

Carpal Tunnel Syndrome: Prevalence and Association with Occupation among Presenting Cases in a Tertiary Care Hospital in North East Bihar

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Abstract

Background: Carpal tunnel syndrome (CTS) is a disorder that causes pain and weakness in the hand and wrist. It usually develops from compression of median nerve when it passes deep to the flexor retinaculum through the carpal tunnel in the wrist. It is characterized by the presence of both sensory and motor presenting features in the peripheral distribution of the nerve. A number of etiological factors have been suggested for the onset of CTS including repetitive prolonged hand activities, recurrent exposure to vibration, extremes of temperatures and mechanical stress. Evolution of the pathophysiology of CTS is not clearly understood, but it appears that the median nerve is compressed when the tissues of the hand surrounding the nerve swell in response to trauma or inflammation. It is often very difficult to determine the precise cause of onset of CTS. Older people are at a higher risk due to degenerative neuropathy.

Aim: The aim of this study was to observe the prevalence of CTS and its association with the occupation.

Materials and Methods: Patients attending the outdoor clinics of Katihar Medical College and presenting with complaints of tingling, burning, numbness, and pain in the hands were referred to the Department of Orthopedics for further clinical examination, diagnosis and management. Cases were categorized into two groups. The first group comprised persons engaged in heavy manual work and the second group consisted of persons engaged in light manual work.

Result: Prevalence of CTS was higher in the first group as CTS is usually triggered in cases with occupation consisting of prolonged heavy manual work.

Conclusion: CTS has a direct relation with occupation and some medical conditions may increase the susceptibility towards developing CTS. Early diagnosis, rest and conservative approach are preferred for the management of CTS.

Key words: Carpal tunnel syndrome, Compression, Median nerve, Occupation

INTRODUCTION

The flexor retinaculum is a strong fibrous band which acts as a tie-beam and converts the anterior concave surface of

the carpus into an osseo-fibrous carpal tunnel. Through this tunnel pass the digital flexor tendons and the median nerve. The median nerve is the chief nerve of sensation in the hand as it supplies the palmar surfaces of the digits the most common employed for feeling and for precision grip. In addition, it is motor to the thenar eminence musculature. The median nerve enters the hand by passing deep to the flexor retinaculum. The median nerve may be compressed in the carpal tunnel due to continued swelling of the synovial sheaths. This is known as the carpal tunnel syndrome (CTS) and is manifested by weakness and wasting of thenar muscles with the loss of power of opposition, and loss

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of cutaneous sensations of the palmar surface involving lateral three and a half of the digits.¹ Upon emerging from the carpal tunnel, the median nerve ramifies. A muscular branch innervates the thenar muscles. Remaining branches terminate in the palmar digital nerves for the thumb, index, middle, and ring fingers. A communicating branch usually links the nerve to the ulnar nerve. The median nerve is prone to compression in the carpal tunnel.² The CTS provides an instructive demonstration of the distribution of the median nerve. Only by knowing its anatomy, it is possible to distinguish this condition from other syndromes that cause paresthesias and muscle atrophy in the hand. The condition is more common in women and often there is no identifiable cause. The syndrome may be precipitated by arthritis of the wrist or intercarpal joints, dislocation of the lunate, tenosynovitis, tumor or acromegaly. Irritation of the nerve may cause a tingling sensation and twitching of the thenar muscles. Due to nerve paralysis, the thenar muscles atrophy and there is anesthesia in the sensory distribution area of the nerve. Movements of fingers and thumb are not seriously impaired. Division of the flexor retinaculum at the wrist relieves symptoms and signs of the compression syndrome. In long-standing cases, nerve regeneration may not take place.³ CTS is a common problem with an estimated annual incidence rate of 0.5-5.1 per 1000.⁴ Certain occupations involving wrist activities materially increase the risk of CTS. This syndrome can also produce nocturnal symptoms including hand or arm pain and numbness. CTS was first reported 1947 by Brian among six cases of CTS in repetitive work.⁵ It is the most common compressive neuropathy of the upper limb and an increasingly recognized cause of work disability.⁶ CTS belongs to a ménage of disorders called cumulative trauma disorders (CTDs) which are caused by the repetitive, sustained, or forceful motions occurring over time, compromising the integrity or functioning of the soft tissues producing inflammation of the tendons or compression of the peripheral nerves.⁷ Higher prevalence rates have been observed in certain groups with repetitive hand movements especially flexion at the wrist joint and extension at the shoulder and elbow joints. Diagnosis of CTS is based on characteristic complaint confirmed preferably by abnormal electrophysiological tests.⁸ In the United States, occupational CTS is a major cause of loss of working days for workers and carpal tunnel release is the most common preferred operation on the hand, accounting for approximately two hundred, thousand procedures each year incurring direct medical costs in excess of one billion dollars annually. More rigorous study of treatment for CTS will be enhanced by better measures of outcome.⁹ CTS is reported to be more common in women.¹⁰ No tests are yet available to target the causative factor.

