Association of Psychosocial Factors with Shoulder Tendinitis: A Cross-Sectional Study in Patients of a Tunisian Hospital

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ABSTRACT

Background: *To assess the association between rotator cuff tendinitis (RCT) occurrence and socio–professional constraints among a sample of professionally active patients.* **Methods:** *This study was based on a questionnaire that collected information on sociodemographic, occupational characteristics, and medical information about shoulder injuries. The assessment of psychosocial constraints at work was performed using the Karasek Job Content Questionnaire.* **Results:** *A total of 100 patients participated in this study. The population was predominantly female (89%), with a mean age of 45±9.5 years. Sixty-five percent of the patients worked in the manufacturing sector, and working as a machine operator was the most common occupation (48%). The average job seniority was 22±9 years. Regarding organization, the most common constraints were the need to respect production standards and deadlines (93%), to work quickly in 96% of cases, and Repeatability (92%). Eighty-eight percent of the patients reported high psychological demands, and 96% had low social support at work. Most of the patients (83%) were under occupational stress or had been subjected to a job–strain situation.* **Discussion:** *In this study, high psychological demand, low decision latitude, and low social support were predominantly reported in the population with percentages of 88%, 93%, and 96%, respectively.*

1. Introduction

Degenerative shoulder pathologies involve lesions of the rotator cuff muscles' tendons, known as "Rotator Cuff Syndrome" (RCS) [1]. RCS is a frequent disorder among working populations, with prevalence rates ranging from 2% to 8.5% [2, 3]. Shoulder tendinitis, a specific type of upper limb musculoskeletal disorders (MSDs), is recognized to have a multifactorial origin, with individual factors such as age and gender playing a crucial role. Women are more likely to develop shoulder tendinitis reflecting both biological predisposition and disparities in occupational conditions between genders [4]. However, defining and classifying shoulder tendinopathies remains challenging due to the lack of universally accepted terminology. The Consensus on arm, neck, and shoulder (CANS) model provides a standardized classification, distinguishing between specific and non-specific musculoskeletal

complaints to improve diagnostic clarity and research consistency [5].

Occupational stress is an increasing concern, with 56% of European workers reporting excessively high workloads. Recent research highlights the strong link between stress and the development of shoulder tendinitis. Elevated stress levels can lead to muscle tension, altered pain perception, and a breakdown in regulating vital systems, including the central nervous, autonomic, endocrine, and immune systems. These are adverse physiological effects. Additionally, a recent systematic review has emphasized the role of specific occupational risk factors, demonstrating that a combination of forceful, repetitive movements—especially when the arm is flexed above 45 degrees—alongside prolonged arm elevation and excessive exertion substantially raises the likelihood of developing shoulder tendinopathy. Employers must recognize these risk factors and implement preventive measures to protect workers from these debilitating conditions [6].

Further evidence confirms the association between occupational biomechanical overload and shoulder tendinopathies, particularly in jobs that require sustained arm elevation combined with forceful exertion [4].

According to the European Communities, identified risk factors include work-related stressors, inadequate social support at work and home, genetic predisposition, pre-existing conditions, and coping difficulties with pain and functional limitations [7]. Specific work-related stressors, such as high job demands, low job control, and poor social support, have been associated with the development of shoulder disorders [8]. Karasek's job strain model suggests that a combination of high job demands, low job control, and poor social support creates a highly stressful work environment, which may accelerate the onset and progression of shoulder tendinitis [9].

Despite these findings, the relationship between RCS and occupational risk factors remains complex and poorly understood. In this context, we hypothesize that psychosocial factors and work-related constraints significantly influence the occupational prognosis of employees suffering from shoulder disorders, especially rotator cuff tendinitis (RCT).

This study assesses the relationship between RCT and work-related factors, applying Karasek's job strain model to a cohort of professionally active patients.

