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WOMEN PERFORMING REPETITIVE WORK: IS THERE A DIFFERENCE IN THE PREVALENCE OF SHOULDER PAIN AND PATHOLOGY IN SUPERMARKET CASHIERS COMPARED TO THE GENERAL FEMALE POPULATION?

VALERIO SANSONE[1,2], CRISTINA BONORA[2], PAOLA BORIA[3], and ROBERTO MERONI[4]

[1] University of Milan, Milan, Italy

Orthopaedic Department

[2] Galeazzi Orthopaedic Institite IRCCS, Milan, Italy

Orthopaedic Department

[3] Occupational medicine – private practice, Milan, Italy

[4] University of Milano-Bicocca, Milan, Italy

Department of Surgery and Interdisciplinary Medicine, Program in Physical Therapy

Abstract

Objectives: Shoulder disorders in the occupational environment have been widely studied, but the quality of research and methodology applied vary. Little has been done to ascertain whether shoulder pain in female repetitive workers is due to any verifiable pathology, or to compare findings with the general population. Therefore, we decided to evaluate the prevalence of self-reported shoulder pain in a group of female supermarket cashiers and in the general female population using a standardized questionnaire. Shoulder pain prevalence was then compared to imaging findings in order to assess specific and non-specific pain prevalence. **Material and Methods:** 196 cashiers and 302 controls filled in a standardized shoulder questionnaire and underwent an imaging examination of a shoulder. **Results:** The prevalence of shoulder pain was significantly higher in the group of cashiers (46.4%) than in the general population (25.5%) (OR = 1.821; 95% CI: 1.426–2.325). Specific pain prevalence was higher among the controls (19.5%) than among the cashiers (13.2%). **Conclusions:** The more frequent reports of shoulder pain in the supermarket cashiers are not correlated with a higher prevalence of imaging abnormalities. The causes of these more frequent complaints should be probably sought in the psycho-social and occupational environment.

Key words:
Female working-age population, Non-specific shoulder pain, Prevalence, Repetitive work, Supermarket cashiers, Ultrasonography

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Corresponding author: V. Sansone, Istituto Ortopedico Galeazzi IRCCS, via Riccardo Galeazzi 4, 20161 Milano, Italy (e-mail: valerio.sansone@unimi.it).

INTRODUCTION

Musculoskeletal disorders (MSDs) is a broad term which encompasses a range of inflammatory and degenerative conditions affecting limbs and spine. They range from non-specific pain syndromes that cannot be attributed to any known pathology, to clearly defined, specific disorders. MSDs constitute one of the most common and costly public health issues in Western societies and, more specifically, MSDs of the upper limb are important causes of morbidity and sickness absence [1,2]. In particular, shoulder problems are very common in Europe and North America [3–7]. In the general population, the reported prevalence of shoulder complaints ranges from 6.9–26% for point prevalence, 18.6–31% for 1-month prevalence, and 4.7–46.7% for 1-year prevalence [6]. In the Netherlands, the 1-year period prevalence was estimated at 30.3%, with associated limitations to daily life and frequent sick leave [8].

In the working population, shoulder disorders and complaints constitute an important and costly health problem. Shoulder pain results in millions of working days being lost per year [9] and costly insurance compensation claims [10]. Although shoulder complaints in the working population have been widely studied, accurate and comparable data on the incidence and prevalence are hard to obtain, and official statistics are difficult to compare across various countries. Moreover, interpretation of the findings is limited by heterogeneity of case definitions, assessment of exposure and the design of longitudinal studies. In a review of shoulder pain in occupational settings performed by van der Windt et al., the authors have found substantial heterogeneity across the studies with regard to the study setting, exposures measured, methods of exposure assessment, statistical analysis and data presentation [11]. This multiplicity hinders sensible statistical pooling of the results.

Gender differences constitute another major complicating factor in the assessment of shoulder disorders. Disparities in the prevalence of musculoskeletal complaints, with a significantly higher prevalence in women, are supported by several studies and are more clearly defined for neck and upper-extremity complaints than for back complaints [4,12–19]. Gender discrepancy has been observed both in the general population [4,8,20,21] and in primary care [22,23].