MATERIALS AND METHODS

A cross-sectional study which evaluated the prevalence of CTS and its association with occupation among the general population was undertaken in a tertiary care center in North East Bihar. Ethical committee clearance was obtained prior to the study. 80 cases of CTS which attended the outdoor Orthopedic Clinic of Katihar Medical College were observed in this study. Cases were categorized into two Groups A and B. Group A consisted of cases engaged in heavy manual work and Group B consisted of cases engaged in light manual work.

Inclusion Criteria

1. Adult males
2. Adult females
3. Cases with intact surgical anatomy of wrist and joint
4. Cases with no past history of nerve injury or pre-existing diseases.

Exclusion Criteria

1. Geriatric males
2. Geriatric females
3. Cases presenting with fracture repair of distal radius, distal ulna or any of the carpus
4. Cases presenting with hormonal conditions and arthritis.

RESULTS

All 80 cases were adults and no pediatric case of CTS was observed. There were 60 cases in Group A of which all were persons involved in occupations concerned with heavy manual work. Twenty cases observed in Group B were involved in occupations concerned with light manual work. In Group A out of 60 presenting cases the occupations of the cases are as follows; drill machine operators (22), construction laborers (16), drivers (12), automotive garage mechanics (5), butchers (3), and railway station porters (2). In Group B out of 20 presenting cases the occupations of the cases are as follows; chefs (6), computer operators (4), tailors (3), gardeners (3), office clerks (2), billboard painters (2). Out of 80 presenting cases, irrespective of group the prevalence among males and females were 53 out of 80 (66.25%) and 27 out of 80 (33.75%) respectively (Table 1-4).

DISCUSSION

CTS is considered an inflammatory disorder caused by repetitive stress, physical injury or a medical condition. CTS is the most common clinical entity seen by the

health surgeons with some reporting that the condition affects up to 10% of the general population.¹¹ It is often very difficult to determine the precise cause. The most important problem associated with this occupational exposure is the complexity of exposure assessment at the workplace. No tests are yet available to target the causative factor. Except in patients with certain underlying diseases, the biological mechanisms leading to CTS are unknown. Some studies suggest that more than half of CTS cases are associated with workplace factors, though there is no strong evidence of cause and effect relationship. CTS is felt to be induced or aggravated by any process that compresses the median nerve as it passes through the narrow carpal canal. Repetitive flexion and extension of the wrist and grasping motions of the hand are thought to repeatedly compress the median nerve between the tendons and carpal bones, leading to nerve injury. Such recurring movements at the wrist joint also make a person prone to develop tendonitis and tenosynovitis. Repetitive heavy manual work or light manual work both can trigger CTS. In this study, we observed 80 cases of CTS which were associated with occupation (Table 1). Prevalence of CTS in relation with occupation and among different genders has been illustrated in Figures 1 and 2. Distribution of cases of CTS among heavy and light workers has been represented in Figures 3 and 4. Heavy manual workers are more prone to developing onset of CTS. As pregnancy was an exclusion criteria in this study we observed that males were more vulnerable to CTS (Table 2). With relation to the occupation in Group A, we observed drill machine workers are more susceptible to CTS due to prolonged use of heavy vibration tools (Table 3). Prolonged vibration exposure resulting in CTS has been documented by Leclerc *et al.*¹² In Group B, we observed that chefs are more vulnerable to CTS due to repetitive and prolonged use of the wrist joint in all stages of cooking, being seconded by professional computer operators (Table 4). Studies now strongly suggest that CTS is primarily associated with medical conditions such as diabetes mellitus, osteoarthritis, hypothyroidism and rheumatoid arthritis. Prevalence of CTS in the general population ranges from 1% to 25% which is comparatively very low.¹³ This syndrome also tends to occur in people with certain genetic or risk factors including obesity, smoking and alcohol abuse. In pregnant women, hormonal fluctuations may trigger CTS due to fluid retention. CTS is typically worse at night and with repetitive activity.¹⁴ Pain or muscle weakness may prevent a person from doing important day-to-day tasks and also affect a person's hobbies. Individuals with CTS are unable to oppose the thumb and have difficulty buttoning a shirt or blouse as well as gripping things such as a comb. As the condition progresses sensory changes radiate to the forearm and axilla.¹⁵ Workers may be compelled to opt for another occupation. It is advisable to begin early conservative

Table 1: Number of cases in each group

Number of presenting cases	Group A	Group B
n=80	60	20

Prevalence among cases in Group A is more than that of Group B

Table 2: Prevalence of CTS among males and females observed in this study

Number of presenting cases	Prevalence among males (%)	Prevalence among females (%)
n=80	53 (66.25)	27 (33.75)

