Attributable Risk of Carpal Tunnel Syndrome in the General Population: Implications for Intervention Programs in the Workplace

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Carpal tunnel syndrome (CTS)

- Most commonly reported nerve entrapment syndrome
  - 119,610 surgical release of the median nerve in France (2003)

- Major proportion of all registered and/or compensated work-related diseases in many countries
  - ~ 35-40% of cases of workers' compensation for limb MSDs in France,

- Work-relatedness well-established
  - CTS risk factors: highly repetitive work, force, combination repetitive movements and force, extreme wrist postures, vibrations.

- Intervention program
  - Medical approach
    - Limited evidence in early treatment, no evidence in prevention
  - Ergonomical intervention
    - Limited evidence (cochrane review)
    - No study showing a decrease of the incidence of CTS after an intervention

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Review


Associations between work-related factors and the carpal tunnel syndrome—a systematic review

by Rogier M van Rijn, MSc,¹ Bionka MA Huisstede, PhD,¹ Bart W Koes, PhD,¹ Alex Burdorf, PhD²


Objectives  The aim of this study was to make a quantitative assessment of the exposure–response relationships between work-related physical and psychosocial factors and the occurrence of carpal tunnel syndrome (CTS) in occupational populations.

Methods  A systematic review of the literature was conducted on the associations of type of work, physical load factors, and psychosocial aspects at work to the occurrence of CTS. The associations between work factors and CTS were expressed in quantitative measures, namely, odds ratios (OR) or relative risks.

Results  Jobs with the highest risk of CTS included work in the meat- and fish-processing industry, forestry work with chain saws, and electronic assembly work (OR 76.5, 21.3, and 11.4, respectively). The occurrence of CTS was associated with high levels of hand–arm vibration, prolonged work with a flexed or extended wrist, high requirements for hand force, high repetitiveness, and their combination. No association was found between any psychosocial risk factor and CTS. Contradictory findings were reported for associations between computer work and CTS.

Conclusions  This review provides consistent indications that CTS is associated with an average hand force requirement of >4 kg, repetitiveness at work (cycle time <10 seconds, or >50% of cycle time performing the same movements), and a daily 8-hour energy-equivalent frequency-weighted acceleration of 3.9 m/s².

Key terms  force, hand–arm vibration, musculoskeletal disorder, nerve compression syndrome, repetitiveness.
EBM for CTS: Cochrane review

• Non surgical treatment of CTS:
  – Current evidence shows significant short-term benefit from oral steroids, splinting, ultrasound, yoga and carpal bone mobilisation.
  – Other non-surgical treatments do not produce significant benefit. More trials are needed to compare treatments and ascertain the duration of benefit (O'Connor D, Marshall S, Massy-Westropp N. Non-surgical treatment (other than steroid injection) for carpal tunnel syndrome. Cochrane Database of Systematic Reviews 2003, Issue 1. Art. No.: CD003219. DOI: 10.1002/14651858.CD003219).

• Ergonomic and physiotherapeutic interventions
  – There is limited evidence for the effectiveness of keyboards with an alternative force-displacement of the keys or an alternative geometry,
  – and limited evidence for the effectiveness of exercises compared to massage; breaks during computer work compared to no breaks; massage as an add-on treatment to manual therapy; and manual therapy as an add-on treatment to exercises. (Verhagen AP, Karels C, Bierma-Zeinstra SMA, Burdorf L, Feleus A, Dahaghin S, de Vet HCW, Koes BW. Ergonomic and physiotherapeutic interventions for treating work-related complaints of the arm, neck or shoulder in adults. Cochrane Database of Systematic Reviews 2006, Issue 3. Art. No.: CD003471. DOI: 10.1002/14651858.CD003471.pub3).
The French Musculoskeletal Disorders Surveillance Program: the Pays de la Loire network

