Journal of Pharmaceutical Research International

33(48A): 41-45, 2021; Article no.JPRI.75135
ISSN: 2456-9119
(Past name: British Journal of Pharmaceutical Research, Past ISSN: 2231-2919, NLM ID: 101631759)

Association of Carpal Tunnel Syndrome in Diabetes Patient

K. Jaganath[1], Arun Kumar[1], Sathish Kumar[1], K. Nithish Raj[2*] and P. Sanmuga Sundaram[2]

[1]Department of Orthopaedics, Saveetha Medical College and Hospital, Thandalam, Chennai, Tamil Nadu, India.
[2]Saveetha Medical College and Hospital, Thandalam, Chennai, Tamil Nadu, India.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/JPRI/2021/v33i48A33210
Editor(s):
(1) Dr. S. Prabhu, Sri Venkateswara College of Engineering, India.
Reviewers:
(1) C. Alice Jayapradha, Maris Stella College, India.
(2) Mr. I. K. Keerthirathne, University of Peradeniya, Sri Lanka.
Complete Peer review History: https://www.sdiarticle4.com/review-history/75135

Original Research Article

Received 05 August 2021
Accepted 11 October 2021
Published 05 November 2021

ABSTRACT

Objective: The objective of our study was to determine Prevalence of carpel tunnel syndrome among diabetic patients and the significant association between carpel tunnel syndrome and diabetes mellitus.
Materials and Methods: Study was conducted on 250 patients at Saveetha medical college and hospital. Study was conducted after getting proper ISE approval. Subjects were selected according to inclusion and exclusive criteria's. For every study subject after getting consent demographic information, past medical history of Diabetes such as type, duration, any associated complication (diabetic neuropathy, retinopathy, etc.), medication, and lifestyle modification were obtained via a self-reporting structured questionnaire and confirmed by the subject's medical record. For every subject, clinical tests such as Tinel's test and Phalen test were performed and nerve conduction study was used for diagnose carpal tunnel syndrome among the subjects who were showing positive clinical test. All data collected were entered into the standardized database and statistic analysis was calculated.

**Corresponding author: E-mail: k.nithraj@gmail.com;*

Results: After analysing the data collected on association between carpel tunnel syndrome and a diabetes patient.
Conclusion: It implies that there is a significant relationship between carpal tunnel syndrome and diabetes patients.

Keywords: Carpel tunnel syndrome; Tinel's test; Phalen's test; nerve conductive study.

1. INTRODUCTION

Carpal tunnel syndrome is defined as the entrapment of the median nerve in the carpal tunnel of the wrist. The onset of the disease usually starts as tingling and numbness or pain in the median nerve area and eventually leads to weakness and impaired hand function [1,2]. It is one of the most common peripheral neuropathies [3]. The incident and prevalence vary from 0.125%-1% and 5-16% depending upon the criteria used for the diagnosis [4].

In majority of patients, the exact cause and pathogenesis where not exactly known. Carpal tunnel syndrome and diabetic poly-neuropathy are common condition in patients with type 1 and type 2 diabetic mellitus [4]. Experimental studies have shown a higher incidence of CTS in workers who are involved in high force and repetitive work compared to others [5,6,7,8].

Diabetic mellitus is a chronic metabolic disorder of carbohydrate, fat, and protein which result in state of hyperglycaemia which may lead to micro and/or macrovascular end organ damage. There are many types of diabetic but most common being type 1(Insulin dependent) and type 2(Non-Insulin dependent) diabetic of which latter is most commonly seen among people. Both of these types were found to be associated with or considered major risk factor for many of peripheral neuropathies [9].

Currently, the electro-diagnostic test is considered as Gold standard for diagnosis of carpal tunnel syndrome [10,11,12]. So far researchers through their studies have identified several factors that may contribute to the development of carpal tunnel syndrome which includes work condition [13,14], health condition, pregnancy, menopause [15,16], and personal factors such as female sex, hereditary, age, tobacco, caffeine and alcohol [17]. But the exact cause of carpal tunnel syndrome is unknown. In this study, we are trying to find out the prevalence of carpal tunnel syndrome among diabetic patients.

2. MATERIALS AND METHODS

The study was duly approved by The Institutional Ethics Committee, Saveetha medical college and hospital.

2.1 Study Design and Duration

A prospective observational study was conducted between Jan 2021 to May 2021 in the department of Orthopaedics, Saveetha medical college and hospital, Thandalam, Chennai, Tamil Nadu.

2.2 Inclusion Criteria

- Both male and female with confirmed diabetes, type 1 or type 2 attending diabetes OPD

2.3 Exclusion Criteria

- Patients below 13 years of age and above 60 years.
- patients having secondary diabetes
- Patients who are suffering from hypothyroidism, rheumatoid arthritis, joint deformities, fractures in the lower forearm, history of septic arthritis, occupational stress and other causes causing peripheral neuropathy including familial causes.

