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Correlation between Duration of Work and Hand Position Using Computer with Carpal Tunnel Syndrome (CTS) at the Registration Administration Officer in Dr. Soetomo General Hospital Surabaya

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Introduction

¹ Computers are used in offices around the world, for the last few decades there has been a rapid increase in computer-related work demands. ¹ Several studies have reported a positive relationship between computer use and musculoskeletal symptoms ⁽¹⁾.

CTS is commonly reported among professional computer users among musculoskeletal disorders. CTS incidents have been reportedly ¹ high among those working with vibrating machines and among office workers, especially typists and data entry sections. Repetitive work on the hands

causes a variety of changes to the carpal tunnel that could cause the CTS. Repetitive was a widely recognized risk factor for occupational CTS due to the increased pressure on the carpal tunnel. The cause of trauma was a hand movement that ¹ has been identified as a disturbing factor for CTS occurrence especially in people who work repetitively requiring strength of the fingers and flexion-extension of the wrist.

The compression ⁵ of the median nerve in the wrist was the most common compression neuropathy and, consequently, was one of the most common reasons for electro diagnostic examination. Almost all patients have compression sites that usually occur in the carpal tunnel resulting in a set of symptoms and signs called carpal tunnel syndrome.

Soetomo General Hospital Surabaya is a type A referral hospital for Eastern Indonesia that uses computerization in its service administration. The patient registration administration officer is one of the jobs in Soetomo General Hospital which is related to repetitive data entry job in long term computer usage ⁽²⁾.

Therefore, the researcher wanted to know the correlation between the duration of work and hand position of computer usage with the incident carpal tunnel syndrome (CTS) which evaluated by electro diagnostic nerve conduction study (NCS) on median wrist nerve in the form of distal latency and Δ SNAP at the registration administration officer in Soetomo General Hospital who uses the computer in its activity.

Method

This study was an observational analytic study that aims to find the correlation between the duration of work and the hand position using a computer with the incidence of carpal tunnel syndrome (CTS) at the registration administration officers in Soetomo General Hospital Surabaya. The cross sectional study was used in this study because it was considered in accordance with the

purpose of research which was to know the correlation between two variables at one time. In addition, this design was relatively easy, fast, and rarely threatened to drop out. Consecutive sampling was used as a method of selecting samples because this method was the best of non-probability sampling and easy to do ⁽³⁾.

This study used cross sectional study because it was considered in accordance with the problems studied and the objectives to be achieved. The sampling of the research was conducted in the Section of Registration of Patients and Neurology Polyclinic at Soetomo General Hospital, while the NCS recording was done in EMG Room of Soetomo General Hospital Surabaya ⁽⁴⁾.

Population and sample

Population in this research was administration officer of patient registration using computer in Soetomo General Hospital. While the samples were the administrative officers of patient registration using both mouse and keyboard computers that fulfilled inclusion-exclusion criteria. The inclusion criteria were the registration administration officers in Soetomo General Hospital using computer in their duties, aged 18 - 56 years, has worked for a minimum of 6 months, and was willing to follow the research. While the exclusion criteria as follows officers who have experienced trauma (carpal or radius fracture), neoplasms, and arthritis; and officers with CTS but did not want to do the NCV screening.

Moreover, the sampling from consecutive admissions was used until the number of samples has been determined. Preliminary research was conducted to determine the sample size. Based on the calculation obtained the required sample size was 12 of each proportion. Then, the total samples obtained were 60 officers in this study. Later on, the results of the preliminary research obtained the required sample size of each proportion was 12 along with the total sample that

obtained during this study was 60 consisting of 6 men (10%) and 54 women (90%). That happened because this research was a cross sectional studies which recording and measuring variables at one time simultaneously ⁽⁵⁾.

The sampling of the research was conducted in the Section of Registration of Patients and Neurology Polyclinic at Soetomo General Hospital, while the NCS recording was done in EMG Room of Soetomo General Hospital Surabaya from October to December 2012.

Reserach variables

The independent variables in this research were the duration of work and hand position of computer usage at the administrative officers of patient registration in Dr. Soetomo General Surabaya. While the dependent variables was the incidence of CTS based on the NCS value of the median nerve wrist by the antidromic examination of the IV finge ⁽⁶⁾.

