Research Article

# A cross-sectional study on the prevalence of work-related musculoskeletal disorders in the employees of pharmaceutical industry

**Hardik R Shah[1], Parul Bhatt[1], Binal D Vaghani[2], Jayul Vaghani[3]**

[1]Department of Medicine, GMERS Medical College, Sola, Ahmedabad, Gujarat, India, [2]Department of Pathology, BJ Medical College, Ahmedabad, Gujarat, India, [3]Rhombus Pharma Pvt. Ltd., Ahmedabad, Gujarat, India

**Correspondence to:** Hardik R Shah, E-mail: hardik_dimpu@yahoo.com

**Received:** November 27, 2016; **Accepted:** December 12, 2016

## ABSTRACT

**Background:** Work-related musculoskeletal disorders (WRMDs) are a group of painful disorders of muscles, tendons, and nerves. Carpal tunnel syndrome, tendonitis, thoracic outlet syndrome, and tension neck syndrome are examples. Fascination with technology, overly ambitious business expectation, and neglected human factor risks can have serious effects on manufacturers, suppliers, and service enterprises. As India is one of the largest and growing hubs in the world of manufacture industry, there is a great need to identify such problem. In this study, we identified such problems and discussed it. **Objectives:** The aim of this study is to gather data to identify jobs or work conditions that are most problematic, using sources such as injury and illness logs, medical records, and job analyses. **Materials and Methods:** Data collection was done by personal interview, history and physical examinations, specific symptoms questionnaire, and rapid upper limb assessment (RULA) survey for WRMDs. **Results:** In our study, we found that prevalence of neck pain was highest followed by back pain in general. Most participants had complained that pain only aggravated when they continue work without taking rest. On examination, the presence of cervical spine tenderness was highest, followed by hand joints and lumbar spine tenderness. In admin and skilled participants, RULA score was up to 4 (satisfactory and modification required), but in unskilled participants, RULA was up to 7 (not satisfactory and immediate changes may require). **Conclusion:** Work activities which are frequent and repetitive or activities with awkward postures cause these disorders which may be painful during work or at rest. Most WRMD affects the hands, wrists, elbows, neck, and shoulders.

**KEY WORDS:** Work-related musculoskeletal disorders; Rapid Upper Limb Assessment Score; Employees; Pharmaceutical Industry

## INTRODUCTION

High technology can make our lives more efficient and exciting. However, certain jobs or work conditions cause a higher rate worker complaints of undue strain, localized fatigue, discomfort, or pain that does not go away after overnight rest. These types of jobs are often those involving activities such as repetitive and forceful exertions; frequent, heavy, or overhead lifts; awkward work positions; or use of vibrating equipment.[1] One of the most prevalent types of work-related injuries is musculoskeletal disorders. Work-related musculoskeletal disorders (WRMDs) result in persistent pain, loss of functional capacity, and work disability, but their initial diagnosis is difficult because they are mainly based on complaints of pain and other symptoms.[2] Therefore, further studies are needed to analyze the association between subjective descriptions and objective findings.[3] The traumatic injuries of the muscles, tendons, and nerves due to accidents are not considered to be WRMDs or are considered separately. Work activities which are

| Access this article online | |
|---|---|
| **Website:** http://www.ijmsph.com | **Quick** Response code |
| **DOI:** 10.5455/ijmsph.2017.1165212122016 | |

International Journal of Medical Science and Public Health Online 2017. © 2017 Hardik R Shah, et al. This is an Open Access article distributed under the terms of the Creative Commons Attribution 4.0 International License (http://creativecommons.org/licenses/by/4.0/), allowing third parties to copy and redistribute the material in any medium or format and to remix, transform, and build upon the material for any purpose, even commercially, provided the original work is properly cited and states its license.

frequent and repetitive or activities with awkward postures cause these disorders which may be painful during work or at rest. Almost all works require the use of the arms and hands. Therefore, most WRMD affects the hands, wrists, elbows, neck, and shoulders. Work using the legs can lead to WRMD of the legs, hips, ankles, and feet. Some back problems also result from repetitive activities.