2.4 Data Collection

- For every subject, clinical tests such as Tinel's test and Phalen test were done
- Nerve conduction study was performed for patient who was positive for above mentioned tests for diagnosing carpal tunnel syndrome.
- All data collected were entered into the standardized database and statistic analysis was calculated.

2.5 Statistic Analysis

After collecting data from the patients, they are entered into the standardized database. The prevalence of carpel tunnel syndrome among diabetes patients, in the general population, is calculated using.

Assuming the Null hypothesis is true, which states that there is no association between carpel tunnel syndrome and a diabetes patient, chi-square (x^2) was calculated, The chi-square statistics 12.5334. The P-value is <0.0004. The test is significant at <0.05.

The chi-square statistic with Yates correction is 11.5392. The *p*-value is .000681. Significant at $p < 0.05$.

It implies that there is a significant associating carpel tunnel syndrome and a diabetes patient.

2.6 Chi-square (x^2) Calculation, [Table 2]

Assuming the Null hypothesis is true, which states that there is no association between carpel tunnel syndrome and a diabetes patient, chi-square (x^2) was calculated,

The chi-square statistic is 20.2021. The *p*-value is < 0.00001. Significant at $p < .05$. The chi-square statistic with Yates correction is 17.6181.

The *p*-value is < 0.00001. Significant at $p < .05$. Since the P-value <0.05, the Null hypothesis is rejected. It implies that there is a significant associating carpel tunnel syndrome and a diabetes patient with peripheral neuropathy.

3. RESULTS

This study was conducted to find out the prevalence of carpal tunnel syndrome among diabetes patients. In this study, we have included 250 study subjects out of which 83% of the population was above 45 years old. The prevalence of carpal tunnel syndrome among diabetes patients was 37.3% (table 1) out of which 22.2% was seen among female patients and rest, 15.1% was among male patients. Also in this study, we have shown that there is a significant association between carpal tunnel syndrome and diabetes patient with peripheral neuropathy and the incidence of CTS increases significantly after 5 years of diabetes.

4. DISCUSSION

After collection of data and statistic analysis it, we have found that the prevalence of carpal tunnel syndrome among diabetes is 37.3% and there is significant association between carpel tunnel syndrome among diabetes patients. The exact cause of carpal tunnel syndrome was not yet clearly understood but many studies have been undertaken to determine the prevalence of carpal tunnel syndrome [18,19]. The prevalence of carpal tunnel syndrome among the general population was about 2.7 per cent [16]. Many studies have shown that the prevalence of carpal tunnel syndrome is much higher in diabetes patients than that of the general population which shows that diabetes are an important risk factor for carpal tunnel syndrome [20,21,22]. There are also some studies that states there is no significant increase prevalence of carpel tunnel syndrome among diabetes patients.

As with most other short term studies, in this study also has some limitations such as, in our study we have only included a certain group of the population that may not represent the entire general population. In spite of these limitations in this study we have calculated the prevalence of CTS among diabetes patients, also we have shown that the incidence of CTS is more among diabetes patient with peripheral neuropathy and it increases with the duration of diabetes mellitus.

Table 1. Clinical signs of CTS for Diabetes and non-Diabetes patients

	Those with clinically positive signs of CTS	Those without clinically positive signs of CTS	Total
Diabetes patients	42	67	109
Non-diabetes patient	26	115	141
Total	68	182	250

Prevalence of CTS understudy group = 27.2%.
Prevalence of CTS among Diabetes patients = 37.3%.
Chi-square (x^2) calculation, [Table 1]

Table 2. Clinical signs of CTS for Diabetes and non-Diabetes patients with neuropathy

	Those with clinically positive signs of CTS	Those without clinically positive signs of CTS	Total
Diabetes patient with neuropathy	12	10	22
Diabetes without neuropathy	10	77	87
Total	22	87	109

Table 3. Clinical signs of CTS among diabetes patent for 5 years

	Those with clinically positive signs of CTS	Without clinically positive signs of CTS	Total
Less than 5 years	10	25	45
More than 5 years	51	23	80
Total	61	48	109

Incident of CTS among diabetes patent for less than 5 years – 22.22%
Incident of CTS among diabetes patent for more than 5 years – 63.75%

5. CONCLUSION

After analysing the data's collected we have show in this study the prevalence of carpel tunnel syndrome was 37.3% among diabetic. We also shown that there is significant association between carpel tunnel syndrome in diabetes patients, also we have shown that the incidence of CTS is more among diabetes patient with peripheral neuropathy and it increases with the duration of diabetes mellitus.

