

Original Research Article

Prevalence of Musculoskeletal Pain and Discomfort in Assembling Tasks as Reported by Automobile Assembly Workers

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ABSTRACT

There is a growing concern to improve productivity, safety, and quality in Indian automobile industries. Repetitive processes and manual material handling are the major problems in the Automobile Assembling Units. Considering the above facts, in the present investigation efforts have been made to assess the prevalence of musculoskeletal pain and discomfort in assembling tasks as reported by automobile assembly workers. Total 111 assembly workers were selected from two wheeler automobile industry of State Infrastructure and Industrial Development Corporation of Uttarakhand Limited (SIIDCUL), Pantnagar. Standardized NORDIC musculoskeletal questionnaire was used to determine the prevalence of self-reported musculoskeletal pain and discomfort in body parts. The data reveals that total 54.25 percent vehicle assembly workers and 58.82 percent paint shop population reported pain in right elbow and 65.76 percent of the total population of vehicle assembly and paint shop respondents was suffering from pain and discomfort in left elbow. Besides this, total 78.72 percent workers of vehicle assembly were having pain and discomfort in left wrist/ hand and from paint shop only 29.41 percent employees had pain in left wrist/ hand. It was concluded that to enhance the work performance and to reduce the problem of musculoskeletal disorder among automobile assembly workers, the organization should provide some ergonomic measure like administrative controls, work practice control and engineering controls.

Keywords

Automobile
Industry, Body
Discomfort,
Ergonomics,
Manual Material
Handling,
Musculoskeletal
Disorder

Introduction

There are many workplaces and tasks in existence which place constraints on a worker, such as maintenance, repair and assembly work (Haslegrave *et al.*, 1997). Assembly in the automotive industry still relies heavily on physical manpower and manual assembly despite the many advances in mechanization; hence the need to examine all aspects of the working conditions as workers are required to adopt awkward working postures and handle loads (Chung *et al.*, 2001). The work involves the

manufacturing of a final product through the process of subassemblies, manufactured parts and components (Dimitriadis, 2006), utilizing precise and sometimes complex equipment, and the organization of thousands of parts. The tasks are characterized as having highly repetitive demands, requiring multiple, dynamic movements which need to occur within a complex time pattern and organizational context, and these processes are thought to increase the likelihood of incurring MSDs

and cumulative trauma disorders (CTDs). Considering the above facts, in the present investigation efforts have been made to assess the prevalence of musculoskeletal pain and discomfort in assembling tasks as reported by automobile assembly workers.

Materials and Methods

Selection of subject and field

The assembly workers were selected from two wheeler automobile industry of State Infrastructure and Industrial Development Corporation of Uttarakhand Limited (SIIDCUL), Pantnagar. Assembly workers were selected from two production department, i.e. vehicle assembly and paint shop. Particularly, from vehicle assembly total 94 assembly workers were selected and from paint shop 17 assembly workers were selected. This cross-sectional study was conducted in order to assess the Prevalence of pain and discomfort among assembly workers involved in the automobile assembling units. All the jobs were observed before start of the study and detailed job information was collected to ensure the completion of ergonomic study.

Nordic Musculoskeletal Questionnaire

Standardized NORDIC musculoskeletal questionnaire was used to determine the prevalence of self-reported musculoskeletal pain/discomfort. NORDIC questionnaire was developed by Kuorinka *et al.*, (1987) and validated by Dickinson *et al.*, (1992) and Chaffin and Anderson (1991). NORDIC questionnaire is a multiple page questionnaire and used for evaluation of musculoskeletal problems. Categorical Yes/No questions were administered to address the incidence included body parts trouble (ache, pain, discomfort) during the whole life span, during last 12 months, one month

and during last 7 days. For these questions the workers responded accordingly to standardize Nordic Questionnaire.

Results and Discussion

The results depict that the prevalence of musculoskeletal problems among the selected employees of vehicle assembly and paint shop. The work-related musculoskeletal problems and the body pain perceived by the workers were determined by administering of standardized Nordic questionnaire. All the selected workers had given their responses, which were analyzed. Workers were asked few questions about perceived pain/discomfort. Pain was measured for past 12 months, last month and for 7 days. Majority of the respondents were feeling pain and discomfort in different body parts. Principally, in Indian automobile sector, assemblies workers are usually adopt standing, bended and twisted, seated, stooping, supine and overhead working postures in awkward working condition.

