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# The prevalence of musculoskeletal disorders in the retail sector: an Italian cross sectional study on 3380 workers

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**Key words**

Retail sector; musculoskeletal disorders; occupational diseases; biomechanical overload; Cross-Sectional Study

**Parole chiave**

Grande distribuzione; disturbi muscolo scheletrici; malattie professionali; sovraccarico biomeccanico; indagine trasversale

**Summary**

**Background:** *Cashiers are not the only workers in the Retail Sector (RS) who are exposed to biomechanical overload risk of the upper limbs and spine.* **Objectives:** *To investigate the prevalence of musculoskeletal disorders among employees in the RS.* **Methods:** *3380 Italian workers were asked to complete a standardized medical history questionnaire to collect data on symptoms and diagnosed disorders affecting upper limbs, spine and knees. These were then compared with data on subjects not exposed to biomechanical overload risk.* **Results:** *21.1% of the workers reported at least one disorder affecting the upper limbs (OR 5.05), i.e., shoulder (OR 3.39), elbow (OR 4.25), wrist/hand (OR 8.39) and CTS (OR 8.70). The prevalence of disc hernia was 16% (OR 3.82). A high prevalence of knee complaints was also found among subjects employed in the RS (OR 1.73).* **Conclusions:** *The high prevalence of musculoskeletal disorders seems to confirm the presence of a risk of biomechanical overload for most job positions in the retail sector, although a possible selection bias cannot be completely ignored. Recommendations for future studies aiming to confirm our results include: involving all workers in every store and collecting information about diagnostic procedures.*

**Riassunto**

**«*La prevalenza delle patologie muscoloscheletriche nel settore della grande distribuzione organizzata: uno studio trasversale italiano su 3380 lavoratori*»**. **Introduzione:** *Nella grande distribuzione organizzata (GDO) la mansione di cassiera non è la sola ad essere sottoposta a rischio da sovraccarico biomeccanico degli arti superiori e del rachide.* **Obiettivi:** *Indagare la prevalenza di patologie muscoloscheletriche tra i lavoratori della GDO.* **Metodi:** *A 3380 lavoratori su territorio italiano è stato sottoposto un questionario anamnestico standardizzato per ottenere informazioni riguardo a sintomi e patologie già diagnosticate agli arti superiori, al rachide e ai ginocchi. I dati ottenuti sono stati confrontati con quelli derivanti da un campione di lavoratori non sottoposti a sovraccarico biomeccanico.* **Risultati:** *Il 21,1% dei lavoratori ha riferito la presenza di almeno una patologia agli arti superiori (OR 5,05), in particolare per i vari distretti: spalla OR 3,39, gomito OR 4,25, polso/mano OR 8,39 e per la sindrome del tunnel*

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*carpale OR 8,70. La prevalenza di ernia discale è risultata pari a 16% (OR 3,82). Anche le patologie del ginocchio mostrano un'alta prevalenza tra i soggetti impiegati nella grande distribuzione (OR 1,73).* **Conclusioni:** *L'alta prevalenza di patologie muscoloscheletriche confermerebbe la presenza di un rischio, trasversale alla maggior parte delle mansioni, da sovraccarico biomeccanico nel settore della grande distribuzione, anche se non si può escludere un bias di selezione. Per confermare questi risultati sarà necessario, in futuro, non solo raggiungere tutti i lavoratori dei singoli punti vendita ma anche acquisire, a fianco della raccolta anamnestica la diagnosi strumentale.*

## Introduction

The Retail Sector (RS), also known as Modern Retail Sector (MRS), has grown remarkably over the last decade in both the "food" and "non-food" areas.

Data taken from the European report *Working Conditions in the Retail Sector* (2012) show that this specific sector accounts for 4.2% of the European GDP, and that the number of employees has increased from 17.000.000 to 19.000.000, thus representing a labour force equal to 9% of all European workers. Up to date, the Italian Retail Sector has reached 450.000 stores.

Several factors led to considerable changes in the organizational structure over the last ten years: more and more companies now require a high number of employees, while small businesses and self-employed workers are decreasing or disappearing. Also, the median age of workers is increasing, with more and more workers preferring part-time jobs, shift work and temporary jobs (especially seasonal). The deregulation of trading hours, especially night and Sunday trading, has had a negative effect on the life of people employed in the retail trade. It comes as no surprise, then, that musculoskeletal disorders and psychosocial risk factors are among the main health issues in this sector.

It is essential to know the health status of this population, as this allows us to plan possible interventions aimed at enhancing their well-being.

