

# SEASONAL DISTRIBUTION AND DEMOGRAPHICAL CHARACTERISTICS OF CARPAL TUNNEL SYNDROME IN 1039 PATIENTS

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**ABSTRACT - Objective:** To describe the demographic characteristics of gender, age, and presence of repetitive movements, intake of alcohol and non-steroid anti-inflammatories (NSAI), medical specialties that referred patients to nerve conduction studies and electromyography (NCS-EMG), school attainment, and seasonal distribution in patients with a neurophysiological diagnosis of carpal tunnel syndrome (CTS) in the State of Rio Grande do Sul, Brazil. **Method:** A series of 1039 patients (1549 hands) with neurophysiologically defined CTS was studied. Patients were referred for NCS-EMG in 3 universities and 2 private services, from August 2001 to January 2003. All patients completed a questionnaire containing demographic information. The diagnosis of CTS was established following a pre-established protocol, with defined diagnostic criteria. **Results:** Around one fourth of patients had already performed NCS-EMG; the greatest frequency of CTS was observed in women (5.6:1) and in patients above the age of 40. Most patients reported performing repetitive movements in their daily routine (69.7%); 12.9% reported use of NSAI and 14.9% regular intake of alcoholic beverages. A greater frequency of CTS was observed in the months of July and August, when compared to the other months of the year. Around 2/3 of the study population had completed at least secondary school. Most requests of nerve conduction studies did not provide a diagnostic hypothesis (59.9%) and neurophysiologic studies were requested mostly by traumatology/orthopedics (71.1%). **Conclusion:** We have concluded that, in our environment, CTS shows some demographical characteristics that are similar to what the literature describes. Also, we have found that most of our sample concluded at least secondary school, and was referred to neurophysiologic studies by orthopedists. To be pointed out is the seasonal distribution of CTS, which demonstrates a significant association with winter months.

**KEY WORDS:** carpal tunnel syndrome, demographical characteristics, seasonal, nerve conduction studies and electromyography, neurophysiology.

## Distribuição sazonal e características demográficas da síndrome do túnel do carpo em 1039 pacientes

**RESUMO - Objetivo:** Descrever as características demográficas de gênero, idade e presença de movimentos repetitivos, uso de álcool e antiinflamatórios não-esteróides (AINE), especialidades médicas de encaminhamento para eletroneuromiografia (ENMG), nível de escolaridade, e distribuição sazonal em pacientes com síndrome do túnel do carpo (STC) diagnosticada neurofisiologicamente no Estado do Rio Grande do Sul, Brasil. **Método:** Foi estudada uma série de 1039 pacientes (1549 mãos), com STC definida neurofisiologicamente, que foram encaminhados para realização de ENMG, em 3 serviços universitários e 2 privados, entre agosto de 2001 a janeiro de 2003. Todos os pacientes responderam questionário com informações demográficas. O diagnóstico da STC foi realizado seguindo protocolo pré-estabelecido, com critérios diagnósticos definidos. **Resultado:** Cerca de um quarto dos pacientes já havia realizado ENMG prévia, sendo observada maior frequência da STC em mulheres (5,6:1) e em pacientes acima de 40 anos. A maioria relatava esforços repetitivos na sua atividade diária (69,7%), 12,9% estava em uso de AINE e 14,9% relatavam ingestão regular de bebidas alcoólicas. Observamos maior frequência da STC nos meses de julho e agosto em relação aos outros meses do ano. Cerca de 2/3 da nossa população apresentava pelo menos o primeiro grau completo. Na maior parte dos pedidos de ENMG não era descrita uma hipótese diagnóstica (59,9%), sendo a traumatologia/ortopedia a especialidade que mais solicitou exames neurofisiológicos (71,1%). **Conclusão:** Concluímos que a STC, em nosso meio, apresenta características demográficas semelhantes às descritas na literatura. A maior parte de nossa amostra apresenta pelo menos o 1º grau completo e foi encaminhada para realização de ENMG por traumatologistas. Salientamos a distribuição sazonal da STC que demonstra uma associação significativa com os meses de inverno.

**PALAVRAS-CHAVE:** síndrome do túnel do carpo, sazonalidade, características demográficas, eletroneuromiografia.

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Carpal tunnel syndrome (CTS) is the most frequent compressive neuropathy seen in humans, and is caused by the compression and ischemia of the median nerve in its passage through the wrist<sup>1,2</sup>. The clinical presentation of this syndrome varies, but its typical clinical picture involves paresthesias and pain in the territory of the median nerve in the hand, with worsening of symptomatology at night or at morning<sup>1,3</sup>. The neurophysiologic study shows reduced velocity of conduction across the wrist, which translates the demyelination secondary to the compression of the nerve, with a reduction in amplitude in the more severe cases. CTS is the most frequently diagnosed condition in neurophysiology services<sup>4</sup>. In our study population, we had previously found the diagnosis of CTS in 31% of the patients referred to nerve conduction studies and electromyography (NCS-EMG) performed in the upper limbs and this is the most frequent neurophysiological diagnosis in our clinical setting<sup>5</sup>.

