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**Key Words**
CTS (Carpel tunnel syndrome), NCS (nerve conduction studies), AAEM (american association of electro diagnostic medicine)

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# A Clinical Study on Carpel Tunnel Syndrome in A Tertiary Care Centre in South India

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**Abstract**
Carpal tunnel syndrome (CTS) is the most common entrapment neuropathy presenting in the neurology clinics. It is due to the compression of the median nerve in the carpal tunnel. It will produce a wide variety of symptoms and signs. This is a retrospective study using the discharge tickets of CTS Patients admitted in neurology ward and out patient's tickets of CTS patients attending in the neurology OPD from August 2019 (01/08/2019 to July 2020 (31/07/2020) at Government medical college, Thrissur. Carpal tunnel syndrome was more common among the females with a female to male ratio of 3.1:1.Majority of the patients belonged to 40-60 age group. Most of the patient had bilateral symptoms and the dominant hand was involved in most of them irrespective of whether it is bilateral or unilateral involvement. Obesity, Diabetes and hypothyroidism were found as common risk factors associated with carpel tunnel syndrome. Phalens tests and Tinel's test were positive in majority of our patients. In our study group, no correlation was observed between the severity of the symptoms and the electro physiological grading of the disease.

## INTRODUCTION

Carpel tunnel syndrome (CTS) is the most common entrapment neuropathy encountered by the neurologist. It is due to the compression of the median nerve in the carpel tunnel[1]. It Manifests as various symptoms like paresthesias and numbness. There are many risk Factors for this condition like environmental and medical conditions like diabetics, pregnancy, Hypothyroidism. This condition has got a female preponderance[2].

**A Brief Review:** Carpal tunnel syndrome is a medical condition in which the median nerve is compressed at the wrist producing various symptoms like numbness and pain. It is the most frequent compression neuropathy found in neurophysiological labs. It is more common in women (506 per 1000000 /year) than in men (139 per 1000/years) (2). It can occur at any age but has a peak incidence of around the age 50[3].

Although most case of CTS are idiopathic, there are still many medical risk factors connected with CTS. Medical risk factors can be divided into extrinsic and intrinsic. Extrinsic factors increase the volume within the carpal tunnel and include factors like pregnancy, menopause, obesity, renal failure, hypothyroidism, use of oral contraceptives and congestive cardiac failure. Intrinsic factors within the nerve increasing the occupied volume inside the tunnel include lumps and tumor like swellings. Neuropathic factors include conditions like diabetes, alcoholism, vitamin deficiency or exposure to toxins[4].

The compression of the median nerve produces the signs and symptoms of CTS. The condition is usually bilateral, the dominant hand seems to be more severely affected. Numbness and paresthesias in the first three fingers are the classical symptoms of CTS. Typically the symptoms present at night and often awakens thee patient from sleep. The other symptoms include numbness, tingling and burning in the median nerve region. In severe instances, weakness in activities such as turning keys while using the hands, opening door knobs or jar lids. Conventional tests for the diagnosis of CTS are Tinels test, Phalens test and median nerve compression test. In the presence of aggrevation of symptoms, these tests are considered to be positive[5].

The most accurate test is nerve conduction studies and EMG. It has a sensitivity of 49-84%and specificity of 95%. Nerve conduction studies (NCS) provide an objective assessment of the physiological condition of the median nerve. Other alternatives diagnosis that should be considered included cervical radiculopathy, peripheral neuropathy, arthritis of the wrist/metacarpal joints, taenosynovitis and ulnar neuropathy[6].

Carpel Tunnel Syndrome was diagnosed if any of the following were present in the nerve conduction studies (criteria by U K Misra and J Kalitha)[7].

