

ORIGINAL ARTICLE

Prevalence of Carpal Tunnel Syndrome and Associated Hand Function Disability Among Diabetic Homemakers: A Cross-Sectional Study

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ABSTRACT

Carpal Tunnel Syndrome (CTS) is common peripheral nerve entrapment disorders, and its prevalence increases in individuals with long-standing diabetes mellitus. Women, particularly homemakers are more vulnerable due to repetitive hand intensive household activities that may aggravate median nerve compression. However, limited evidence exists regarding CTS prevalence specifically among diabetic homemakers. The objective of the study is to find prevalence of Carpal Tunnel Syndrome in Diabetic Homemakers, using Graham's CTS-6 criteria. To find associated hand function disability among Diabetic Homemakers, using BCTQ. A cross-sectional study was conducted among 180 diabetic homemakers at diabetic clinics in and around Pune. Participants were screened using Graham's CTS-6 diagnostic criteria for CTS, followed by assessment of symptom severity and functional impairment using Boston Carpal Tunnel Questionnaire (BCTQ). Statistical analyses were carried out using SPSS, among the 180 participants, 28.9% screened positive for CTS. Most CTS-positive individuals exhibited mild to moderate symptom severity, while severe cases were less frequent. Functional evaluation revealed that 83% of CTS-positive participants experienced some degree of disability. The right hand was most commonly affected, aligning with dominance distribution in the sample. Carpal Tunnel Syndrome (CTS) is notably prevalent among diabetic homemakers, often leading to significant difficulties in daily functioning. The combined impact of diabetes-related nerve damage and repetitive household tasks increases their vulnerability. Early detection, ergonomic education, and preventive rehabilitation are crucial to reduce risk and enhance quality of life in this population.

Keywords: Diabetes Mellitus, Carpal Tunnel Syndrome, Hand Function Disability, Homemakers

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INTRODUCTION

Carpal tunnel syndrome (CTS) is the condition that arises when the median nerve becomes compressed, and it is the most prevalent peripheral nerve entrapment disorder across the globe. [1] In individuals with a normal wrist posture, intracarpal tunnel pressure generally remains between 3–5 mmHg. Due to repetitive flexion extension this pressure elevates to approximately 20–30 mmHg, blood flow to the median nerve becomes compromised causing carpal tunnel syndrome. [2] A housewife is usually described as a woman whose primary role is to manage the household task [3] Women engage in a wide range of daily activities, particularly in the kitchen, and the continuous nature of this work often contributes to physical health issues, including musculoskeletal disorders. On average, women in India devote approximately 3.2 hours per day to housework. [3] Domestic work, often spans the entire day and imposes significant physical, emotional, and intellectual demands. In India, more than 60% of women are predominantly involved in domestic work.[4] Several studies have demonstrated that women are more prone to musculoskeletal disorders (MSDs) than men, largely because they spend more time engaged in household activities. This prolonged exposure contributes to disability over time, causing CTS as a major

health issue among women. [5] Diabetes Mellitus (DM) is a group of metabolic disorders characterised by persistently raised blood sugar levels.[6] People with diabetes frequently experience various upper-limb musculoskeletal complications, which often result in pain, restricted movement, discomfort, and a reduced quality of life. [7] Diabetes Mellitus (DM) is also a significant contributor to the occurrence of carpal tunnel syndrome (CTS), with diabetic individuals showing a several-fold higher risk of developing the condition. [8] In chronic hyperglycemia sorbitol synthesis increase as excess glucose shift to an alternative aldose reductase-driven polyol pathway as sorbitol cannot move easily across cell membranes, it accumulates and causes neuronal swelling, reduces Na/K ATPase activity, leading to sodium accumulation and axonal edema. Persistent high blood sugar further promotes the formation of advanced glycation end-products (AGEs), contributing to nerve degeneration [9][8]. Diabetic nerves become more vulnerable to compression due to early metabolic and vascular changes. In the carpal tunnel, wrist flexion or extension can raise pressure 8–10 times, and traction forces reduce intraneural circulation. These factors damage the myelin sheath, impair axons, and injure connective tissues, creating a cycle of swelling, hypoxia, and worsening carpal tunnel syndrome (CTS) [10] Musculoskeletal issues are found in approximately 36–75% of diabetic patients.[6] Several studies identify DM as a significant risk factor for CTS. One study reported CTS in 11% of those with Type 1 DM, 12% with Type 2 DM, and 8% of non-diabetic individuals, with women being affected more often. [11][12] The association between CTS and diabetics is not well understood.[13] Long term diabetics lead to nerve damage and musculoskeletal issues which contribute to hand disability, homemakers are at risk due to repetitive hand and wrist movement, increasing the chance of CTS and hand function impairment. Diabetes is one of the common risk factors for Carpal Tunnel Syndrome. Commonly the Type 2 diabetic. As research on diabetic homemakers is limited, this study aims to identify the prevalence of CTS and related hand function impairment in this population.

