

## Carpal Tunnel Syndrome: A cross - Sectional Study in 928 Patients in Iraq

Hikmet kadum Abbas (FICMS)

### Abstract

**Background:** Carpal tunnel syndrome is caused by entrapment of the median nerve and results in pain, tingling and numbness in the wrist and hand. It is a common condition in general practice.

**Objectives:** This study was done to determine the epidemiological and clinical features of CTS.

**Methods** A cross-sectional study was carried out on Carpal tunnel syndrome [CTS] cases diagnosed over a 14 years period, from May 1998 to May 2012 by the researcher. All data regarding the age at presentation, gender, pregnancy, hypertension, DM, salty food, response to conservative treatment, response to surgical treatment, a total number of 928 cases were included in this study.

**Results;** Among the 928 CTS patients; there were (0.107%) below 15 years,( 25.64%) from 15-30 years, (50.75%) from 31-45 years, (20.68%) from 46-60 years, and (2.80%) above 60. According to gender distribution, there were (0.969%) male,( 99.03%) female. In this study there were (13.27%) pregnant,( 86.72%) not pregnant, (5.92%) hypertensive,( 94.07%) not hypertensive, (8.40 %) diabetic,( 91.59%) not diabetic, (44.40%) eating salty food, (55.60%) not eating salty food .According to response to treatment, (58.72%) respond to conservative treatment,( 41.27%) not respond to conservative treatment, (94.51%) good response to surgical treatment,( 5.48%) not respond to surgical treatment.

**Conclusions:** This study showed

1. The predominant age of patients [females] 31-45 years.
2. The ratio of female /male is far higher than in other places of the world.
3. The prevalence of pregnant women with CTS is less than other studies.
4. There is some statistical significant association between CTS and consuming salty food.
5. Surgical treatment is highly successful.

**Keywords:** Carpal tunnel syndrome, Median nerve, Entrapment neuropathy.

---

Orthopedic Unit/ College of Medicine / Wasit University/ Wasit/ Iraq.

## الخلاصة

**الخلفية:** متلازمة النفق الرسغي مصطلح يطلق على حالة تصيب العصب الاوسط اثناء دخوله الرسغ مما يؤدي الى ظهور الم وتتمل وخطر في اليد وهي حالة شائعة.

**الاهداف:** دراسته وبأئيه المتلازمة عند المرضى في العراق.

**طريقه البحث:** دراسته مقطعية على حالات جمعت خلال ١٤ سنة بلغ عددها ٩٢٨ حاله وتم دراسته المتغيرات التاليه: العمر و الجنس، الحمل، ارتفاع ضغط الدم، ملح الطعام، الاستجابيه للعلاج التحفظي ، الاستجابيه للعلاج الجراحي.

**النتائج:** من بين ٩٢٨ حاله درست تبين ان ٥٠,٧٥% بعمر ٣١-٤٥ سنة بينما ٢٠,٦٨% من ٤٦-٦٠ سنة ونادر الحدوث في الاعمار اقل من ١٥ واكثر من ٦٠، نسبة اصابه النساء الى الرجال ٩٩ الى ١. عدد المصابات اثناء الحمل ١٣,٢٧%، المصابات مع ارتفاع الضغط ٦%، داء السكر ٩%، ٤٤,٤٠% يتناولون نسبة عاليه من ملح الطعام، ٥٨,٧٢% استجابو للعلاج التحفظي، ٩٤,٥% استجابو بصوره جيده للعلاج الجراحي.

### الاستنتاجات:

- ١- نسبة الاصابه عند النساء اعلى بكثير من الرجال مقارنة بالبحوث الاخرى.
- ٢- اعلى نسبة اصابة عند النساء في الثلاثينات حتى منتصف الاربعينات.
- ٣- نسبة الاصابة عند الحوامل اقل مما موجود في البحوث الاخرى.
- ٤- هنالك علاقة احصائية مؤكدة عن زيادة الاصابات وتناول ملح الطعام بكثرة.
- ٥- العلاج الجراحي له نسبة نجاح عالي.

## Introduction

Carpal tunnel syndrome (CTS) is an entrapment median nerve neuropathy.