2. Methods

2.1. Participants

This is a retrospective cross-sectional study among employed patients suffering from shoulder pain, followed by the Department of Occupational Medicine at the University Hospital of Taher Sfar of Mahdia-Tunisia between January 2019 and December 2022. Patients with less than two years of job tenure were excluded from this study.

2.2. Questionnaire

Data were collected through direct interviews with patients who consented to participate in the study. We used a pre-established and anonymous questionnaire with several measures:

- Sociodemographic characteristics: age, gender, marital status, education level, etc.
- Medical history and lifestyle: tobacco use, physical activity, etc.
- Occupational characteristics: work sector, job position, job seniority, work schedule, etc.

Characteristics and medical information about the RCT were collected by reviewing the patients' medical records, including data from the physical examination, ultrasound results of the painful shoulder, and details about the treatment provided. Based on the shoulders' ultrasound findings, we dichotomized the participants into two groups:

- RCT (-): No ultrasound-detectable tendon lesions;
- RCT (+): presence of ultrasound abnormalities consistent with tendonitis.

** Psychosocial constraints at work:
They were assessed using the Job Content Questionnaire with 29 items in its validated French

version. This instrument explores three dimensions [10, 11]:

- Psychological demand (PD), which assesses the psychological overload of work (9 items);
- Decisional latitude (DL) refers to employees' control over their duties and how they want to perform these tasks. It includes both competence and decision-making authority (9 items);
- Social support (SS) at work, which Evaluates the level of social and emotional support provided by superiors and co-workers (11 items).

Responses to the questionnaire items were collected using a four-point Likert scale, ranging from (1) "Strongly Disagree" to (4) "Strongly Agree." A score was assigned for each of the three dimensions mentioned above.

The scores are interpreted as follows [12]:

- A score of DL ≤ 69 indicates that the subject experiences a low degree of work flexibility;
- A score of PD ≥ 21 means that the person is experiencing high psychological demands at work;
- A score of SS≤ 23 indicates poor SS from colleagues and management.

The combination of high PD and low DL defines "job strain." The "Iso-strain" describes the situation associated with "job strain" and "social isolation,"i.e., low SS. Table 1 shows the psychometric properties of the French version of the JCQ. Cronbach's alpha coefficients, all between 0.73 and 0.83, confirm the instrument's internal consistency.

2.3. Statistical Analysis

Analyses were conducted using the Statistical Package for the Social Sciences (SPSS) version 21.0.

Table 1. Cronbach's alpha coefficients for the JCQ scales.

Cronbach's alpha coefficients	Women	Men
Decision latitude	0.81	0.83
Psychological demands	0.73	0.74
Social support	0.82	0.80

The χ^2 and Fisher's exact tests were performed to assess differences in proportions of categorical variables between the two groups: those with and without RCT.

Multivariable logistic regression was employed to predict factors influencing the occurrence of RCT. In this model, only significant variables of interest at a threshold of 20% (p < 0.2) were introduced. A significance level of p < 0.05 was considered for statistical significance.

3. Results

3.1. General and Medical Characteristics of the Study Population

The present study included 100 patients with a mean age of 45±9.5 years (24-61 years) and a female predominance (89%). Almost all patients (90%) were right-handed. The mean BMI of the study population was 28±4.3 kg/m2 (20.2-39 kg/m2), and most participants (79%) were classified as overweight or obese.

3.2. Medical Characteristics of the Participants

More than 90% of the participants exhibited positive signs of shoulder impingement (Neer, Hawkins, and Yocum signs), and 86% had at least one positive tendon test (Gerber, Palm Up, Jobe, and Patte tests). Sixty-nine participants (69%) showed tendon abnormalities on shoulder ultrasound and were classified in the RCT (+) group.