### Other Names for WRMDs

WRMDs are very difficult to define within traditional disease classifications. These disorders have received many names, such as:

- WRMDs.
- Repetitive strain injuries.
- Cumulative trauma disorders.
- Overuse syndrome.
- Regional musculoskeletal disorders.

Most of the names do not accurately describe the disorders. For example, the term "repetitive strain injuries" suggest that repetition causes these disorders, but awkward postures also contribute. These terms are used synonymously. In the absence of an agreement, WRMD term is used in this document.

Rapid upper limb assessment (RULA)[4] was developed to evaluate the exposure of individual workers to ergonomic risk factors associated with upper extremity MD. A single-page worksheet is used to evaluate required body posture, force, and repetition. Based on the evaluations, scores are entered for each body region in section A for the arm and wrist, and Section B for the neck and trunk. After the data for each region are collected and scored, tables on the form are then used to compile the risk factor variables, generating a single score that represents the level of MD risk. The RULA was designed for easy use without the need for an advanced degree in ergonomics or expensive equipment. Different procedures for measuring the perception of pain have been proposed. Among these, visual scales have been extensively utilized for measuring the severity of pain. Some of these have been considered to be simple, reliable, and universally reproducible.[5]

However, pain is an essentially subjective experience that may be "associated with actual or potential tissue damage or described in terms of such damage".[6] The perceived dimensions may not represent the dimensions of a physical injury. Therefore, functional evaluations such as clinical evaluation and disability assessments have been considered useful for determining limitations.[7] Pransky et al.,[8] in a review of studies, using questionnaires to assess general physical function, indicated that some of the self-reporting instruments reviewed showed good reliability and validity for detecting changes in illness status. Among the instruments extensively applied for evaluating, disability is the Oswestry low back pain disability questionnaire (ODQ).[9] Although this was originally developed for measuring the level of functionality among patients with low back pain, it might be possible to apply it to other illnesses to assess the impact of chronic pain on the daily activities of individuals.[10] Another self-assessment instrument, the work ability index (WAI)[11] was originally proposed for evaluating how well a worker is able to perform the work and to support aging workers in their changes overtime. Applications of this instrument have shown good validity when compared to results from clinical examinations.[12,13]

Since the functional aspects of WRMDs seem to be influenced by the perception of pain, it would be useful to investigate the extent to which the functional factors evaluated through ODQ (disability) and WAI (ability), and objective factors (sick leave and clinical examination) correlate with other factors that are supposedly more subjective, such as the reporting of symptoms and the perception of pain. Therefore, the objective of the present study was to evaluate aspects of WRMDs among active workers at an industrial company.

### Risk Factors for WRMDs

WRMDs arise from the arm and hand movements such as bending, straightening, gripping, holding, twisting, clenching, and reaching (Figures 1 and 2). These common movements are not particularly harmful in the ordinary activities of daily life. What makes them hazardous in work situations is the continual repetition, often in a forceful manner, and most of all, the speed of the movements and the lack of time for recovery between them. Generally, none of these factors acts separately to cause WRMD. WRMDs commonly occur as a result of a combination and interaction among them. WRMDs are associated with work patterns that include: (i) Work postures and movements; (ii) repetitiveness and pace of work; (iii) force of movements; (iv) vibration; (v) a pace of work: Not allow recovery between movements; (vi) temperature; (vii) lack of influence or control over one's job; (viii) increase pressure (e.g., to produce more); (ix) lack of poor communication; and (x) monotonous/uniform tasks.

### Aims and Objectives

- Documentation of baseline data about WRMDs.
- Evaluation of burden of WRMDs in workers and employees.
- Identification of environmental risk factors for WRMDs.

## MATERIALS AND METHODS

### Study Site

The present study was done at reputed pharma industry at Ahmedabad.

### Sample Size

All employees (voluntary participation) were included in the study.