**Pathophysiology:** is not completely understood but can be considered as:

- Compression of the median nerve traveling through the carpal tunnel [1].
- The National Center for Biotechnology Information and highly cited older literature say the most common cause of CTS is typing and repetitive industrial work [2]
- More recent research by Lozano-Calderón has cited genetics as a larger factor than use and has encouraged caution in ascribing causality [3]

**Causes:** Most cases of CTS are of unknown causes, or idiopathic [4]. Carpal Tunnel Syndrome can be associated with any condition that causes pressure on the median nerve at the wrist. Some common conditions that can lead to CTS include obesity, oral contraceptives, hypothyroidism, arthritis, diabetes, and trauma and pregnancy [5]. Carpal tunnel is also a feature of a form of Charcot-Marie-Tooth syndrome type 1 called hereditary neuropathy with liability to pressure palsies [6]

**Epidemiology:** Carpal tunnel syndrome can affect anyone. In the U.S., roughly 1 out of 20 people will suffer from the effects of carpal tunnel syndrome. Caucasians have the highest risk of CTS compared with other races such as non-white South Africans. Women suffer more from CTS than men with a ratio of 3:1 between the ages of 45–60 years. Only 10% of reported cases of CTS are younger than 30 years. Increasing age is a risk factor. CTS is also common in pregnancy [7]. The incidence and prevalence varies, 0.125% - 1% and 5-16 %, [8]. It is a condition of middle-aged individuals and affects females more often than males. Since its first description by Phalen in the 1950s, several studies have reported marked female preponderance and a peak incidence around 55 to 60 years, [9]. In the first population based study, Stevens *et al* noted that the mean age at diagnosis was 50 years for men and 51 years for women [9]. In a recent surveillance study from Canterbury and Huddersfield, UK, Bland *et al* reported an annual incidence of 139.4 cases per 100,000 in females and 67.2 cases per 100,000 in males, with a female to male ratio of 2.07(10).

Carpal tunnel syndrome is common in pregnant women 20-23%. It is commonly diagnosed during the third trimester of pregnancy and it is often bilateral. In the majority of patients symptoms will resolve either spontaneously or will respond to conservative treatment after delivery [9, 10, and 11].

CTS has often been reported to occur secondarily to diabetes as one of its neuropathic complications, [12]

**Signs and symptoms:** The main symptom of CTS is intermittent numbness of the thumb, index, long and radial half of the ring finger, the numbness often occurs at night, with the hypothesis that the wrists are held flexed during sleep. Recent literature suggests that sleep positioning, such as sleeping on one's side, might be an associated factor [13]. It can be relieved by wearing a wrist splint that prevents flexion [14]. Less-specific symptoms may include pain in the wrists or hands and loss of grip strength (both of which are more characteristic of painful conditions such as arthritis) [15]. Long-standing CTS leads to permanent nerve damage with constant numbness, atrophy of the muscles of the thenar eminence [16], and weakness of palmar abduction of the thumb [17].

Pain in electrophysiologically verified CTS is associated with misinterpretation of nociception and depression [18].

Some posit that median nerve symptoms can arise from compression at the level of the thoracic outlet or the area where the median nerve passes between the two heads of the pronator teres in the forearm but this is highly debatable [19,20].

**Diagnosis:** There is no consensus reference standard for the diagnosis of carpal tunnel syndrome. A combination of described symptoms, clinical findings, and electrophysiological testing is used by a majority of hand surgeons [3]. Numbness in the distribution of the median nerve,

nocturnal symptoms, thenar muscle weakness/atrophy, positive Tinel's sign at the carpal tunnel, and abnormal sensory testing such as two-point discrimination have been standardized as clinical diagnostic criteria by consensus panels of experts [16].

**Treatment:** Palliative treatments for CTS include use of night splints and corticosteroid injection. The only scientifically established disease modifying treatment is surgery to cut the transverse carpal ligament [20].

According to the 2007 guidelines by the American Academy of Orthopedic Surgeons, early surgery with carpal tunnel release is indicated where there is clinical evidence of median nerve denervation or the patient elects to proceed directly to surgical treatment. Otherwise, the main recommended treatments are local corticosteroid injection, splinting (immobilizing braces), oral corticosteroids and ultrasound treatment. The treatment should be switched when the current treatment fails to resolve the symptoms within 2 to 7 weeks. However, these recommendations have sufficient evidence for carpal tunnel syndrome when found in association with the following conditions: diabetes mellitus, coexistent cervical

radiculopathy, hypothyroidism, polyneuropathy, pregnancy, rheumatoid arthritis, and carpal tunnel syndrome in the workplace [21].

