International Journal of Biomedical Research
ISSN: 0976-9633 (Online); 2455-0566 (Print)
Journal DOI: https://doi.org/10.7439/ijbr
CODEN: IJBRFA

Original Research Article

Occupational Risk of Upper Extremity Injury due to Extended Fingernails in Clerical Workers

Haitham Juma, Sean Welsh*, Cesar Reis, Haley Reis and Josileide Gaio

Department of Occupational Medicine, Loma Linda University, United States

QR Code

***Correspondence Info:**
Dr. Sean Welsh
Department of Occupational Medicine,
Loma Linda University, United States

***Article History:**
Received: 26/05/2017
Revised: 01/06/2017
Accepted: 01/06/2017
DOI: https://doi.org/10.7439/ijbr.v8i6.4186

Abstract

Twenty-two volunteer clerical workers entered this pilot study. They were screened with regard to inclusion and exclusion criteria, which consisted of nail length and presence or absence of artificial nails. A questionnaire was administered regarding a possible relationship between nail length (whether artificial or not) and extension injury of their hands, wrists, and forearms. The results of this pilot study did not show a statistically positive association. This may have resulted from the choice of the clerical workers and/or low power (given that it was a pilot study). A more diversified multi-location study with more volunteers is recommended to determine if there is any relationship between hand, wrist, or forearm injury and over-sized fingernails in clerical workers.

Keywords: Upper extremity injury; occupational medicine; extended fingernails.

1. Introduction

Several patients presenting to the occupational medicine center presented with extension injuries to the hands, wrists and forearms and were noted to have longer than normal fingernails (both artificial and natural). These workers have jobs that require substantial typing throughout their work day. Upon further investigation, it was clear that individuals with long nails were more inclined to interact with their keyboards in a poor ergonomic fashion. This likely contributed to their injury. The purpose of this pilot study was to determine whether a non-ergonomic posture of the fingers resulting from oversized nails is a contributing factor to hand, wrist, or forearm injury. A preliminary review of the literature did not reveal any published studies evaluating this hypothesis. However, there are several studies on extension injuries that exist.

2. Literature Review

Upper extremity injuries related to work represent a significant percentage of occupational injuries. The prevalence of upper extremity injuries, including carpal tunnel syndrome, ranges from 5-15% [1-3]. This is in contrast to the prevalence of such injuries among the general population, which has been cited to be 1-5% [4-5]. Accordingly, the economic burden of upper extremity injuries in the workplace has significant impact. It has been estimated that the cumulative loss of wages for a patient claiming an industrial carpal tunnel syndrome case is between $45,000 and $89,000 in the six years following post-injury [7]. Altogether, upper extremity injuries, including carpal tunnel syndrome, represent a significant burden to employers and workers' compensation suppliers.

Upper extremity injuries associated with work include epicondylitis, forearm strain, wrist strain, carpal tunnel syndrome, DeQuervain's tenosynovitis, trigger finger, and tendonitis. The pathophysiologic mechanisms behind the majority of these involve repetitive strain and poor ergonomics [8]. Moreover, risk factors for developing a repetitive strain injury of the upper extremity have been reported to include body mass index, gender, diabetes, and rheumatoid arthritis [9]. In particular, both work-related

ergonomic stressors and physical factors were independent risk factors for carpal tunnel syndrome [9]. While much research has been devoted to the ergonomic component to upper extremity injuries, there are fewer studies evaluating physical factors other than general points such as weight, body habitus, and presence of other medical conditions. In particular, less attention has been paid to how cosmetic features such as long natural or prosthetic fingernails impact the risk of developing upper extremity injuries. One study evaluated the effects of key switch designs and finger posture on the kinematic forces employed during typing. It was found that joint torques and stiffness parameters differed significantly across key switch designs and finger postures [10]. Fingernail length has the potential to affect finger posture in clerical workers using computer keyboards notwithstanding other ergonomic considerations. This study aims to delineate the relationship, if any, between fingernail length and risk of upper extremity injury among clerical workers.

3. Objectives

The objective of this study was to determine if there is any statistically significant relationship between long fingernails in workers doing clerical jobs (keyboarding) and extension injuries of the hand, wrist and forearm.

Based on firsthand clinical experience, it was our hypothesis that fingernails which extend beyond the tips of the fingers, whether natural or artificial, can increase the risk of work related hand/forearm injury because of the poorer ergonomics that result when interacting with the computer keyboard.

