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Functional incapacity related to rotator cuff syndrome in workers. Is it influenced by social characteristics and medical management?

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ABSTRACT

Study Design: Survey.
Introduction: Rotator cuff syndrome (RCS) is one of the most common musculoskeletal disorders reported in workers. The functional incapacity related to RCS may vary according to the sociodemographic context and to the medical management.
Purpose of the Study: The purpose of this is to analyze the RCS-related functional incapacity assessed by the Disabilities of the Arm, Shoulder and Hand (DASH) questionnaires in workers according to their sociodemographic characteristics and the use of care.
Methods: A cross-sectional study was carried out on a French sample of workers diagnosed with RCS. The DASH and DASH-work scores were studied according to the sociodemographic factors, musculoskeletal symptoms, and RCS medical management during the preceding 12 months.
Results: Two hundred seven workers who suffered from RCS filled out the questionnaire of which 80% were still working. The DASH score was significantly higher in women (24.0 vs 17.4; $P < .01$; effect size (d) = 0.39), in patients over the age of 50 years (23.6 vs 11.3; $P < .005$) and in case of another upper limb musculoskeletal disorder ($P < .0001$; $d \geq 0.4$). The DASH and DASH-work scores were significantly higher in case of use of care for RCS ($P < .005$; $d > 0.6$).
Discussion: The demographic factors and the RCS medical management influenced the overall incapacity assessed by the DASH questionnaire. Work incapacity was more especially related to the use of care for RCS.
Conclusion: The sociodemographic and medical parameters added to other established predictors could help guide clinicians in managing their patients.

Introduction

Upper-extremity musculoskeletal disorders (UE-MSDs) are currently by far the most common occupational pathology in developed countries.[1,2] The rotator cuff syndrome (RCS) is the second most frequent location of UE-MSDs after the wrist/hand locations. Whether caused and/or aggravated by working conditions, RCS is responsible for significant disability, sickness absence, and high economic and health care burden. The socioeconomic consequences are numerous, both at the level of the individual and more generally at company and society levels.[3] Moreover, the disability prognostic in workers with RCS is a complex phenomenon which can be related with several domains including sociodemographic factors, and medical characteristics and management.[4-7]

The assessment of functional incapacity and residual functional capacities of the upper limb allows assessing the impact of RCS on quality of life as well as on daily life and occupational activities; it also allows guiding RCS-related management. Only a few studies have investigated prognostic factors for UE-MSDs.[6-8] Since early intervention produces better results, it would be highly beneficial to promptly identify workers at risk of greater disability and prolonged absence or work cessation, thus enabling targeted rehabilitation strategies. Functional assessment included objective and subjective parameters. Among the 16 questionnaires aimed at assessing the functional capacities of the shoulder, the Disabilities of the Arm, Shoulder and Hand Scale (DASH) is a relevant tool for

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evaluating subjective shoulder disability of injured workers with UE-MSDs and can also be used as a simple surveillance tool in an active working population.[8-14]

Purpose of the study

To provide a comprehensive overview of the current increased number of UE-MSDs in relation to work, the French National Public Health Agency (*Santé publique France*) has developed an experimental network for the epidemiological surveillance of UE-MSDs in a French region.[15] The aim of the study was to describe and analyze the scores obtained with the DASH questionnaire according to the sociodemographic and medical characteristics and management of workers diagnosed with a RCS.

Methods

The studied population

Between 2002 and 2005, 83 occupational physicians from a French region were volunteered to participate in a sentinel network for the surveillance of MSDs;[15] each of them randomly included 1-112 workers during the inclusion period (3 years). In order to be included, a worker had to be aged between 20 and 59 years, work in a private or public company located in our region, regardless of the type of employment contract and whether they suffered from MSD or not, and had to give consent. The workers filled out a self-administered questionnaire that assessed various sociodemographic, medical, and occupational characteristics. A clinical examination was performed by the occupational physicians, which could diagnose the main UE-MSDs including RCS, according to the clinical examination protocol of the European SALTSA consensus[16] that led to the diagnosis of RCS in 274 of the 3,710 workers (7.4 %) included in the study.