### Data Collection Method

#### *Personal interview, history and physical examinations*

Seven general questions related to age, sex, marital status, vocational/professional education, occupation, work task, workplace, and department in initial questionnaire and personal interview were noted. The examination consisted of careful inspection, palpation, evaluation of the amplitudes of functional movement, and special detailed tests based on Hoppenfeld,[14] such as the Adson, Filkenstein, and Phalen tests, and maneuvers to test bicipital and elbow tendonitis.


**Figure 1:** (a-c) Cervical joints and upper limb (arm, hand, wrist, and finger joints) joint position, action, location, and movement while work. Muscle swelling near elbow joint


**Figure 2:** (a-d) Position of hand while picking up the water washed syrup bottles and arranging in dryer cum sterilizer. Picking up bottles and quality assessment of filled syrup bottles before packaging syrup and capsules packaging in plastic bags and box (both upper and lower)

#### *Specific symptoms questionnaire*

The specific questionnaire covered seven items: Current ability to work compared with lifetime best, ability to work in relation to the demands of the job, number of current diseases diagnosed by a physician, estimated work impairment due to diseases, sick leave during the past 12 months, own prognosis of ability to work 2 years from now, and mental resources. Personal information was obtained, and the subjects' discomfort was characterized feelings of heaviness, numbness, tingling or "pins and needles", pain, the onset, and the duration of symptoms, according to the regions affected. These regions were divided into the neck, shoulders, elbow-forearm, and wrist-hand. Information relating to the length of work service and sick leave related to pain or musculoskeletal discomfort were obtained from the records available in the company. RULA survey for WRMDs[3] and WAI was performed. This questionnaire[15] was used to evaluate the impact of WRMDs on the ability to work. The answers to each question were scored. The final evaluation enabled classification of the subject's workability into four categories: Excellent, good, moderate, and poor.

## RESULTS

WRMDs result in persistent pain, loss of functional capacity, and work disability. These disorders have multifactorial genesis including physical, organizational, and individual factors and can correspond to different clinical diagnoses. Some of these are more specific, while others relate to diffuse signs and symptoms.[16] The present study was conducted among different category of workers to evaluate WRMDs. The observations of the present study are depicted in Figures 3-6.

## DISCUSSION

The purpose of discussion is not to plan and implement ergonomics improvements directly but to discuss the types of workplace problems and risks that require immediate attention. In a present study, overall male (58.57%, $n = 70$) participants were more than female (41.43%, $n = 70$) participants, but out of three departments, unskilled department has a female predominance. In fact, the ratio is reverse (female worker: 60%, $n = 40$). In age distribution, more younger participants (age < 31 years) were observed in unskilled department (57.5%, $n = 40$), but overall (48.57%, $n = 70$) are of between 31 years and 40 years. While in a study by Walsh et al.,[2] the majority of the participants were female and <41 years old. Overall data show that young female participants are more in the unskilled department. During the evaluation of body mass index (BMI) calculation status, most of the participants are healthy (BMI < 25, 91.42%, $n = 70\%$), but in admin department, presence of overweight participants is almost one-third (33%, $n = 15$). Overweight attributes to

