

# Prevalence of carpal tunnel syndrome in workers dealing with bovine manual milking

*Prevalência da síndrome do túnel do carpo em trabalhadores que lidam com a ordenha manual de bovinos*

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## ABSTRACT

**BACKGROUND AND OBJECTIVES:** This study aimed at evaluating the prevalence of carpal tunnel syndrome among bovine manual milking workers in a city of the countryside of the State of Paraná.

**METHODS:** Sample (n=92) was selected as from medical physiotherapy prescriptions for patients diagnosed with such syndrome, in the period from 2008 to 2010.

**RESULTS:** Participated in the study 80 females with mean age of 47.7±11.3 years, and 12 males with mean age of 43.9±12.6 years. Among patients, 41 participants (44.6%) had performed manual milking in some period of life, being 36 females (39.1%) and 5 males (5.4%). Only females with carpal tunnel syndrome remained with manual milking as their primary occupation.

**CONCLUSION:** This study has shown high frequency of carpal tunnel syndrome among workers dealing with manual milking, and suggests the expansion of bovine milk production mechanization to prevent carpal tunnel aggressions.

**Keywords:** Carpal tunnel syndrome, Ergonomics, Labor safety, Median nerve neuropathy, Workers' health, Working environment.

## RESUMO

**JUSTIFICATIVA E OBJETIVOS:** O objetivo deste estudo foi verificar a prevalência da síndrome do túnel do carpo na ordenha manual de bovinos em uma localidade do interior do Estado do Paraná.

**MÉTODOS:** A amostra (n=92) foi selecionada a partir de prescrições médicas de fisioterapia para pacientes com diagnóstico desta síndrome, ocorridas no período de 2008 a 2010.

**RESULTADOS:** Foram incluídas 80 mulheres com média de idade de 47,7±11,3 anos e 12 homens com média de idade de

43,9±12,6 anos. Entre os acometidos, 41 participantes (44,6%) realizaram a ordenha manual em algum momento da vida, sendo 36 mulheres (39,1%) e 5 homens (5,4%). Somente as mulheres com síndrome do túnel do carpo permaneciam com a ordenha manual na sua ocupação principal.

**CONCLUSÃO:** Este estudo mostrou elevada frequência de síndrome do túnel do carpo em trabalhadores que lidam com a ordenha manual e sugere a expansão da mecanização da produção do leite de gado bovino como medida preventiva às agressões no túnel do carpo.

**Descritores:** Ambiente de trabalho, Ergonomia, Neuropatia do nervo mediano, Saúde dos trabalhadores, Segurança ocupacional, Síndrome do túnel do carpo.

## INTRODUCTION

Carpal tunnel syndrome (CTS) was firstly described by British surgeon James Paget in 1854, after observing a disease affecting forearm, wrist and hand, causing hand paresthesia, pain and functional incapacity. The American Academy of Orthopaedic Surgeons has defined CTS as symptomatic compression neuropathy of the median nerve at the level of the wrist<sup>1</sup>.

CTS is the most frequent compressive neuropathy being responsible for 90% of occurrences<sup>2</sup>. Its incidence is estimated in 3.8% of world population. It is a condition of middle-age individuals with peak of prevalence around 55 to 60 years of age; it is more frequent among females as compared to males with prevalence rate of 9.2 and 6%, respectively<sup>3</sup>. It may affect the dominant hand, the non-dominant hand or both. Its etiology involves not totally explained mechanical, chemical and psychic mechanisms<sup>4</sup>.

The National Center for Health Statistics estimates that in the United States, per year, it is the disease most taking people away from work. Almost half the CTS cases result in 31 days or more of leave/year. Approximately one million American adults require medical treatment and approximately half the cases require surgical treatment at a cost of approximately 2 billion dollars/year<sup>5</sup>. In the United Kingdom, prevalence reaches 7% to 16% and surgical decompression rate is 43 to 74 cases for every 100 thousand inhabitants/year<sup>6</sup>.