- Program of the National Institute for Public Health Surveillance (2002-2004) in the Pays de la Loire region (Ha et al, OEM 2009)
  - Surveillance of carpal tunnel syndrome (CTS) and sciatica (herniated disc surgery) in the general population
  - Registration of claims for work-related MSDs
  - Surveillance of MSDs in the working population

- Main objectives
  - To estimate the incidence of MSDs according to economic activities and occupations in the general population of the area of Maine & Loire
  - To assess the proportion of MSDs attributable to work to economic activities and occupations in the general population
Experimental network for the surveillance of MSDS in the Pays de la Loire region in France

- Neurologists, hand surgeons → General population (49/44)
- Occupational physicians → Working population (Pays de la Loire)

Incidence
- CTS
- Herniated lumbar disk

Prévalence
- MCP
- MSDs / other diseases

Prévalence
- MSDs
- Risk factors

LEEST University of Angers

Ha et al. Occup Environ Med (in press)

DST - InVS
Working and non-working men and women in the Maine & Loire area

Men

- Non working: 19
- Working: 81%

Women

- Non working: 34
- Working: 66%
Epidemiological surveillance of carpal tunnel syndrome in the general population

- Surveillance of carpal tunnel syndrome (CTS) in the general population of the Maine & Loire (M&L) district:
  - 1.2% of the French population, aged 20-59 [193,802 men (49.9%) and 194,276 women (50.1%)]
  - economic structure diversified and similar overall to that of most French regions

- Objectives of the present study
  - To estimate the incidence of CTS according to the main industry sectors and occupation categories at high risk of CTS
  - To estimate the attributable fraction of CTS to work among exposed (AFEs) and in the population (PAFs) according to the main industry sectors and occupation categories at high risk of CTS
  - To give information on the proportion of avoidable cases of CTS in the general population if efficient intervention programs were implemented at the workplace
Methods: case definition

- **Cases of CTS defined by both clinical and electrophysiological criteria:**
  - Symptoms classified as “classic/probable” CTS
  - At least two electrodiagnostic (EDX) criteria (standardized protocol) (Roquelaure et al., Muscle Nerve 2008; 37: 477-82)
  - Patients aged 20-59 years and living in the M&L area
  - Absence of previous CTS (same hand) or polyneuropathy

- **Prospectively included by the 4 EDX centers over the three year period (2002-2004)**

- **Postal questionnaire**
  - Response rate: 97% (1,135 subjects, 815 ♀ and 320 ♂)
  - Medical & surgical history (obesity, thyroid disorders, diabetes, MSDs)
  - Work history in the last five years
Analyses : SIRs and RRss

• **Distribution of CTS cases** according to the last industry sector and occupation during the 5 years preceding the EDX diagnosis

• **Incidence rates were estimated**
  – by patient and not by wrist
  – using the 1999 INSEE census data

• **Standardized incidence ratios (SIR) :**
  – SIR = observed cases / expected cases for the main economic sectors and occupation
  – For each gender

• **Age-adjusted relative risks (RR) of CTS according to industry and occupation categories**
  – computed using the Mantel-Haenszel method with the whole sample of subjects included in the study as a reference, whether they were employed at the time of diagnosis or not.

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ABSTRACT: The purpose of this study was to estimate the incidence of carpal tunnel syndrome (CTS) in a general population according to employment status and to assess the proportion of cases attributable to work. CTS occurring in patients aged 20–59 years living in the French Maine and Loire region were included prospectively from 2002 to 2004. Medical and occupation history was gathered by mailed questionnaire. Incidence rates of CTS and relative risks (RRs) of CTS were computed in relation to employment status. The attributable fractions of risk of CTS to work among the exposed persons (AFEs) were calculated. A total of 1168 patients (819 women, 349 men) were included during the 3-year period. The mean incidence rate of CTS per 1000 person-years was higher in employed than unemployed persons (1.7 vs. 0.8 in women and 0.8 vs. 0.3 in men). The excess risk of CTS was statistically significant for male (RR 4.2) and female (RR 3.0) blue-collar workers and female lower-grade white-collar workers (RR 2.5). The AFE to work in general was 47% (95% confidence interval: 39–54) in women. AFEs reached higher values in female blue-collar workers [67% (65–69)] and lower-grade services, sales, and clerical white-collar workers [61% (57–64)]. The AFE in male blue-collar workers was 76% (72–80). These data show a higher incidence of CTS in the working than the non-working population and suggest that a substantial proportion of CTS cases diagnosed in lower-grade white-collar and blue-collar workers are attributable to work.