The literature shows an increase in musculoskeletal disorders among people employed in the Retail Sector, cashiers being the most affected and the most studied group (4, 5, 9, 10, 17, 18, 25-28, 36, 40-43). Osorio et al. (1994) noted a prevalence of CTS of 16% among female cashiers.

In 2005 Bonfiglioli et al. reported a prevalence of carpal tunnel syndrome in full-time and part-time female supermarket cashiers of respectively 7.89% and 3.53%.

In their study on 128 female cashiers, Di Piede et al. (2011) reported a prevalence of CTS and ulnar nerve entrapment of the elbow of 19% and 8.3%, respectively. Rotator cuff tendinosis was also diagnosed in 19.5% of cases.

Violante et al. (2005) examined a population of 3.702 workers employed in small, medium and large superstores. The prevalence of lumbar disc herniation was 4.4% (diagnosis established through clinical and instrumental examination).

The few studies that focused on musculoskeletal disorders affecting upper limbs, the spine and lower limbs in workers performing all kind of tasks showed a relatively high prevalence (23, 49, 55).

Despite many changes in organization and technology, the retail trade still shows an increased risk of musculoskeletal disorders caused by biomechanical overload and awkward postures of the upper limbs and spine.

This research aimed at investigating whether the prevalence of musculoskeletal disorders is greater among RS workers than among employees working in a safer environment, absolutely free from biomechanical overload risk.

## Methods

The study started in July 2012 by interviewing trade union representatives with the aim of getting a better understanding of all the different settings within the Retail Sector. It was equally important to define a terminology all workers would agree upon.

Following this preliminary phase, a questionnaire was created, divided into five macro-sections. The first macro-section aims at collecting personal and work data; the three following sections focus on

musculoskeletal disorders affecting the upper limbs, lumbosacral spine and knees that occurred in the previous 12 months; the last macro-section includes questions taken from the *Fifth European Working Conditions Survey* (20), on both the perception of occupational risk and personal health.

A whole section was dedicated to previously diagnosed disorders: in addition to the specific diagnostic procedure they underwent, workers were also asked to provide the year of their medical report.

The upper limb disorders (documented by a specific diagnostic procedure) covered in this study were those defined in an informed consent form (12, 13) as being related to the risk of biomechanical overload:

a) For the shoulder region: tendinopathies of the rotator cuff and the long head of the biceps, subacromial bursitis
b) For the elbow region: epicondylitis and lateral epicondylitis
c) For the hand/wrist region: tendinopathies of hand/wrist flexors and extensors
d) Carpal Tunnel Syndrome (CTS)

As for disorders affecting the lumbosacral spine, only disc hernia was taken into consideration if documented by CAT or RMI.

Regarding knee disorders, meniscal and ligament lesions, as well as osteoarthritis were taken into consideration because the literature links them to work-related biomechanical overload factors (1-3, 32, 31, 38, 48, 50, 54). In this case, subjects were considered to be suffering from a disease when they had been diagnosed with at least one of the disorders mentioned above (documented by a specific diagnostic procedure).

The questionnaire also included questions on potential confounders such as gender, race, age and BMI (7, 8, 21, 24, 29-30, 33, 46, 51-53). It was administered by trade union representatives after a special step-by-step training: contents and mode of administration were explained during a full-day meeting. A trial period started thereafter during which the first batch of questionnaires was collected and sent out for correction. This preliminary phase ended with a one-day refresher training including error correction. The questionnaire was then uploaded online. Data collectors who showed good understanding of the collection process were given a password, so that they could upload each questionnaire onto the online database. The whole training process took four months.

Data collectors were actively tutored through ad hoc meetings. A demo video was also shot that showed how to administer the questionnaire. It is available online on the homepage of the UIL-TuCS website. Interviews were carried out following two methods, often combined afterwards: individual and group interviews. Most data collectors started off with individual interviews and performed a second collection during meetings. This turned out to be the best procedure.

All participants joined voluntarily and all data were collected anonymously. Data collection took place from January 2012 to July 2013 on the basis of the number of retail stores in every Italian region.