In the working population, the gender difference for upper-limb MSDs is confirmed, although relatively little research has been focused specifically on upper limb complaints in female workers. Indeed, in their 2010 report, the European Agency for Safety and Health at Work called for more research into upper limb disorders occurring in higher risks groups such as women, younger and temporary workers [24]. The shoulder is reported as one of the most common sites of pain amongst female workers, especially when repetitive actions are performed [21,25–29]. However, again there is lack of reliable data, even on the real prevalence of shoulder disorders in women whose occupation requires performance of repetitive tasks.

A further hindrance to accurate analysis of the burden of shoulder MSDs is caused by the diagnostic methods used in the collection of data. The majority of the information reported in the existing studies has been gathered using questionnaires, which consider only subjective symptoms, according to a considerable variety of case definitions [9]. Very few studies indeed have evaluated pain as stated by objective measures, using methodologies capable of revealing the range of most common musculoskeletal disorders, such as radiological examination.

A scientifically valid diagnosis is of particular importance in the light of the now well-recognized and accepted evidence of 2 coexisting types of shoulder pain: the specific and non-specific pain [7,30]. The different nature of these 2 conditions should be taken into account when planning treatment and prevention strategies, as they may be completely different. Specific pain is due to a well-defined shoulder disorder, clinically and/or radiographically diagnosed. Non-specific pain can be defined as the presence of pain without physical signs or any recognizable underlying pathology [30]. Although a very common complaint, little is known about its aetiology [30–32].

Based on these considerations, this cross-sectional, blinded, controlled study aimed at shedding light on the shoulder pain issue in female workers. The primary goal of the study was to evaluate the prevalence of shoulder pain in a group of female workers who performed a repetitive job, compared to a group of female working-age subjects selected at random from the general population. A secondary purpose was to investigate whether the reported pain was correlated with any underlying shoulder abnormality on imaging. To our knowledge, this is the only study that compares reported shoulder pain with imaging findings, in a group of female workers.

MATERIAL AND METHODS

Between November 2011 and April 2012, all the female cashiers from 3 supermarkets in the same province of northern Italy were requested to participate in our study. One hundred ninety six cashiers agreed to take part in it, whilst 24 were unable or refused to participate. The mean duration of employment as a supermarket cashier was 11.49±6.93 years (min. 6 months, max 31.25 years). A control group, consisting of 302 female subjects from the general population, was recruited from the customers of the supermarkets where the cashiers worked. A prepaid gift card was given to reduce the selection-bias: a free ultrasonographical examination and the amount of time needed to fill in the questionnaires could have been selective factors for subjects with a pre-existing pathology.

Exclusion criteria included: presence of evident or previously diagnosed major pathologies such as rheumatic-linked conditions, brachial plexus palsy, tumors, or major trauma (fractures of the upper humerus or glenoid and recurrent gleno-humeral dislocations), and presence of specific risk factors such as heavy and/or repetitive work. Repetitive work was defined as work that involved continuous repetitive hand or arm movements (e.g., data entry, packing, letter sorting, shop cashier, machine feeding, sewing, etc.) [33]. All the subjects signed an informed consent document before commencement of the study.

The study was divided into 2 parts. Firstly, each subject responded to a questionnaire that focused on pain of the upper limb and was based on the criteria of the Nordic Musculoskeletal Questionnaire [34]. To ensure that each subject fully understood the questions, the questionnaire was administered by an orthopaedic specialist. The questionnaire asked whether the subject had pain in their shoulders, and if pain was present, the characteristics of the symptoms were requested. In order to capture chronic, acute and continuous symptoms, in our questionnaire "pain" was defined as being in pain for at least 1 day a month, or for at least 7 consecutive days, in the past year. A positive response to either of these possibilities was defined as a "symptomatic shoulder." A negative response was deemed an "asymptomatic shoulder."