Distal median motor latency >4.4ms. (2) Difference between distal motor latency of median and ulnar nerves>1.1ms. (3) Difference between distal sensory latency of median and ulnar nerves>0.2ms (4). (A). Difference between median and ulnar sensory latencies on stimulating fourth digit and recording from wrist at equal distance >0.2ms

Difference between median and radial sensory latencies on stimulating thumb and recording from wrist at equal distance >0.4 ms. (5). Palm wrist conduction: Difference between median and ulnar sensory latencies across 8cm >0.4ms.(6). Inching technique: Latency jump >0.2ms/cm.(7). Comparison of lumbrical (median nerve) and interosseous (ulnar) latencies greater than or equal to 0.6ms.

**Patients were Classified Based on NCS Studies as per the AAEM (American Association of Electrodiagnostic Medicine) Criteria**[8]: The treatment of CTS depends on the severity. In mild cases the injection of corticosteroids and application of wrist splints are beneficial. In severe cases we may have to release the median nerve by surgery. Females have a higher incidents of CTS. Pregnancy and lactation are increased risk factors and increase in intensity of symptoms is in future pregnancy. Recurrence of CTS after surgery is also common.

**Objectives:**

- To study the, gender distribution, age of onset and clinical presentation of patient with Carpal Tunnel Syndrome admitted in neurology department of a tertiary care hospital In Kerala coming for follow up in outpatients.

## MATERIALS AND METHODS

**Study Design:** Cross sectional study-Record based

**Study Setting**: GMC, Department of Neurology Thrissur

Study participants. This is a retrospective study using the discharge tickets of CTS Patients admitted in neurology ward and out patient's tickets of CTS patients attending in the neurology OPD from August 2019 (01/08/2019 to July 2020 (31/07/2020).

**Inclusion Criteria:** All the patients in the study are diagnosed on clinical features of CTS and on nerve conduction study features.

**Exclusion Criteria**: Cases of Cervical Radiculopathy, Peripheral Neuropathy, Cervical Rib, Ulnar Neuropathy,

Arthritis of wrist and Metacarpels who do not have the NCS features of CTS are excluded.

**Study Period:** 3 months

**Simple Size:** All cases during the period 01/08/2018-31/07/ 2021 are included. Data collection tool-structured proforma

**Methodology:** Data collection Record based Analysis. Secondary data of patients with CTS will be collected using a structured proforma. Data on clinical presentation, age of onset, gender, progression and clinical test performed and Nerve conduction tests employed will be collected and analysed.

Variables included Age of onset, Gender, Presentation (signs and symptoms), Severity and Duration of symptoms and clinical tests.

**Data Analysis:** Data entered in MS excel and amp, analyzed using appropriate software like Epi info. Qualitative data was analyzed using proportions. They were tabulated and amp, discussed.

**Ethical Consideration:** This is a record based study. It was started after getting the approval from the research and ethical committee. Confidentiality of data will be maintained.