The operational definition for the variable of the patient registration administration officer was the officer whose daily activities related to the administration of the patient using computer in both the mouse and keyboard at least in the last 6 months. The duration of work was a routine activity related to the use of computers. The position of the hand was a habit of hand position when the working using a computer ⁽⁷⁾. Flexions and neutrals were the position between the forearm and hand in straight position with no flexion/extension on the wrist. CTS was an entrapment neuropathy by the median nerve compression that were diagnosed with anamnesis (pain or thickness on the anterior surface of the thumb, index finger, middle finger and half radial of ring finger a few weeks earlier), physical examination (positive sign of Tinel or Phalen) and was proved by using nerve conduction study ⁽⁸⁾.

4
Table 1. the Nerve Conduction Study (NCS) assessment of the median wrist nerves

	Normal (msec)	Mild (msec)	Moderate (msec)	Severe (msec)
DL CMAP	< 4	4	4-6	>6
Δ SNAP the median-ulnar nerves	< 0,4	0,4	0,4-2	>2

4
 Table 1 shows that the Nerve Conduction Study (NCS) assessment of the median wrist nerves using IV finger antidromic examination and normal assessment of CTS (mild, moderate, severe)

Data collection

Prior to the data collection, all subjects which included in the inclusion criteria were briefed on the purpose, usefulness, and risk of the research, then asked to follow the study without coercion. At the end of the explanation, the subjects were asked to read the research descriptions. If the subjects have been understood, they were asked to sign the statement of consent to participate in research. However, if there were things that have not been understood or less clear then it could be asked back to the doctor who gave an explanation ⁽²⁾.

The subjects who have signed a letter of approval will be recorded in the form of identity and characteristics. The data were collected by the author and other resident doctors with the following steps; conducting anamnesis, physical and neurology examination, selecting the samples for the experimental group according to the inclusion and the exclusion criteria, data collection, nerve conduction study (NCS) examination, and lastly, all results were collected for the data tabulation and the statistical analysis. The correlation between working duration and hand position

with CTS incidents assessed with NCS median nerve wrist was analyzed by fisher test because it did not meet the requirements of chi square test ⁽⁹⁾.

Result

The basic data of the patient was taken through the direct interview with the patient and the nerve conduction study (NCS) examination was performed in the EMG room of the neurological department of Soetomo General Hospital Surabaya.

Table 2. Basic Characteristics of Subjects

	Subject n = 60	Percentage (%)
Sex		
Woman	54	90
Man	6	10
Age (years)	37,80 ± 10,841	
Work duration		
Years	9,75 ± 8,36	
Hours / day	6,02 ± 1,367	
Years / hours	15078,80 ± 12419,52	
Hand Position		
Normal	19	31,7
Extension	41	68,3
Nerve Conduction Study (NCS) of the Median Nerve		
Normal	10	16.7
Mild	38	63.6
Moderate	8	13.3
Severe	4	6.7

Additionally, sex of the subjects could be seen in table 2 about the characteristics of research subjects based on the demographic factors. The total subjects were 60 officers consisting of 54 women (90%) and 6 men (10%) with the mean age of 37.80 + 10,841. The youngest subject ³ was 22 years old, while the oldest was 53 years old.

Moreover, [table 2](#) shows the mean of work duration was $9.75 \pm 8,361$ years, with the working duration at least 0.5 years and the longest 25 years. Meanwhile, the working duration of subjects was 6.02 ± 1.367 hours/day, with a minimum working time of 3 hours/day and the longest 8 hours/day. The mean of working duration of subjects in the year/hours was $15078,80 \pm 12419,52$ year/hours. The subject characteristics of hand position related to wrist position when using keyboard and mouse were 19 subjects with normal position also 41 subjects with experienced extension position.

The result of nerve conduction study (NCS) of the median nerve was 11 hands of normal (18.4%), mild carpal tunnel syndrome experienced by 37 hands (61.7%), moderate carpal tunnel syndrome experienced by 8 hands (13.3%), and 4 hands (6.7%) experienced severe carpal tunnel syndrome.