A follow-up self-questionnaire was sent, and a follow-up medical of the workers initially included was undertaken between 2007 and 2010. The questionnaire was divided into 2 parts: (1) a general part that assessed sociodemographic characteristics and musculoskeletal symptoms through the Nordic questionnaire[17,18] and (2) a part specifically aimed at workers suffering from a RCS at inclusion which included an assessment of the medical and surgical treatment (including physician consultations, physiotherapy sessions, and sick leave duration) related to the RCS and an assessment of the functional incapacity of the upper limb using the DASH questionnaires.

Variables of interest

Assessment tools

The DASH questionnaire is a self-administered questionnaire composed of 30 items, supplemented by 1 optional module containing 4 items relating to the impact of UE-MSDs at work (DASH-work questionnaire).[19] This module is assessed separately from the first 30 items. Regarding the main questionnaire, at least 27 of 30 items must be completed in order to calculate the score. The 4 items of the work-related module must be completed for the calculation of the DASH-work score. Each item is graded according to a Likert scale (1: no difficulty; 2: slight difficulty; 3: average difficulty; 4: great difficulty; and 5: impossible). The total calculated score ranges from 0 to 100; the higher the score, the greater the incapacity.[17] For illustration purposes, the average DASH score for a general American population is 10.1/100.[18]

The Nordic questionnaire is a tool aimed at MSDs screening, created to answer the question: "Do musculoskeletal troubles occur in a given population, and if so, in what parts of the body are they localized?"[17] It is used in the study in the form of a self-administered questionnaire. It includes closed questions aimed specifically at various areas affected by MSDs. A human body is presented as a model divided into 10 anatomical areas for which the symptoms (stiffness, pain, discomfort, and numbness) are evaluated systematically over a given period (preceding 7 days or 12 months). The Nordic questionnaire is validated for the assessment of shoulder MSDs.[20,21]

Risk factors

Regarding individual risk factors, age at follow-up was evaluated in 3 categories (under 40 years old; between 40 and 49 years; and over 49 years old). This choice was made given that the prevalence and disability of RCS increases significantly after the age of 40 years and even more so after the age of 50 years.[22] The follow-up body mass index (BMI) was evaluated in 3 categories: underweight and normal weight (BMI < 25 kg/m^2), overweight (BMI between 25 and 30 kg/m^2), obesity (BMI ≥ 30 kg/m^2) according to the World Health Organization.

Regarding the medical management, evaluated aspects at follow-up were sick leaves, physician consultations, physiotherapy sessions, and surgery in relation with the RCS during the preceding 12 months.

Statistical analyses

The DASH scores were evaluated on the basis of individual factors (age, gender, and BMI), the presence (or the absence) of MSDs of the upper limb and the spine (shoulders, elbows, hands, fingers, neck, upper and lower back, and hips) at follow-up, and the RCS medical management during the preceding 12 months. The DASH scores were compared using parametric (Student and analysis of variance) and nonparametric (Wilcoxon and Kruskal-Wallis) tests with Epi Info software. The significance threshold was set at 0.05. Finally, the effect sizes (d) were calculated when parametric tests were used, and percentages of difference were calculated when nonparametric tests were used.

Each subject provided informed written consent to participation in the study at baseline, and the study received approval from France's National Committee for Data Protection (Commission Nationale de l'Informatique et des Libertés), first in 2001 and then again in 2006.

Results

Among the 274 workers diagnosed for a RCS during the first phase of the study (2002-2005), 207 filled out the questionnaire of the second phase of the study at follow-up between 2007 and 2010. The DASH score could be calculated for 190 of them. One hundred sixty-two workers reported shoulder's symptoms during the preceding 12 months (through the Nordic questionnaire) and 167 were still working during the second questionnaire; the DASH-work score could therefore be calculated for 154 workers (81.1%).

The population for which the DASH score could be calculated was formed of 55.3% of men. The subjects were mainly over the age of 50 years (57.9%). Slightly over half of the subjects were overweight or obese (51.4 %). The averages of the DASH and DASH-work scores were 20.3 $\pm$ 16.6 and 20.5 $\pm$ 19.9/100, respectively.

The DASH score was significantly higher in women than in men (24.0 vs 17.0; $P = 0.008$). The DASH score was significantly higher in subjects over the age of 40 years, and even higher in those over 50 years, compared to those under the age of 40 years ($P = 0.003$). However, no significant difference was found within the BMI categories. No significant difference was found for the DASH-work score according to individual factors (Table 1).