## RESULTS AND DISCUSSIONS

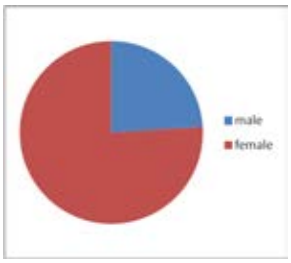


Fig. 1: Gender ratio

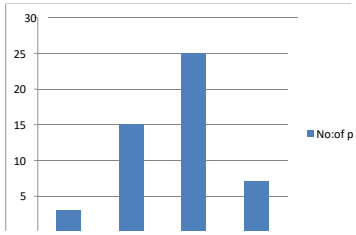


Fig .2: Age wise distribution of patients

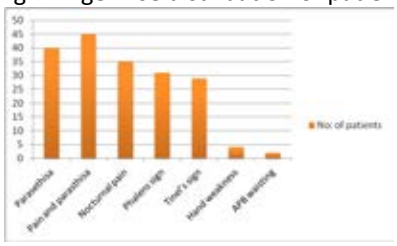


Fig. 3: Clinical Signs and symptoms

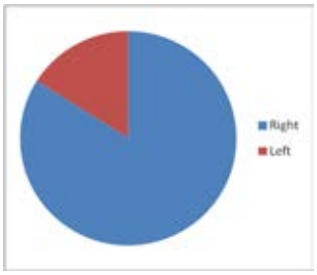


Fig. 4: Handedness of patients

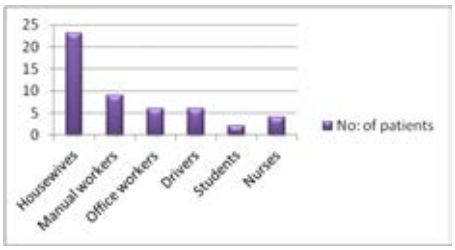


Fig. 5: Occupation of Patients

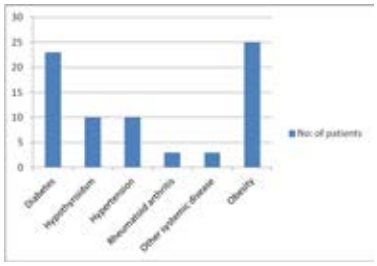


Fig. 6: Incidence of Systemic Disease in Study Group

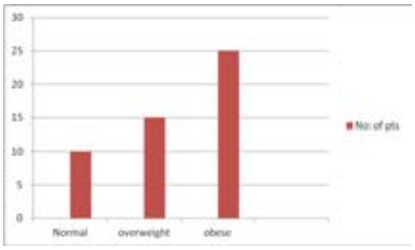


Fig.7: Body Mass Index of Patients

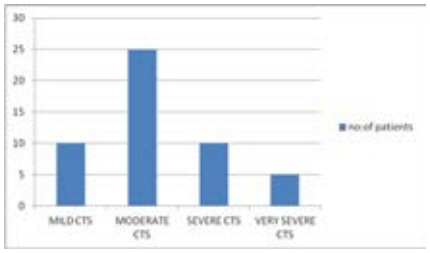


Fig.8: Grading of CTS as per NCS Studies

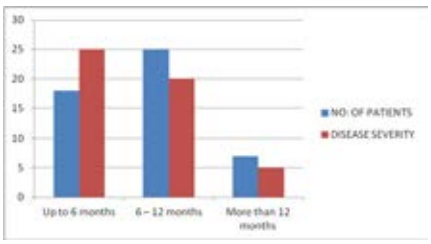


Fig. 9: Correlation between duration of symptoms and severity of symptoms clinically

**Table No: 1**

| Symptoms and signs | No: of patients and percentage |
|---|---|
| Parasethisa | 40 pts (80%) |
| Pain and parasthisa | 45 pts (90%) |
| Nocturnal pain | 35 pts (70%) |
| Phalens sign | 31 pts (62%) |
| Tinel's sign | 29 pts (58%) |
| Hand weakness | 4 pts (8%) |
| APB waisting | 2 pts (4%) |

**Table no:2**

| Mild CTS | Mild carpal tunnel syndrome (CTS) is characterized by delayed sensory peak latency and decreasing sensory amplitude. |
|---|---|
| Moderate CTS | Moderate CTS Abnormal median sensory interaction with addition of motor distal latency prolongation |
| Severe CTS | Severe carpal tunnel syndrome (CTS) involves a significant prolongation of median nerve motor and sensory distal latency, along with a reduction in both sensory and motor amplitude. |
| Very severe CTS | In cases of very severe carpal tunnel syndrome (CTS), there are no detectable sensory or motor responses from the median nerve |

**Table 3**

| Duration | NO: Of patients |
|---|---|
| Up to 6 months | 18 patients (36%) |
| 6-12 months | 25 patients (50%) |
| More than 12 months | 7 patients (14%) |

**Table 4**

| Duration | Disease severity as per subjevtive | symptoms |
|---|---|---|
| No: of patients | 18 | 25(Mild +Moderate) |
| Up to 6 months | 25 | 20(Moderate+ Severe) |
| 6 – 12 months | 7 | 5(Very severe) |
| More than 12 months | | |