The second part of the study consisted of a static and dynamic ultrasound (US) assessment of both shoulders. This was performed by a blinded radiologist with 20 years of experience in musculoskeletal diseases and ultrasound examination. The equipment included a very high resolution linear tranducer (Logiq E9 with a 15 MHz matrix probe, G.E Healthcare, Milwaukee, WI, USA). The radiologist, unaware of the symptoms or medical history of the subject, evaluated both shoulders. The purpose of the examination was to assess the presence of abnormalities affecting anatomic structures, rather than to investigate the specific characteristics and presentation of particular pathologies. After the ultrasound examination, the radiologist filled in a data sheet based on a binary criterion: whether the findings for each anatomical structure were normal or abnormal. A tendon was considered abnormal when 1 or more of the following features were observed: thickening or thinning of the structure, foci of increased and/or reduced echogenicity, significant calcifications, partial or full-thickness discontinuity [35].

Abnormal findings during the dynamic assessment were: biceps tendon instability within the bicipital groove;

subscapularis bunching against coracoid; supraspinatus bunching against the acromion or coraco-acromial ligament. If the radiologist had any doubts concerning the ultrasound findings, the subject underwent a magnetic resonance imaging (MRI) examination (Intera 1.5T, Philips Healthcare, Eindhoven, Netherlands). The data sheet was then compiled according to the MRI results.

Ethics

The study was performed according to the ethical standards of the local Institutional Review Board and to the Helsinki Declaration of 1975, as revised in 1983.

Statistical analysis

Descriptive statistics were used to describe the study samples, and independent Student's t-test was used in order to compare the means of the 2 independent samples. Odds ratios and prevalence ratios with 95% confidence interval were used for 2×2 contingency tables. The Chi^2 statistic was used to investigate whether distributions of categorical variables differed from one another. For all analyses SPSS Version 21 (version 21; IBM, Armonk, NY) was used.

RESULTS

The age range for the whole cohort of 498 subjects was from 20–55 years, with a mean age of 38.11±8.64 years. The right arm was dominant in 465 subjects (93.4%), and the left was dominant in the remaining 33 (6.6%). In the cashiers group, 92.9% (182 subjects) were right arm dominant, compared to 93.7% (283 subjects) in the control group. There was no statistical difference between the anthropometric characteristics of the 2 groups (see Table 1).

Self-reported pain

According to the findings from the questionnaire, 46.4% of the cashiers (91 subjects) reported shoulder pain, as opposed to 25.5% (77 subjects) in the control group (OR = 1.821; 95% CI: 1.426–2.325). This significantly higher prevalence of symptomatic shoulders in the cashiers versus controls was observed in both the dominant and non-dominant limb (see Tables 2 and 3).

Correlation between the age and reported presence of shoulder pain

The distribution of shoulder symptoms according to age for the 2 groups, for both the dominant and the non-dominant arm, is presented in Table 4. Both for the cashiers and for the control group there was a higher prevalence of symptomatic subjects in the older age groups, with the symptomatic shoulders increasing gradually for each age group. This was true for both dominant and non-dominant shoulders (Cashiers: dominant – $Chi^2 = 18.41$, $p = 0.005$; non dominant – $Chi^2 = 15.305$, $p = 0.018$, and for the control group: dominant – $Chi^2 = 25.457$, $p < 0.001$; non dominant $Chi^2 = 28.139$, $p < 0.001$).

Table 1. Anthropometric data of the study and control groups

Parameter	Cashiers (N =196) (M±SD)	Control (N = 302) (M±SD)	t	p
Age (years)	37.39±7.35	38.58±9.36	–1.577	0.115
Height (cm)	163.52±6.52	163.61±6.08	–0.169	0.866
Weight (kg)	61.38±11.14	62.14±12.03	–0.705	0.481
Body mass index	22.95±3.95	23.19±4.22	–0.647	0.518

M – mean; SD – standard deviation.

Table 2. Reported presence of shoulder pain – dominant arm

Variable	Cashiers (N = 196) [n (%)]	Control (N = 302) [n (%)]	OR	95% CI
Significant pain present	72 (36.7)	60 (19.9)	1.849*	1.381–2.475
Significant pain absent	124 (63.3)	242 (80.1)	0.790*	0.700–0.891

OR – odds ratio; CI – confidence interval.
* Statistically significant.