3.3. Occupational Characteristics of the Participants

Clothing manufacturing was the most represented sector in the study (65%), followed by automotive wiring (12%) and food industry (10%). The average job seniority of the participants was 22±9.1 years, with 58% having more than 20 years of seniority. Half of the patients worked as sewing machine operators. In 95% of cases, participants worked 8 hours a day, and 88% held fixed daytime jobs, while 12% had shift and/or night work.

3.4. Organizational Constraints

Eighteen percent reported experiencing all seven organizational constraints simultaneously: multi-tasking, dependence on co-workers' work, adherence to production standards or deadlines, continuous monitoring or supervision, external demand, automatic pace, and work repetition.

3.5. Psychosocial Constraints at Work

The average scores of mental strain, PD, and job DL were 16±3.7, 25±4.7, and 39±5.1, respectively. Eighty-eight percent of participants were exposed to high PD, and most (83%) were in a job-strain situation. Iso-strain was present in 82% of all cases.

3.6. Factors Associated to the Occurrence of RCTs

In the present study, RCT was significantly associated with gender (p=0.03), type of occupational sector (p ≤0.001), workstation (p≤0.001), PD (p=0.04), and job strain (p=0.03) (Table 2). RCT was significantly more prevalent among female employees (p=0.03), those in machine work positions (p≤0.001), and individuals in the clothing sector (p ≤10^{-3}). Organizational constraints significantly associated with RCT included a work schedule enforced by continuous supervision (p=0.001) and/or an automatic pace (p=0.008). In the univariate analysis, the incidence of RCT was more common among employees facing high psychological demands (p=0.04) and those in job strain situations (p=0.03). The reported p-values indicate the statistical significance of the results based on χ^2 tests.

3.7. Determinants of the Occurrence of RCTs

In the multivariate analysis, the risk of RCT was multiplied by a factor of 1.3 among machine workers (p≤0.001; OR=1.3; 95% CI = [1.09; 2.03]), by a factor of 3.7 among participants subjected to continuous monitoring by superiors at work (p<0.001; OR=3.72; 95% CI = [1.05; 9.8]), and by a factor of 4.9 among those with low SS (p=0.08; OR=4.9; 95% CI = [1.17; 9.4]). (Table 3).

4. Discussion

Rotator cuff tendinitis (RCT) is a significant health issue for workers, and its occupational relationship has been established for a long time [13]. Among physical workers, shoulder tendinopathy is estimated to affect between 15 and 20% [14] with a reported incidence of 19.9 per 10,000 workers per year in Washington by Silverstein et al. [15]. In our study, RCT was diagnosed in 69% of the cases referred for shoulder pain during the study period. For the diagnostic criteria of RCT, we opted for a combination of ultrasound and clinical diagnostic tests.

According to the literature, the etiology of RCT is a complex process influenced by numerous personal and occupational risk factors. The higher prevalence among women may be linked to biological predispositions, partly explained by physiological hormonal changes women experience throughout their life cycle. For instance, menopause can lead to accelerated bone loss, increasing the risk of musculoskeletal disorders (MSDs). Additionally, a genetic predisposition may contribute to findings that being white and female significantly increases the risk of developing RCT [16].

The predominance of women can also be explained by differences in working conditions between the sexes [4]. In fact, women are often overexposed to monotonous and repetitive tasks that generate localized constraints, particularly on the extremities. Advanced age appears to be an important factor in the intrinsic etiology of RCT among the active population [3, 17]. The high prevalence of RCT in our workforce may be partly attributed to age, as more than half of the patients were older than 40 years. However, the association between age and the risk of RCT occurrence was not statistically significant. This aligns with existing knowledge about age-related degenerative diseases and changes in the rotator cuff tendons due to aging [18, 19, 20].

In our study, overweight and obesity were observed in 41% and 38% of the cases, respectively, but these conditions did not constitute significant risk factors for RCT. The relationship between RCT and overweight has been discussed in the literature [21, 22]. According to Miranda et al. and Roquelaure et al., there is no statistically significant relationship

Table 2. Factors associated with the occurrence of RCT.

