34.1)	0.765
<6/min	27 (21.3)	23 (24.0)	11 (23.4)	61 (22.6)	
None	52 (40.9)	45 (46.9)	20 (42.5)	117 (43.3)	
Keyboard-typing					
≥18/min	48 (37.8)	28 (29.1)	16 (34.0)	92 (34.1)	0.765
<18/min	27 (21.3)	23 (24.0)	11 (23.4)	61 (22.6)	
None	52 (40.9)	45 (46.9)	20 (42.5)	117 (43.3)	
Hand movement					
≥6/min	77 (60.6)	62 (64.6)	32 (68.1)	171 (63.3)	0.631
<6/min	50 (39.4)	34 (35.4)	15 (31.9)	99 (36.7)	
Break time	119 (93.7)	88 (91.7)	46 (97.9)	253 (93.7)	0.357
Hand vibration	4 (3.2)	3 (3.1)	2 (4.3)	9 (3.3)	0.928
Single job	117 (92.1)	92 (95.8)	43 (91.5)	252 (93.3)	0.468
Hand use in hobby	19 (15.0)	14 (14.6)	9 (19.2)	42 (15.6)	0.754
Affected hand					
Dominant	124 (97.6)	88 (91.7)	43 (91.5)	255 (94.4)	0.097
Non-dominant	3 (2.4)	8 (8.3)	4 (.5)	15 (5.6)	
Current symptom					
Pain/numbness	44 (34.6)	31 (32.3)	20 (42.5)	95 (35.2)	0.475
Symptom-free	83 (65.4)	65 (67.7)	27 (57.5)	175 (64.8)	
Current hand use					
Normal	74 (58.3)	58 (60.4)	27 (57.5)	159 (58.9)	0.926
Limited	53 (41.3)	38 (39.6)	20 (42.5)	111 (41.1)	
Work-relatedness	81 (63.8)	65 (67.7)	25 (53.2)	171 (63.3)	0.236

ISCO-08, International Standard Classification of Occupations 2008; TSIC, Thailand Standard Industrial Classification; CTS, carpal tunnel syndrome; DQT, de Quervain's tenosynovitis; TF, trigger finger

Recognition of work-related conditions

Overall, 31 of the cases (13.0%) were recognized by medical professionals as work-related conditions: 19 cases (15.0%) of CTS, two cases (2.1%) of TF, and 10 cases (21.3%) of DQT. Patients

with TF tended to be unrecognized 12.7 times more frequently than patients with DQT (95%CI = 2.65, 60.75). In the univariate analysis, only Health Scheme CSMBS showed some association with the recognition of work-relatedness. However,

Table 3. Association between factors and work-related cases

Factor	Work-related outcome		Crude odds ratio (95%CI)	Adjusted odds ratio (95%CI)
	Yes n = 171 (%)	No n = 99 (%)		
Sex				
Female	150 (65.8)	78 (34.2)	1.92* (0.99,3.73)	1
Male	21 (50.0)	21 (50.0)	1	1.07 (0.42,2.68)
Age group				
20–40	19 (70.4)	8 (29.6)	1.80 (0.72,4.49)	1
41–59	94 (66.7)	47 (33.3)	1.51 (0.89,2.56)	1.63 (0.51,5.10)
60–65	58 (56.9)	44 (43.1)	1	1.06 (0.33,3.35)
BMI				
<23	27 (31.0)	60 (69.0)	1.49 (0.84, 2.64)	1.35 (0.64,2.86)
23–< 25	19 (37.3)	32 (62.7)	1.13 (0.58, 2.20)	1.22 (0.51,2.96)
≥25	53 (40.2)	79 (59.8)	1	1
Non-DM	152 (67.6)	73 (32.4)	2.83* (1.47,5.44)	2.35** (1.19,6.75)
Non-hypothyroidism	170 (64.9)	92 (35.1)	12.93* (1.56,106.75)	13.97** (1.34,146.13)
Affected hand			1.16 (0.40,3.36)	–
Dominant	162 (63.5)	93 (36.5)	1	–
Non-dominant	9 (60.0)	6 (40.0)	1	1
Health Scheme				
CSMBS	100 (58.8)	70 (41.2)	2.01 (0.85,4.75)	2.03 (0.65,6.39)
SSS	23 (74.2)	8 (25.8)	1.32 (0.55,3.13)	1.00 (0.28,3.56)
UC	17 (65.4)	9 (34.6)	1.80 (0.86,3.76)	1.06 (0.42,2.70)
Out-of-pocket	31 (72.1)	12 (27.9)		
Job groups				
Educational skilled labor	54 (60.7)	35 (39.3)	1.11 (0.55,2.19)	1.40 (0.47,4.18)
Skilled labor	85 (67.5)	41 (32.5)	1.49 (0.77,2.86)	1.92 (0.73,5.06)
General labor	32 (58.2)	23 (41.8)	1	1
Worktime/week				
≤20 hours	41 (38.7)	65 (61.3)	1	1
21–25 hours	31 (73.8)	11 (26.2)	4.46* (2.02,9.85)	2.11 (0.81,5.51)
26–29 hours	45 (75.0)	15 (25.0)	4.75* (2.35,9.60)	3.26** (1.35,7.89)
≥30 hours	54 (87.1)	8 (12.9)	10.70* (4.62,24.76)	4.48** (1.65,12.18)
Hand using				
Tool-use	79 (78.2)	22 (21.8)	14.03* (6.22, 31.6)	7.92** (2.83,22.17)
Computer-use	51 (68.0)	24 (32.0)	8.30* (3.65, 18.9)	4.72** (1.84,12.14)
Writing	30 (75.0)	10 (25.0)	11.73* (4.42, 31.1)	4.88** (1.53,15.61)
General use	11 (20.4)	43 (79.6)	1	1
Single job	167 (66.3)	85 (33.7)	6.87* (2.19,21.53)	10.13** (2.59,39.57)
Break time	163 (64.4)	90 (35.6)	2.03 (0.75,5.46)	–
Hand-use in hobby	10 (23.8)	32 (76.2)	2.21* (1.32,3.69)	–