Table 3. Reported presence of shoulder pain – non-dominant arm

Variable	Cashiers (N = 196) [n (%)]	Control (N = 302) [n (%)]	OR	95% CI
Significant pain present	54 (27.6)	38 (12.6)	2.190*	1.506–3.183
Significant pain absent	142 (72.4)	264 (87.4)	0.829*	0.753–0.913

Abbreviations as in Table 2.

Table 4. Reported presence of shoulder pain by age group

Age (years)	Pain in dominant arm [n (%)]		Pain in non-dominant arm [n (%)]	
	no	yes	no	yes
Cashiers				
20–25	6 (75.0)	2 (25.0)	8 (100.0)	0 (0.0)
26–30	16 (76.7)	8 (33.3)	16 (66.7)	8 (33.3)
31–35	43 (81.1)	10 (18.9)	45 (84.9)	8 (15.1)
36–40	34 (63.0)	20 (37.0)	39 (72.2)	15 (27.8)
41–45	16 (50.0)	16 (50.0)	22 (68.8)	10 (31.3)
46–50	4 (40.0)	6 (60.0)	5 (50.0)	5 (50.0)
51–55	5 (33.3)	10 (66.7)	7 (46.7)	8 (53.3)
total	124 (63.3)	72 (36.7)	142 (72.4)	54 (27.6)
Control				
20–25	27 (100.0)	0 (0.0)	26 (96.3)	1 (3.7)
26–30	35 (89.7)	4 (10.3)	38 (97.4)	1 (2.6)
31–35	43 (82.7)	9 (17.3)	49 (94.2)	3 (5.8)
36–40	48 (87.3)	7 (12.7)	50 (90.9)	5 (9.1)
41–45	35 (77.8)	10 (22.2)	32 (71.1)	13 (28.9)
46–50	27 (69.2)	12 (30.8)	36 (92.3)	3 (7.7)
51–55	27 (60.0)	18 (40.0)	33 (73.3)	12 (26.7)
total	242 (80.1)	60 (19.9)	264 (87.4)	38 (12.6)

Ultrasound/MRI examination

The prevalence of abnormalities in the imaging examinations was almost equal between the 2 groups, with 8.7% (17 subjects – of whom 3 subjects bilaterally) showing alterations in the cashiers group, as opposed to 8.6% (26 subjects – of whom 14 subjects bilaterally) in the control group, although there was a significantly higher ratio of subjects with bilateral abnormalities in the controls (OR = 5.444; 95% CI: 1.257–23.587). The ultrasound results by arm dominance are given in Table 5. Thirteen subjects whose US examinations were inconclusive were referred for MRI examination (5 in the cashiers group and 8 in the controls).

Correlation of the imaging findings with age

The prevalence of abnormalities showed a tendency to increase along with age in the control group for both shoulders, and in the dominant shoulder in the cashiers group (Table 6).

Table 5. Findings of the imaging – dominant and non-dominant shoulders

Group	Dominant shoulder		Non-dominant shoulder	
	abnormal findings [n (%)]	normal findings [n (%)]	abnormal findings [n (%)]	normal findings [n (%)]
Cashiers	6.1 (12)	93.9 (184)	4.1 (8)	95.9 (188)
Control	7.3 (22)	92.7 (280)	6.0 (18)	94.0 (284)