**Gender:** In our study there were 50 patients, out of which 38 were females and 12 males. Shown in figure no.1

**Presentation:** Most common symptoms were paresthesias present in 40 patients, followed by pain and paraes thesia and nocturnal pain. Phalens sign and Tinel's sign was positive in 31 patients and 29 patients respectively. Hand weakness was present in 4 patients and Abductor pollicis Brevis waisting was present in 2 patients. Shown in figure No. 3 and Table No. 1

Handedness and Unilateral and bilateral presentation-Symptoms were present in both hands in 35 patients and in one hand only in 50 patients. Dominant hander's more involved in 42 patients while non-dominant hand was more involved in 8 patients irrespective of whether presentation was bilateral or unilateral. Shown in figure no . 4

**Occupation of Patients:** A detailed occupational history of each patient of in our study was taken. 23 patients were housewives followed by manual workers (9 patients),Office workers (6patients), Drivers (6 patients), Students (2 patients), Nurses (4 patients) shown in figure no.5

Patient's records were scrutinised and the blood routine, blood sugar, Liver function test, renal function test, Thyroid function test and other relevant investigations were analyzed.

Obesity, Diabetes, Hypertension, Hypothyroidism and Rheumatoid arthritis were the common risk factors noted in our study. There were 23 (46%)patients with Diabetes 10 (20%) patients with Hypothyroidism, 10 (20%) patients with Hypertension, 3(6%) patients with Rheumatoid Arthritis, 25 (50%) patients with obesity and 3(6%) patients with Other systemic diseases. Shown in figure no.6

Data on each of these factors were studied in detailed and further analysed. Based on the BMI, patients were classified as normal, over weight and obese as shown in figure no.7

Patients were diagnosed have carpel tunnel syndrome based on the crtiteria laid down by U K Misra and J Kalitha et al.7 Depending upon the NCS finding, they were further classified as mild, moderate, severe and very severe shown in figure no.8

Patients were classified based on NCS Studies as per the AAEM Criteria, which is given in table no. 2 below8

**Duration of Symptoms:** Patients were classified as per the duration of symptoms and shown in table no. 3

A Correlation between duration of symptoms and clinical disease severity as experience by the patient and the NCS findings are shown in table no. 4. Also shown in figure no.9

Gender-In our study, the female to male ratio was 3.1:1.In the study by Salah El- 2 the female male ratio was found to be 4:1.IN another study by Vishali Kotwal Et al9,there is again a female preponderance with a female to male ration of 3:1.

**Age:** The maximum number of patients were found in the 40-60years group in our study,25 patients (50%).These findings are consistent with the studies of Vishali Kotwal Et al 9 and Goyal[10].

**Presentation:** Symptoms were present in both hands in 35(70%) patients and in one hand only in 15 (30%) patients. Dominant hander's more involved in 42 patients while non-dominant hand was more involved in 8 patients in our study. Pawel Dec and Andrzej Zyluk et al have reported bilateral symptoms in 22-87% in their study[11] and the study by Malibary *et al* also found that bilateral involvement was more common[12].Irrespective of the bilateral or Unilateral symptoms, dominant hand was involved more in the studies of vishali kotwal et al9 and in the study by salah el Magzoub M2

**Presentation**: Most common symptoms were paresthesias present in 40 patients, followed by pain and paraesthesia and nocturnal pain. Phalens sign and Tinel sign was positive in 31 patients and 29 patients respectively. Hand weakness was present in 4 patients and Abductor pollicis Brevis waisting was present in 2 patients involved in 84% of the patients. Similar presentations are seen in the studies of Vishali Kotwal[9]

**Signs: Phalens test:** in this test, the patient is asked to flex the wrist and maintain it in that position for 60 seconds. If the patient experiences pain or paraesthesia in the distribution of the median nerve, it is considered as a positive test. In our study group, 31 patients (62%) had a positive phalen sign. The sensitivity of Phalens test is reported to be between 67% - 83%[13,14,15]