Table 1 clearly envisages that since last 12 months, 37.23 percent vehicle assembly workers and 64.70 percent paint shop workers who were involved in assembly operation had pain and discomfort in neck. When asked about pain in right shoulder 79.78 percent of vehicle assembly workers and 29.41 percent paint shop workers respondents reported discomfort during the activity whereas, regarding pain and discomfort in left shoulder, total 69.14 percent employees of vehicle assembly and 47.05 percent employees of paint shop respectively reported pain and discomfort during the assembling tasks. Besides this, when asked about pain in both shoulders 86.17 percent of vehicle assembly workers and 17.64 percent paint shop respondents reported discomfort while performing the activities.

Total 54.25 percent vehicle assembly workers and 58.82 percent paint shop population reported pain in right elbow and 65.76 percent of the total population of vehicle assembly and paint shop respondents was suffering from pain and discomfort in left elbow. When asked about the pain in both elbow total 63.82 percent vehicle assembly workers and 76.47 percent paint shop assembly workers were reported discomfort whereas, 94.68 percent vehicle assembly workers and 17.64 percent paint shop workers reported pain and discomfort in Right wrist/ hand and total 77.65 percent vehicle assembly employees and 58.82 percent paint shop workers reported pain and discomfort in left wrist/hand.

From both the department total 53.15 percent employees reported pain and discomfort in both wrist/hands. When asked about the pain in upper back total 60.63 percent vehicle assembly workers and 52.94 percent paint shop assembly workers were reported discomfort whereas 77.65 percent vehicle assembly workers and 82.35 percent paint shop workers reported pain and discomfort in lower back.

Majority of vehicle assembly workers (37.23 percent) reported pain in hip/ thighs but only 11.76 percent paint shop workers were suffering from pain and discomfort in the same region. Total 67.56 percent of vehicle assembly workers and paint shop population reported pain in knee whereas 74.77 percent population had pain and discomfort in ankles/ feet.

Assembly workers were also asked about their prevalence of pain since last month and it was revealed that more than 50 percent of the employees of paint shop (63.96 percent) were having pain in their neck and from the department of vehicle assembly total of 58.82 percent employees were suffering

from the neck pain since last month. From the total sample, total 73.87 percent employees of both department were suffering from pain in right shoulder whereas, 89.36 percent employees of vehicle assembly were suffering from pain in their left shoulder and only 17.64 percent employees of paint shop were suffering from pain and discomfort in the same body region. When asked about pain in both shoulder, total 73.40 percent employees of vehicle assembly and 70.58 percent employees of paint shop reported pain and discomfort during the activity. Total 54.95 percent employees of vehicle assembly were having pain in their right elbow whereas more than half of the population of paint shop was having the pain and discomfort in right elbow. From the total population of vehicle assembly, 65.76 percent employees were suffering from pain and discomfort in left elbow and 71.27 percent employees of paint shop have pain in the same body part. Only 23.52 percent employees of vehicle assembly and paint shop were reported pain in both elbows. Regarding pain and discomfort in right wrist/ hand 56.38 percent employees of Vehicle assembly were reported the problem of pain and discomfort and only 17.64 percent employees had the pain and discomfort since last month in right wrist/ hand.

Besides this, total 78.72 percent workers of vehicle assembly were having pain and discomfort in left wrist/ hand and from paint shop only 29.41 percent employees had pain in left wrist/ hand. From both departments, total 83.78 percent employees were suffering from pain and discomfort in both wrists/ hands. From the total sample of vehicle assembly 69.14 percent employees were suffering from pain and discomfort since last month and only 29.41 percent employees of paint shop reported pain and discomfort in same body region.