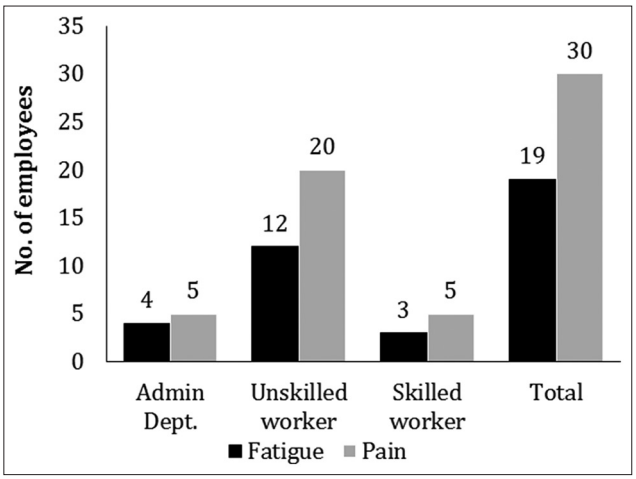


**Figure 3:** Fatigue and pain (symptom) distribution

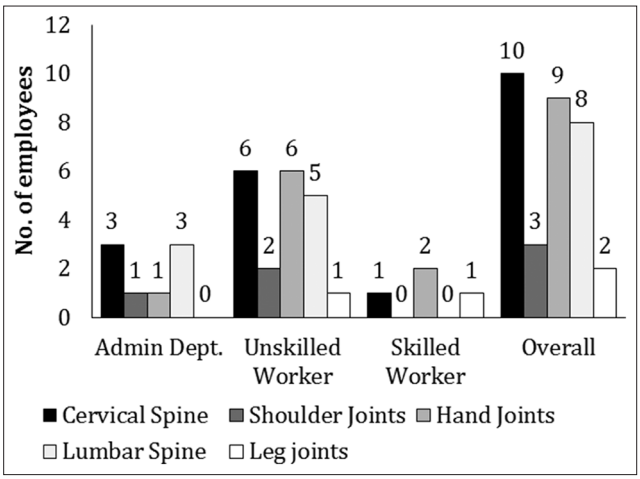


**Figure 5:** Location of tenderness (sign) distribution

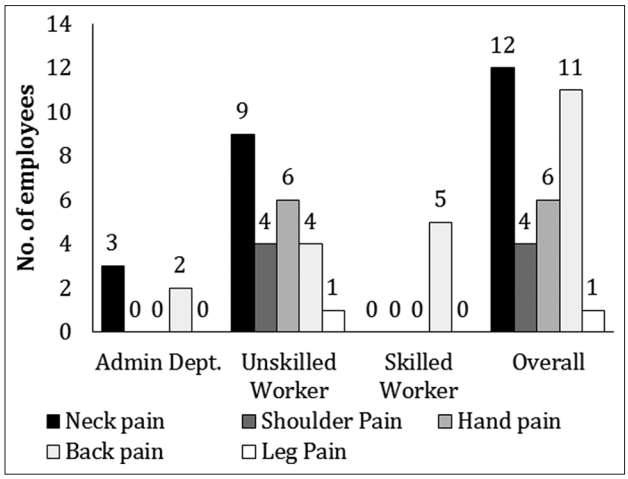


**Figure 4:** Location of pain (symptom) distribution

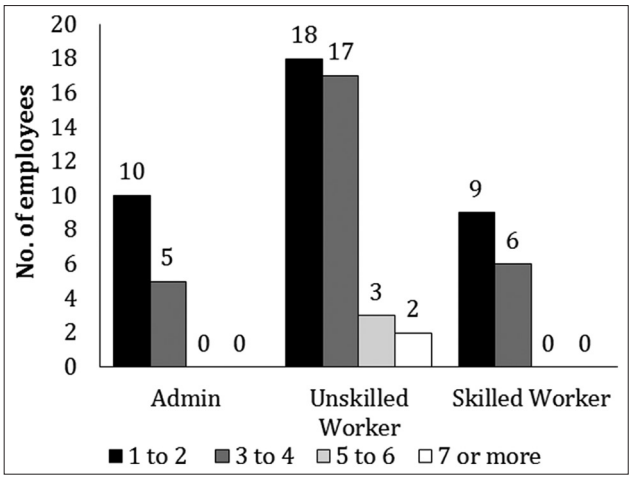


**Figure 6:** Distribution according to rapid upper limb assessment score

their sedentary work and lifestyle as well as socioeconomic status.

In history, questionnaire complaints of pain (42.85%, $n = 70$) are more than that of fatigue (27%, $n = 70$). Majority of the participants (nearly 2/3) were from unskilled worker department of total, participants complaining of pain (66%, $n = 30$) and fatigue (63.7%, $n = 19$) are from unskilled department. Although work pattern, duration, workload distribution, mechanizations, and hygienic conditions were good, improper positions and techniques may lead to problems during work (Figure 1). While in an observation by Walsh et al.,[2] the majority of the participants, who had been working for 6 or more years, tended to report moderate or large numbers of symptoms of medium or high severity and presented moderate to large numbers of clinical findings.