WORK INCREASES THE INCIDENCE OF CARPAL TUNNEL SYNDROME IN THE GENERAL POPULATION

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GUY RAIMBEAU, MD, MARCEL GOLDBERG, MD, and ELLEN IMBERNON, MD

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3 Institut National de la Santé et de la Recherche Médicale, U687, Villejuif, France

Accepted 9 November 2007
Results (1)

- Total of 1,168 incident cases (1,644 wrists) over the three year period
  - Sex ratio (women/men): 2.3
  - Bilateral cases: 39%
  
  - The mean year incidence of CTS:
    - 1.4 per 1,000 females
    - 0.6 per 1,000 males

  - No variation over the three year period

- Medical history:
  - Previous CTS in the other hand: 21%
  - Obesity: 15.6%
  - Diabetes mellitus: 4.0%
  - Thyroid disease (in females only): 13.1%
  - At least one of these disorders: 20% of men and 30% of women
Incidence of CTS

Incident cases for 1,000 person-year

Age (year)

Men  Women

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Results (2)

• **Work history**
  – 97% completed the postal questionnaire
  – 91% **worked** in the last 5 years and 80% at the time of the diagnosis
  – **Incidence rates** higher in employed workers at the time of the diagnosis than in unemployed workers
    • 1.7 ‰ vs. 0.8 ‰ among females
    • 0.6 ‰ vs. 0.3 ‰ among males

– **Relative risk of CTS employed/non employed**
  • Women: \( RR_{\text{adjusted for age}} = 1.9 \ (1.6-2.3) \)
  • Men: \( RR_{\text{adjusted for age}} = 1.5 \ (1.0-2.2) \)
Incident cases of CTS (women)

1999 INSEE census

Low-grade white-collar W 31

12

Blue-collar W

Femmes 49

Inactifs
Agriculteurs
Artisans
Cadres sup
Pro Inter
Employés
Ouvriers

Incident cases of CTS

Low-grade white-collar W 47

20

Blue-collar W

Femmes réseau SCC

Inactifs
Agriculteurs
Artisans
Cadres sup
Pro Inter
Employés
Ouvriers

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Age-adjusted relative risk of CTS

- Farmers
- Craftsmen
- Professionals
- Technicians
- Low-grade white-collar workers
- Blue-collar workers

Women vs. Men

RR (Relative Risk)

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Standardized incidence ratios of CTS in women

* p < 0.05
Standardized incidence ratios of CTS in men

Blue-collar workers

* p < 0.05
Analyses: Attributable Fraction of Risk among Exposed (AFE)

• Distribution of CTS cases according to the last industry sector and occupation during the 5 years preceding the EDX diagnosis

• Age-adjusted relative risks (RR) of CTS according to industry and occupation categories
  – computed using the Mantel-Haenszel method with the whole sample of subjects included in the study as a reference, whether they were employed at the time of diagnosis or not.

• Attributable fractions of risk to work in the particular industry or occupation category in exposed individuals
  – computed for industries and occupations at high risk when at least five cases of CTS occurred

\[
AFE \, (\%) = \frac{(RR-1)}{RR}
\]

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CTS: Attributable fraction to work among exposed

Attributable fraction of risk among exposed

$$\text{AFE} = \frac{C(\text{RRi})}{A + B + C(\text{RRi})}$$

Cases of CTS attributable to “work” = $C_{\text{RRi}}$

“Natural” cases of CTS among exposed and unexposed to work

“Natural” cases of CTS

AFE = 80%

AFE = 50%
Attributable Risk of Carpal Tunnel Syndrome According to Industry and Occupation in a General Population