Table 6. Findings of the imaging by age group

Age (years)	Dominant shoulder		Non-dominant shoulder	
	normal findings [n (%)]	abnormal findings [n (%)]	normal findings [n (%)]	abnormal findings [n (%)]
Cashiers				
20–25	8 (100.0)	0 (0.0)	8 (100.0)	0 (0.0)
26–30	21 (87.5)	3 (12.5)	23 (95.8)	1 (4.2)
31–35	51 (96.2)	2 (3.8)	52 (98.1)	1 (1.9)
36–40	53 (98.1)	1 (1.9)	50 (92.6)	4 (7.4)
41–45	31 (96.9)	1 (3.1)	30 (93.8)	2 (6.3)
46–50	8 (80.0)	2 (20.0)	10 (100.0)	0 (0.0)
51–55	12 (80.0)	3 (20.0)	15 (100.0)	0 (0.0)
total	184 (93.9)	12 (6.1)	188 (95.9)	8 (4.1)
Control				
20–25	27 (100.0)	0 (0.0)	27 (100.0)	0 (0.0)
26–30	37 (94.9)	2 (5.1)	39 (100.0)	0 (0.0)
31–35	50 (96.2)	2 (3.8)	51 (98.1)	1 (1.9)
36–40	53 (96.4)	2 (3.6)	54 (98.2)	1 (1.8)
41–45	44 (97.8)	1 (2.2)	44 (97.8)	1 (2.2)
46–50	32 (82.1)	7 (17.9)	34 (87.2)	5 (12.8)
51–55	37 (82.2)	8 (17.8)	35 (77.8)	10 (22.2)
total	280 (92.7)	22 (7.3)	284 (94.0)	18 (6.0)

Interestingly, there were no cashiers over 50 years of age with US abnormalities in the non-dominant shoulder.

Given the relatively small number of abnormalities within the 2 groups, we divided them into subgroups of over 50 and under 50 years of age. The prevalence of abnormalities increased along with age both in the cashiers (7.7% in cashiers < 50 years old, vs. 18.75% ≥ 50 years) and in the control group (6% in controls < 50 years old, vs. 21.2% ≥ 50 years), with no statistically significant differences between the groups. The results for imaging abnormalities by arm dominance are shown in Tables 7 and 8.

Correlation of the questionnaire with imaging results

Of the cashiers who had reported shoulder pain, 86.8% (79 subjects) had normal shoulders on imaging, as compared to 80.5% (62 subjects) in the control group. Conversely, approximately 5% of both the cashiers and controls had not reported pain and yet had abnormalities on US/MRI (4.8% cashiers; 4.9% controls). This means that of the cashiers with abnormal imaging findings, 70.5% (12 subjects) were symptomatic (i.e., had reported pain), as compared to 57.7% (15 subjects) in the control group. The results for correlation between pain and imaging by arm dominance are presented in Tables 9 and 10.

Table 7. Imaging findings – dominant shoulder

Age (years)	Findings [n (%)]		OR	95% CI
	normal	abnormal		
< 50				
cashiers	171 (95.0)	9 (5.0)	0.887	0.375–2.097
control	236 (94.4)	14 (5.6)		
≥ 50				
cashiers	13 (81.3)	3 (18.8)	1.269	0.294–5.487
control	44 (84.6)	8 (15.4)		

Abbreviations as in Table 2.

Table 8. Imaging findings – non-dominant shoulder

Age (years)	Findings [n (%)]		OR	95% CI
	normal	abnormal		
< 50				
cashiers	172 (95.6)	8 (4.4)	1.407	0.518–3.822
control	242 (96.8)	8 (3.2)		
≥ 50				
cashiers	16 (100.0)	0 (0.0)	n.a.	n.a.
control	42 (80.8)	10 (19.2)		

n.a. – not applicable. Other abbreviations as in Table 2.

Table 9. Correlation of the pain questionnaire and imaging – dominant shoulder

Pain	Findings [n (%)]	
	normal	abnormal
Cashiers		
reported	65 (90.3)	7 (9.7)
not reported	119 (96.0)	5 (4.0)
Control		
reported	48 (80.0)	12 (20.0)
not reported	232 (95.9)	10 (4.1)

Table 10. Correlation of the pain questionnaire and imaging – non-dominant shoulder

Pain	Findings [n (%)]	
	normal	abnormal
Cashiers		
reported	49 (90.7)	5 (9.3)
not reported	139 (97.9)	3 (2.1)
Control		
reported	30 (79.0)	8 (21.0)
not reported	254 (96.2)	10 (3.8)