	RCT(+) N(%)	RCT(-) N(%)	p
Gender:			
Male	3(4.3)	8(25.8)	0.03
Female	66(95.7)	23(74.2)	
BMI (Kg/m2):			
< 25	17(24.6)	4(5.7)	0.18
[25-30]	30(43.4)	11(15.9)	
≥ 30	22(31.8)	16(23.1)	
Age group:			
<to 40 years	19(27.5)	4(12.9)	0.08
≥ to 40 years	50(72.4)	27(87.1)	
Dexterity:			
Right-handed	61(88.4)	29(93.5)	0.71
Left-handed	8(11.6)	2(6.5)	
Sector:			
Manufacturing	55(79.7)	10(32.2)	$\leq 10^{-3}$
Others	14(20.3)	21(67.8)	
Job Position:			
Machine worker	42(60.8)	6(19.3)	$\leq 10^{-3}$
Other	27(39.2)	25(80.7)	
Job seniority:			
< 10 years	9(10.5)	7(20.6)	0.37
[10– 20] years	20(26.3)	6(13.3)	
>20 years	40(63.2)	18(56.1)	
Number of work hours per day:			
≤8h	68(94.7)	29(93.5)	0.50
>8h	1(5.1)	2(6.5)	
Multitasking:			
Yes	40(57.9)	20(64.5)	0.53
No	29(42.1)	11(35.5)	
Dependence on other colleagues' work:			
Yes	38(55.1)	13(41.9)	0.22
No	31(44.9)	18(58.1)	
Respect of production standards			
Yes	65(94.2)	28(90.3)	0.67
No	4(5.8)	3(9.7)	
Continuous monitoring or supervision			
Yes	65(94.2)	21(67.7)	10^{-3}
No	4(5.8)	10(32.3)	
External demand			
Yes	47(68.1)	25(80.6)	0.19
No	22(31.9)	6(19.4)	
Automatic rate			
Yes	69(100)	27(87.1)	0.008
No	0	4(12.9)	

	RCT(+) N(%)	RCT(-) N(%)	p
Job decision latitude			
Low	66(95.7)	27(87.1)	0.19
high	3(4.3)	4(12.9)	
Psychological demand			
low	5(7.2)	7(22.6)	0.04
high	64(92.8)	24(77.4)	
Social support			
low	68(98.5)	28(90.3)	0.08
high	1(1.5)	3(9.7)	

RCT: Rotator Cuff Tendinitis.

Table 3. Determinants of the occurrence of RCT.

	RCT(+)	RCT(-)	p	OR	95% CI
Gender					
Male	4.3	25.8	0.03	0.33	[0.03; 2.9]
Female	95.7	74.2			
Age group					
<to 40 years	27.5	12.9	0.08	0.2	[0.03; 1.3]
≥ to 40 years	72.4	87.1			
Job Position					
Machine worker	60.8	19.3	≤10^{-3}	1.3	[1.09; 2.03]
Other	39.2	80.7			
Continuous monitoring or supervision					
Yes	94.2	67.7	≤10^{-3}	3.72	[1.05; 9.8]
No	5.8	32.3			
Social support:					
low	98.5	90.3	0,08	4,9	[1.17; 9.4]
high	1.5	9.7			

between BMI and RCT [3, 18]. However, some studies have shown a positive association; for example, Reichardt et al. reported a significant association between being overweight and the occurrence of RCT in a study that included 6 237 participants [23].

Occupational risk factors for RCT remain a debated topic. Risk assessments related to biomechanics, psychosocial factors, and work organization have primarily focused on highly exposed workers, which may limit the generalizability of findings to the broader population experiencing varying levels of exposure to work-related shoulder constraints [18]. Overall, MSDs impact all occupational sectors with varying prevalence, as indicated by numerous scientific studies. The industrial sector is the most affected, followed by agriculture and public administration [24, 25].