In Brazil, CTS represents more than half the cases of Work-Related Musculoskeletal Disorders (WRMD). WRMD are responsible for approximately 70% of labor diseases needing social security benefits due to medical leave<sup>7</sup>. According to the Ministry of Labor and Social Security, there have been major increases, in

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the last two decades, in the granting of social security sickness insurance for compressive upper limb neuropathies. In 2014, it has benefited 22,298 beneficiaries<sup>8</sup>. This represents a considerable financial impact for the public system providing medical and social security assistance to CTS patients<sup>9</sup>. CTS is a widely recognized occupational complication involving manual work of prehension, strength or repetition<sup>7</sup>. The presence of one of these factors tends to increase the risk for CTS in up to five times<sup>10</sup>. Bovine manual milking (MM) is a typical example of repetitive and chronic effort frequently used by the agribusiness worker and positively associated to CTS<sup>4</sup>. MM is the oldest milk extraction system and is still present in small properties with small herds. It requires less expensive equipment and more personal effort. It requires repetitive wrist and hand movements in a pulsing rhythm of 40 to 50 cycles/minute, for a continuous period of 4 to 7 minutes for each animal, twice a day in average. A case-control study carried out in Turkey, by Suleyman et al.<sup>4</sup> has classified MM as occupational risk activity after obtaining from the milking group a relative risk 13 times higher for developing CTS as compared to controls. MM is common in families living in small rural properties in the largest dairy basin of Western Paraná and the second largest of the State. Within this perspective, our study aimed at investigating the prevalence of CTS among people involved with bovine MM.

**METHODS**

This cross-sectional study has used data of medical charts of patients of a Physiotherapy service linked to the complementary services network of the Single Health System of the city of Marechal Cândido Rondon, State of Paraná – Brazil. Data were selected by a single investigator among medical charts accumulated in the period from 2008 to 2010. Sample was established as from medical charts of patients with medical prescription for physiotherapeutic treatment for CTS. Medical charts with medical diagnosis of CTS submitted or not to surgical procedures, with any professional occupation, of patients of both genders aged 45 years or above, were selected, resulting in 107 valid occurrences. Fifteen patients were excluded: 4 with incomplete history and 11 with history of wrist trauma previous to neurocompression symptoms or for being diabetic. So, 92 medical charts were evaluated. To understand the MM history of patients, the following questions were asked during initial interview: a) Do you perform or have you performed MM in some stage of our life? (yes/no); b) For how long do you carry out or have carried out this occupation? (Answer accepted in years); c) In your routine, how many days a week do you perform or have performed MM? d) How long would daily milking take or has taken? (Answer accepted in minutes). Questionnaire is part of baseline evaluation of patients with wrist and hand compressive syndrome, carried out by the Physiotherapy department. This study was approved by the Ethics Committee for Research Involving Human Beings, Universidade Estadual do Oeste do Paraná (UNIOESTE), opinion 320 de 2009.

**Statistical analysis**

Data were analyzed with the Stata 11.0\* and Microsoft® Excel 10.0 programs. Statistical meaning was evaluated with Pearson Chi-square ( $\chi^2$ ) test. Results with significance probability (p) lower than 0.05 were considered with statistically significant difference.

**RESULTS**

Among 92 cases of CTS, 80 were females (87%) with mean age of 53±8.24 years (CI95% 46 – 62) and 12 were males (13%), with mean age of 55±9.8 years (CI95% 46 – 64). The practice of MM was present in some moment of life of 44.6% (n=41) patients with CTS, being more prevalent among females (87.8%; n=36) as compared to males (12.2%; n=5). Ranchers were the most affected professionals (68.3%; n=28). For the group with positive history of MM, male-female ratio was 1:16, with mean occupation along life during 22.67±8.49 years and 809.97±193.57 minutes/week. Distribution of frequency of major occupation and time dedicated to MM are detailed in tables 1 and 2. Among CTS patients, 65 individuals (71%) were submitted, by medical request, to electrophysiological exam (EMG). Some level of abnormality in median nerve ner-

**Table 1.** Distribution of frequency of patients of both genders, with carpal tunnel syndrome and positive history of bovine manual milking, according to major occupation. Marechal Cândido Rondon - PR, 2008 to 2010

Major occupation	Female total	Female w/ MM	Male total	Male w/ MM
Rancher	32	26	02	02
Bank clerk	03	00	01	00
Business	03	01	01	01
Cook	01	00	00	00
Home /housekeepers	15	03	00	00
Cleaning woman	02	00	00	00
Industry worker	08	03	03	01
Professor	03	00	01	00
Others	13	03	04	01
Total	80	36	12	05

MM = manual milking.