YVES ROQUELAURE,1 CATHERINE HA,2 GUILLAUME NICOLAS,3 MARIE-CHRISTINE PÉLIER-CADY,3 CAMILLE MARIOT,3 ALEXIS DESCATHA,4 ANNETTE LECLERC,4 GUY RAIMBEAU,3 MARCEL GOLDBERG,2 AND ELLEN IMBERNON2

Objective. An epidemiologic surveillance network for carpal tunnel syndrome (CTS) was set up in the general population of a French region to assess the proportion of CTS cases attributable to work in high-risk industries and occupations. Methods. Cases of CTS occurring among patients ages 20–59 years living in the Maine and Loire region were included prospectively from 2002 to 2004. Medical and occupation history was gathered by mailed questionnaire for 815 women and 320 men. Age-adjusted relative risks of CTS and the attributable risk fractions of CTS among exposed persons (AEFs) were computed in relation to industry sectors and occupation categories. Results. Twenty-one industry sectors and 8 occupational categories for women and 10 sectors and 6 occupational categories for men were characterized by a significant excess risk of CTS. High AFE values were observed in the manufacturing (42–93% for both sexes), construction (66% for men), and personal service industries (66% for women) and in the trade and commerce sectors (49% for women). High AFE values were observed in lower-grade white-collar occupations for women (43–67%) and blue-collar occupations for men (60–74%) and women (48–88%). Conclusion. The attributable proportions of CTS cases among workers employed in industry sectors and occupation categories identified at high risk of CTS varied between 30% and 93%.
Analyses : Population Attributable Fractions of risk (PAFs)

- Distribution of CTS cases according to the last industry sector and occupation during the 5-year period before the diagnosis

- Population attributable fractions of risk to work in the particular industry or occupation category at high risk of CTS:

\[
PAF = P_e \left( RR - 1 \right) / \left[ P_e \left( RR - 1 \right) + 1 \right]
\]

- \( RR \) : Age-adjusted relative risk of CTS according to the last industry and occupation category (reference = whole sample of subjects)
- \( P_e [%] \) : proportion of subjects involved in the general population

- PAF represents the *proportion of cases of CTS in the whole population which could be avoided* if the occupation category (or industry sector) under consideration did not expose to an excess of risk of CTS.
## AFEs and PAFs of CTS according to occupation category in women

<table>
<thead>
<tr>
<th>Occupation category</th>
<th>Pe (%)</th>
<th>N (%)</th>
<th>Age-adjusted RR [CI95%]</th>
<th>PAF [CI95%]</th>
<th>AFE [CI95%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farmers</td>
<td>1.9</td>
<td>19 (2.3)</td>
<td>1.0 [0.6-1.5]</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Craftswomen, saleswomen and managers</td>
<td>2.3</td>
<td>10 (1.2)</td>
<td>0.5 [0.3-1.0]</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Professionals</td>
<td>4.3</td>
<td>23 (2.8)</td>
<td>0.7 [0.5-0.7]</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Technicians, associate professionals</td>
<td>14.2</td>
<td>64 (7.8)</td>
<td>0.6 [0.4-0.7]</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Lower grade white-collar workers</td>
<td><strong>30.5</strong></td>
<td>384 (46.8)</td>
<td><strong>2.0 [1.8-2.3]</strong></td>
<td><strong>23.8 [18.7-28.5]</strong></td>
<td><strong>50.5 [46.6-54.2]</strong></td>
</tr>
<tr>
<td>Blue-collar workers</td>
<td><strong>12.4</strong></td>
<td>234 (28.5)</td>
<td><strong>2.9 [2.5-3.4]</strong></td>
<td><strong>18.9 [15.3-22.4]</strong></td>
<td><strong>65.2 [62.8-67.5]</strong></td>
</tr>
<tr>
<td>Pensioners and other non-working persons</td>
<td>34.4</td>
<td>80 (9.8)</td>
<td>0.2 [0.2-0.3]</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Persons working during the 5-year period before the diagnosis; Pe (%): percentage in the general population of the Maine-et-Loire area; N (%): number and distribution of CTS incident cases by occupation category; CI95 %: 95% confidence interval; Unspecified categories: 6 for women (0.7%) and 4 for men (1.3%);