Collected data were then compared with similar sets of data obtained from reference groups, collected by occupational physicians using the same medical history form. Reference groups included clerical workers who used a visual display unit, could make autonomous decisions about breaks and had the possibility of switching between sitting and standing position (no data entry, no call center):

- A sample of 2022 workers not exposed to biomechanical overload (Meroni et al. 2010); clerks working at a VDU for a duration of time equal to or exceeding 20 hours per week, including insurance and bank employees (no desk activity). In the sample studied, no association was shown between VDU work and onset of upper limb diseases. This population was used as a reference group for upper limb disorders.
- A sample of 1059 workers from Milan State University and Politecnico already subject to medical surveillance for VDU operators and biological risk and not exposed to biomechanical overload risk (14). The study investigated the prevalence of disorders and diseases affecting upper limbs, lower limbs and spine. This population was used as a reference group for those disorders.
- A sample of 1625 VDU operators from an Italian insurance agency, working for a duration of time exceeding 20 hours per week and not

exposed to biomechanical overload (11). The population was used as a reference group for disc hernia.

Inclusion criteria for workers of the retail sector were the following:

- Age <65
- Having spent more than 6 months in the current job

3380 questionnaires were collected, 3359 of which could be analyzed according to the established criteria.

Incomplete data on disorders were analysed as follows: disorders were only taken into consideration if associated with a suitable diagnostic procedure. Some positive subjects turned out to be negative: 22 for the shoulder region, 13 for the elbow region, 17 for hand/wrist region, 23 for CTS and 52 for lumbosacral disc hernia.

### Statistical analysis

To evaluate the association between employment in the RS and musculoskeletal disorders, univariate and multiple logistic regression models were used to calculate odds ratios (ORs) and 95% confidence intervals (CIs). In multiple regression models gender, age (five categories: 15-24, 25-34, 45-54, and 55-64 years), and BMI (four categories: <18.50, 18.50-24.99, 25.00-29.99, and 30+ kg/m$^2$) were included as potential confounders. Analyses were performed with Stata 13 (StataCorp. 2013 Stata: Release 13. Statistical Software. College Station, TX: Stata Corp LP).

## Results

A total of 3380 subjects (2140 females; 1219 males) working in 28 different chain stores in 15 Italian regions were interviewed. The median age was 41,6 years, with a distribution in age and gender classes as shown in table 1.

The median BMI was 23.8 and 65.9% of workers had normal weight, with only 6% suffering from obesity. The medium time spent on the job was 15.6 years; 47.5% of the subjects worked part-time (up to 35 hours a week), while 75.5% worked on shifts and 37.5% worked overtime.

**Table 1** - Distribution of interviewees in age and gender classes

| Age groups year | Female | | Male | |
|---|---|---|---|---|
| | N | % | N | % |
| 15-24 | 54 | 2.5 | 35 | 2.9 |
| 25-34 | 370 | 17.3 | 253 | 20.8 |
| 35-44 | 936 | 43.7 | 436 | 35.8 |
| 45-54 | 654 | 30.6 | 407 | 33.4 |
| 55-64 | 126 | 5.9 | 88 | 7.2 |
| Total | 2140 | 100.0 | 1219 | 100.0 |

It is worth analysing the sample on the basis of how many workers were employed in each store, using the same classification adopted throughout Europe: about half of the sample (46.1%) worked in stores with 50 to 249 workers; 23.3% of the interviewees were employed in stores with 20 to 49 workers; 22.4% in stores with over 250 workers and the remaining 8.2% in stores with less than 20 workers.

The sample was also analysed on the basis of the "main task" performed by the workers, considered as such if performed for at least 70% of the total work time. The distribution is shown in table 2.

Out of the total, 2168 subjects (64.1% of the interviewees) reported that they underwent periodic health surveillance (as prescribed by Italian legislation); 465 subjects (21.4%), reported that they had

**Table 2** - "Main" tasks analyzed on the basis of gender

| Task/In charge of | Female | | Male | |
|---|---|---|---|---|
| | N. | % | N. | % |
| More than one task | 419 | 69.1 | 187 | 30.9 |
| Cashier | 716 | 92.3 | 60 | 7.7 |
| Wharehouse worker | 60 | 22.1 | 212 | 77.9 |
| Maintenance operator | 84 | 68.3 | 39 | 31.7 |
| Shelf Restocking | 302 | 55.0 | 247 | 45.0 |
| Fruit & Vegetables | 59 | 36.2 | 104 | 63.8 |
| Frozen Food | 17 | 58.6 | 12 | 41.4 |
| Gourmet food dept. | 175 | 65.5 | 92 | 34.5 |
| Meat & Poultry department | 43 | 25.1 | 128 | 74.9 |
| Fish Department | 53 | 57.6 | 39 | 42.4 |
| Bakery | 100 | 73.5 | 36 | 26.5 |
| Salesperson | 112 | 64.0 | 63 | 36.0 |
| Total | 2140 | 63.7 | 1219 | 36.3 |

a fit for work certificate with restrictions signed by an occupational health physician. A more in-depth analysis showed that the most common restrictions involved the lumbosacral spine (10.2%), followed by the upper limbs (5.7%), and then the lower limbs (3%). Setting age as the main criterion in the analysis of restrictions, a positive trend was noticeable as age increased: from 3.2% in the 15-24 year range to 38.9 in the 55-64 year range.