In our study, 65% of the patients were employed in the clothing industry. These results can be attributed to the significant dominance of this sector in the central region of Tunisia, which accounts for 34% of all Tunisian manufacturing industries [26]. Activities in this sector are characterized by rapid and repetitive movements that engage localized muscle tendons and require the maintenance of constrained postures, necessitating considerable endurance [27].

These results are consistent with findings from several studies. For instance, Ghram et al. reported that, in a study involving 359 textile industry workers (89.7% women and 10.3% men) in the Monastir region, the shoulder was the most severely affected area (56% of cases) [28]. Working in the textile industry increased the risk of minor to moderate disability by 1.7 times compared to other manufacturing industries or office workers, according to Brisson C et al. [29]. In this sector, workers face postural and gestural constraints that affect the humeroscapular articulation, including repetitive external rotation and ante-pulsion of the upper limbs, along with static abduction without shoulder support [30].

While there is an extensive bibliography on physical risk factors for rotator cuff tendinopathy, there is less focus on psychosocial risk factors. Furthermore, research on organizational risk factors for RCT is limited. These factors can be defined as objective aspect of work organization. According to the SUMER surveys (medical surveillance of employee exposure to occupational risks) and working conditions surveys, authors have noted an intensification of work over the years, marked by increased organizational constraints—both industrial (e.g., automatic movement of products, machine cadence, and production deadlines) and commercial (e.g., external demand requiring immediate response) [32, 33]. In 1984, only 3% of unskilled workers were subject to these two constraints, compared to 27% in 2013 (3% and 39% among commercial employees, respectively) [34].

Referring to the study by Bodin et al. in 2017, it was reported that workers exposed to high levels of rhythm constraints (aside from those imposed by external demands), repetitive tasks, shift work, job rotation, and low decision latitude experienced more frequent shoulder pain and had higher rates of diagnosed rotator cuff syndrome than employees in other job categories [35]. This was confirmed in our study; in fact, being subjected to organizational constraints such as a work rhythm depending on continuous controls (p=0.001) or an automatic pace (p=0.008) was strongly associated with the risk of RCT. However, a work rhythm imposed by other employees' work, external demands, or production standards did not influence the occurrence of RCT in our study population.

Recent studies on RCT have highlighted the importance of psychosocial factors in exacerbating these occupational diseases. Generally, "psychosocial factors" refer to an individual's subjective assessment of the work environment, which can positively influence performance by enhancing motivation, happiness, and well-being [36]. However, these factors can also serve as sources of occupational stress [37]. Regarding psychosocial risk factors for RCT, Bongers et al. proposed two potential pathways of influence [38]: 1. Direct effects on biomechanical constraints: When workers perceive psychosocial factors such as high job demands or low control, they may feel compelled to adapt by accelerating their movements or adopting uncomfortable postures. This increased biomechanical strain can directly contribute to the onset of RCT. 2. Indirect effects through physiological stress responses: When workers perceive psychosocial factors as threats needing resolution, this can activate a cascade of stress-related physiological responses involving the immune, endocrine, central nervous, and autonomic nervous systems. The activation of these processes can adversely affect muscles and tendons, consequently increasing the risk of RCT. In summary, the findings of this study regarding organizational constraints as psychosocial risk factors for RCT can be understood within the broader context of how work-related psychosocial factors—through both biomechanical and physiological pathways—contribute to the development of MSDs like RCT in working populations.

Pope et al. (1997) reported a direct relationship between psychosocial factors, aspects of the work environment, disability, and shoulder pain [39]. In this study, we utilized the Karasek questionnaire, which examines the effects of mental stress at work on overall health. This questionnaire assesses each employee's level of PD, decision-making power, and SS in the workplace [10]. In our study, high PD, low DL, and low SS were predominantly reported in the population with the following percentages: 88%, 93%, and 96%, respectively. Only high PD was significantly related to the RCT.