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## AFEs and PAFs of CTS according to occupation category in men

<table>
<thead>
<tr>
<th>Occupation category</th>
<th>Pe (%)</th>
<th>N (%)</th>
<th>Age-adjusted RR</th>
<th>PAF [CI95%]</th>
<th>AFE [CI95%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farmers</td>
<td>4.8</td>
<td>14 (4.4)</td>
<td>1.2 [0.7-2.1]</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Craftswomen, saleswomen and managers</td>
<td>6.3</td>
<td>13 (4.1)</td>
<td>0.6 [0.3-1.0]</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Professionals</td>
<td>9.1</td>
<td>17 (5.3)</td>
<td>0.7 [0.4-1.2]</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Technicians, associate professionals</td>
<td>16.7</td>
<td>29 (9.2)</td>
<td>0.5 [0.4-0.8]</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Lower grade white-collar workers</td>
<td><strong>7.8</strong></td>
<td>24 (7.6)</td>
<td>1.3 [0.8-2.0]</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Blue-collar workers</td>
<td><strong>35.9</strong></td>
<td>210 (66.7)</td>
<td><strong>3.8</strong> [3.0-4.7]</td>
<td><strong>73.3</strong> [68.4-77.5]</td>
<td><strong>49.7</strong> [41.3-56.8]</td>
</tr>
<tr>
<td>Pensioners and other non-working persons</td>
<td>19.4</td>
<td>10 (3.1)</td>
<td>0.2 [0.1-0.4]</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Persons working during the 5-year period before the diagnosis; Pe (%): percentage in the general population of the Maine-et-Loire area; N (%): number and distribution of CTS incident cases by occupation category; CI95%: 95% confidence interval; Unspecified categories: 6 for women (0.7%) and 4 for men (1.3%); Y Roquelaure
Methods : Analyses (2)

- **Hypothetical computation** of the theoretical potential impact of intervention programs:
  - Assuming
    - a causal relationship between CTS and work exposure
    - efficient intervention programs in high risk industries and occupations

  - The PAF value gives information on the **potential impact of totally efficient intervention programs reducing the risk** of CTS in high risk industries and occupations to the **mean level of the general population**

  - To be more **realistic**, we computed hypothetical PAF values based on the **assumption of a decrease in the RRs** of CTS of only 30% (Melchior *et al.*, 2006)
ORIGINAL ARTICLE

Why are manual workers at high risk of upper limb disorders? The role of physical work factors in a random sample of workers in France (the Pays de la Loire study)

M Melchior, Y Roquelaure, B Evanoff, J-F Chastang, C Ha, E Imbernon, M Goldberg, A Leclerc, and the Pays de la Loire Study Group

Objectives: To investigate the reasons for the excess risk of upper limb musculoskeletal disorders among manual workers compared with other workers in a random sample of 2656 French men and women (20–59 years old) participating in a study on the prevalence of work-related upper limb disorders conducted by France's National Institute of Health Surveillance.

Methods: Prevalence ratios (PR) of physician-diagnosed musculoskeletal disorders of the shoulder, elbow, wrist, and hand (any of six leading disorders, rotator cuff syndrome, carpal tunnel syndrome) in manual versus non-manual workers were calculated using Cox regression models with a constant time of follow up and robust variance.

Results: 11.3% of men and 15.1% of women were diagnosed with an upper limb disorder. The risk was especially high in manual workers (PRs: 1.40 to 2.10). Physical work factors accounted for over 50% of occupational disparities overall, 62% (men) to 67% (women) for rotator cuff syndrome, and 96% (women) for carpal tunnel syndrome. The authors calculated that under lower levels of physical work exposures, up to 31% of cases among manual workers could have been prevented.