MATERIAL AND METHODS

Ethical approval was obtained from the committee. A cross-sectional study was conducted among 180 diabetic homemakers attending diabetic clinics in and around Pune. Women with Type 2 diabetes for at least 5 years, performing manual household work for more than 2 hours per day or at least 5 days a week for the past 2 years were included. Those with conditions like rheumatoid arthritis, hypothyroidism, forearm fractures, wrist or nerve injuries, osteoarthritis, pregnancy, prior CTS surgery, cervical radiculopathy, brachial plexopathy, CNS lesions, spinal diseases, or neuromuscular disorders were excluded.

PROCEDURE:

Written consent was taken from all participants. Eligible homemakers with ≥ 5 years of Type 2 diabetes were assessed for CTS using the CTS-6 criteria and then evaluated for hand function disability through the Boston Carpal Tunnel Syndrome Questionnaire (BCTQ).

OUTCOME MEASURES:

Boston Carpal Tunnel Syndrome Questionnaire (BCTQ) is a patient-based outcome measure that has been developed specifically for patients with CTS. It has two distinct scales. Symptom Severity Scale (SSS), and the Functional Status Scale (FSS). Higher scores on either scale indicate more severe symptoms or greater functional limitation.

RESULT

The present cross section was conducted among 180 diabetic homemakers to find the prevalence of carpal tunnel syndrome and associated hand function disability among diabetic homemakers. The data was collected and statistically analysed using SPSS, Excel and G Power.

Table 1: Prevalence of Carpal Tunnel Syndrome Among Diabetic Homemakers Based on CTS-6 score

CTS Score		
Positive/Negative	Count	Percent (%)
Negative	128	71.1%
Positive	52	28.9%
Total	180	100.0%

Out of the total 180 participants, 52 individuals screened positive for CTS, yielding a point prevalence of 28.9%. This indicates that more than one in every four diabetic homemakers in this study were found to have clinical signs and symptoms consistent with median nerve compression at the wrist.

Table 2: Distribution of Boston Carpal Tunnel Questionnaire (BCTQ) Symptom Scores Among

BC	TQ Symptoms	
Severity	Count	Percent (%)
Asymptomatic (11)	93	51.7%
Mild (12-22)	53	29.4%
Moderate (22-23)	28	15.6%
Severe (34-44)	6	3.3%
Total	180	100.0%

The data shows that 93 participants (51.7%) were classified as asymptomatic, reporting minimal to no symptoms. However, a significant 48.3% individuals reported experiencing symptoms ranging from mild to severe.

Table 3: Distribution of Boston Carpal Tunnel Questionnaire (BCTQ) Function Status Scores Among Diabetic Homemakers

	BCTQ Function	
Function status	Count	Percent (%)
Asymptomatic (0-8)	113	62.8%
Mild (9-16)	40	22.2%
Moderate (17-24)	20	11.1%
Severe (25-32)	7	3.9%
Total	180	100.0%

The findings reveal that functional impairment of the hand was common among CTS-positive diabetic homemakers. Out of 53 participants, the majority experienced mild (39.6%) or moderate (32.1%) functional limitation, while 11.3% had severe limitation. Only 17% of participants reported no functional limitation despite being CTS-positive. This indicates that CTS not only affects sensory function but also has a noticeable impact on daily hand-related tasks, which are particularly important for homemakers who rely heavily on repetitive hand movements during household activities.