DISCUSSION

It is clear that the increase in the reported shoulder pain amongst workers in the developed world has a major medical and socio-economic impact. In the EU, approximately 23% of workers in the existing and prospective member countries reported neck and shoulder pains, with the range extending from 8.2% in Ireland to 53.5% in Finland [24]. Unfortunately, aetiology and pathogenesis of shoulder disorders remain controversial. Moreover, complex anatomical and functional structure of the shoulder joint complicates identification of the source of pain. Gender, ethnicity, temperament and genetic factors also contribute to individual variation in pain sensitivity, which is reflected by the large ranges of incidence and prevalence rates reported in the literature [36,37]. Differences in case definitions, types of sampling procedures, variety in response rates, and the type of measurement instruments used are also responsible for these large ranges. Such diversity in the reported prevalence rates may impair an accurate evaluation and understanding of the problem.

Amongst the various sources of disparity, gender appears to be a major determining factor. One of the various possible hypotheses to explain this apparent disparity is that female patients may be more prone to suffer from non-specific pain, for which psychological or psycho-social factors have been invoked [30,38,39]. The gender discrepancy for shoulder pain is amplified in the case of repetitive work, although it should be also considered that the typical occupations requesting repetitive tasks are jobs predominantly performed by women.

Repetitive work has shown a higher theoretical risk of MSD and is frequently correlated with "negative"

psycho-social factors [1,40]. As noted above, this could influence the prevalence of non-specific pain among these types of workers. In the literature there is a wide variation (between 24% and 65%) in the quantitative findings regarding the prevalence of shoulder complaints among the female population performing repetitive work [41–44]. Indeed, a variety of work sectors have been studied, which each involves extremely different, though repetitive, tasks: sewing machine operators, assembly workers, furniture upholsterers, supermarket workers, dental hygienists, hair stylists, cake decorators and clerical workers [45–51]. Although within the sector of supermarket cashiers the relationship between repetitive strain injuries in the upper limb and occupation has been postulated [40,42,52–55], there has been relatively little data that confirms or refutes this hypothesis. In all the studies on the various occupational sectors, there is little homogeneity in age, sex, cultural and social variables. Given this lack of homogeneity, it has been proposed that the occurrence of MSDs should be also assessed in the general population [30]. Indeed, there is still a great need for population-based studies on shoulder disorders with well-defined and objective diagnostic criteria.

Finally, there is often lack of clarity on case definitions. There is an emerging consensus on the viewpoint that differing definitions of shoulder pain substantially contribute to the wide range of prevalence rates reported [1,6,7,9,56]. Overall, it appears that there is no widely accepted standard for clinical pain assessment that would facilitate comparison of outcomes across the studies and drawing valid conclusions. In our study we attempted to adhere to the aforementioned criteria for more homogenous and objective studies, reducing the variables as much as possible, introducing an objective diagnostic tool (US/MR imaging) and enlarging the study to include the general population. To our knowledge, there is no similar study in the literature. Consequently, we examined 2 groups of the same age range and sex, living in the same geographic area. Although the control group was selected at random, there was no statistical difference in somatic features (i.e., body mass index, right/left hand dominance, age, etc.) with respect to the study group. Moreover, the study group consisted of employees who had performed the same repetitive job for a reasonably long period (average service was 11.49 years) thus, eliminating the variables present in several studies where workers performed different tasks.

Our questionnaire was based on the Nordic Musculoskeletal Questionnaire, which is considered to be a good instrument for screening patients as it is sensitive and repeatable [57–59]. Finally, an imaging examination conducted by an experienced musculoskeletal radiologist provided an objective benchmark with which to compare the reported shoulder pain [60]. We decided to use US as a reference standard due to its accuracy, tolerability and cost-effectiveness. Furthermore, it allows a dynamic evaluation, which is not possible with other imaging techniques [61,62]. It is important to note that in our study, the ultrasound examinations were performed using a 15 MHz matrix array probe instead of the 5 to 12 MHz conventional probe commonly used in other studies. This allowed better spatial resolution, and consequently, gave higher image quality, enabling the assessment of even very small alterations.