In detailed history, the prevalence of neck pain was highest followed by back pain in general. An extraordinary finding is prevalence of back pain is high (33.3%, $n = 15$) in skilled persons, and no other types of pain are recognized by them. This seems secondary to their odd sitting positions and other work habits. No participant had pain that affects off-work life or sleep. Most participants had complained that pain only aggravated when they continue work without taking rest; otherwise, mostly pain recovers by rest of few minutes or change of work profile (Figure 2). In a study by Walsh et al.,[2] the results from the clinical examinations presumed to be the most objective indicators studied here, correlated positively with other variables. Significant and good correlations were found between clinical findings and symptoms and between clinical findings and WAI. Significant but moderate correlations were found between clinical findings and the pain scale. The results from the logistic regression analysis showed that the symptoms reported at the time of the assessment, which represent the most recent events, were well correlated with the results from the pain scale and clinical findings, likewise, the clinical findings and symptom reports were also well correlated in relation to each other. In Walsh et al.,[2] the results from the ordinal logistic regression showed that the reported symptoms correlated with the results from the pain scale and clinical findings but not with WAI. Clinical

findings correlated with the reporting of symptoms and WAI results but not with the pain scale.

The results from the pain scale correlated with the results from the symptom reports. Both instruments were strongly based on the subjects' perceptions and therefore provided validation for individuals' responses regarding their assessments of their present clinical condition. Clinical findings and symptom reports are instruments of differing nature, considering that the clinical examination is performed by the evaluator by means of provocative tests, while the reporting of symptoms is the result of the individual's perception. Nonetheless, they were well correlated probably because the two instruments assessed the same dimension of the problem, i.e. the clinical condition and the resultant symptoms that were presented by the individual at the time of the assessment. The relationships between the reporting of symptoms, pain scale, and clinical findings indicated that the subject's current state was well recognized by the instruments utilized for this purpose. Thus, it can be suggested that the use of symptom reports that also involve assessments of pain symptoms would be preferable to clinical evaluations for assessing current conditions among individuals presenting WRMDs, as they are easier to apply and require less professional attention and training. This would be particularly valid when more recent stages of such disorders are evaluated.

On examination, presence of cervical spine tenderness was highest followed by hand joints and lumbar spine tenderness. This is secondary to position and improper technique. Although most of the workers have RULA score that is satisfactory, except for a few (Figure 3). In admin and skilled participants, RULA score was up to 4 (satisfactory, modification required). However, in unskilled participants, RULA was up to 7 (not satisfactory and immediate changes may required). This is because of improper position, technique, and work pattern. That affects their position and contributes to high RULA score (Figure 4). The studies by Eskelinen et al.[12] and Nygard et al.[17] observed a satisfactory relationship between the functional and subjective results from WAI and the results from more objective measurements. Eskelinen et al.[12] compared the clinical assessments of health status and work ability with the subjective assessments, as reported on a questionnaire, and found a good correlation between them. Nygard et al.[17] also studied the relationship between objectively measured physical and mental functional capacity and work and found that objective physical measurements such as muscle strength correlated with WAI. In the present study, the negative relationship between clinical findings and WAI was the strongest association found between the results analyzed. The clinical findings involved the presence of physical signs, thus indicating that the more advanced stages of the disorders had been reached. Therefore, it would in some manner be expected that these changes could interfere in the workers' physical capacities.

**Recommendations**

Ergonomically, suitable position and work design with proper education and automation are suggested. Periodical medical examinations are advised to identify occupational hazards including WRMD.

## CONCLUSION

Work activities which are frequent and repetitive or activities with awkward postures cause these disorders which may be painful during work or at rest. Most WRMD affects the hands, wrists, elbows, neck, and shoulders.