Conclusions: In working men and women, upper limb musculoskeletal disorders are frequent. Physical work exposures, such as repetitive and forceful movements, are an important source of risk and in particular account for a large proportion of excess morbidity among manual workers.

Accepted 13 June 2006
Published Online First 20 June 2006
Hypothetical values of the PAF

- Assuming a decrease of 30% in the RR of CTS after an intervention program, PAFs would be:
  - 37% in male blue-collar workers instead of 50%
  - 11% in females blue-collar workers instead of 19%
  - 11% in female lower-grade white-collar workers instead of 24%

- Assuming the same decrease for the manufacturing sector, PAFs would be:
  - 7% instead of 17% in men
  - 4% instead of 10% in women.

- The same assumption for the service industries sector in women would remove all excess risk of CTS for this sector.
**Conclusion**

- The maximum **theoretical** impact of prevention programs of CTS would be between 5 and 50% at the population level in **this region**, depending on the occupational category or industry sector under consideration.

- **Intervention programs of more limited effectiveness** would have a relatively limited impact on the burden of CTS at the population level.

- Although these results should be confirmed in other regions, they provide useful information to help public policy to define prevention strategies at the population level.
Simulation of intervention program aiming to reduce the incidence of CTS in the general population

• **Population:**
  – 100,000 women in the Maine et Loire area
  – 65.6% working *(exposed)*, 34.4% non working *(unexposed)*

• **Risk of CTS:**
  – Moderate risk for the whole female working population *(RR working / non working) = 2*
  – Risk higher in several sectors *(automotive, meat processing, etc.)* and occupations *(blue-collar and low grade white-collar workers)* *(overexposed)*

• **Hypothesis: reduction of the risk of 20% to 50%**
General population of 100,000 women

Working (%) = 65.6; I = 381/100 000
- \( I_{\text{non working}} = 231/100 000 \) (“natural cases”)
- \( I_{\text{working}} = 459/100 000 \)

381 cases of CTS with 149 attributable to work

301 cases
- 149 cases “in excess” (50%)
- 152 “natural” cases (50%)
- 79 “natural” cases

\[ RR = 2 \; ; \; AFE = 50\% = \frac{149}{301} \; ; \; PAF = 40\% = \frac{149}{381} \]

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General population of 100,000 women
Incidence decrease of 20% in working subjects

Taux activité = 65,6%; I= 320/100 000
- Inon working = 231/100 000 (“natural cases”)
- Iworking = 367/100 000

320 cases of CTS with 89 attributable to work

65,600 working women exposed
61 cases avoided
89 cases “in excess”
241 cases
(-60 cases)
152 “natural” cases
79 “natural” cases

Impact = -61/381 = -16%
RR = 1,6 ; FRAE = 37% = (89/241); FRAP = 28% = (89/320)

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General population of 100,000 women
Incidence decrease of 50% in working subjects

Working (%) = 65.6%; \( I = \frac{232}{100\,000} \)
- \( I_{\text{non working}} = \frac{231}{100\,000} \)
- \( I_{\text{working}} = \frac{231.1}{100\,000} \)

232 cases of CTS with 1 attributable to work

65,600 working women exposed
34,400 non working women unexposed

153 cases (\( \approx 148 \) cases)

148 cases avoided
1 case
79 “natural cases”

Impact = \(-\frac{148}{381} = -38.8\% \)

RR = 1.2; FRAE = 0.6% = (1/152); FRAP = 0.05% = (1/232)

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Case study: hospital cleaners
PCS 5221

Moderate risk excess of CTS with numerous women exposed to work
F = 4668 (2.40%)
Relative risk of CTS in hospital cleaners

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General population of 100,000 women