This study had four principle objectives. The first objective was to assess the prevalence of work related hand and forearm injuries related to "long" fingernails (natural or artificial) among female clerical workers. The second objective was to investigate the ergonomic position of the hands and fingers while at work in the same group of workers. The third objective was to assess the association between long fingernails and extension hand/forearm injuries among the same group of clerical workers who spend half or more of the working day on typing activities. The fourth objective was to determine the etiology of, and suggestions for the prevention of the extension injury.

4. Methods

This is a cross-sectional pilot study. Questionnaires were distributed to all volunteer female employees who do keyboarding as their major job activity. The data was collected, analyzed, and categorized by keyboarding hours, level of pain and length of employment under current conditions. Further, they were categorized by nail length: (1) long natural nails; (2) long artificial nails; and (3) normal length natural nails. The length of the study was four months.

4.1 Subject Recruitment & Inclusion Criteria

The target population is adult females between the ages of 18-65 years old who do keyboarding at least 50% of their working day. The questionnaires were written in English and distributed electronically and manually. Recruitment was primarily through email. Basic informed consent was obtained from the study participants. Women aged 18-65 who do keyboarding at least 50% of their working day, with or without extended fingernails, were included in the study. Pregnant patients, as well as those with a history of previous hand and forearm injury, trauma, deformity, surgeries on hands, and/or severe arthritis were excluded from the study.

5. Results

Frequencies and percentages of symptom characteristics among patients were divided into wrist pain, lower arm pain, thumb pain, elbow pain, and numbness (Table 1). 40.9-63.64% of the individuals who participated did not report having any of the symptoms listed. 40.9% of the workers reported past wrist pain and numbness. The most common intermittent type of pain was reported as either wrist pain or numbness (13.6%). Nail type did not make a difference for the reported symptoms. In other words, whether the person had long, short, natural, or artificial nails did not change the frequency of each symptom (Table 2). Individuals who reported having long artificial nails also reported the highest median pain level (Table 3). Normal nail length was associated with the lowest median pain level. The most common nail type among the clerical employees was artificial long nails (Figure 1). The majority of the clerical employees were found to be right hand dominant (Figure 2).

Table 1. Frequencies and percentages of symptom characteristics among participants

Variables	Constantly	Off and On	None/past	Never
Wrist pain	0	3 (13.6%)	9 (40.9%)	10 (45.5%)
Lower arm pain	0	2 (9.09%)	6 (27.27%)	14 (63.64%)
Thumb pain	1 (4.8%)	3 (13.3%)	3 (19%)	13 (61.9%)
Elbow pain	0	1 (4.5%)	8 (36.4%)	13 (59.1%)
Numbness	1 (4.5%)	3 (13.6%)	9 (40.9%)	9 (40.9%)

Table 2. Test Statistics showing chi-square results for testing differences between nail type groups and each symptom assessed

	WRIST	LO_ARM	ELBOW	NUMB	SYMPT	PAIN	HAND	THUMB
Chi-Square	3.597	0.394	0.673	0.229	5.084	2.490	0.788	2.725
df	2	2	2	2	2	2	2	2
P value	0.166	0.821	0.714	0.892	0.079	0.288	0.675	0.256

b. Grouping Variable: NAIL
p> 0.05, Not statistically significant.

Table 3. Frequency and median (IQR) pain level by type of nails

Nail Type	N (%)	Median (IQR) pain level
Normal length nail	4 (18)	0.5 (0 – 1)
Long artificial nail	12 (55)	3.5 (0.5 - 5.5)
Long natural nail	6 (27)	2 (0 - 6)