Group has not been considered in this table. CTS: Carpal tunnel syndrome

Table 3: Occupation specific distribution of cases in Group A

Group A (n=60)	Occupation
22 cases	Drill machine operators
16 cases	Construction labourers
12 cases	Drivers
5 cases	Automotive garage workers
3 cases	Butchers
2 cases	Railway station porters

Table 4: Occupation specific distribution of cases in Group B

Group B (n=20)	Occupation
6 cases	Chefs
4 cases	Computer operators
3 cases	Tailors
3 cases	Gardeners
2 cases	Office clerks
2 cases	Billboard painters

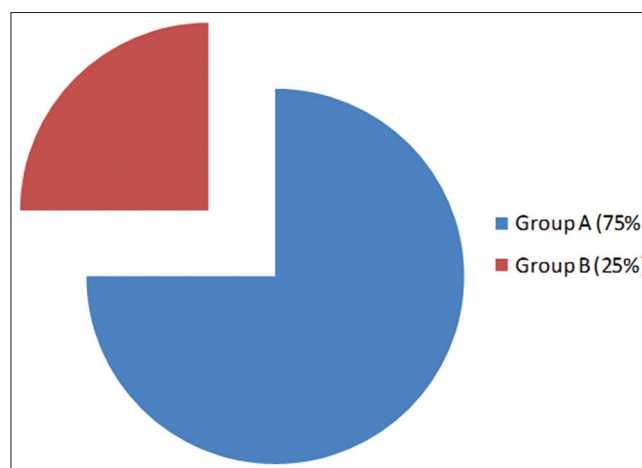


Figure 1: Prevalence of carpal tunnel syndrome in relation with nature of occupation. Group A contains 60/80 (75%) cases and Group B 20/80 (25%) cases observed in this study

treatment to avoid surgical intervention. The most common type of conservative treatment is corticosteroid injections

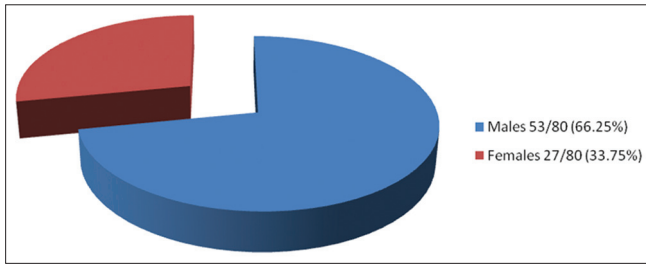


Figure 2: Prevalence of carpal tunnel syndrome (CTS) among males and females. Group to which the male or female belongs has not been considered in this figure. Result shows that prevalence of CTS among males is higher than that among women

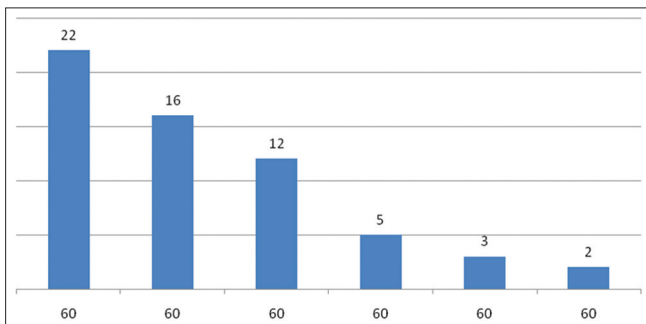


Figure 3: Distribution of cases presenting with carpal tunnel syndrome in Group A

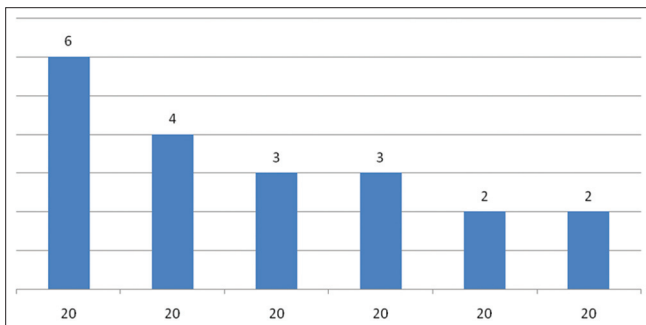


Figure 4: Distribution of cases presenting with carpal tunnel syndrome in Group B

that are quite successful in mild cases of CTS. In all the cases we encountered, rest and physiotherapy was advised with considerable results. In a follow-up, we observed that the inflammation of adjacent tissues had subsided, and compression symptoms of the median nerve were substantially relieved.

CONCLUSION

Anatomical knowledge of the carpal canal and clinical knowledge of CTS are both crucial for assessing the prognosis of median nerve entrapment neuropathy. CTS exhibits female predilection due to smaller wrists and lower carpal tunnel volumes. Heavy manual workers using heavy-duty vibration tools are vulnerable to CTS. Experts have suggested that people who are physically fit have a lower risk for developing CTS. Regular regimen involving resistance training strengthens the muscles of the girdles and the limbs.

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