Table 3. Fisher Test Analysis between the Work Duration with the Incidence of CTS

		CTS Incident				P
		Normal		CTS		
		N	%	N	%	
Work Duration	< 3 years	7	38,9	11	61,1	0,005
	>3 years	3	7,1	39	92,9	

Additionally, 11 subjects with a working duration <3 years experienced CTS (61.1%) whereas CTS incidence in long-term officers ≥ 3 years was found in 39 subjects (92.9%). The correlation between the working duration and the CTS incidence was analyzed by Fisher test that resulted in a significant difference with $P = 0,005$ (significance Fisher) and odd ratio of 8,273 (95% CI 1,829-37,410). The duration of work was calculated based on the working duration in year multiplied by the mean of working duration each subject in hours for each day was (276 effective working days in a year).

Table 4. Fisher Test Analysis between the Work Duration in the Year/Hours with the Incidence of CTS

		CTS Incidents				P
		Normal		CTS		
		N	%	n	%	
Work Duration	< 3000 hours	4	40,0	6	60,0	0,052
	≥3000 hours	6	12,0	44	88,0	
Work Duration	< 4000 hours	5	41,7	7	58,3	0,021
	≥4000 hours	5	10,4	43	89,6	

Table 4 shows that CTS incidence was experienced by 6 subjects with duration of <3000 hours (60%) and 44 subjects with duration >3000 hours (88%). The correlation between the working duration in year/hours and the CTS incidence was analyzed by Fisher test that resulted in no significant difference with P=0,052 (significance value Fisher) and odd ratio of 4,889 (CI 95% 1,063-22,484). CTS incidence was experienced by 7 subjects with duration of <4000 hours (60%) and 43 subjects with duration ≥4000 hours (88%). The data analysis of the correlation between the working duration in year/hours and the CTS incidence was a significant difference with P=0,021 (significance value Fisher) and odd ratio 6,143 (CI 95% 1,406-26,842).

Table 5. Fisher Test Analysis between Hand Position with CTS Incidents

		CTS Incidents				P
		Normal		CTS		
		N	%	N	%	
Hand Position	Normal	5	26,3	14	73,7	0,263
	Extension	5	12,2	36	87,8	
Total		10	16,7	50	83,3	

Table 5 shows that 14 subjects experienced CTS incidence in normal hand position (73.7%) and 36 subjects with extension hand position experienced CTS incidence (87.8%). Fisher test was

performed to see the correlation between the hand position and the CTS incidence which resulted in no significant difference with $P = 0,263$ (Fisher significance value) and odds ratio 2,571 (95% CI 0,644-10,270).

Discussion

The data above shows that women have higher risk to get the symptom because it was likely due to the use of intensive and repetitive hand in doing housework, typing and other work traditionally that done mostly by women ⁽¹⁰⁾. This might be part of the explanation of why the prevalence of CTS in women was way greater than in men ⁽¹¹⁾. Moreover in this study, both working duration in years and in year/hours associated with the computers usage have the risk factors for CTS events after examination with a nerve conduction study (NCS). This was consistent with a study by Ali KM who found that working with computers was 2.4 times more likely to have CTS (95% CI 1.4-3.8). The administrative activity was a repetitive activity with stress and mechanical stress, constantly **typing and using the mouse, compared to other computer** users ⁽¹²⁾.

The extension hand position risk for CTS incidence in this study was not statistically significant, but the proportion in this group (87.8%) was higher than the normal position (73.7%). These results were consistent with the results of Ali KM's study which have a higher risk for CTS but did not statistically significant . The position of the extension hands while working using the computer causes the carpal tunnel to narrow **compared to the neutral position** ⁽¹³⁾**This requires ergonomic attention. Keeping hands neutral while working with a computer could be facilitated by using adjustable seats and the proper positioning of the keyboard and mouse. Creating awareness among computer professionals to kept the hands in a neutral position was also important** ⁽¹¹⁾.

The results of this study implied that CTS was an important musculoskeletal problem in administration officers who use computers. CTS have been reported to be a painful condition with numbness and tingling in the hands and an important cause of an occupational disability⁽¹⁴⁾. Therefore, it was important to make an early diagnosis of CTS in administration officers who use the computers based on clinical symptoms and examinations to prevent the development of working disability. It was also important to study the relationship of further risk factors, as well as to implement ergonomic rules to relieve suffering and pain⁽¹⁵⁾.

