Research Article

MUSCULOSKELETAL SYMPTOMS DUE TO WORK STRESS AMONG WOMEN IN PACKING ACTIVITIES OF PHARMACEUTICAL INDUSTRY: ERGONOMIC INTERVENTIONS

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ABSTRACT

Work related musculoskeletal disorders (WMSD) are a group of painful disorders of muscles, tendons and nerves. Work activities which are frequent and repetitive, or activities with awkward postures cause these disorders which may be painful during work or at rest. Work related musculoskeletal disorders arise from ordinary arm and hand movements such as bending, straightening, gripping, holding, twisting and reaching. These common movements are not particularly harmful in the ordinary activities of daily life, but they are hazardous in work situations of continual repetition with lack of time for recovery between them. Often the worker has no control over timing and speed of work because of external factors like assembly line speed or quota systems due to which stress levels may increase. With higher stress level comes muscle tension causing fatigue and again increased risk for WMSD. The psychosocial health factors like high job stress and high job demands, mental work load and perceived stress may contribute towards developing MSD. A study was undertaken to determine the prevalence of musculoskeletal symptoms among women workers involved in packing activities of pharmaceutical industry. The sample consisted of 270 women workers randomly selected from nine pharmaceutical industries in Hyderabad. A scale was developed to study the musculoskeletal symptoms in nine anatomical body regions. The musculoskeletal discomforts like pain, stiffness, swelling, spasms and so on experienced by women were explored. The work stress assessment scale developed by Telaprolu N (1998) was used for the present investigation. The scores found among the respondents indicated moderate stress levels in the work. The computed F values revealed significant mean difference between work stress and lower limb symptoms. Administrative interventions like job rotation, job training, and reducing monotony of tasks were suggested for relieving stress and intern reducing work related musculoskeletal symptoms.

INTRODUCTION

Work related musculoskeletal disorders (WMSD) are a group of painful disorders of muscles, tendons and nerves. Work activities which are frequent and repetitive, or activities with awkward postures cause these disorders which may be painful during work or at rest. Repetitive activities using arms and hands affect the hands, wrists, elbows, neck and shoulders. Work using the legs can lead to work related musculoskeletal disorders of the legs, hips, ankles and feet. Some back problems also result from repetitive activities. Work related musculoskeletal disorders arise from ordinary arm and hand movements such as bending, straightening, gripping, holding, twisting, clenching and reaching. These common movements are not particularly harmful in the ordinary activities of daily life, but they are hazardous in work situations of continual repetition, often in a forceful manner with lack of time for recovery between them.

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Often the worker has no control over timing and speed of work because of external factors like assembly line speed or quota systems due to which stress level may increase. With higher stress level comes muscle tension causing fatigue and again increased risk for work related musculoskeletal disorders. Perceived job stress may reduce the ability for the musculoskeletal system to recover during or after work. The central nervous system responses to perceived job stress may increase sensitization to pain stimuli leading to develop musculoskeletal symptoms (Devereux *et al.*, 2004). The impact of musculoskeletal symptoms on working life is huge. Musculoskeletal disorders can interfere with activities at work and can lead to reduced productivity, sickness, absence and chronic occupational disability.

MATERIALS AND METHODS

Sampling procedure: Hyderabad was selected to draw the sample for the present investigation. The women who were involved in the packing activities in pharmaceutical industries for a period of minimum three years and aged above 30 years

were selected as the sample for the study. A sample of 270 women was chosen at random from nine pharmaceutical industries from the list procured from office of the Commissioner of Industries.

Data collection: In the present investigation work stress that can be experienced by women involved in packing activities of pharmaceutical industries was explored in terms of work demands, performance demands, technology limitation, personal capabilities limitation and job insecurity. Hence the present investigation was aimed at exploring the relationship between worker's perceived level of work stress and its contribution in developing work related musculoskeletal symptoms. The work stress assessment scale developed by Telaprolu N (1998) was used for the present investigation. Work stress scale consisted of 29 items pertaining to the parameters viz. work demands, performance demands, technology limitation, personal capabilities limitation and job insecurity. The items of the scale were designed to measure the extent of work stress symptoms the subject perceives like tension, worries, unhappiness, muscle tightness, heart beat rising, feeling panic, depression, losing confidence due to the demands, performance expectations, lack of technology to meet the work demands, individual skill limitations and job insecurity.