**Tinels's test:** It is done by tapping over the volar surface of the wrist, if the patient has paraesthesia in the figures innervated by the median nerve, it is considered as a positive test. In our study, it was positive in 29patients (58%).The specificity of the tinels test is reported to be between 48%-73% in the studies of Kuhlman et al ,Naranjo et al and Amirfeyz R et al.The specificity of the test is between 30%-94% in the same studies[13,14,15] Occupation: In our study, majority of the patients were housewives,23 (46%) .An increased prevalence of CTS was reported among housewives in the study of Vishali Kotwal[9]

**Risk factors:** There were 23 (46%)patients with Diabetes 10(20%) patients with Hypothyroidism ,10(20%) patients with Hypertension,3(6%) patients with Rheumatoid Arthritis ,25(50%) patients with obesity and 3(6%) patients with Other systemic diseases.

**Obesity:** In our study, most of the patients were overweight or obese (40 patients) Sharief et al has described that there is a relation between increased BMI and CTS. (Ref no: 16).In obese patients, increased fat accumulation occurs within the carpel tunnel and also there is an increased hydrostatic pressure inside the carpel tunnel. This goes in accordance with the the studies of Becker[17].

**Diabetes:** 23 patients were diabetic, studies by Wiberg et al has shown a strong correlation of diabetes with CTS.(Ref no: 18 ).Same observation has been made by Becker[17].

**Hypothyroidism**: 10 patients had elevated TSH in our study, hypothyroidism has been shown to be one of the causes or risk factors for CTS.In uncontrolled hypothyroidism, there will be deposition of mucopolysaccrorides on the median nerves.A swelling may also develop in the synovial membranes around the tendons in the carpel tunnel. This has been described by Rempel[19]

**Electro Physiological Findings**: In our study, 10 patients were having mild CTS, 25 patients had moderate CTS, 10 had severe CTS AND 5 had very severe CTS as per the AAEM criteria.

**Correlation of Clinical Symptoms with NCS Findings.** The duration of symptoms were compared with the clinical severity as per the NCS studies. 18 patients had very severe symptoms clinically and on the basis of NCS, they were categorized as mild and moderate cases but their duration of symptoms was up to 6 months. Another 25 patients had moderate symptoms and they were classified as moderate to severe based on the NCS studies, but their duration of symptoms in these cases was 6-12 months. Another 5 patients had mild symptoms and were classifies as very severe by NCS studies. But, the duration of symptoms was above 12 months and they had mild symptoms clinically.

In our study, more patients are having severe symptoms than detected by nerve conduction studies. So the severity of complaints experienced by the patients were not matching with neither the severity detected by nerve conduction studies nor with the duration of symptoms. In the study by Leighton Chan[20] also there was no statistically significant correlation between the symptom severity of the patients and the

electrophysiological studies. Firosh Khan *et al* has described in his study that the symptoms were more in concordance with psychological factors than NCS findings[20]. Itsubo et al and Longstaff et al have also found similar findings in their studies[22,23].

Truini *et al* has forwarded many postulations for this difference in correlation[24]. In the early course of the CTS, the thin myelinated A delta fibers and the unmyelinated C fibers are involved first. These fibers carry the pain sensation and their dysfunction is not pickup in the nerve conduction studies. The thick myelinated A beta fibers are involved only in the late stages of the disease. The dysfunction of the fibers will produce abnormalities in the nerve conduction studies. Another thing is that the patient who is not accustomed to pain and other sensory symptoms may complain of severe pain and other dysfunction in the early part of the disease, but as the disease progresses he becomes tolerates these symptoms in a much better way. Nunez et al has described that the painful symptoms of CTS are dependent on the general mood and psychological status of the patient[25].

## CONCLUSION

Carpel tunnel syndrome is more common among females. Most of the patients belonged to the 20-40 age group. Most of the patients had bilateral symptoms. Symptoms were more pronounced in the dominant hand, irrespective of whether the disease was unilateral or bilateral. Phalens sign and Tinel's sign were found positive in a significant number of our patients. Most of the patients in our study were obese or overweight. Diabetes and hypothyroidism were found as substantial risk factors in our study group. There was no correlation between the severity of the symptoms experienced by the patients and the electrophysiological severity grading of the disease.

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