Sick leave was also considered, both as a total and in relation to disorders affecting single regions. Out of a total of 44076 sick days, 56.3% were due to musculoskeletal disorders. Specifically, 30.9% of sick days were due to lumbar spine disorders, 17.6% to upper limb disorders and 7.8% to disorders affecting the lower limbs.

Collected data refer both to disorders occurring in the previous 12 months and to complaints diagnosed beforehand. In this article, only results related to disorders, documented by a specific diagnostic procedure, caused by a possible biomechanical overload are analysed.

## Upper limb disorders

Regarding tendon complaints and entrapment neuropathies (especially CTS), the analysed regions included shoulder, elbow, wrist and hand. 21.1% of the interviewed subjects reported at least one upper limb disorder, its trend being positive with age. In detail, the prevalence of shoulder disorders was 9.1% in females and 7.1% in males; 6.4% and 3.3% for elbow disorders, respectively; 9.6% and 4.9% for the wrist/hand region, and 7.8% and 2.1% for CTS.

A comparison between workers of the retail sector and unexposed subjects was carried out first and foremost by considering all those positive for a disorder affecting a given region (shoulder, elbow, wrist/hand, CTS). As can be seen in tables 3-6, the crude odds ratios obtained by comparing the OR for workers of the RS and unexposed subjects were all significantly positive, with gender, BMI and age set as confounders. Adjusting the result for such factors did not substantially alter the original data ob-

**Table 3 -** Presence of shoulder disorder: comparison between workers of retail sector and workers not exposed to biomechanical overload risk

| Shoulder disorders | Negative | Positive | OR-crude | 95% CI | OR-adjusted | 95% CI* |
|---|---|---|---|---|---|---|
| Exposure | | | | | | |
| Negative | 2994 | 54 | 1.00 | (Reference) | 1.00 | (Reference) |
| Positive | 3089 | 277 | 4.97 | 3.70-6.68 | 3.39 | 2.23-5.17 |
| Gender | | | | | | |
| Male | 2667 | 103 | 1.00 | (Reference) | 1.00 | (Reference) |
| Female | 3416 | 228 | 1.73 | 1.36-2.19 | 1.29 | 0.99-1.68 |
| Age | | | | | | |
| 15-24 y | 161 | 0 | - | | - | |
| 25-34 y | 1681 | 33 | 1.00 | (Reference) | 1.00 | (Reference) |
| 35-44 y | 2237 | 107 | 2.44 | 1.64-3.62 | 1.85 | 1.19-2.86 |
| 45-54 y | 1538 | 136 | 4.5 | 3.06-6.63 | 3.13 | 2.04-4.82 |
| 55-64 y | 430 | 53 | 6.27 | 4.01-9.82 | 6.35 | 3.87-10.42 |
| Test for trend | | | | | | P<0.0001 |
| BMI | | | | | | |
| Underweight | 177 | 11 | 0.86 | 0.46-1.62 | 1.01 | 0.53-1.92 |
| Normal weight | 2673 | 192 | 1.00 | (Reference) | 1.00 | (Reference) |
| Overweight | 948 | 72 | 1.06 | 0.80-1.41 | 0.9 | 0.67-1.21 |
| Obesity | 224 | 24 | 1.49 | 0.95-2.33 | 1.19 | 0.75-1.88 |
| Test for trend | | | | | | P=0.904 |

Adjusted for gender, age, and BMI

**Table 4** - Presence of elbow disorders: comparison between workers of retail sector and workers not exposed to biomechanical overload risk