The prevalence of musculoskeletal symptoms was obtained by developing a scale and using it in the present study. Musculoskeletal symptoms are developed in the nine anatomical regions of the human body such as (i) neck (ii) shoulder (iii) elbow (iv)wrist/hand (v) upper back (vi) lower back (vii) hips/thighs/buttocks (viii) knees and (ix) ankles/feet (Dickinson *et al.* 1992). According to the classification proposed by Winwood and Smith (1985) the nine anatomical body regions were grouped as (i) neck (ii) shoulder (iii) upper limb (iv) back and (v) lower limb. The scale assessed the musculoskeletal symptoms like pain, stiffness, swelling, spasms, cramps, numbness and tingling sensations.

Scoring and interpretation: Subjects were requested to state the frequency of experiencing the feelings stated in the items of the scale. The respondents were asked to mark 'always' if the frequency of experiencing the feeling was 5 times a day. If the frequency of experiencing the feeling was 4 times in a day then they were asked to mark 'frequently'. When the frequency of experiencing the feeling was 2-3 times in a day and one time in a day then the respondents were asked to indicate sometimes and rarely respectively. If the respondents do not experience the feeling at all then they were asked to mark 'never'. The response categories always, frequently, sometimes, rarely and never were given scores 5,4,3,2 and 1 respectively. The minimum possible score for work stress is 29 which indicate the person never experienced and the maximum possible score was 145. Higher the score higher the extent of work stress experienced by the subject.

The frequency of experiencing the musculoskeletal symptoms in nine anatomical body regions varied from never to always. The frequency of symptoms was assessed as never if symptoms may not present. The frequency of symptoms was assessed as rarely, sometimes, frequently and severe if prevalence of symptoms was few hours in a week, 1-2 days in a week, 3-4

days in a week and throughout the week respectively. Higher the score indicated higher the prevalence of symptoms.

Statistical analysis: Frequencies, percentages, means and standard deviations were computed for the collected basic information like age, perception of work stress and prevalence of musculoskeletal symptoms. Analysis of variance (ANOVA) was computed for knowing significance between work stress and musculoskeletal symptoms. A significant 'F' in an analysis of variance is simply an indication that not all the population means are equal. When significant 'F' values were found, multiple comparison tables were made to find out the exact category contributing significantly resulting in musculoskeletal symptoms.

RESULTS AND DISCUSSION

Work stress

The work stress score in the work stress assessment scale developed for the present investigation ranged from 29 to 145 with a possible minimum score of 29 and maximum score of 145. The work stress score experienced by the respondents ranged from 41 to 87. The scores found among the respondents indicated moderate stress levels in the work. The work stress of the seventy per cent of the respondents ranged from 55 to 70. The work stress of the 18.15 per cent of the respondents ranged from 71 to 87 indicating high stress among the sample. Very few respondents (11.85%) experienced low stress levels ranged from 41 to 54. The mean work stress score was estimated as 62.17 with a standard deviation of 7.95 (Fig 1). In the present investigation nearly three fourth of the respondents were suffering from work stress in their job.
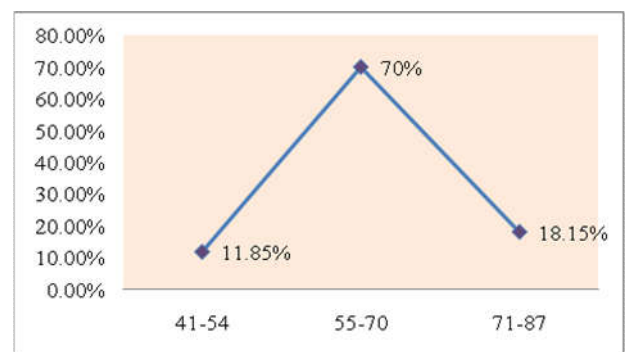

Figure 1. Distribution of sample by work stress score

Kinman and Jones (2005) also reported the same in their study on lay representations of stress in different jobs. In their study they found that almost one third of the participants felt that all jobs were potentially stressful inducing by authority to complete in tight time scale. The remaining participants tended to express that some jobs were intrinsically high in stress involving working under conditions of physical danger, responsibility for the welfare of others and dealing with people who are themselves experiencing stress. In the present investigation nearly three fourth of the sample were experiencing moderate level of work stress. The packing activities of the women carrying out in pharmaceutical industry were not physically strenuous. Their work demands concentration and continuous alertness. Probably these factors might be putting the women under stress.