Table 4: Distribution of CTS-Positive Participants by Hand Function Status, CTS Severity, and Side Affected

Variable	Category	Count	Percentage (%)
Hand Function Status	No Functional Limitation	9	17%
	Moderate Functional Limitation	17	32.1%
	Mild Functional Limitation	21	39.6%
	Severe Functional Limitation	6	11.3%
	Total	53	100%
CTS Severity	Mild	21	39.6%
	Moderate	26	49.1%
	Severe	6	11.3%
	Total	53	100%
Side Affected	Bilateral	9	17%
	Left	4	7.5%
	Right	40	75.5%
	Total	53	100%

When classified according to severity of CTS symptoms, nearly half of the affected participants (49.1%) fell into the moderate category, followed by 39.6% with mild symptoms and 11.3% with severe CTS. This suggests that most cases were identified at a mild to moderate stage, likely due to gradual symptom progression rather than acute onset.

Analysis of laterality showed that CTS was predominantly right-sided (75.5%), with 17% bilateral and 7.5% left-sided involvement, the right-hand predominance can be attributed to hand dominance, as most participants were right-hand dominant. Repetitive use of the dominant hand during domestic tasks such as cooking, cleaning, and lifting objects may contribute to increased pressure on the median nerve, leading to higher CTS occurrence on that side. The presence of bilateral CTS in nearly one-fifth of the participants indicates that some homemakers experience symmetrical neuropathic changes, likely reflecting systemic diabetic neuropathy rather than isolated mechanical strain.

DISCUSSION

The present cross-sectional study, reported 28.9% of prevalence this prevalence is notably higher than that reported in the general population (3.7- 5.8%). Further, homemakers performing household task which involve repetitive forceful activity increase carpal tunnel pressure and cause microtrauma of the median nerve. Chammas et al. in his study reported that repetitive wrist flexion and extension increase the pressure of carpal tunnel, predisposing individual to nerve compression.[14] In diabetes, metabolic and vascular changes render the peripheral nerve more susceptible to compression. When repetitive tasks are performed, it increases carpal tunnel pressure and reduce the intraneural microcirculation, damage the myelin sheath and the axonal function, causes nerve edema ultimately leading to carpal tunnel syndrome.[10]

This finding suggest that diabetes and repetitive hand use are important contributing factor in the development of carpal tunnel syndrome nearly one-third of diabetic homemakers experience median nerve compression at the wrist.

Our study is consistent with the previous studies showing a strong association between diabetes and Carpal Tunnel Syndrome (CTS). Sanjari et al. reported that diabetic patients had nearly twice the odds of developing CTS compared to non-diabetics.[15] Further Islam MR, Rahman et, in his study found that it was observed that 26.0% of patients with DPN had CTS in study.[16] Akulwar et al, after doing electrophysiological study in diabetic patients, concluded in their study that 24.53% cases had CTS. [17] CTS arises from compression of the median nerve within the carpal tunnel and is commonly observed among individuals performing frequent, strenuous manual tasks.[18]

Further our study analysis revealed that hand function disability was common among CTS-positive participants. Approximately 82.7% of those with CTS experienced some degree of functional limitation, ranging from mild (39.6%) to severe (11.3%). Carpal Tunnel Syndrome (CTS) is widely recognized to impair hand function. Gundmi et al., in a meta-analysis of diabetic patients, reported significant reductions in grip and pinch strength, accompanied by loss of hand function.[19] Another study reported that, the decrease in hand function status in hyperglycemia is due to muscle protein break down and increase in

systemic inflammation which in turn decrease use of muscle energy and lead to muscle atrophy.[20] These findings reflect CTS significantly affects homemaking tasks such as cooking, cleaning, and lifting. On the BCTQ Symptom Scale, nearly half of participants reported mild to severe symptoms, while 37.2% noted functional limitations. These results show that even early CTS can disrupt daily household and self-care activities. Khired Mathew et al. further observed that women performing hand-intensive tasks, such as homemaking or manual labour, not making them more prone to median nerve damage at the wrist.[5]

CONCLUSION

The study found that Carpal Tunnel Syndrome is prevalent among diabetic homemakers, 28.9% showing positive CTS findings. A significant number of affected individuals also experience mild to moderate hand function disability. Right hand dominance and repetitive household task contributed to symptom severity. Overall, diabetes combined with manual homemaking work increases the risk of CTS and functional impairment. Longer diabetes duration and repetitive manual household task emerged as the notable contributors.

LIMITATIONS

Electromyogram/nerve conduction velocity (EMG/NCV) testing was not done which could confirm the diagnosis of CTS in uncertain cases and could also help to localize the site of nerve entrapment. CTS

symptoms often overlap with diabetic neuropathy, making it hard to distinguish the source of hand dysfunction.