**Objectives of the study:** To determine the epidemiological and clinical features of CTS.

### Materials and Methods

A cross-sectional study was carried out on Carpal tunnel syndrome cases diagnosed over a 14 – years period, from May 1998 to May 2012 by the researcher. All data regarding the age at presentation, gender, seasons, pregnancy, hypertension, DM, salty food, response to conservative treatment, response to surgical treatment.. A total number of 928 cases were included in this study. This study

done to determine the epidemiological factors in relation to CTS and clinical features of CTS.

The protocol of study includes the following steps:

1. History
2. Clinical examination
3. Investigations: nerve conduction study and EMG whenever indicated [doubtful diagnosis]
4. Conservative treatment

A- Lifestyle modification

B- Exercise: Tendon and nerve gliding exercises have been shown to reduce the need for surgical intervention in CTS. The median nerve gliding exercises is performed by placing your arm to your side and slightly behind you with the elbow gently straight. With your palm facing forward, pull your

wrist back until mild tension is felt somewhere in the arm, then relax the wrist forward until the tension is relieved.

C- Wrist splints

The pressure in the carpal tunnel is lowest in the neutral position.

D- Oral medications: Diuretics, Vitamin B6 supplement (Pyridoxine), Non-steroidal anti-inflammatory drugs (NSAID).

5. Surgery [open release of flexor retinaculum]

6. Follow up visits for 2 months.

Chi-square ( $\chi^2$ ) test used and the corresponding 95% of confidence interval (95% C.I) were used to estimate the risk factors. The data were analyzed using the statistical package for social sciences (SPSS ver.12). A (p- value < 0.05) considered significant.

## Results

**Table(1):** Distribution of the disease group by age.

Age[years]	Number of cases	Percentage
Below 15	1	0.107
15-30	238	25.64
31-45	471	50.75
46-60	192	20.68
Above 60	26	2.80
Total	928	100

**Table(2):** Distribution of the study group by gender.

Gender	Number of cases	Percentage
Male	9	0.969
Female	919	99.03
Total	928	100

**Table(3):** Distribution of the study group according to pregnancy.

Pregnancy	Number of cases	Percentage
Positive	122	13.27
Negative	797	86.72
Total	919	100

**Table(4):** Distribution of the study group according to hypertension.

Hypertension	Number of cases	Percentage
Positive	55	5.92
Negative	873	94.07
Total	928	100

**Table(5):** Distribution of the study group according to patients' being diabetic or not

DM	Number of cases	Percentage
Positive	78	8.40
Negative	850	91.59
Total	928	100

**Table(6):** Distribution of the study group according to salty food.

Salty food	Number of cases	Percentage
Positive	412	44.40
Negative	516	55.60
Total	928	100

Note: salty food involve adding extra salt, consuming pickles, potato chips, spicy food, kernels.

**Table(7):** Distribution of the patients' group according to response to conservative treatment.

Response to conservative treatment	Number of cases	Percentage
Good	545	58.72%
Bad	383	41.27%
Total	928	100%

**Table(8):** Distribution of the patients' group according to response to surgical treatment.

Response to surgical treatment	Frequency	Percentage
Good	362	94.51
Bad	21	5.48
Total	383	100

## Discussion

This study showed that the majority of the studied group was between 31-45 years old (50.75%), whereas other studies (Ashworth, D'Arcy) reported that the majority of cases of CTS are between 45-60 years [7,22]. The age between 31-45 years in females is the age of reproduction and completion of the families with the peak of household responsibilities in our society, most of the females at the age of 50 years and more will

have less household responsibilities, and this might explain the differences in the age group distribution.

In this study almost all the studied cases were females (99.03%). Most studies (e.g. D'Arcy) reported a prevalence three to four folds higher in females compared to males [22]. The cause of this higher prevalence generally was explained by a narrower carpal tunnel outlet, therefore a pronounced decrease in the tunnel volume in females compared to males.

The female /male ratio [99/1] in this study needs more elaboration and further studies in our country to confirm or disconfirm it.