| Elbow disorders | Negative | Positive | OR-crude | 95% CI | OR-adjusted | 95% CI* |
|---|---|---|---|---|---|---|
| Exposure | | | | | | |
| Negative | 3031 | 17 | 1.00 | (Reference) | 1.00 | (Reference) |
| Positive | 3188 | 178 | 9.95 | 6.04-16.41 | 4.25 | 2.28 -7.93 |
| Gender | | | | | | |
| Male | 2720 | 50 | 1.00 | (Reference) | 1.00 | (Reference) |
| Female | 3499 | 145 | 2.25 | 1.63-3.12 | 2.30 | 1.60-3.30 |
| Age | | | | | | |
| 15-24 y | 161 | 0 | - | | - | |
| 25-34 y | 1704 | 10 | 1.00 | (Reference) | 1.00 | (Reference) |
| 35-44 y | 2276 | 68 | 5.09 | 2.61-9.92 | 2.95 | 1.50-5.80 |
| 45-54 y | 1582 | 92 | 9.91 | 5.14-19.01 | 5.69 | 2.93-11.05 |
| 55-64 y | 459 | 24 | 8.91 | 4.23-18.76 | 6.57 | 3.06-14.08 |
| Test for trend | | | | | | P<0.0001 |
| BMI | | | | | | |
| Underweight | 185 | 3 | 0.41 | 0.13-1.30 | 0.42 | 0.13-1.36 |
| Normal weight | 2756 | 109 | 1.00 | (Reference) | 1.00 | (Reference) |
| Overweight | 958 | 62 | 1.64 | 1.19-2.25 | 1.63 | 14.16-2.89 |
| Obesity | 237 | 11 | 1.17 | 0.62-2.21 | 1.02 | 0.54-1.95 |
| Test for trend | | | | | | P=0.025 |

Adjusted for gender, age, and BMI

**Table 5** - Presence of wrist/hand disorders: comparison between workers of retail sector and workers not exposed to biomechanical overload risk

| Wrist/hand disorders | Negative | Positive | OR-crude | 95% CI | OR-adjusted | 95% CI* |
|---|---|---|---|---|---|---|
| Exposure | | | | | | |
| Negative | 3002 | 46 | 1.00 | (Reference) | 1.00 | (Reference) |
| Positive | 2966 | 400 | 8.80 | 6.46-11.99 | 8.39 | 4.94-14.24 |
| Gender | | | | | | |
| Male | 2684 | 86 | 1.00 | (Reference) | 1.00 | (Reference) |
| Female | 3284 | 360 | 3.42 | 2.69-4.35 | 3.02 | 2.31-3.95 |
| Age | | | | | | |
| 15-24 y | 160 | 1 | 0.23 | 0.03-1.65 | 0.17 | 0.02 1.29 |
| 25-34 y | 1668 | 46 | 1.00 | (Reference) | 1.00 | (Reference) |
| 35-44 y | 2173 | 171 | 2.85 | 2.05-3.98 | 1.80 | 1.25-2.59 |
| 45-54 y | 1504 | 170 | 4.1 | 2.94-5.72 | 2.41 | 1.67-3.47 |
| 55-64 y | 426 | 57 | 4.85 | 3.24-7.26 | 4.19 | 2.67-6.59 |
| Test for trend | | | | | | P<0.0001 |
| BMI | | | | | | |
| Underweight | 173 | 15 | 0.95 | 055-1.63 | 0.97 | 0.55-1.70 |
| Normal weight | 2625 | 240 | 1.00 | (Reference) | 1.00 | (Reference) |
| Overweight | 904 | 116 | 1.4 | 1.11-1.77 | 1.53 | 1.18-1.96 |
| Obesity | 212 | 36 | 1.86 | 1.27-2.71 | 1.85 | 1.24-2.75 |
| Test for trend | | | | | | P<0.0001 |

Adjusted for gender, age, and BMI

**Table 6** - Presence of carpal tunnel syndrome: comparison between workers of retail sector and workers not exposed to biomechanical overload risk

| Carpal tunnel syndrome | Negative | Positive | OR-crude | 95% CI | OR-adjusted | 95% CI* |
|---|---|---|---|---|---|---|
| Exposure | | | | | | |
| Negative | 3027 | 21 | 1.00 | (Reference) | 1.00 | (Reference) |
| Positive | 3174 | 192 | 8.72 | 5.54-13.72 | 8.70 | 3.81-19.88 |
| Gender | | | | | | |
| Male | 2743 | 27 | 1.00 | (Reference) | 1.00 | (Reference) |
| Female | 3458 | 186 | 5.46 | 3.64-8.21 | 5.08 | 3.25-7.94 |
| Age | | | | | | |
| 15-24 y | 161 | 0 | - | | - | |
| 25-34 y | 1699 | 15 | 1.00 | (Reference) | 1.00 | (Reference) |
| 35-44 y | 2267 | 77 | 3.85 | 2.20-6.71 | 2.26 | 1.23-4.14 |
| 45-54 y | 1582 | 92 | 6.59 | 3.80-11.42 | 3.74 | 2.05-6.8 |
| 55-64 y | 455 | 28 | 6.97 | 3.69-13.16 | 5.45 | 2.71-10.97 |
| Test for trend | | | | | | P<0.0001 |
| BMI | | | | | | |
| Underweight | 182 | 6 | 0.84 | 0.36-1.94 | 0.82 | 0.35-1.93 |
| Normal weight | 2757 | 108 | 1.00 | (Reference) | 1.00 | (Reference) |
| Overweight | 963 | 57 | 1.51 | 1.08-2.09 | 1.7 | 1.20-2.41 |
| Obesity | 228 | 20 | 2.23 | 1.36-3.67 | 2.27 | 1.35-3.82 |
| Test for trend | | | | | | P<0.0001 |