**Table 2.** Distribution of mean for age, milking time (year) and weekly milking duration (minutes) in carpal tunnel syndrome patients of both genders. Marechal Cândido Rondon - PR, 2008 to 2010

	Manual milking (male)	Manual milking (female)	$\chi^{2**}$
Age (years)	55.16±9.8	53.28 ±8.24	0.284
MM period (years)	28.16±9.13	19.67± 8.49	0.001
MM duration (minutes/week)*	847±180.37	809.97±193.57	0.452

\* Value obtained by the product of mean milking time of each animal by the mean number of milked animals and number of weekly milkings; \*\* Pearson Chi-square test.

vous conduction was detected in 48 exams (74%), being 42 in females (88%) and 6 in males (12%). From this total, 16 cases (17.4%) were treated with surgical decompression, being 14 in females and 2 in males. Dominant hand wrist was affected in approximately 85% of cases, as described in table 3.

**Table 3.** Frequency of lateral dominance of carpal tunnel syndrome in patients of both genders, according to bovine manual milking history. Marechal Cândido Rondon - PR, 2008 to 2010

	Females w/MM	Males w/MM	Males wo/MM	Females wo/MM	Total
Bilateral CTS	03	00	01	03	07
Dominant hand CTS *	31	05	05	36	77
Non-dominant hand CTS *	03	00	01	04	08
Total	37	05	07	43	92

\* Dominant hand is the hand people use to write.

## DISCUSSION

MM involves the continuous and forced use of fingers flexor muscles and is considered professional risk factor for CTS<sup>4</sup>. In our study, the prevalence of CTS was higher among females (87%) as compared to males, in line with results obtained by Campoamor et al.<sup>11</sup> in the region of Ribeirão Preto, SP, who identified increased prevalence of CTS among females of 88%.

Approximately half CTS patients had positive MM history, with male-female ratio of 1:7. This score is higher than correlated studies which have pointed to male-female ratio of 1:3-4<sup>4,6</sup>. In Marechal Cândido Rondon, sexual division on peasantry seems to divide the occupational function, starting from the assumption that females are more prone to subsistence or own consumption work as compared to males.

CTS in hands dealing with MM was diagnosed with the help of EMG in 52% of cases. There is no consensus whether CTS diagnosis should be done in clinical or electrophysiological basis. At clinical evaluation, some maneuvers may produce false-positive and false-negative results, being limited as clinical signs, while positive EMG should only be considered in face of the existence of symptoms<sup>12</sup>.

CTS was more prevalent among workers with repetitive and aggressive wrist use. A systematic review by Hagberg, Morgenstern & Kelsh<sup>13</sup> has shown prevalence variation of 0.6 to 61% in different professional groups, with higher risk factor for more forced manual occupations. This study has shown that most CTS patients (72%) continued with the same occupational activities, even with the presence of symptoms; other 28% have migrated to different occupation or function. Among workers remaining with MM, all were females. Females who have not migrated to the mechanical milk extraction mode remained exposed to worsening of disease and resulting physical and functional incapacities.

The affection of the dominant hand was more frequent for both genders (84%). For Toy, Simpson & Tintner<sup>14</sup>, dominant hand is that initially affected by later bilateral affections. Within this perspective, it seems coherent to assume that unilateral CTS patients, especially those preserving occupation, are exposed to increased risk of evolving to bilateral CTS.

Preventively, it is necessary that such workers are informed about such occupational risks. Labor safety should be a stressed item which cannot be compromised by any other justification. So, a valuable tool are public health system efforts to guide professionals, especially those acting on basic attention, with regard to health prevention, surveillance and assistance of workers to provide the characterization of relationships between diseases and occupations, which is critical to promote quality, resolute capacity and integrality of actions and services directed to the working population.

Kouyoumdjian & de Araujo<sup>15</sup> have observed that CTS symptoms in general do not appear in the beginning of the milking activity, since mean time between milking and onset of first CTS changes is 4.5 years. Within this perspective, it is suggested the development of randomized studies to establish the risk attributable to MM as triggering factor for CTS along time. The strength of our study is its focus on the objective of presenting a starting point for future prospections toward the identification and application of preventive measures related to MM and the presence of CTS.

## CONCLUSION

This study has shown high prevalence of CTS in bovine MM. So, it seems feasible the counseling for milking mechanization, as well as a preventive measure for the presence and worsening of CTS. Finally, our results reaffirm the commitment of continuing reinforcing measures and actions needed to protect and promote health of all workers.

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