## REFERENCES


1. Centers for Disease Control and Prevention. The National Institute for Occupational Safety and Health (NIOSH). Ergonomics and musculoskeletal disorders. Available from: <https://www.cdc.gov/niosh/topics/ergonomics/default.html>. [Last accessed on 2016 May 28].
2. Walsh IA, Oishi J, Coury HJ. Clinical and functional aspects of work-related musculoskeletal disorders among active workers. Rev Saude Publica. 2008;42(1):108-16.
3. Björkstén MG, Boquist B, Talbäck M, Edling C. The validity of reported musculoskeletal problems. A study of questionnaire answers in relation to diagnosed disorder and perception of pain. Appl Ergon. 1999;30:325-30.
4. McAtamney L, Nigel-Corlett E. RULA: A survey method for the investigation of work-related upper limb disorders. Appl Ergon. 1993;24(2):91-9.
5. Huskisson EC. Visual analogue scales. In: Melzack R, editor. Pain Measurement and Assessment. New York: Raven Press; 1983. p. 33-7.
6. Merskey H, Albe-Fessard DG, Bonica JJ, Carmon A, Dubner R, Kerr FW, et al. Pain terms: A list with definitions and notes on usage. Recommended by IASP Subcommittee of Taxonomy. Pain. 1979;6(3):249-52.
7. Rossignol M. Establishing a prognosis for low back problems. In: Ranney D, editor. Chronic Musculoskeletal Injuries in the Work Place. Philadelphia, PA: WB Saunders Company; 1997. p. 193-215.
8. Pransky G, Feuerstein M, Himmelstein J, Katz JN, Vickers-Lahti M. Measuring functional outcomes in work-related upper extremity disorders. Development and validation of the Upper Extremity Function Scale. J Occup Environ Med. 1997;39(12):1195-202.
9. Fairbank JC, Couper J, Davies JB, O'Brien JP. The oswestry low back pain disability questionnaire. Physiotherapy. 1980;66(8):271-3.
10. Ranney D, editor. Disability assessment forms. In: Chronic Musculoskeletal Injuries in the Workplace. Philadelphia, PA: WB Saunders Company; 1997. p. 314-8.
11. Loisel P, Poitras S, Lemaire J, Durand P, Southière A, Abenhaim L. Is work status of low back pain patients best described by an automated device or by a questionnaire? Spine (Phila Pa 1976). 1998;23(14):1588-94.
12. Eskelinen L, Kohvakka A, Merisalo T, Hurri H, Wägar G. Relationship between the self-assessment and clinical

assessment of health status and work ability. Scand J Work Environ Health. 1991;17 Suppl 1:40-7.
13. Zwart BC, Frings-Dresen MH, van Duivenbooden JC. Test-retest reliability of the Work Ability Index questionnaire. Occup Med (Lond). 2002;52(4):177-81.
14. Hoppenfeld S. Physical Examination of the Spine and Extremities. New York: Appleton-Century-Crofts; 1983.
15. Tuomi K, Ilmarinen J, Jahkola A, Katajarinne L, Tulkki A. Índice de Capacidade para o Trabalho. Trad. De FM Fischer. São Carlos: Edufscar; 2005.
16. Bernard BP, editor. Musculoskeletal Disorders and Workplace Factors: A Critical Review of Epidemiologic Evidence for Work-Related Musculoskeletal Disorders of the Neck, Upper Extremity, and Low Back. Atlanta: US Department of Health and Human Services, National Institute for Occupational Safety and Health; 1997. (NIOSH Publication, 97-141). Available from: http://www.cdc.gov/niosh/docs/97-141. [Last accessed on 2016 May 28].
17. Nygard CH, Eskelinen L, Suvanto S, Tuomi K, Ilmarien J. Associations between functional capacity and work ability among elderly municipal employees. Scand J Work Environ Health. 1991;17 Supp1:122-7.

**How to cite this article:** Shah HR, Bhatt P, Vaghani BD, Vaghani J. A cross-sectional study on the prevalence of work related musculoskeletal disorders in the employees of pharmaceutical industry. Int J Med Sci Public Health 2017;6(8):1336-1341.

**Source of Support:** Nil, **Conflict of Interest:** None declared.