Adjusted for gender, age, and BMI

tained by evaluating the crude OR. Specifically, the adjusted OR for shoulder disorders was 3.39 (CI 2.23-5.17); 4.25 (CI 2.28-7.93) for elbow disorders; 8.39 (CI 4.94-14.24) for the wrist/hand region and 8.70 (CI 3.81-19.88) for CTS. Gender showed marked differentiation regarding elbow disorders (OR 2.3), wrist-hand disorders (OR 3.02) and CTS (OR 5.08), yet not for shoulder disorders. Age classes, too, showed increasing OR for all the upper-limb disorders considered; this was more evident as age increased. Unlike the literature data, BMI did not appear to be relevant for shoulder disorders, while it was for disorders affecting the elbow, wrist/hand region, and CST.

## Lumbosacral spine: disc hernia

Only disc hernia was taken into consideration, both present at time of research and surgically removed.

The overall presence of disc hernia was 16% (13.3% females; 17.3% males), 2.7% of whom had already undergone surgery. A positive trend was noticeable as age increased (from a frequency of 3.4% in the 15-24 years range to 22% in the 55-64 years range).

For people working in the RS, multiple logistic regression showed an OR of 3.82 (95% CI 3.08-4.74). The confounding factors taken into account were gender, BMI and age (the latter grouped into classes). Adjusting the result for such factors did not substantially alter the original data obtained by evaluating the raw OR. Again, a positive trend was noticeable in relation to age, with an OR between 0.68 (youngest age group) and 4.15 (oldest age group). Gender did not seem to be of relevance while obese subjects showed an OR of 1.55 (table 7).

## Lower limbs: knee pathologies

Meniscal lesions, tendon injuries and osteoarthritis were dealt with in this section by analysing aggregate data.

The prevalence of knee complaints was 11.6% in males and 6.5% in females, with the latter showing a positive trend as age increased.

**Table 7** - Presence of disc hernia: comparison between workers of the retail sector and workers not exposed to biomechanical overload risk

| Disc hernia | Negative | Positive | OR-crude | 95% CI | OR-adjusted | 95% CI* |
|---|---|---|---|---|---|---|
| Exposure | | | | | | |
| Negative | 4498 | 173 | 1.00 | (Reference) | 1.00 | (Reference) |
| Positive | 2825 | 541 | 4.98 | 4.17-5.95 | 3.82 | 3.08-4.74 |
| Gender | | | | | | |
| Male | 3263 | 299 | 1.00 | (Reference) | 1.00 | (Reference) |
| Female | 4060 | 415 | 1.11 | 0.95-1.30 | 0.94 | 0.78-1.12 |
| Age | | | | | | |
| 15-24 y | 215 | 5 | 0.71 | 0.28-1.78 | 0.68 | 0.27-1.72 |
| 25-34 y | 2168 | 71 | 1.00 | (Reference) | 1.00 | (Reference) |
| 35-44 y | 2595 | 257 | 3.02 | 2.31-3.96 | 2.30 | 1.70-3.11 |
| 45-54 y | 1780 | 297 | 5.09 | 3.90-6.65 | 3.74 | 2.78-5.05 |
| 55-64 y | 533 | 78 | 4.45 | 3.19-6.25 | 4.15 | 2.86-6.03 |
| Test for trend | | | | | | P<0.0001 |
| BMI | | | | | | |
| Underweight | 240 | 10 | 0.38 | 0.20-0.73 | 0.46 | 0.24-0.89 |
| Normal weight | 3471 | 375 | 1.00 | (Reference) | 1.00 | (Reference) |
| Overweight | 1230 | 204 | 1.53 | 1.28-1.84 | 1.33 | 1.09-1.62 |
| Obesity | 292 | 59 | 1.87 | 1.39-2.52 | 1.55 | 1.14-2.13 |
| Test for trend | | | | | | P<0.0001 |

Adjusted for gender, age, and BMI

Multiple logistic regression analysis highlighted a higher presence of knee disorders among subjects employed in the RS than among unexposed subjects (OR 1.73 95% C.I. 1.25-2.41). The confounding factors taken into account were gender, BMI and age (the latter grouped into classes). Adjusting the result for such factors did not substantially alter the original data obtained by evaluating the raw OR. A correlation was found between OR and BMI, with OR 1.15 for overweight subjects and OR 1.47 for obese subjects (table 8).