However, this study still has limitations, firstly, the predominant population was female. Based on a comparison study of CTS between men and women, it was not clear whether the results of this study could be generalized to the male population. Secondly, electro diagnostic standard was used in this study to diagnose CTS. Then, Thirdly, the positioning of the hands did not use a detailed angle.

Conclusion

There was a correlation between the working duration both in years and in year/hours with CTS incidences based on NCS median nerve results. Also, there was no correlation between extension hand position when using computer with CTS occurrences based on NCS median nerve wrist results at registration administration officers in Soetomo General Hospital Surabaya.

Ethical clearance

The research process involves participants in the survey using a questionnaire that was accordant with the ethical research principle based on the regulation of research ethic committee.

The present study was carried out in accordance with the research principles. This study implemented the basic principle ethics of respect, beneficence, non-maleficence, and justice.

Conflict of Interest

There is no report of conflict of interest so far and this paper is 100% original and never been published before elsewhere.

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References

1. Hasanah RA, Suwandi T, Wibowo A. Prevalence on the Occurrence of Computer Vision Syndrome to VDT Operator in Bank Surabaya, Indonesia. *Indian J Public Heal Res Dev.* 2017;8(4).
2. Sari YK, Martiana T, Dewanti L. Factors related to personal absorbed dose in health workers at hospital's radiology unit. *Indian J Public Heal Res Dev.* 2018;9(12):606–11.
3. Miftahussurur M, Yamaoka Y. Diagnostic methods of *Helicobacter pylori* infection for epidemiological studies: critical importance of indirect test validation. *Biomed Res Int.* 2016;2016.
4. Kusumo AD, Bramantoro T, Berniyanti T, Wening GRS, Sosiawan A, Palupi R. Actuating food residual detection habit using self-made disclosing agent solution to improve the dental hygiene for fertile age mothers. *J Int Oral Heal.* 2019;11(1):33.
5. Kurniasari SF, Ulfiana E, Efendi F. The effect of sleep hygiene and brain gym on increasing elderly comfort and sleep quality. *Indian J Public Heal Res Dev.*

2018;9(12):589–94.

6. Nakagawa S, Maeda-Iino A, Miyawaki S. Relationships of maxillofacial morphology and malocclusion with handgrip strength in adult women. *Orthod Craniofac Res.* 2019;
7. Sutrisno I, Firmansyah M, Widodo RB, Ardiansyah A, Rahmat MB, Syahid A, et al. Implementation of Backpropagation Neural Network and Extreme Learning Machine of pH Neutralization Prototype. In: *Journal of Physics: Conference Series.* IOP Publishing; 2019. p. 12048.
8. Szabo RM, Slater Jr RR, Farver TB, Stanton DB, Sharman WK. The value of diagnostic testing in carpal tunnel syndrome. *J Hand Surg Am.* 1999;24(4):704–14.
9. Machin A, Hamdan M. Factors Associated with Onset to Hospital Delay among Stroke Patients in the Emergency Department. *Indian J Public Heal Res Dev.* 2018;9(11).
10. Garfinkel MS, Singhal A, Katz WA, Allan DA, Reshetar R, Schumacher Jr HR. Yoga-based intervention for carpal tunnel syndrome: a randomized trial. *Jama.* 1998;280(18):1601–3.
11. Warren DJ, Otieno LS. Carpal tunnel syndrome in patients on intermittent haemodialysis. *Postgrad Med J.* 1975;51(597):450–2.
12. Phalen GS. The Carpal-tunnel Syndrome: Clinical Evaluation of 598 Hands. *Clin Orthop Relat Res.* 1972;83:29–40.
13. Katz JN, Larson MG, Sabra A, Krarup C, Stirrat CR, Sethi R, et al. The carpal tunnel syndrome: diagnostic utility of the history and physical examination findings. *Ann Intern Med.* 1990;112(5):321–7.
14. Katz JN, Simmons BP. Carpal tunnel syndrome. *N Engl J Med.* 2002;346(23):1807–12.
15. Katz JN, Stirrat CR. A self-administered hand diagram for the diagnosis of carpal tunnel

syndrome. *J Hand Surg Am.* 1990;15(2):360-3.

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