Table 1
DASH and DASH-work scores according to individual characteristics at follow-up

Variable	*N*	Mean	SD	Median	*P* value	Effect size (Cohen's d)	Percentage difference
DASH score							
Gender					0.008[a]	0.39	
Female	85	24.0	16.8	19.2			
Male	105	17.4	16.4	13.0			
Age					0.003[b]		
< 40 y (ref)	22	11.3	9.2	8.8			
40-49 y	58	17.6	16.2	14.0			56
≥ 50 y	110	23.6	17.6	18.3			**109**
BMI					0.752[b]		
< 25 kg/m^2 (ref)	90	19.5	16.5	15.5			
25-30 kg/m^2	67	20.9	15.4	17.5			7
≥ 30 kg/m^2	28	22.6	21.3	14.2			16
DASH-work score							
Gender					0.150[a]	0.23	
Female	69	23.6	25.7	12.5			
Male	85	17.9	23.7	6.3			
Age					0.231[b]		
< 40 y (ref)	21	15.5	25.4	0.0			
40-49 y	55	17.8	22.0	6.3			15
≥ 50 y	78	23.6	26.2	18.8			52
BMI					0.235[b]		
< 25 kg/m^2 (ref)	75	18.3	25.6	6.3			
25-30 kg/m^2	54	23.3	23.2	18.8			27
≥ 30 kg/m^2	21	20.5	24.9	6.3			12

Significant result in bold.
BMI = body mass index; DASH = Disabilities of the Arm, Shoulder and Hand; SD = standard deviation.
[a] Student *t*-test.
[b] Kruskal-Wallis test.

Table 2
DASH scores according to the presence of musculoskeletal disorders (MSDs) reported on the Nordic questionnaire

MSDs' location	*N*	Mean	SD	Median	*P* value[a]	Effect size (Cohen's d)
Neck/nape					**0.001**[a]	0.48
No	77	15.6	14.8	12.5		
Yes	113	23.6	17.5	18.3		
Shoulder/arm with elbow/ forearm and/ or hand/wrist					**<0.0001**[b]	
No	41	6.6	7.8	2.5		
Shoulder alone	47	20.0	15.3	16.7		
Shoulder with another location of MSD	102	26.0	17.1	22.9		
Shoulder/arm					**<0.001**[a]	**1.14**
No	41	6.6	7.8	2.5		
Yes	149	24.1	16.7	19.2		
Elbow/forearm					**0.009**[a]	0.40
No	119	17.9	15.4	15.0		
Yes	71	24.5	18.4	18.3		
Hand/wrist					**<0.001**[a]	0.72
No	97	14.8	14.1	11.7		
Yes	93	26.2	17.6	20.8		
Fingers					**<0.001**[a]	**0.80**
No	123	15.9	14.1	13.4		
Yes	67	28.5	18.5	24.2		
Upper back					**0.004**[a]	0.45
No	125	17.8	17.0	13.3		
Yes	65	25.2	15.7	20.8		
Lower back					0.163[a]	0.21
No	69	18.1	17.8	13.8		
Yes	121	21.6	16.3	17.5		
Hip/thigh					**0.004**[a]	0.46
No	134	18.1	16.3	14.4		
Yes	56	25.8	17.1	20.8		

Significant results in bold.
SD = standard deviation.
[a] Student *t*-test.
[b] Kruskal-Wallis test.

The workers who reported an upper limb MSD during the preceding 12 months had a significantly higher DASH score, regardless of the anatomical affected area; this was not the case for low back pain. Moreover, we observed a very significant difference in the DASH score depending on whether the subjects did not show any shoulder symptom, showed isolated shoulder symptoms, or showed shoulder symptoms as well as a different other area of the upper limb ($P < .0001$) (Table 2).

Finally, the DASH and DASH-work scores were significantly higher in workers who had consulted a physician ($P < .001$) or a physiotherapist ($P < .001$) or who benefited from one or several sick leaves ($P < .001$) related to the shoulder symptoms during the previous 12 months. By contrast, there was no significant difference for the DASH and DASH-work scores depending on whether or not surgery had been performed on the shoulder (Tables 3 and 4).