Working (%) = 65.6%; \( l = \frac{232}{100\,000} \)
- \( l_{\text{non working}} = \frac{231}{100\,000} \)
- \( l_{\text{working}} = \frac{231.1}{100\,000} \)
- \( l_{\text{hospital cleaners}} = \frac{485}{100\,000} \)

381 cases of CTS with 290 attributable to work in general and 6.5 to work as hospital cleaner

2,400 H Cleaners

63,200 working women exposed

34,400 non working women unexposed

12 cases

290 cases

6,5 cases in excess

5.5 natural cases

144 cases “in excess” (50%)

146 “natural” cases (50%)

79 “natural” cases

RR = 2; FRAE = 50% = (149/301); FRAP = 40% = (149/381)
General population of 100,000 women
In incidence decrease of 20% in hospital cleaners uniquely

Working (%) = 65.6%; \( I = \frac{232}{100\,000} \)
- \( I_{\text{non working}} = \frac{231}{100\,000} \)
- \( I_{\text{working}} = \frac{231.1}{100\,000} \)
- \( I_{\text{hospital cleaners}} = \frac{388}{100\,000} \)

378 cases of CTS with 290 attributable to work in general and 3.5 to work as hospital cleaner

2,400 H Cleaners

63,200 working women exposed

34,400 non working women unexposed

290 cases

9 cases

(-3 cases)

144 cases “in excess” (50%)

146 “natural” cases (50%)

79 “natural” cases

Impact = \( \frac{3}{381} = 0.8\% \)

RR = 2; FRAE = 50% = (144/290); FRAP = 38% = (144/378)
Theoretical impact of intervention program of CTS

• **Population of 100,000 women:**
  – Working rate = 65.6%; including **2,400 aide-nurses**
  – Incidence rate of CTS = 381/100,000 women, i.e. 381 cases of CTS /
    year
  – Relative risk of CTS in working women = 2

• **Decrease of 20% of the relative risk of CTS:**
  – **In all working women:**
    • gain of 61 cases among 381, i.e. $\sim 16\%$ of all CTS cases
    • gain of 61 cases among 149 cases attributable to work, i.e. $\sim 41\%$
  – **In hospital cleaners uniquely:**
    • gain of 3 cases among 381, i.e. $\sim 1\%$ of all CTS cases
    • gain of 3 cases among 12 occurring in aide-nurses, i.e. $\sim 25\%$
    • gain of 3 cases among 6 cases attributable to work, i.e. $\sim 50\%$
Simulation of intervention program aiming to reduce the incidence of CTS in a large company at high risk of CTS

• **Population:**
  – 1,000 women in the Maine et Loire area
  – 50% highly exposed

• **Overexposure to the risk of CTS** (highly exposed / exposed):
  – High: RR = 15
  – Moderate: RR = 5

• **Hypothesis: reduction of the risk of 30%**

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Industrial company with 1,000 female blue-collar workers highly overexposed to the risk of CTS

RR = 15; 50% of women overexposed

Références

- $I_{\text{mean}} = I_{\text{working in the area}} = 4/1000$
- $I_{\text{non working}} = 2/1000$ (“natural cases”)
- $I_{\text{over exposed}} = (15 \times I_{\text{e}}) = 60/1000$

32 cases of CTS with 29 attributable to work

- 1 natural case
- 2 cases

- 91%
- 9%
Industrial company with 1,000 female blue-collar workers highly overexposed to the risk of CTS

RR = 15; 50% of women overexposed; decrease of incidence of 20% in overexposed

Référence

- $I_{\text{mean}} = I_{\text{working in the area}} = 4/1000$
- $I_{\text{non working}} = 2/1000$ (“natural cases”)
- $I_{\text{over exposed}} = 48/1000$ (RR=12)

26 cases of CTS with 23 attributable to work

Impact = 6/32 = 19%

89 %

11%
Industrial company with 1,000 female blue-collar workers highly overexposed to the risk of CTS

