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## Uncomfortable work place layout leading to musculoskeletal symptoms in packing units of pharmaceutical industry: Guidelines for ergonomic interventions

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### Abstract

Work related musculoskeletal disorders are a group of painful disorders of muscles, tendons and nerves. Work activities which are frequent and repetitive, with awkward postures cause these disorders. The present investigation is aimed to investigate the comfortability of work place layout among the women working in packing units of pharmaceutical industry. Workplace layout scale is developed to measure the user comfortability in terms of five parameters viz. work seat, work table, clearance, arm reach and posture. The results showed only 2.6 per cent respondents were satisfied with work place layout. To improve workplace layout some ergonomic interventions were suggested.

**Keywords:** Work related musculoskeletal disorders, ergonomic interventions, work place layout

### 1. Introduction

Uncomfortable workplace layout in the work lead to postural deviation in different body parts and in turn causing work related musculoskeletal disorders. 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, feet and some back problems also. The most important factors in the work place layout are, it should allow the worker to work with comfortable seat, work table, convenient location of frequently used equipment, comfortable access to tools and equipment without postural deviation.

Under the present investigation work place layout where the women carry out packing activities in pharmaceutical industry were assessed with the help of work place layout scale developed taking into consideration the factors such as work seat, work table, clearance like head room, leg room, elbow room, arm reach and posture in terms of convenient location of frequently used tools and equipment.

### 2. Review of Literature

Choobineh *et al.* (2007) <sup>[1]</sup> in a study on musculoskeletal problems among workers of an Iranian communication company found high rate of musculoskeletal disorders due to poor working conditions like high height of tables, inappropriate seats with back rest in the work station. Based on findings it was concluded that any ergonomic program in the work place should be focused on eliminating awkward postures of shoulders, back and neck and redesigning work stations based on ergonomic principles were recommended.

Saha *et al.* (2010) <sup>[3]</sup> studied health status of the workers engaged in small scale garment industry. They found that musculoskeletal problems (69.64%) were the commonest health problem. The reasons might be due to the fact that their work required them to remain in a bent position for many hours at a stretch, often in an overcrowded, ill ventilated and poor illuminated room.

### 3. Methodology

**3.1 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

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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.

### 3.2 Measuring Instruments

The comfort in the work place lay out was measured by using work place lay out scale constructed for the present study. Work place lay out scale consisted of five parameters viz. work seat, work table, clearance, arm reach and posture. The comfortable level of the work seat in the work place was measured in terms of adjustable seat height, appropriate width, lumbar support, provision of arm rests and comfortability of seat. The work table comfort was measured in terms of adjustable height, width, surface of the table, round corners to avoid injuries and provision of foot rests. Clearance is the minimum space required for the body or body segment to pass through. The measurement of clearance included the room available for keeping legs, arms, head, knees while working and operating controls on the machinery. The comfort in arm reach was measured in terms of reaching or grasping position like sitting straight without bending, stretching and extending. Posture is measured in terms of risk involved while working like bending, twisting of upper body, neck, head, upper limb and wrist.

The respondents were asked to indicate the level of comfort experienced in terms of fully, partially and not at all. The respondents were asked to mark ‘fully’ if they were able to work comfortably without any discomfort. If the level of discomfort was bearable with some inconvenience and partially satisfied with the prevailing conditions then they were asked to mark ‘partially’. If the extent of discomfort was to the level of interfering with their performance in the work

and not satisfied at all then they were asked to indicate ‘not at all’. The response categories fully, partially and not at all were given scores 3, 2 and 1 respectively. The scores were interpreted such that the higher the score the higher the comfortability in the work place. The possible score range for work seat, work table, clearance, arm reach and posture were 13-39, 6-18, 5-15, 7-21 and 8-24 respectively. Overall total score ranged from 39-117. High score denotes higher level of comfort.

The musculoskeletal symptoms like pain, stiffness, swelling, spasms, cramps, numbness, tingling sensation, soreness, heaviness, burning and tenderness in nine anatomical body parts were identified using musculoskeletal symptoms assessment scale developed for the present investigation. The data was interpreted using necessary statistical tools.