Table.1

S. No.	Body part	Pain/discomfort during last 12 month			Pain/discomfort during last month			Pain/discomfort during last Seven days		
		Vehicle Assembly (nv=94)	Paint Shop (np=17)	Total (n=111)	Vehicle Assembly (nv=94)	Paint Shop (np=17)	Total (n=111)	Vehicle Assembly (nv=94)	Paint Shop (np=17)	Total (n=111)
1	Neck	35 (37.23)	11(64.70)	46(41.44)	61(64.89)	10(58.82)	71(63.96)	56(59.57)	8(47.05)	64(57.65)
2	Shoulder									
	Right	75(79.78)	5(29.41)	80(72.07)	79(84.04)	3(17.64)	82(73.87)	78(82.97)	10(58.82)	88(79.27)
	Left	65(69.14)	8(47.05)	73(65.76)	84(89.36)	7(41.17)	91(81.98)	82(87.23)	13(76.47)	95(85.58)
	Both	81(86.17)	3(17.64)	84(75.67)	69(73.40)	12(70.58)	81(72.97)	75(79.78)	9(52.94)	84(75.67)
3	Elbow									
	Right	51(54.25)	10(58.82)	61(54.95)	48(51.06)	14(82.35)	62(55.85)	45(47.87)	11(64.70)	56(50.45)
	Left	68(72.34)	5(29.41)	73(65.76)	67(71.27)	9(52.94)	76(68.46)	58(61.70)	8(47.05)	66(59.45)
	Both	60(63.82)	13(76.47)	73(65.76)	74(78.72)	4(23.52)	78(70.27)	55(58.51)	3(17.64)	58(52.25)
4	Wrist/hands									
	Right	89(94.68)	3(17.64)	92(82.88)	53(56.38)	3(17.64)	56(50.45)	64(68.08)	7(41.17)	71(63.96)
	Left	73(77.65)	10(58.82)	83(74.77)	74(78.72)	5(29.41)	79(71.17)	59(62.76)	12(70.58)	71(63.96)
	Both	51(54.25)	8(47.05)	59(53.15)	84(89.36)	9(52.94)	9383.78	74(78.72)	4(23.52)	78(70.27)
5	Upper back	57(60.63)	9(52.94)	66(59.45)	65(69.14)	5(29.41)	70(63.06)	61(64.89)	15(88.23)	76(68.46)
6	Lower back	73(77.65)	14(82.35)	87(78.37)	81(86.17)	14(82.35)	95(85.58)	52(55.31)	11(64.70)	63(56.75)
7	Hips/thighs	35(37.23)	2(11.76)	37(33.33)	69(73.40)	6(35.29)	75(67.56)	44(46.80)	3(17.64)	47(42.34)
8	Knees	64(68.08)	11(64.70)	75(67.56)	45(47.87)	11(64.70)	56(50.45)	82(87.23)	9(52.94)	91(81.98)
9	Ankles/feet	67(71.27)	16(94.11)	83(74.77)	58(61.70)	9(52.94)	67(60.36)	74(78.72)	5(29.41)	79(71.17)

Majority of the workers of vehicle assembly (86.17 percent) were having the pain and discomfort in lower back whereas as total 82.35 percent employees of paint shop had the problem of pain and discomfort in lower back. When asked about pain in hips/thighs total 73.40 percent vehicle assembly workers and 35.29 percent paint shop respondents reported pain and discomfort during the activity. From the total population 50.45 percent vehicle assembly and paint shop workers had discomfort in knees whereas 60.36 percent respondents were suffering with pain in ankles/ feet.

Since last seven days, 59.57 percent vehicle assembly workers and 47.05 percent paint shop workers who were involved in assembly operation had pain and discomfort in neck. When asked about pain in right shoulder 82.97 percent of vehicle assembly workers and 58.82 percent paint shop workers respondents reported discomfort during the activity whereas, regarding pain and discomfort in left shoulder, total 87.23 percent employees of vehicle assembly and 76.47 percent employees of paint shop respectively reported pain and discomfort during the assembling tasks.

Besides this, when asked about pain in both shoulders 79.78 percent of vehicle assembly workers and 52.94 percent paint shop respondents reported discomfort while performing the activities. Total 47.87 percent vehicle assembly workers and 64.70 percent paint shop population reported pain in right elbow and 59.45 percent of the total population of vehicle assembly and paint shop respondents was suffering from pain and discomfort in left elbow.

When asked about the pain in both elbow total of 58.51 percent vehicle assembly workers and 17.64 percent paint shop assembly workers were reported discomfort

whereas, 68.08 percent vehicle assembly workers and 41.17 percent paint shop workers reported pain and discomfort in right wrist/ hand and total 62.76 percent vehicle assembly employees and 70.58 percent paint shop workers reported pain and discomfort in left wrist/hand. From both the department total 70.27 percent employees reported pain and discomfort in both wrist/hands.

When asked about the pain in upper back total 64.89 percent vehicle assembly workers and 88.23 percent paint shop assembly workers were reported discomfort whereas 55.31 percent vehicle assembly workers and 64.70 percent paint shop workers reported pain and discomfort in lower back. Majority of vehicle assembly workers (46.80 percent) reported pain in hip/thighs but only 17.64 percent paint shop workers were suffering from pain and discomfort in the same region. Total 81.98 percent of vehicle assembly workers and paint shop population reported pain in knee whereas 71.17 percent population had pain and discomfort in ankles/ feet.

From the analysis of data and scores obtained by Nordic Musculoskeletal Questionnaire it can be concluded that in Indian automobile sector principle causes of musculoskeletal disorder are assembly workers are usually adopt numerous awkward working postures such as standing, bended and twisted, seated, stooping, supine and overhead working postures. The suitability of a specified body posture of the workers depends on the levels to which that body posture proficiently and capably facilitates work implementation and maintain the equilibrium between task and operator. The worker's physical reactions such as energy expenditure, muscular effort and spinal loading etc. are also firmly associated with it. It was also suggested that

to enhance the work performance of assembly workers, the organization should provide some ergonomic measure like administrative controls, work practice control and engineering controls.

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