Discussion

The present study carried out within a large population of workers highlights higher DASH scores in women, in workers over the age of 40 years, those who suffered from upper limb MSDs (regardless of its location) and those who had sought medical treatment in relation with the RCS. However, the DASH score was not affected by overweight or any surgery performed on the shoulder. The DASH-work score was only affected by medical management (excluding surgery) related to the RCS, during the preceding 12 months.

The DASH score averages observed in our population were overall lower than those observed in other populations of workers suffering from MSDs.[8,23-25] This can be explained by the fact that our population was recruited through occupational medicine and mainly consisted of still working people at baseline. Conversely, the DASH and DASH-work scores observed in our population were overall higher than in general populations of workers (not specifically diagnosed with a MSD). This can be explained by the higher sensitivity of our diagnostic methods for MSDs (through the SALTSA-standardized clinical examination).[16,22]

A significantly higher DASH score in women (24.0 vs 17.4; $P < .01$; d = 0.39) confirms the data found in the literature.[26,27] It could be explained by women's higher sensitivity to pain and the fact that they report functional incapacity more readily than men do.[28] Another hypothesis could be linked to the types of tasks performed depending on gender.[29] Unsurprisingly, the study confirms the impact of age on the DASH score.[7] Indeed, in our study, the DASH score was twice as high for workers aged over 50 years as for workers aged less than 40 years (23.6 vs 11.3; $P < .005$). The physiological aging of tissue combined with cumulative exposure to work constraints during the course of a career may explain this result. Moreover, aging causes tissue to adapt and recover slower following physical efforts.[30] Our results do not show a significant impact of BMI on the DASH scores. Indeed, it is more common to observe overweightness having an impact on the pain and functional incapacity of the lower limb and lumbar spine.[31] Previous studies showed above all, the impact of obesity on the occurrence of MSDs as opposed to on the functional incapacity that is cause.[32,33] Finally, this study did not allow measuring the impact of psychological factors on the DASH score. However, literature shows that focusing on depression has a significant impact on the variation of the DASH score, but its clinical relevance has not been established.[34,35]

Table 3
DASH scores according to RCS medical management during the preceding 12 months

Variable	*N*	Mean	SD	Median	*P* value	Effect size (Cohen's d)	Percentage difference
Physician consultation					**<0.001**[a]	**1.03**	
No	92	14.7	12.8	12.5			
Yes	76	30.5	18.0	28.9			
Number of consultations							
1	16	21.0	17.2	15.7			
2 or 3	30	29.2	17.3	25.8			
> 3	16	42.5	15.6	45.4			
Physiotherapy session					**<0.001**[a]	**1.02**	
No	118	16.9	14.6	14.4			
Yes	48	32.7	17.4	31.4			
Number of sessions							
< 5	15	27.5	17.4	20.5			
5-15	12	31.8	17.8	26.7			
> 15	10	42.9	13.6	44.6			
Sick leave					**<0.001**[b]		**117**
No	149	18.7	15.1	16.7			
Yes	15	40.5	17.8	43.3			
Sick leave duration							
< 30 d	4	41.6	19.9	48.8			
30-55 d	4	30.0	17.1	25.9			
> 55 d	3	42.2	20.5	44.2			
Shoulder surgery					0.225[b]		43
No	155	20.9	16.2	18.1			
Yes	14	29.8	23.0	20.0			

Significant results in bold.
RCS = rotator cuff syndrome; SD = standard deviation.
[a] Student *t*-test.
[b] Wilcoxon test.

Table 4
DASH-work scores according to RCS medical management during the preceding 12 months

Variable	*N*	Mean	SD	Median	*P* value	Effect size (Cohen's d)	Percentage difference
Physician consultation					**<0.001**[a]	0.64	
No	80	15.0	21.8	6.3			
Yes	58	30.5	27.2	25.0			
Number of consultations							
1	12	16.1	22.2	9.4			
2-3	26	33.4	29.6	28.1			
> 3	10	39.4	23.8	50.0			
Physiotherapy session					**0.002**[a]	0.62	
No	105	17.6	23.0	6.3			
Yes	34	32.9	28.6	28.1			
Number of sessions							
< 5	13	34.6	27.4	31.3			
5-15	8	25.0	20.6	21.9			
> 15	6	51.0	34.8	53.1			
Sick leave					**0.001**[b]		**159**
No	127	19.1	23.4	12.5			
Yes	11	49.4	30.4	50.0			
Sick leave duration							
< 30 days	3	66.7	14.4	75.0			
30-55 days	4	37.5	32.3	37.5			
> 55 days	2	40.6	13.3	40.6			
Shoulder surgery					0.210[b]		54
No	130	22.3	25.6	12.5			
Yes	8	10.2	17.0	3.1			

Significant results in bold.
RCS = rotator cuff syndrome; SD = standard deviation.
[a] Student *t*-test.
[b] Wilcoxon test.