In the present study about (13.27%) Of the female studied cases were pregnant. CTS was found in 28 percent of pregnant women (Atisook, Baxter) in their third trimester (Swelling in the hand and wrist caused by fluid retention compresses the median nerve) [23, 24], so the prevalence in this study is lower than in other countries; poor antenatal care could be a factor in lower prevalence, more studies is needed to prove and explain this finding.

The cause in the majority of CTS cases is unknown (idiopathic) [25] but some of the risk factors have been identified. The authors acknowledged Diabetes Mellitus (DM) and its treatment (Insulin, Sulphonylureas, Metformin) as risk factors. This study found that there is some relation (8.40%) between CTS and DM. Lazaro and Kerwin reported that Persons with diabetes or other metabolic disorders that directly affect the body's nerves and make them more susceptible to compression are at high risk. [19, 25].

(5.92%) of the studied group were hypertensive. CTS were reported in hypertensive patients following the successful treatment of their hypertension in about 8% [26].

This study showed that ( 44.40%) of the studied group eating salty food [adding extra salt, consuming pickles, potato chips, spicy food, kernels ], no author has such finding in the available literatures , extra salt can cause fluid retention affecting the space in the carpal tunnel.

About (58.72%) of the studied group in this study had a good response to conservative treatment including (lifestyle modification, wrist splints, exercise, oral medications: diuretics, vitamin B6, NSAID). In a survey of American hand surgeons, diuretics, Vitamin B6 supplement (Pyridoxine) were used in the treatment of CTS [27]. The surgical risk, the increased number of

patients seeking treatment for CTS, the reported success rate for conservative treatment ranging from 13-92% in some of the studies and the mild-to-moderate presentation picture in some cases keeps the conservative treatment options as a more appealing choice as a first line of treatment [28].

According to response to surgical treatment, about (94.51%) had good response .Surgery to correct carpal tunnel syndrome has a high success rate. Up to 90% of patients were able to return to their same jobs after surgery [29] Decompression of the median nerve at the wrist with release of the transverse carpal ligament is the surgical procedure of choice [the surgical treatment for the patients involved in the study] [30].

Conclusions: This study showed

1. The predominant age of patients [females] 31-45 years.
2. The ratio of female /male is far higher than in other places of the world.
3. The prevalence of pregnant women with CTS is less than other studies
4. There is some statistical significant association between CTS and consuming salty food
5. Surgical treatment is highly successful.

## References

- [1] Scott, Kevin R.; Kothari, Milind J.. "Treatment of carpal tunnel syndrome". *UpToDate*. 2009;35:23-27.
- [2] Lo, S. L., K. Raskin, et al.. "Carpal tunnel syndrome: a historical perspective." *Hand Clinics* . 2002;18(2): 211-7.
- [3] Lozano-Calderón, S; Anthony, S; Ring, D. "The quality and strength of evidence for etiology: example of carpal tunnel syndrome". *The Journal of hand surgery* . 2010 ;33 (4): 525–38.
- [4] Rempel, D; Evanoff B, Amadio PC, et al. "Consensus criteria for the classification of carpal tunnel syndrome in epidemiologic