The questionnaire revealed a statistically significant difference in the prevalence of reported pain between the supermarket cashiers and the general population control group (46.4% versus 25.5%). These findings are similar to those reported in the literature: in an analysis from the Swedish Work Environment Authority [63], 46% of the checkout operators reported shoulder pain compared to 36% of the general female working population, whereas Niedhammer et al. have reported the presence of shoulder pain ranging from 22.9 to 51.4% among supermarket cashiers [44].

We observed abnormalities on imaging in 8.7% of the cashier shoulders, with a higher prevalence on the

dominant side (6.1%). A similar prevalence of shoulder abnormalities was observed in the control group (8.6%), with again a higher prevalence in the dominant shoulder (7.3%). It is interesting to note that there was a statistically significant higher prevalence of bilateral abnormalities in the control group than in the cashiers (4.6% vs. 1.5%). A possible explanation is that, due to the position of the till, there is more mechanical loading on the right shoulder of the cashiers, whereas the controls could feasibly be exposed to more equal loading on both shoulders in their daily activities. However, there was no statistical difference between the number of abnormalities observed in the right and left arms of the cashiers, so the nature of the cashiers' work does not seem to influence the presence of abnormalities in the shoulder structures.

Correlating subjective symptoms and abnormal radiographic findings, the prevalence of specific pain was 13.2% among the cashiers and 19.5% among the general population. Non-specific pain prevalence was higher among the cashiers (86.8%) than in the control group (80.5%). If we consider only the subjects who had abnormal findings on imaging, there was a larger number of symptomatic shoulders among the cashiers (70.5%) than in the control group (57.7%), with the dominant arm (slightly) more involved (58% dominant, 42% non-dominant). As the aim of this study was to investigate the presence of abnormalities rather than to analyze the specific characteristics of the observed pathologies, we cannot assess whether or not this higher percentage of symptomatic abnormalities in the cashiers group is due to more severe or extensive anatomic alterations than those reported in the controls. Nevertheless, it may in part be explained by the frequently advocated multifactorial origin of shoulder pain, that includes not only the effects of mechanical load, but also the psycho-social work environment [1,11,40].

Comparison of our findings with earlier research is difficult, as the association of questionnaires and radiographic examination has seldom been used previously. In the only directly comparable study, 19.5% of a cohort of 128 cashiers reported shoulder pain, and 100% of them showed abnormalities on ultrasound [55]. However, the number of subjects is relatively small, and there is no comparison with a general female population. Miranda et al. and Walker-Bone et al. have estimated the prevalence of non-specific pain in general female adult populations comparing reported pain to clinical examination: the rates of non-specific pain were 13.7% and 2.5%, respectively [7,30]. A possible explanation for these lower values for prevalence of non-specific pain may be the use of a clinical rather than a diagnostic imaging examination.

Our results are consistent with several studies that have reported an increase in shoulder disorders along with age [64–66]. Ageing has been shown to be associated with degenerative changes in tendons and articular cartilage, and with the development of periarticular calcifications. In both the cashiers and the general population the prevalence of pain increased along with age, with higher values observed in the cashiers group. Indeed, the higher prevalence of pain in older age is reflected in an increase in anomalous US findings in both groups. However, degenerative changes may not always cause pain: we observed that approximately 9.1% of all the subjects who were 50 years of age or older were asymptomatic whilst having anomalous US findings.

CONCLUSIONS

Our results confirm the existing data about a higher prevalence of subjective shoulder complaints among female workers performing repetitive task, compared to the general population. However, this difference was not matched by an equivalent variation in radiographically verified shoulder disorders between the 2 groups. Limb dominance does not seem to have a significant influence on the prevalence, whereas complaints and imaging abnormalities increase along with age.

Although pain often accompanies abnormal imaging findings, the presence of shoulder imaging anomalies may not necessarily be correlated with the symptoms. Whether specific or non-specific, shoulder pain tends to be more frequent among workers, reinforcing the suspicion that the cause of repetitive work complaints should be sought also within the psycho-social work environment. Prospective, controlled cohort studies, based on good case-definitions, will hopefully provide information needed to quantify the real amount of repetitive work-related shoulder pain in terms of the prevalence, incidence and functional impairment, which are necessary prerequisites for adequate treatment and prevention.

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