Figure 1: Prevalence of participants by nail type

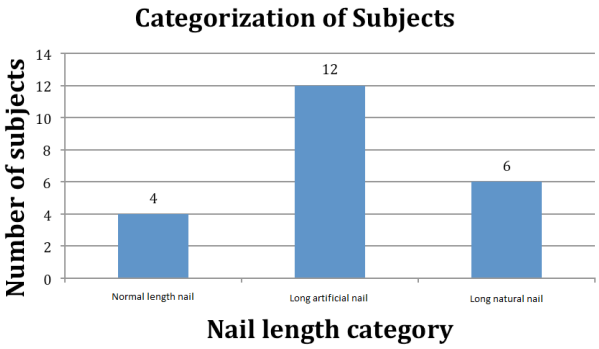
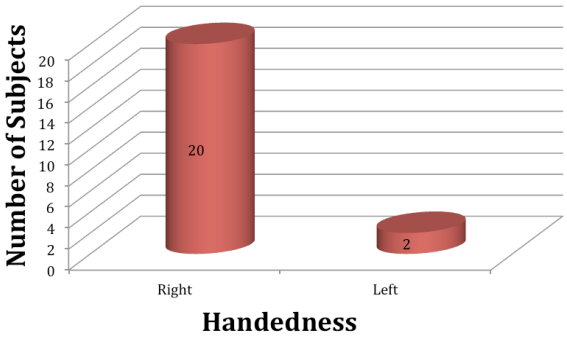


Figure 2: Prevalence of dominant hand among participants



6. Discussion

This pilot study did not show a statistically significant relationship between long nails and hand, wrist and forearm injury. All the candidates with long finger nails (artificial and natural) did use the keyboard in an ergonomic way. This pilot study was conducted on twenty-two volunteers from two different sites. Subject were adult female clerical workers who engaged in keyboarding and computer work more than half their work day. Although no statistically significant relationship was found between fingernail length and symptoms of upper extremity injury, this study opens the door for further investigation and discussion regarding an important aspect of clinical occupational medicine and ergonomics. The burden of such injuries remains a significant concern for insurance carriers and employers. The implications are far reaching and touch upon aspects of corporate productivity and the nation's economy. Moreover, we recommend that occupational medicine clinics that manage such injuries pay special attention to patients' fingernail length, and include such factors when offering therapies and counseling regarding prevention. In conclusion, this topic deserves further attention and more formalized investigation so as to provide better insight into the complex interplay of personal and physical factors in the context of repetitive physical exposures in the workplace.

7. Conclusion

No statistically significant relationship between fingernail extension and upper extremity injuries appears to exist in the occupational setting based on this preliminary investigation. However, further research may be appropriate given the firsthand clinical experience of many occupational physicians in this area.

References

[1]. Franzblau A, Werner RA, Valle J, Johnston E. Workplace surveillance for carpal tunnel syndrome: A comparison of methods. *J Occup Rehabil* 1993; 3(1): 1–14.

[2]. Homan MM, Franzblau A, Werner RA, Albers JW, Armstrong TJ, Bromberg MB. Agreement between symptom surveys, physical examination procedures and electrodiagnostic findings for carpal tunnel syndrome. *Scand J Work Environ Health* 1999; 25(2): 115–124.

[3]. Franklin GM, Haug J, Heyer N, Checkoway H, Peck N. Occupational carpal tunnel syndrome in Washington state, 1984–1988. *Am J Pub Health* 1991; 81: 741–746.

[4]. Atroshi I, Gummesson C, Johnsson R, Ornstein E, Ranstam J, Rosen I. Prevalence of carpal tunnel syndrome in a general Population. *JAMA* 1999; 282(2): 153–158.

[5]. De Krom MC, Kester AD, Knipschild PG, Spaans F. Risk factors for carpal tunnel syndrome. *Am J Epid* 1990; 132(6): 1102–1110.

[6]. Manktelow RT, Binhammer P, Tomat LR, Bril V, Szalai JP. Carpal tunnel syndrome: cross-sectional and outcome study in Ontario workers. *J Hand Surg* 2004; 29A:307–317.

[7]. Foley M, Silverstein B, Polissar N. The economic burden of carpal tunnel syndrome: long term earnings of CTS claimants in Washington State. *Am J Ind Med* 2007; 50:155–172.

[8]. Bernard B, ed. Musculoskeletal disorders and workplace factors. Cincinnati, OH: National Institute for Occupational Health and Safety, US Department of Health and Human Services, 1997.

[9]. Gell N, Werner RA, Franzblau A, Ulin SS, Armstrong TJ. A Longitudinal Study of Industrial and Clerical Workers: Incidence of Carpal Tunnel Syndrome and Assessment of Risk Factors. *Journal of Occupational Rehabilitation*, 2005; 15(1): 47-55.

[10]. Jindrich DL, Balakrishnan AD, Dennerlein JT. Effects of keyswitch design and finger posture on finger joint kinematics and dynamics during tapping on computer keyswitches. *Clin Biomech (Bristol, Avon)*. 2004 Jul; 19(6):600-8.