## Discussion and conclusions

The analysed results seem to confirm an excessive prevalence of disorders among workers in the Retail Sector as opposed to employees undoubtedly not exposed to biomechanical overload risk (11, 14, 15, 39). Presumably, the diseases were due to biomechanical overload. The findings also match data reported throughout Europe (5, 24, 34, 36, 41, 42, 44, 49) and Italy (4, 9, 10, 17, 45, 55).

Such excess could be linked to the presence of biomechanical overload risk in all job positions of the Retail Sector. Moreover, the presence of risk of biomechanical overload of the upper limbs and the presence of risk associated with manual material handling seem to be confirmed by the numerous risk assessment forms examined. This applied to several job positions for which a specific health surveillance protocol had been activated.

This should encourage an analytic assessment of the levels of biomechanical overload risk and, consequently, a search for ergonomic solutions, not only regarding work organization and tools, but also environmental and structural aspects. Evidently, this should be done considering both marketing strategies and workers' wellbeing.

It is worth mentioning that, regarding health conditions of people employed in the RS, the only Italian study considered of European relevance (published on the Eurofound website) is the one carried out in the Marche Region and commissioned by IRES (21).

Due to several problems, some Regions did not

**Table 8** - Presence of knee disorders: comparison between workers of retail sector and workers not exposed to biomechanical overload risk

| Knee disorders | Negative | Positive | OR-crude | 95% CI | OR-adjusted | 95% CI* |
|---|---|---|---|---|---|---|
| Exposure | | | | | | |
| Negative | 978 | 49 | 1.00 | (Reference) | 1.00 | (Reference) |
| Positive | 3086 | 280 | 1.81 | 1.32-2.48 | 1.73 | 1.25-2.41 |
| Gender | | | | | | |
| Male | 1486 | 160 | 1.00 | (Reference) | 1.00 | (Reference) |
| Female | 2578 | 169 | 0.60 | 0.48-0.76 | 0.64 | 0.50-0.81 |
| Age | | | | | | |
| 15-24 y | 105 | 6 | 1.17 | 0.48-2.81 | 1.13 | 0.47-2.74 |
| 25-34 y | 943 | 46 | 1.00 | (Reference) | 1.00 | (Reference) |
| 35-44 y | 1494 | 135 | 1.85 | 1.31-2.61 | 1.75 | 1.23-2.49 |
| 45-54 y | 1179 | 104 | 1.8 | 1.26-2.58 | 1.64 | 1.13-2.36 |
| 55-64 y | 315 | 35 | 2.27 | 1.44-3.60 | 1.97 | 1.21-3.18 |
| Test for trend | | | | | | P=0.008 |
| BMI | | | | | | |
| Underweight | 183 | 5 | 0.37 | 0.15-0.92 | 0.46 | 0.18-1.14 |
| Normal weight | 2670 | 195 | 1.00 | (Reference) | 1.00 | (Reference) |
| Overweight | 924 | 95 | 1.41 | 1.09-1.82 | 1.15 | 0.88-1.51 |
| Obesity | 219 | 29 | 1.81 | 1.20-2.74 | 1.47 | 0.96-2.26 |
| Test for trend | | | | | | P=0.017 |

Adjusted for gender, age, and BMI

meet the set requirements. However, those Regions were undoubtedly outnumbered by those in which data collection was successful. Interviewed subjects mostly worked in food chain stores, although quite a few workers from non-food stores were also involved. Store partition on the basis of the number of employees provides a clear picture of the Italian situation. By involving small work environments, the degree of coverage achieved by the study becomes significant. Nonetheless, it may be of relevance to say that, on a few occasions, management deliberately hindered the process, especially by making it hard to interview the employees.

Workers were interviewed either individually or in groups. This may have led to a bias, as the latter may entail a higher probability of error. However, interviewers had already conducted many individual interviews and were thus familiar with the modality.