### 3. Results and Discussion

The comfort in the work place lay out was measured by using work place lay out scale constructed for the present study. The work place lay out comfort scale measures work seat, work table, clearance like head room, leg room, elbow room, arm reach and posture in terms of convenient location of frequently used tools and equipment. The scores on the scale ranged from 39 to 117. The work place lay out score of the majority of the respondents (88.89%) ranged from 61 to 75. The work place lay out score of 8.5 per cent of the respondents ranged from 39-61. Only 2.6 per cent respondents were satisfied with work place lay out comfortability where the score ranged from 76 to 88. The mean work place lay out comfortability score was 68.11 with standard deviation of 7.22 (Figure 1).

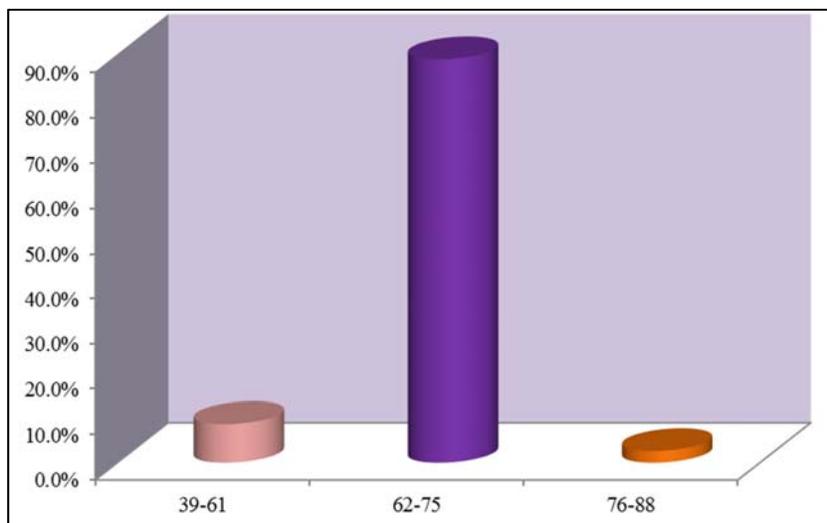


Fig 1: Distribution of sample by the work place layout score (N=270)

According to the present study the work place lay out was partially comfortable. Work place lay out is one of the important factors that can cause musculoskeletal symptoms among workers. Management should focus on proper work place lay out in view of workers health. Ergonomic interventions are of foremost important in designing a work station. The results indicated that lay out in the work place was partially comfortable indicating it needs to be improved. The study conducted by Hasalkar *et al.* (2007) [2] on the farm women while performing the top dressing of fertilizer activity also stressed that the workstation must be designed

ergonomically and should be user friendly where the work carried out in traditional method in bending posture caused them to develop MSD.

### 4. Suggested Guidelines for Ergonomic Interventions

As the uncomfartability of work place layout increased the musculoskeletal symptoms in lower limb increased. As the work place lay out uncomfartability increased musculoskeletal disorders and functional limitations in shoulder, upper limb, lower limb and over all body increased.



**Fig 2:** Uncomfortable work table and work seat



**Fig 3:** Uncomfortable work place

**Table 1:** Proposed ergonomic interventions for the risk factors related to work place lay out in the organization.

Risk factors	Ergonomic interventions		
	Engineering	Administrative	Personal
i) Uncomfortable work seat.	i) Provide adjustable work seats with arm and lumbar support.	i) Use job enlargement	i) Adopt good working postures.
ii) Uncomfortable work table.	ii) Provide adjustable work table.	ii) Allow short breaks	
iii) Working surface too high.	iii) Provided arm and foot rests.	iii) Training and education in good ergonomic work postures.	
	iv) Reorient work.		

**5. Conclusion**

In the present investigation the work place lay out was studied in terms of work seat, work table, clearance like head room, leg room, elbow room, arm reach and posture in terms of convenient location of frequently used tools and equipment. The worker’s perception of comfort in work place was assessed from their answers. Even though it was not comfortable in terms of dimensions assessed in the work place but their expectations were less and their adjustability was more to the prevailed circumstances. Hence to improve the work place layout some ergonomic interventions were suggested like providing adjustable work seats with arm and lumbar support, providing adjustable work table, providing arm and foot rests and redesigning work station.

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