In a recent systemic review, Leong et al (2019) [17] noted that several psychological factors—such as high PD, low work control or decision-making power, low commitment to safety, job dissatisfaction,

and low coworker support—have been identified by multiple authors as risk factors for RCT in the workforce. However, their meta-analysis indicates that only high PD is significantly associated with an increased risk of RCT.

Similar findings have been extensively documented in the literature. Pougnet et al. (2014) reported that 50% of the 30 agents in the sterilization department were experiencing stress related to job strain, which largely contributed to the incidence of MSDs [40]. Additionally, in a 2017 study involving 254 patients, Fennani found that 90% of the patients were suffering from occupational stress and experienced job strain, which was significantly correlated with multisite musculoskeletal damage [41]. Exposure to psychosocial factors is intertwined with organizational and physical constraints, creating a complex relationship among various occupational risk factors for RCT. In this context, Niedhammer et al. (2016) noted that workers exposed to various pace-related and physical constraints (such as heavy lifting, poor posture, and vibrations) were more likely to experience work-related stress and job strain [42].

In the present study, the multivariate analysis identified several predictive factors for the risk of RCT: being a machine worker ($p \leq 0.001$; OR=1.3; 95% CI = [1.09; 2.03]), being subjected to continuous monitoring by superiors ($p < 0.001$; OR=3.72; 95% CI = [1.05; 9.8]), and having low social support at work ($p = 0.08$; OR=4.9; 95% CI = [1.17; 9.4]). Furthermore, research has examined how individual patient characteristics influence the impact of RCT on professional activity. A 2014 study by Dunn et al. evaluated 393 patients with rotator cuff tears and found that the level of shoulder activity was significantly correlated with the patient's age, sexe, and occupation but not with the size of the tear or the severity of the injury [43]. The current study revealed similar findings, with female gender ($p = 0.005$) identified as the only personal factor associated with a reduction in professional activity.

In conclusion, preventing RCT should focus on modifiable factors within employees' professional environments. While organizational factors play a role, they primarily impact employees' physical and psychological strains. Work organization highlights the dual technical and social dimensions of professional risk factors. On the technical side, prevention efforts should concentrate on improving working conditions, particularly regarding rhythms and cadences, and seek ergonomic solutions to enhance psychological well-being.

This is the first study to emphasize the influence of psychosocial constraints on RCT occurrence among Tunisian workers. However, some limitations exist: the study's cross-sectional nature may lead to selection and recall bias, and there was no objective assessment of workers' biomechanical constraints. Additionally, data collection coincided with the emergence of the SARS-CoV-2 virus, which caused significant upheaval and stress, potentially affecting pain perception and study results. Lastly, using self-administered questionnaires for risk assessment could lead to inaccuracies in exposure reporting, as workers with RCT might overreport pain, while those who changed jobs may underreport exposure.

5. Conclusion

The present study highlights the critical role of psycho-organizational constraints in the occurrence of RCT among Tunisian workers, particularly those in manufacturing industries. These constraints significantly influence work activity and can be considered predictors of the ability to return to work after a rotator cuff tendon injury. Given the high prevalence of these disorders and their impact on employees' quality of life and work capacity, it is essential to implement appropriate preventive measures. Notably, only high PD was significantly associated with RCT. In a recent systematic review, Leong et al. (2019) also noted that high PD can be associated with an increased risk of RCT.

AVAILABILITY OF DATA AND MATERIALS: The raw data used in this study are available in an SPSS file. The questionnaire used can be obtained upon request from the corresponding author.

COMPETING INTERESTS: The Authors declare no conflict of interest.

AUTHORS CONTRIBUTION: N.B.: study conception, design analysis, and interpretation of results; M.L.: data collection. N.G.: draft manuscript. I.R. and A.K.: contributed to researching data sources and reorganizing the text. T.K. and A.M.: discussed and revised the manuscript. All authors approved the final version of the manuscript.

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