Also, the recruiting system may have led to a sampling error: subjects who accepted to be interviewed may have been more susceptible to problems related to musculoskeletal disorders, or have a closer relationship with the company trade union representatives. It should be stressed that most of the interviews took place during union meetings. Because such meetings usually occur when the stores are open, multiple meetings were required daily to reach a good number of active workers. However, meeting hours must also be compatible with company work organization and its part-time employees. Unfortunately, interviewers had limited time (s paid leave for union duties) to collect data. It is not surprising, therefore, that we were not able to interview a large number of workers in each store.

Out of a total of 450.000 workers employed in the Italian retail sector, 3.380 were interviewed for the study (0.75%). In small retail stores (< 50 workers), the participation rate varied between 15% and 70% (45% average) while in medium and big stores the participation rate was below 30%. This may have led to a selection bias.

Data concerning diagnosed complaints were collected through a medical history questionnaire, yet this was not supported by documents confirming the diagnostic procedure. However, in order to avoid upward bias, incomplete data were considered and

analysed as negative. This, in turn, may have caused a downward bias in the prevalence.

Psychosocial risk factors were not investigated, although they play an important role in assessing work and health conditions in the Retail Sector. According to the 2007 ad hoc paper issued by EU Labour Force Survey (LFS), 21% of those who work in trading claimed to be exposed to factors that could affect their mental state, with numbers fairly similar for males and females. In Italy, this percentage is 13%.

Workers' perception of their own health condition deserved more in-depth analysis. The questionnaire presented the same questions asked during the 5th EWCS interviews, and the same applied to sick leave. 42% of our sample considered their health or safety to be at risk because of their job, compared to 24% of the European sample. Also, 60% of our sample believed that their job had a negative effect on their health, compared to 25% of the European sample. These data show how people's attitude towards their work and its consequences on their life seems to be worse in Italy (at least regarding this sample study). Moreover, 42.3% of interviewees believed that their musculoskeletal disorders were caused by their job, while 39.5% thought that their job had worsened their disorders. Data from the 5th EWCS interviews show that 43% of European workers stated that they took at least one day off because of health issues; more than 40% of cases were due to musculoskeletal disorders. Regarding work days lost due to sickness, data collected from the sample showed that more than 50% were due to musculoskeletal disorders. If part of the sick leave was due to musculoskeletal disorders caused or worsened by daily work activities, it is evident that, by improving work conditions, sick leave would also decrease, thus resulting in a profit.

In its original form, the study would have also included people employed in the RS yet not exposed to biomechanical overload (security staff, CCO, clerks) as an internal reference group. Unfortunately, their number turned out to be too small to be used for a comparison with the exposed subjects. For this reason, data on exposed workers from the RS were compared with data on external reference groups of unexposed workers from non-trading sectors. This was possible because data were collected using the same structured medical history questionnaire. However, data from the reference groups were collected by occupational physicians. The fact of having workers interviewed by two different professional figures may have caused a bias.

Concerning disorders affecting the upper limbs, lumbosacral spine and lower limbs, the collected data showed no remarkable differences between the various job positions. This may be due to the small samples recruited for some of them. Because we did not know the total number of workers for each job position, a comparison between OR could not be carried out. The findings, divided according to single job positions, can be found in the study "Disturbi muscoloscheletrici nella Grande Distribuzione organizzata" (http://www.uiltucs.it/pdf/giornale-della-UILTuCS/partecipazione-n-1-2014_supplemento.pdf).

The information about the type of contract signed by the workers – full-time/part-time – was not used in the analysis of clinical data, as the questionnaire did not ask to specify how long people had been working full-time or part-time.

The data showed that 21% of subjects who underwent periodic health surveillance had work restrictions due to musculoskeletal disorders/diseases. It may be difficult to (re)locate such subjects in a work environment where many tasks involve possible exposure.

Clearly, assessing the risk in the retail sector is arduous, especially biomechanical overload risk. This is due not only to the number of different tasks and job positions (often poorly characterized or fragmented), but also to a great variability in the workload (with its weekly, monthly or yearly peaks) and the high number of both seasonal and part-time workers.

It would be beneficial to carry out more studies on the retail sector, possibly backing up the collection of data through questionnaires with a diagnostic procedure, and then comparing such data with those taken from periodic health surveillance and risk assessment forms. In order to avoid a possible selection bias, data need to be collected on a greater number of workers in each store. This may provide a better understanding not only of a worker's health status, but also, on a more general level, of the degree of knowledge about the presence of risk.

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