*p < 0.1; **p < 0.05

DM, diabetes mellitus; BMI, body mass index; CSMBS, Civil Servant Medical Benefit Scheme; SSS, Social Security Scheme, UC, Universal Coverage

in the multivariate model, there were no statistically significant associations. Smoking and post-partum were not included because the number of patients was too small to analyze. Details are shown in Table 4.

DISCUSSION

This study found that among patients with the three most common hand MSDs, 63.3% of

the cases were determined to be associated with work-related conditions based on NIOSH criteria. In contrast, only 13.0% were recognized based on their work history. Work factors such as the type of hand use, hand use in hobbies, work hours, and having a single job were statistically significantly associated with work-related conditions. No factors were significantly related to the non-recognition of work-relatedness, which could have resulted

Table 4. Association between factors and unrecognized cases of work-related hand diseases

Factor	Recognition of work-relatedness		Crude odds ratio (95%CI)	Adjusted odds ratio (95%CI)
	Recognized n = 31 (%)	Not recognized n = 239 (%)		
Sex: male	3 (7.1)	39 (92.9)	1.82 (0.53,6.28)	2.02 (0.55,7.41)
Age group				
20-40	5 (18.5)	22 (81.5)	1	1
41-59	18 (12.8)	123 (87.2)	1.53 (0.52,4.61)	1.55 (0.47,5.11)
60-65	8 (7.8)	94 (92.2)	2.67 (0.79,8.95)	2.59 (0.70,9.59)
BMI				
<23	10 (11.5)	77 (88.5)	1.23 (0.43, 3.44)	1.09 (0.36,3.32)
23-<25	7 (13.7)	44 (86.3)	1	1
≥25	14 (10.6)	118 (89.4)	1.34 (0.51,3.54)	1.32 (0.48,3.65)
Health Scheme				
CSMBS	17 (10.0)	153 (90.0)	2.63* (0.99,6.99)	2.72 (0.89,2.83)
SSS	7 (22.6)	24 (77.4)	1	1
UC	3 (11.5)	23 (88.5)	2.24 (0.51,9.71)	2.47 (0.48,12.73)
Out-of-pocket	4 (9.3)	39 (90.7)	1.84 (0.75,10.74)	3.48 (0.77, 14.72)
Education level				
Middle school	12 (14.0)	74 (86.0)	1.13 (0.41,3.12)	1.06 (0.35,3.16)
High school	7 (15.6)	38 (84.4)	1	1
Higher education	12 (8.6)	127 (91.4)	1.95 (0.71,5.30)	1.59 (0.65,3.88)
Workplace				
Services	9 (11.3)	71 (88.8)	1.06 (0.43,2.61)	1.59 (0.57,4.43)
Merchandise	9 (11.3)	71 (88.8)	1.06 (0.43,2.61)	1.14 (0.43,2.98)
Authorities	13 (11.8)	97 (88.2)	1	1

* $p < 0.1$;

BMI, body mass index; CSMBS, Civil Servant Medical Benefit Scheme; SSS, Social Security Scheme, UC, Universal Coverage

from the high percentages of non-recognition across all patients.