Regarding the DASH-work score, no significant relation has been shown with individual risk factors. This is undoubtedly explained by the purely work-related nature of the questions in this module. Moreover, the subjects who were not still working at the time of the second phase of the study were not taken into consideration for this score and yet, some of them could have been excluded from work due to a serious functional incapacity of the shoulder or retired on account of their age; these are conditions which are likely to influence the DASH-work score, but which have not been measured here. Furthermore, the level of functional incapacity felt by a worker can be decreased by using job retention measures (workstation layout, transfer to a different department, and so on), which lead to a decrease of the DASH-work score.[7] This specific module has been studied to a relatively small extent in the literature, and it could be more subjective than the rest of the DASH questionnaire on account of the potential impact of working conditions perceived by the worker on functional incapacity at work and therefore on the DASH-work score.[36]

The results of the Nordic questionnaire have demonstrated a significant higher DASH score for workers suffering from MSDs that affects the upper limb and/or the upper back. This was particularly true in case of upper limb disorder (26.0 vs 6.6; $P < .0001$). The DASH questionnaire is therefore a tool used for the overall assessment of the upper limb, sensitive, but not exclusively specific to the shoulder.[10] One of the elements that could explain this weak specificity could be the usual interdependence between neck pain and shoulder pain, as well as the projection of neck pains onto the upper limb and conversely.[37] Nevertheless, the DASH questionnaire remains a valid tool in the case of neck pain.[10,37,38] The projection of referred pain of the upper limb probably also explains why we observe higher DASH scores in the case of multiple MSDs of the upper limb.[22]

Our results highlight a significant increase in DASH and DASH-work scores for workers who consulted a physician or physiotherapist or who were placed on sick leaves in relation with shoulder's symptoms. This supports the hypothesis that workers who feel a greater functional incapacity (measured by DASH and DASH-work scores) are also the ones who most often seek medical treatment.[6] Workers who were on sick leave had the highest DASH and DASH-work scores (40.5 vs 18.7; $P < .001$ and 49.4 vs 19.1; $P = .001$, respectively). However, our results must be interpreted with caution on account of the small number of subjects and more especially for shoulder surgery.

Finally, the self-administered questionnaire, despite the sources of bias associated with it, is undoubtedly the best approach in assessing perceived functional incapacity, which is therefore subjective. This approach, used alongside an objective clinical assessment of physical incapacity, is essential to the overall understanding of the impact of the RCS.

Conclusions

The study highlights the clinical relevance of DASH scores, including in case of multiple disorders of the upper limb, and the use of these scores on a large sample of workers shows the feasibility of using them as part of routine practice.[13,14,39] Our study confirms the impact of sociodemographic and medical characteristics and management on RCS-related functional incapacity assessed by the DASH tool in workers. These results have clinical and research implications since these parameters added to other established predictors could help predict the functional incapacity degree and even could help predict stay at work in individuals with UE-MDSs. Moreover, the DASH tool could potentially help guide clinicians in determining early interventions for those patients.

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Quiz: # 618

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1. The functional incapacity in patients suffering from rotator cuff syndrome was assessed using
   a. the McClure-LaStayo Functional Shoulder Battery
   b. a battery of tests specifically designed by the authors for this study
   c. the DASH and DASH-work scores
   d. the Jebson-Taylor Upper Extremity Functional Assessment Scale
2. Data were collected from
   a. self-administered questionnaires
   b. one-on-one interviews between patients and physicians
   c. one-on-one interviews between patients and therapists
   d. retrospective chart reviews
3. Incapacity scores were higher in
   a. left handed patients
   b. patients ages 20-40 years old
   c. men
   d. women
4. Of the subject population _____ % continued working
   a. 50
   b. 75
   c. 80
   d. 95
5. Though it was found that demographic factors affected incapacity, medical intervention was an even greater influence on outcomes
   a. false
   b. true

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