- studies". *Am J Public Health*.1998;88 (10): 1447–1451.
- [5] Graham, B; Regehr G, Naglie G, Wright JG. "Development and validation of diagnostic criteria for carpal tunnel syndrome". *Journal of Hand Surgery* .2006;31A (6): 919–924.
- [6] Bickel, Kyle D. "Carpal Tunnel Syndrome". *Journal of Hand Surgery*.2010;35 (1): 147–152.
- [7] Ashworth, Nigel L.. "Carpal Tunnel Syndrome". *eMedicine*.2008; 44(5):215-220.
- [8] Atroshi, I.; Gummesson, C; Johnsson, R; Ornstein, E; Ranstam, J; Rosn, I. "Prevalence of Carpal Tunnel Syndrome in a General Population". *JAMA*.1999; 282 (2): 153–158.
- [9] Stevens JC, Sun S, Beard CM, O'Fallon WM, Kurland LT. Carpal tunnel syndrome in Rochester, Minnesota, 1961 to 1980. *Neurology*1988;38(1):134-8.
- [10] Mondelli M, Giannini F, Giacchi M. Carpal tunnel syndrome incidence in a general population. *Neurology* 2002;58(2):289-94.
- [11] Turgut F, Cetin ahinahin M, Turgut M, Bölükbaşı O. The management of carpal tunnel syndrome in pregnancy. *J Clin Neurosci*2001;8(4):332-4
- [12] Chammas M, Bousquet P, Renard E, et al. Dupuytren's disease, carpal tunnel syndrome, trigger finger, and diabetes mellitus. *J Hand Surg [Am]* 2005;20:109-14.
- [13] Uemura, T; Hidaka N, Nakamura H.. "Clinical outcome of carpal tunnel release with and without opposition transfer." *J Hand Surg Eur Vol*. 2008;35 (8): 632–6.
- [14] Nunez, F; Vranceanu, AM; Ring, D. "Determinants of pain in patients with carpal tunnel syndrome". *Clinical orthopaedics and related research*.2010; 468 (12): 3328–32.
- [15] Walker, Jennie A. "Management of patients with carpal tunnel syndrome". *Nursing Standard* .2010;24 (19): 44–8.
- [16] Katz, Jeffrey N.; Simmons, Barry P. "Carpal Tunnel Syndrome". *New England Journal of Medicine* .2002;346 (23): 1807–12.
- [17] Mondelli M, Rossi S, Monti E, Aprile I, Caliandro P, Pazzaglia C *et al*. Long term follow-up of carpal tunnel syndrome during pregnancy: a cohort study and review of the literature. *Electromyogr Clin Neurophysiol*2007;47(6):259-71.
- [18] Netter, Frank. *Atlas of Human Anatomy* (5th ed.). Philadelphia, PA: Saunders Elsevier.2011; pp. 412, 417, 435.
- [19] Lazaro, R. "Neuropathic symptoms and musculoskeletal pain in carpal tunnel syndrome: Prognostic and therapeutic implications". *Surgical Neurology* .1997;47 (2): 115–7; discussion 117–9.
- [20] Sternbach, G. "The carpal tunnel syndrome". *Journal of Emergency Medicine*.1999;17 (3): 519–523.
21. Board of directors. *Clinical Practice Guideline on the Treatment of Carpal Tunnel Syndrome*. American Academy of Orthopaedic Surgeons. September 2008; p206-212.
- [22] D'Arcy, C. A. and S. McGee. "The rational clinical examination. Does this patient have carpal tunnel syndrome? *JAMA* 2000 Sep 20;284(11):1384." *JAMA*.2000; 283(23): 3110-7
- [23] Atisook , et al ..Carpal tunnel syndrom during pregnancy. *J Med Assoc*.1995; 78(8):410-4.
- [24] Baxter-Petralia P. *Therapist's management of the carpal tunnel syndrome*. In: Hunter J, Schneider L, Mackin E, eds. *Rehabilitation of the Hand; Surgery and Therapy*. Vol e. 3rd ed. St. Louis: Mosby; 1990.
- [25] Kerwin, G., C. S. Williams, et al.. "The pathophysiology of carpal tunnel syndrome." *Hand Clinics*.1996; 12(2): 243-51



[26] Emara, M. K. and A. M. Saadah. "The carpal tunnel syndrome in hypertensive patients treated with beta-blockers." *Postgraduate Medical Journal*.1988; 64(749): 191-2.

[27] Duncan, K. H., R. C. Lewis, Jr., et al.. "Treatment of carpal tunnel syndrome by members of the American Society for Surgery of the Hand: results of a questionnaire." *Journal of Hand Surgery – American*.1987; Volume 12(3): 384-91

[28] Osterman, A. L., M. Whitman, et al.. "Nonoperative carpal tunnel syndrome treatment." *Hand Clinics* .2002;18(2): 279-89

[29] Quaglietta, Paolo; Corriero, G.. Endoscopic carpal tunnel release surgery: retrospective study of 390 consecutive cases. "Advanced Peripheral Nerve Surgery and Minimal Invasive Spinal Surgery". *Acta Neurochirurgica Supplementum. Acta Neurochirurgica* .2005;97: 41–59.

[30] Trumble TE, Diao E, Abrams RA, Glibert-Anderson MM. Single-portal endoscopic carpal tunnel release compared with open release: a prospective, randomized trial. *J Bone Joint Surg* 2002; 84: 1107-1115.