A number of studies that describe the clinical characteristics of CTS have already been made<sup>6-9</sup>. Other studies have described information related to independent risk factors, such as obesity, the female gender, and age above 40 years<sup>5,10</sup>. Although other factors, such as diabetes mellitus, hypothyroidism, the use of oral contraceptives, smoking, early onset of menopause, and lesion due to repetitive movements, are likely to be associated with CTS, there is no consensus in the literature<sup>5,11-13</sup>. However, other characteristics, such as the increase in wrist index (antero-posterior measure/lateral measure), have been related to the severity of CTS<sup>10</sup>. Moreover, there is relevant information available for the understanding of this disease, such as social indicators, that have not yet been well studied in CTS patients.

The aim of this study is to describe the demographic aspects of CTS patients, including school attainment, the medical specialty to refer most patients to NCS-EMG, as well as the seasonal distribution of the diagnosis of CTS, neurophysiologically defined in a population referred to NCS-EMG in the State of Rio Grande do Sul, Brazil.

## METHOD

From August 2001 to January 2003, all CTS patients, which was defined based on neurophysiologic criteria, were studied prospectively. These patients came from NCS-EMG services of 3 university hospitals and 1 private hospital in the city of Porto Alegre, and from one private service in the city of Caxias do Sul, Rio Grande do Sul,

Brazil. All patients signed an informed consent form agreeing to participate in the study. The following information was collected through the completion of a questionnaire: age, gender, school attainment, hometown, previous NCS-EMG, alcohol intake, use of anti-inflammatory medications, and presence of repetitive movements of wrist flexion or extension in daily activities. The month when the test was performed, the specialty of the doctor requesting it, and the diagnostic hypothesis were also analyzed.

The neurophysiologic study was carried out by specialists in clinical neurophysiology, following the same evaluation protocol of CTS, using either Nihon-Koden Neuropack 4 or Medelec-Oxford Synergy equipment. The criteria used for the diagnostic have been described by Becker et al.<sup>5</sup>, and are summarized as follows: a) difference greater than 10m/s between velocity of mixed conduction or difference greater than 0.5ms in peak latencies of ulnar and median nerves in the palm-wrist segment (8cm) or; b) difference greater than 0.5ms between peak antidromic sensitive latencies of radial and median nerves, registered for the 1<sup>st</sup> finger (10cm) or; c) absence of sensitive response of the median nerve, when the diagnostic of polyneuropathy, brachial plexus lesion, and median nerve lesion proximal to wrist were excluded or; d) difference greater than 0.4 ms between distal motor latencies of the median and ulnar nerves, for the 2<sup>nd</sup> lumbrical-interosseous.

For the analysis of the variables, a database was developed using Access 2000<sup>®</sup>. All variables included in the database were revised by an outside researcher. Data analysis was done using software SPSS version 10<sup>®</sup>. A confidence interval of 95% was used for the frequencies of qualitative variables, and means and standard deviations were used for quantitative variables. Chi-square was used to compare frequencies, and a value of  $p < 0.05$  was considered significant.

## RESULTS

Of a total of 2582 patients, who had been requested NCS-EMG of at least one upper limb, 1039 patients (40.2 %) with CTS were diagnosed, totaling 1549 hands. The frequency of CTS diagnosis was greater in the winter months of July and August, in which 43.4% of studies yielded a diagnosis of CTS, as opposed to 37.8% ( $\chi^2=8.66$ ;  $p=0.003$ ) in the remaining months (Fig 1).

Table 1 describes the frequencies of demographic variables and some clinical information of patients with CTS. Age ranged from 12 to 88 years old, with mean of  $48.3 \pm 12.4$  years old. The female to male ratio was approximately 5.6:1. One third of the patients had not completed the first 8 years of school, while 19% had a university degree. More than half of the cases were living in other cities,

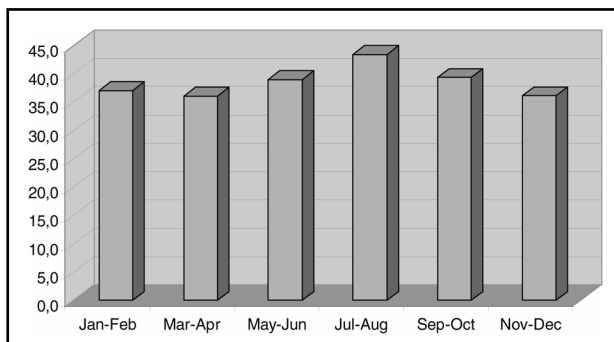


Fig 1. Seasonal distribution of the frequency (%) of CTS diagnosis among hands studied in services of NCS-EMG in Rio Grande do Sul.

of which approximately half were located in the immediate periphery of Porto Alegre. Most patients were referred to NCS-EMG by orthopedists (71.1%). Approximately one fourth of the population had a previous NCS-EMG. The diagnostic hypothesis

had been informed in nearly 40% of the referrals and CTS was a hypothesis in only 15.8% of test requests. Regular alcohol intake was reported by 14.9% of cases, and 42.7% mentioned the use of medications, with NSAID accounted for 12.9%. Most patients (69.7%) reported making repetitive movements in their daily routine.