More than half the patients were in the age group 41-59 years old. This result aligns with the NIOSH worker health chartbook (1), which reported that 31.1% of study participants with MSDs were in the 45-59 age group. This finding also corresponds with a Canadian study where half of the participants with work-related repetitive strain injuries were between 25 and 54 years old (30). Studies from France similarly concluded that greater age was the main personal risk factor for work-related musculoskeletal disorders (WRMSDs) (22, 31).

Work hours per week was associated with WRMSDs and the incidence increased as patients worked longer hours. This result is supported by a previous study which found a similar pattern of overtime or long working hours being associated with MSDs as well as an established dose-response relationship between work duration and hand symptoms (32). Other studies have similarly found

that various occupations involving both tool and computer use could be associated with WRMSDs, including forceful hand movements (20, 33-35). Repetitive movement has also been found to be associated with WRMSDs in other studies (7, 30). In this study, hand-use in hobbies was correlated with workers with a single job in the test for collinearity; therefore, it was removed from the final model. In addition, patients with a single job were statistically significantly associated with WRMSDs. This finding aligns with a recent systematic review reporting that a specific job task can lead to occupational overuse syndrome (36).

The present study found that patients with no other relevant medical conditions, i.e. diabetes mellitus, or hypothyroidism, were associated with work-related factors. In contrast, previous studies have found that diabetes mellitus and metabolic syndrome were significantly associated with MSDs (37). The present study could not interpret the results of smoking, the main factor found to be related to upper extremities MSDs in other

studies (38). We hypothesize that this is due to the limited number of participants in the present study.

MSDs of the hand were under-recognized as work-related in this study, with only 13.0% being recognized by medical professionals. This finding is similar to Yagev's study in 2008 (39) and a study in Spain in 2019 (40). Patients' personal characteristics can affect doctors' recognition of work-relatedness and can also result in a longer period to detect work-relatedness (40, 41). The present study did not find a significant difference in recognition between age groups, but, according to Ramada's 2014 study, older patients have a lower prevalence of being recognized (42). Patients paying for medical treatment out-of-pocket had the highest odds of non-recognition, but the association was not statistically significant. That might be due to patients with this health care scheme being generally older and mostly retired. There is only limited evidence regarding the relationship between health benefit schemes and recognition of work-relatedness.

The results of this study demonstrate the low recognition of WRMSDs, which could result in patients not receiving appropriate authorized welfare and other health-care benefits. This study could not identify factors related to under-recognition; however, factors associated with work-relatedness were identified and could be used in developing screening questions to increase recognition, e.g., the type of hand use and work hours. Furthermore, another study showed that establishing a special occupational medicine unit could also help improve recognition (40).

The present study is among the first in Thailand to explore factors associated with MSDs of the hand without regard to the participant's occupation in a health care setting. All eligible subjects were enrolled, and the response rate was 100.0%. Limitations of this study include the small sample size which, due to time limitations, was less than originally planned. Participants may also have had recall bias. Finally, the study only examined patient factors, omitting the potential influence of physicians' experience and knowledge. Orthopedists see a substantial number of patients with WRMSDs; therefore, their insights could benefit efforts to increase the recognition of WRMSDs in the future.

CONCLUSION

This study examined the three major work-related hand diseases, CTS, TF and DQT, in working patients at Ramathibodi Hospital in 2022-2023. The prevalence of work-related cases was 63.0%, but the recognition of that relatedness by attending physicians was only 13.0%. Factors associated with work-relatedness were working longer hours, working with tools, using computers, writing, having a single job, and no underlying DM or hypothyroidism. Hospitals should develop screening systems to identify patients with work-related diseases and should also seek ways to assist patients to receive authorized welfare and other benefits. Further studies should also be conducted to explore ways to increase recognition by physicians or connections between a patient's working situation and MSDs.

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CONFLICT OF INTEREST

The authors declare no conflicts of interest.