FUTUTRE SCOPE:

Study should focus on early quick assessment and intervention of CTS in diabetic homemaker. Further study should focus on developing diagnostic criteria to differentiate between CTS and diabetic neuropathy.

Rehabilitation protocol for improve hand function and prevent CTS.

REFERENCES

1. Feng, B., Chen, K. (2021). 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*, 21:57.
2. Ghasemi-rad, M., Nosair, E. (2014). A handy review of carpal tunnel syndrome: From anatomy to diagnosis and treatment. *World Journal of Radiology*, 6(6):284–300.
3. Kaur, C., Kaur, G., Bindra, S., Singh, P.P. (2024). Prevalence and risk factors of musculoskeletal disorders among housewives: A survey study. *International Journal of Science and Healthcare Research*, 9(2):391–399.
4. Mondal, J., Bhattacharjee, T. (2022). Prevalence of work-related musculoskeletal disorders among rural housewives in Central India. *Asian Pacific Journal of Health Sciences*, 9(2):183–187.
5. Mathew, A.E. (2021). A clinical and neurophysiological analysis of idiopathic carpal tunnel syndrome with respect to gender and occupation. *Annals of Indian Academy of Neurology*, 24(6):865–872.
6. Bekele, A., Abele, G. (2022). Prevalence and associated factors of carpal tunnel syndrome among diabetic patients in Arba Minch General Hospital, Southwest Ethiopia. *Diabetes & Metabolic Syndrome*, 15:983–993.
7. Kiani, J., Goharifar, H. (2014). Prevalence and risk factors of five most common upper extremity disorders in diabetics. *Journal of Research in Health Sciences*, 14(1):93–96.
8. Erol, K., Topalagu, U.S. (2022). Frequency of carpal tunnel syndrome and hand dysfunction in prediabetes: A cross-sectional controlled study. *Turkish Journal of Physical Medicine and Rehabilitation*, 68(1):62–69.
9. Zimmerman, M., Gottsäter, A., Dahlin, L.B. (2022). Carpal tunnel syndrome and diabetes: A comprehensive review. *Journal of Clinical Medicine*, 11(6):1674.
10. Rota, E., Morelli, N. (2016). Entrapment neuropathies in diabetes mellitus. *World Journal of Diabetes*, 7(17):342–353.
11. Han, H.Y., Kim, H.M. (2016). Clinical findings of asymptomatic carpal tunnel syndrome in patients with diabetes mellitus. *Annals of Rehabilitation Medicine*, 40(3):489–495.
12. Sozen, T., Basaran, N.C. (2018). Musculoskeletal problems in diabetes mellitus. *European Journal of Rheumatology*, 5(4):258–265.
13. Abuharb, A.I., Almughira, A.I. (2024). Prevalence, awareness, and management of carpal tunnel syndrome among diabetic patients. *Cureus*, 16(2):e53683.
14. Chammas, M., Boretto, J. (2014). Carpal tunnel syndrome – Part I (anatomy, physiology, etiology and diagnosis). *Revista Brasileira de Ortopedia*, 49(5):429–436.
15. Sanjari, M. (2024). Investigating the association between diabetes and carpal tunnel syndrome: A systematic review and meta-analysis. *PLOS ONE*, 19(3):e0299442.
16. Rahman, T.B. (2018). Frequency of carpal tunnel syndrome in patients having diabetes mellitus with neuropathy in a tertiary care hospital of Bangladesh. *Journal Name*, 8(3).
17. Akulwar, A.S. (2013). Clinical and electrophysiological evaluation of carpal tunnel syndrome in diabetes mellitus to assess association of age, gender and duration of diabetes on median neuropathy at wrist. *The Health Agenda Journal*, 71–76.
18. Dong, D. (2021). Prevalence of carpal tunnel syndrome in long-term type 2 diabetes mellitus. *Journal of Diabetes Research*, 2021.
19. Erol, K. (2022). Frequency of carpal tunnel syndrome and hand dysfunction in prediabetes: A cross-sectional controlled study. *Turkish Journal of Physical Medicine and Rehabilitation*, 68(1):62–69.
20. Paul, A. (2024). Functional impairment of hand in persons with type 2 diabetes mellitus: A narrative review. *International Journal of Health Sciences and Research*, 14(11).

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