Table 1. Analysis of variation of work stress groups with regard to musculoskeletal symptoms experienced in anatomical body regions by women in packing activities

Symptoms	Source of variation	df	Sum of squares	Mean sum of squares	F-value	Probability F-value
Neck	Between work stress groups	2	201.42	100.71	0.66 [NS]	0.52
	With in work stress groups	267	40786.08	152.76	–	–
	Total	269	40987.50	–	–	–
Shoulder	Between work stress groups	2	225.00	112.50	0.74 [NS]	0.48
	With in work stress groups	267	40548.87	151.87	–	–
	Total	269	40773.87	–	–	–
Upper limb	Between work stress groups	2	512.65	256.32	1.01 [NS]	0.37
	With in work stress groups	267	67769.52	253.82	–	–
	Total	269	68282.16	–	–	–
Back	Between work stress groups	2	370.12	185.06	1.24 [NS]	0.29
	With in work stress groups	267	39840.31	149.21	–	–
	Total	269	40210.43	–	–	–
Lower limb	Between work stress groups	2	1319.10	659.55	2.98*	0.05
	With in work stress groups	267	59067.87	221.23	–	–
	Total	269	60386.97	–	–	–
Over all body	Between work stress groups	2	11239.63	5619.82	1.55 [NS]	0.21
	With in work stress groups	267	970041.74	3633.12	–	–
	Total	269	981281.37	–	–	–

Table 2. Mean comparisons and significant probabilities between different work stress groups with respect to musculoskeletal symptoms

Symptoms	Work stress groups	Mean scores	Work stress groups		
			Low	Medium	High
Lower limb	Low work stress	24.32	–	0.02811	0.02471
	Medium work stress	30.22	0.02811	–	0.52343
	High work stress	31.82	0.02471	0.52343	–

* $p < \alpha = 0.05$ significant at 5 percent, otherwise non-significant.
Hence, the null hypothesis was rejected.

Risk factors related to work stress: The risk factors related to work stress of the respondents found in the packing activities of pharmaceutical industry were

- Measuring with measurement jar and pouring it in a bottle and bottle is slippery and completing the task in the given time.
- Monotonous work requiring few skills
- Holding the tool continuously throughout the day.
- Holding the cover in other hand to pour the medicine powder in it.
- Lack of control on work and working methods.

Figure 2 and 3. Work stress as a risk factor

Work stress and musculoskeletal symptoms

The null hypothesis formulated for the present investigation was

H₀: There exist no mean differences between musculoskeletal symptoms experienced in anatomical body regions by women in packing activities and their perceived level of work stress.

The computed F values revealed significant mean difference at 0.05 level between work stress and lower limb symptoms. The F values between work stress and neck, shoulder, upper limb and back regions showed no significant mean difference (Table 1). The work stress groups were categorized as low work stress experiencing group, moderate work stress experiencing group and heavy work stress experiencing group according to the stress score obtained by using work stress scale. According to multiple comparisons test women with low work stress differed significantly at 0.05 level from women with medium work stress and also women with high work stress in lower limb musculoskeletal symptoms (Table 2).

According to the present investigation it was found that the work stress was contributing to develop musculoskeletal symptoms in lower limb for women in packing activities. In this investigation it was found that work stress was directly proportional to perceived level of musculoskeletal symptoms which means the higher the work stress the person was more prone to develop musculoskeletal symptoms. The results of the present investigation were in line with the results of the study conducted by Nag *et al.* (2012), wherein they examined the prevalence of musculoskeletal pain and discomfort (MSD) among workers engaged in fish processing activities and found that work stress was contributing to develop musculoskeletal symptoms in lower limb.

Ergonomic Interventions

Ergonomic interventions include looking at the effect of the whole work place, equipment, work methods and work organization etc. to identify problems and solutions. Appropriate ergonomics intervention for any single specific disorder is likely to help prevent other disorders.

This is because of the common biological processes involved in some of the disorders (European Agency for Safety and Health at work, 2000). According to Norman and Wells (1998) ergonomic interventions are commonly classified as engineering, administrative and behavioural/personal interventions. For the present risk factors related to work stress engineering interventions like automation and administrative interventions like job rotation, job training, reducing monotony of tasks where appropriate, encouraging team work, monitoring and control of shift work or overtime working and ensuring good communication and reporting of problems were proposed to control and reduce the symptoms. Personal interventions like providing hand gloves and use of absorbing material to avoid slipperiness were suggested.

Conclusion

The perceived job stress may reduce the ability for the musculoskeletal system to recover during or after work. As work stress increased the musculoskeletal symptoms in lower limb in the women engaged in packing activities of pharmaceutical industries increased. Administrative interventions like job rotation, job training, and reducing monotony of tasks were suggested for relieving stress and intern reducing work related musculoskeletal symptoms.

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