REFERENCES

1. Division of Population Health, National Center for Chronic Disease Prevention and Health Promotion. Work-Related Musculoskeletal Disorders & Ergonomics. CDC A [Internet]. 2020 [cited Feb 12, 2020]. Available from: <https://www.cdc.gov/workplace-healthpromotion/health-strategies/musculoskeletal-disorders/index.html>
2. Nogueira C, Kocks D, Frost C. WHO/ILO Joint Estimates of Work-related Burden of Disease and Injury. *Occup Health South Afr*. 2021;27:179-80.
3. Boden L. Capture-recapture estimates of the undercount of workplace injuries and illnesses: sensitivity analysis. *Am J Ind Med*. 2014;57:1090-9.
4. Briggs A, Cross M, Hoy D, Sánchez-Riera L, Blyth F, Woolf A, et al. Musculoskeletal Health Conditions Represent a Global Threat to Healthy Aging: A Report for the 2015 World Health Organization World Report on Ageing and Health. *The Gerontologist*.

- 2016;56(Supplement_2):S243-55.
5. Briggs A, Woolf A, Dreinhöfer K, Homb N, Hoy D, Kopansky-Giles D, et al. Reducing the global burden of musculoskeletal conditions. *Bull World Health Organ.* 2018;96:366-8.
6. Hulshof CTJ, Pega F, Neupane S, van der Molen HF, Colosio C, Daams JG, et al. The prevalence of occupational exposure to ergonomic risk factors: A systematic review and meta-analysis from the WHO/ILO joint estimates of the work-related burden of disease and injury. *Environ Int.* 2021;146:106157. PubMed PMID: 33395953
7. Iqbal Z, Alghadir A. Cumulative trauma disorders: A review. *J Back Musculoskelet Rehabil.* 2017;30:663-6.
8. Currie K, Tadisina K, Mackinnon S. Common Hand Conditions: A Review. *Jama.* 2022;327:2434-45.
9. Osiak K, Elnazir P, Walocha J, Pasternak A. Carpal tunnel syndrome: state-of-the-art review. *Folia Morphol (Warsz).* 2022;81:851-62.
10. Sucher B, Schreiber A. Carpal Tunnel Syndrome Diagnosis. *Physical Medicine and Rehabilitation Clinics of North America.* 2014;25:229-47.
11. Dale A, Harris-Adamson C, Rempel D, Gerr F, Hegmann K, Silverstein B, et al. Prevalence and incidence of carpal tunnel syndrome in US working populations: pooled analysis of six prospective studies. *Scand J Work Environ Health.* 2013;39:495-505.
12. Allbrook V. 'The side of my wrist hurts': De Quervain's tenosynovitis. *Aust J Gen Pract.* 2019;48:753-6.
13. Laoopugsin N, Laoopugsin S. The study of work behaviours and risks for occupational overuse syndrome. *Hand Surg.* 2012;17:205-12.
14. Wolf JM, Sturdivant RX, Owens BD. Incidence of de Quervain's tenosynovitis in a young, active population. *J Hand Surg Am.* 2009;34:112-5.
15. Jordaán PW, Klumpp R, Zeppieri M. Triggering, clicking, locking and crepitus of the finger: a comprehensive overview. *World J Orthop.* 2023;14:733-40.
16. Langer D, Maeir A, Michailovich M, Luria S. Evaluating hand function in clients with trigger finger. *Occup Ther Int.* 2017;2017:9539206. PubMed PMID: 29097982.
17. Balogh I, Arvidsson I, Björk J, Hansson G, Ohlsson K, Skerfving S, et al. Work-related neck and upper limb disorders - quantitative exposure-response relationships adjusted for personal characteristics and psychosocial conditions. *BMC Musculoskelet Disord.* 2019;20:139. PubMed PMID: 30935374.
18. Feng B, Chen K, Zhu X, Ip WY, Andersen LL, Page P, et al. Prevalence and risk factors of self-reported wrist and hand symptoms and clinically confirmed carpal tunnel syndrome among office workers in China: a cross-sectional study. *BMC Public Health.* 2021;21:57. PubMed PMID: 33407293.
19. Gerr F, Monteilh C, Marcus M. Keyboard use and musculoskeletal outcomes among computer users. *J Occup Rehabil.* 2006;16:265-77.
20. Greiner B, Nolan S, Hogan D. Work-related upper limb symptoms in hand-intensive health care occupations: a cross-sectional study with a health and safety perspective. *Phys Ther.* 2019;99:62-73.
21. Özdemir G. Working hand syndrome: a new definition of non-classified polyneuropathy condition. *Medicine (Baltimore).* 2017;96:e7235. PubMed PMID: 28640120
22. Roquelaure Y, Ha C, Rouillon C, Fouquet N, Leclerc A, Descatha A, et al. Risk factors for upper-extremity musculoskeletal disorders in the working population. *Arthritis Rheum.* 2009;61:1425-34.
23. International Labour Organization. List of Occupational Diseases (Revised 2010). Occupational Safety and Health Series, No. 74 [Internet]. 2010. Available from: <https://www.ilo.org/publications/ilo-list-occupational-diseases-revised-2010>
24. Notification of the Ministry of Labour: List of Occupational Diseases [Internet]. 2023 Available from: <https://dl.parliament.go.th/handle/20.500.13072/608686> [in Thai].
25. Kreshpaj B, Bodin T, Wegman D, Matilla-Santander N, Burstrom B, Kjellberg K, et al. Under-reporting of non-fatal occupational injuries among precarious and non-precarious workers in Sweden. *Occup Environ Med.* 2022;79:3-9.
26. Greaves W, Das R, McKenzie J, Sinclair D 2nd, Hegmann K. Work-Relatedness. *J Occup Environ Med.* 2018;60:e640-6.
27. Kusnetz S HMe. A Guide to the Work-relatedness of Disease. DHEW Publication. 1979.
28. Ijmker S, Huysmans M, van der Beek A, Knol D, van Mechelen W, Bongers P, et al. Software-recorded and self-reported duration of computer use in relation to the onset of severe arm-wrist-hand pain and neck-shoulder pain. *Occup Environ Med.* 2011;68:502-9.
29. Kapellusch J, Garg A, Hegmann K, Thiese M, Malloy E. The Strain Index and ACGIH TLV for HAL: risk of trigger digit in the WISTAH prospective cohort. *Hum Factors.* 2014;56:98-111.
30. Breslin F, Ibrahim S, Smith P, Mustard C, Amick B, Shankardass K. The demographic and contextual correlates of work-related repetitive strain injuries among Canadian men and women. *Am J Ind Med.* 2013;56:1180-9.
31. Petit Le Manac'h A, Roquelaure Y, Ha C, Bodin J, Meyer G, Bigot F, et al. Risk factors for de Quervain's disease in a French working population. *Scand J Work Environ Health.* 2011;37:394-401.
32. S IJ, Huysmans MA, Blatter BM, van der Beek AJ, van Mechelen W, Bongers PM. Should office workers spend fewer hours at their computers? A systematic review of the literature. *Occup Environ Med.* 2007;64:211-22.
33. Betzl J, Kraneburg U, Megerle K. Overuse syndrome of the hand and wrist in musicians: a systematic review. *J Hand Surg Eur Vol.* 2020;45:636-42.
34. Dahlgren G, Liv P, Öhberg F, Slunga Järholm L, Forsman M, Rehn B. Correlations between ratings and technical measurements in hand-intensive work. *Bioengineering (Basel).* 2023;10(7):867. PubMed PMID: 37508893