## DISCUSSION

The present study has found a much greater number of female patients aged 40 or up, as reported by other authors<sup>5,7,9</sup>, being in accordance with studies that show these variables as real risk factors<sup>5,10</sup>. The high frequency of individuals exposed to repetitive movements in our sample is in line with several studies that suggest that repetitive activities of wrist flexion and extension are, also, risk factors for CTS<sup>1,12,14</sup>. Our population included individuals from different regions of the state of Rio

Table 1. Demographic and clinical characteristics of patients with neurophysiologic diagnosis of CTS.

Feature	Frequency (%)	CI 95%
Gender (N = 1039)		
Male	15.2	13.1 - 17.5
Female	84.8	82.5 - 86.9
Previous NCS-EMG (N = 855)	26.4	23.5 - 29.6
Schooling (N = 795)		
None	1.9	1.1 - 3.0
< 8 years	31.4	28.3 - 34.7
8 - 11 years	18.7	16.1 - 21.6
11 years (secondary school)	28.9	25.9 - 32.2
University	19.0	16.4 - 21.8
Hometown (N = 984)		
Porto Alegre	42.6	39.5 - 45.7
Suburbs of Porto Alegre	27.3	24.6 - 30.2
Northeastern region of the State	13.6	11.6 - 15.9
Other cities	16.5	14.2 - 18.9
Repetitive movements (N = 1016)	69.7	66.8 - 72.5
Medical specialist referring patient (N = 934)		
Orthopedist	71.1	68.1 - 73.9
Occupational medicine specialist	12.2	10.2 - 14.4
Neurologist	6.2	4.8 - 7.9
General physician	3.9	2.8 - 5.2
Other	6.6	5.2 - 8.4
Use of NSAID (N = 1039)	12.9	10.9 - 15.1
Intake of alcoholic beverages (N = 1036)		
No intake	85.1	82.8 - 87.2
Low intake	13.8	11.8 - 16.1
High intake	1.1	0.53 - 1.9

CI 95%, confidence interval of 95%; NSAID, non-steroid anti-inflammatory.

Grande do Sul, of whom 2/3 had finished at least the first 8 years of school. This level of schooling is higher than that of the general population, probably because greater schooling leads to easier access to medical care and neurophysiologic evaluation and/or to a greater concern over symptoms of CTS.

Most of the specialists who referred patients for upper limb NCS-EMG were orthopedists. Occupational medicine was the second most frequent specialty to refer patients to NCS-EMG in our study. Two other studies from Brazil have previously shown that most neurophysiological studies came from either orthopedists<sup>9</sup> and rheumatologists<sup>15</sup>, however, the proportion of patients referred by orthopedists was far greater in our study than in either of those. This finding probably reflects a local pattern of medical care, but may also suggest that the medical specialties preferentially dealing with CTS has been changing over time.

We have found a very low frequency of diagnostic hypotheses in the requests for NCS-EMG, and, specifically, the absence of an exact description of the suspicion of CTS, which may demonstrate that the clinical presentation of CTS really varies, resulting in assistant physicians not considering this hypothesis, or that physicians do not routinely write in test requests their diagnostic questions, expecting the neurophysiologic test to present the final diagnosis.

The use of anti-inflammatory medications was considered low for a population in which the chronic clinical picture of pain is frequent. Such fact, associated with the greater search for surgical specialty, may indicate that patients with CTS seek treatments that offer more immediate solutions. Moreover, we have observed no intake of alcohol in most of the study population, but we believe that the method of data collection underestimated this piece of data. Nevertheless, both for NSAID and alcohol intake, the lack of a group of controls limits the definition of a clear association between these variables and CTS; further studies counting with groups of comparison are needed for a more correct conclusion.

We have found that the frequency of CTS diagnosis in our study was significantly higher among patients referred to NCS-EMG in the months of July and August, in which the coldest temperatures

occur in our region. This finding has not been reported previously, but is probably not due to a decrease in conduction velocity due to low temperature, as hands were warmed before the examination when necessary. Moreover, the diagnostic criteria were based on comparison with other nerves of the same hand. Therefore, we believe that CTS patients might seek medical assistance more frequently in winter, possibly due to worsening of symptoms with cold weather.

We have concluded that, in our environment, CTS presents some demographic characteristics similar to those described in the literature. Also, most of our sample had completed at least secondary school and was referred to the performance of NCS-EMG by orthopedists. We point out the seasonal distribution of CTS that demonstrates a significant association with winter months. The confirmation of a likely role of lower temperatures in the worsening of the symptoms, however, calls for analytical studies designed for this purpose.

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