CONSENT

As per international standard or university standard, patients' written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

The study was duly approved by The Institutional Ethics Committee, Saveetha medical college and hospital.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Omer Jr GE. Median nerve compression at the wrist. Hand clinics. 1992;8(2):317-24.
2. Stetson DS, Silverstein BA, Keyserling WM, Wolfe RA, Albers JW. Hypothesis relating cumulative trauma to the median nerve with sub-clinical nerve conduction deficits. American Journal of Industrial Medicine. 1995;27(2):309-10.
3. Camps C, Lahiri A, Lim AY. Compression of the Ulnar Nerve. InElective Hand Surgery: Rheumatological and Degenerative Conditions, Nerve Compression Syndromes. 2011;8:409-427. World Scientific.
4. Tanaka S, Wild DK, Seligman PJ, Behrens V, Cameron L, Putz-Anderson V. The US prevalence of self-reported carpal tunnel syndrome: 1988 National Health Interview Survey data. American Journal of Public Health. 1994;84(11):1846-8.
5. Silverstein BA, Fine LJ, Armstrong TJ. Occupational factors and carpal tunnel syndrome. American journal of industrial medicine. 1987;11(3):343-58.
6. Blanc PD, Faucett J, Kennedy JJ, Cisternas M, Yelin E. Self-reported carpal tunnel syndrome: Predictors of work disability from the National Health Interview Survey Occupational Health Supplement. American journal of industrial medicine. 1996;30(3):362-8.
7. Chiang HC, Chen SS, Yu HS, Ko YC. The occurrence of carpal tunnel syndrome in frozen food factory employees. Gaoxiong yi xue ke xue za zhi= The Kaohsiung Journal of Medical Sciences. 1990;6(2):73-80.
8. Shim JM. The effect of carpal tunnel changes on smartphone users. Journal of Physical Therapy Science. 2012;24(12): 1251-3.
9. Ferry S, Pritchard T, Keenan J, Croft P, Silman AJ. Estimating the prevalence of

delayed median nerve conduction in the general population. British journal of rheumatology. 1998;37(6):630-5.
10. Amirhasani S, Mousavizadeh A, Ghaffari P, Khosravi Z, Khademi A. Prevalence of carpal tunnel syndrome in women of Boyerahmad Township. J Adv Med Biomed Res. 2012;20(79):103-11.
11. De Krom MC, Knipschild PG, Kester AD, Thijs CT, Boekkooi PF, Spaans F. Carpal tunnel syndrome: prevalence in the general population. Journal of Clinical Epidemiology. 1992;45(4):373-6.
12. Santoso B, Masduchi RH, Subadi I, Ien S. The effect of low level laser therapy in carpal tunnel syndrome patients. Folia Medica Indonesiana. 2007;43(4):235.
13. Roquelaure Y, Ha C, Pelier-Cady MC, Nicolas G, Descatha A, Leclerc A, Raimbeau G, Goldberg M, Imbernon E. Work increases the incidence of carpal tunnel syndrome in the general population. Muscle & nerve. 2008;37(4):477-82.
14. Weintraub MI, Cole SP. A randomized controlled trial of the effects of a combination of static and dynamic magnetic fields on carpal tunnel syndrome. Pain Medicine. 2008;9(5):493-504.
15. Al-Rousan T, Sparks JA, Pettinger M, Chlebowski R, Manson JE, Kauntiz AM, Wallace R. Menopausal hormone therapy and the incidence of carpal tunnel syndrome in postmenopausal women: Findings from the Women's Health Initiative. PloS One. 2018;13(12): e0207509.
16. 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):153-8.
17. Nathan PA, Keniston RC, Lockwood RS, Meadows KD. Tobacco, caffeine, alcohol, and carpal tunnel syndrome in American industry: a cross-sectional study of 1464 workers. Journal of occupational and environmental medicine. 1996;38(3):290-8.
18. Gülşen İ, Ak H, Evcılı G, Balbaloglu Ö, Sösüncü E. A retrospective comparison of conventional versus transverse mini-incision technique for carpal tunnel release. International Scholarly Research Notices. 2013;2013.
19. Prick JJ, Blaauw G, Vredeveld JW, Oosterloo SJ. Results of carpal tunnel release. European journal of neurology. 2003;10(6):733-6.
20. Dyck PJ, Kratz KM, Karnes JL, Litchy WJ, Klein R, Pach JM, Wilson DM, O'brien PC, Melton L. The prevalence by staged severity of various types of diabetic neuropathy, retinopathy, and nephropathy in a population-based cohort: the Rochester Diabetic Neuropathy Study. Neurology. 1993;43(4):817.
21. Stevens JC, Sun S, Beard CM, O'fallon WM, Kurland LT. Carpal tunnel syndrome in Rochester, Minnesota, 1961 to 1980. Neurology. 1988;38(1):134.
22. Viikari-Juntura E, Silverstein B. Role of physical load factors in carpal tunnel syndrome. Scandinavian journal of work, environment & health. 1999;163-85.

Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle4.com/review-history/75135