35. Huysmans M, Ijmker S, Blatter B, Knol D, van Mechelen W, Bongers P, et al. The relative contribution of work exposure, leisure time exposure, and individual characteristics in the onset of arm-wrist-hand and neck-shoulder symptoms among office workers. *Int Arch Occup Environ Health*. 2012;85:651-66.
36. Demissie B, Bayih E, Demmelash A. A systematic review of work-related musculoskeletal disorders and risk factors among computer users. *Heliyon*. 2024;10:e25075. PubMed PMID: 38318034
37. N JHS, L A, R GVG, da Silveira D, B PN, Almeida SF. Epidemiology of trigger finger: metabolic syndrome as a new perspective of associated disease. *Hand (N Y)*. 2021;16:542-5.
38. van den Berge M, van der Beek AJ, Türkeli R, van Kalken M, Hulsege G. Work-related physical and psychosocial risk factors cluster with obesity, smoking and physical inactivity. *Int Arch Occup Environ Health*. 2021;94:741-50.
39. Yagev Y, Gringolds M, Karakis I, Carel R. Carpal Tunnel Syndrome: Under-recognition of Occupational Risk Factors by Clinicians. *Industrial health*. 2008;45:820-2.
40. Benavides FG, Ramada JM, Ubalde-López M, Delclos GL, Serra C. A hospital occupational diseases unit: an experience to increase the recognition of occupational disease. *Med Lav*. 2019;110:278-84.
41. Pelegrí A, Serra C, Ramada JM, Palma-Vásquez C, Benavides FG. Waiting time from identification to recognition an occupational disease in Spain. *Gac Sanit*. 2022;36:257-9.
42. Ramada Rodilla JM, Delclós Clanchet J, Benavides FG, Fontané Ventura J, Arango Toro O, Serra Pujadas C. [Identification of occupational diseases in a tertiary care hospital]. *Arch Prev Riesgos Labor*. 2014;17:18-25.