RR = 15; 50% of women overexposed; decrease of incidence of 50% in overexposed

Référence
- $I_{\text{mean}}$ = $I_{\text{working in the area}}$ = 4/1000
- $I_{\text{non working}}$ = 2/1000 (“natural cases”)
- $I_{\text{over exposed}}$ = 30/1000 (RR=7,5)

17 cases of CTS with 14 attributable to work

Impact = $15/32 = 47\%$

82 %

13%
Industrial company with 1,000 female blue-collar workers moderately overexposed to the risk of CTS

RR = 5; 50% of women overexposed

Références

- $I_{\text{mean}} = I_{\text{working in the area}} = 4/1000$
- $I_{\text{non working}} = 2/1000$ (“natural cases”)
- $I_{\text{over exposed}} = (5 \times I_{\text{e}}) = 20/1000$

12 cases of CTS with 9 attributable to work

- 10 cases “in excess” (97%)
- 1 natural case
- 2 cases

- 75%

- 25%

- 1 case exposed
- 1 natural case

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Industrial company with 1,000 female blue-collar workers moderately overexposed to the risk of CTS
RR = 5; 50% of women overexposed; decrease of incidence of 20% in overexposed

Références
- \( I_{\text{mean}} = I_{\text{working in the area}} = \frac{4}{1000} \)
- \( I_{\text{non working}} = \frac{2}{1000} \) (“natural cases”)
- \( I_{\text{over exposed}} = (4 \times \text{Ine}) = \frac{16}{1000} \)

10 cases of CTS with 7 attributable to work

Impact = \( \frac{2}{12} = \frac{17}{100} = 17\% \)

1000 workers, 50% overexposed (RR=5)
10 CTS / year after the intervention (vs. 12) impact of 2 CTS less per year…

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Industrial company with 1,000 female blue-collar workers
moderately overexposed to the risk of CTS
RR = 5; 50% of women overexposed; decrease of incidence of 50% in overexposed

Références
- \( I_{\text{mean}} = I_{\text{working in the area}} = 4/1000 \)
- \( I_{\text{non working}} = 2/1000 \) ("natural cases")
- \( I_{\text{over exposed}} = (2.5 \times I_{\text{inc}}) = 10/1000 \)

7 cases of CTS with 4 attributable to work

Impact = 5/12 = 42% 

1000 workers, 50% overexposed (RR=5)
7 CTS / year after the intervention (vs. 12) impact of 5 CTS less per year...
Population totale de 100 000 femmes
extrapolation des données traceur EMG et du PMSI régional

Taux activité = 65,6 %; I= 381/100 000
- I_{inactives} = 231/100 000
- I_{actives} = 459/100 000

381 cas de SCC dont
149 attribuables à
l’activité professionnelle

RR = 2 ; FRAE = 50 % = (149/301) ; FRAP = 40 % = (149/381)

Y Roquelaure
CONCLUSION

• Theoretical impact of prevention program of CTS at the workplace
  – Reduce the number of incident cases attributable to work uniquely
  – Few influences on the incident “natural cases” of CTS
  – Reduction of incident cases / year require a major reduction of the RRs and large companies to be seen as a result of the intervention program at the workplace

• Intervention at the workplace cannot reduce all the CTS diagnosed at the workplace!
  → Be cautious for the objectives of the intervention program
  → Be cautious for the assessment of the study

• Need to combine primary prevention with rehabilitation program and return to work program
Présentation du LEEST

Responsable du laboratoire
Pr Yves Roquelaure

Statut du laboratoire
Unité Associée InVS, UPRSES EA 4338, IFR 132

Objectif
Le LEEST a pour objectif principal l'étude interdisciplinaire des pathologies liées au travail ou à fort retentissement professionnel, notamment les troubles musculo-squelettiques des membres (TMS*) et les lombalgies, y compris leurs dimensions psychologiques, sociales et économiques.

Organisation
Le projet scientifique du laboratoire est bâti autour de deux approches complémentaires :

- Thématique 1 : Épidémiologie et surveillance des TMS
- Thématique 2 : Interventions de prévention
Thank you for your attention