



ISSN: 2395-7476
IJHS 2016; 2(3): 283-286
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www.homesciencejournal.com
Received: 17-07-2016
Accepted: 18-08-2016

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Ergonomic evaluation of work related musculoskeletal disorders among tailors

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Abstract

Work related musculoskeletal disorders (WMSDs) have been described as the most common cause of severe long term pain and physical hazards affecting people across the world. Tailors were performing various activities to create new pieces of clothing from patterns and designs or modify existing garments to fit to the customers. Due to nature of this profession tailors adopted awkward posture and repetitive motion, which cause musculoskeletal discomfort and occupational health hazards. Therefore the present study was conducted on 60 male respondents engaged with tailoring profession from Pantnagar (Uttarakhand, India). The musculoskeletal symptoms were assessed by using body map and standardized Nordic questionnaire. A precoded questionnaire was also developed to measure the exposure regarding the type of machine being operated, working hour, units produced per day, workspace and workplace storage. For the major activities it was found that the respondents reported pain 34% in neck in cutting, 40% in lower back in stitching and 48% in neck in ironing activity. The result of Nordic questionnaire revealed that more than 50 percent of the respondents reported pain in lower back, neck and shoulder. The findings indicate that the tailors were doing very hard but not realizing the risks of musculoskeletal discomforts associated with their poorly designed workstation, tasks and awkward working postures.

Keywords: WMSDs, awkward posture, musculoskeletal discomfort, workstation

1. Introduction

In India, textile industry had its beginning during the first half of the 20th century and witnessed impressive growth during the last four decades. The textile industry is primarily concerned with the production of yarn, and cloth and the subsequent design or manufacture of clothing and their distribution. The process of producing complete garment is include spinning the yarns, making cotton bundles, preparing fabrics, cutting and stitching of the fabric etc. Whereas, textile sector also includes self-employed garment workers or tailors (Darzi), who work in their own work shop and only prepare garment as per the choice of customers. The main activities performed by the tailors at their workstation are dealing with the customer, taking measurement of the customer, cutting of the fabric, stitching of the fabric, finishing of the stitched garment, ironing to the stitched garment and inspection of stitched garment.

Tailors face a substantially higher risk of muscle pain and injury than workers involved in other jobs because the frequency of postural discomfort increases with years of employment. Factors such as repetition, force, stress and strain, and vibration are associated with higher rates of injury. Even though many technologies have been developed in textile sector, but the tailors are still using the foot treadle and hand wheel sewing machine, which are causing accidents in hand and foot due to the repetitive and continuous pressure giving by manual effort of operators.

The tailor's job involves monotonous and highly repetitive as they performed their task from morning to late night in a sitting working posture with upper back curved and head bent over the sewing machine. The work is visually demanding and requires a high degree of concentration and accuracy.

Research on working conditions and associated problems in the garment workstation unit have been conducted by Maier and his findings supported the outcomes expected from work environments with poor ergonomic features, including constrained postures, repetitive motions and strong visual demands.

Ranney *et al.* suggested that one of the worst aspects of sewing machine operations in the garment making is the body posture of operators are forced to assume throughout the workday. Prolonged sitting, in unnatural postures is not uncommon and is often accompanied with seats that have no backrests. Therefore, the purpose of this study was to assess the prevalence of work related musculoskeletal symptoms in tailors, and pain in different body parts due to the tailoring profession.

2. Material and methods

Purposive sampling design was used to select the study area and sample size of 60 male respondents between 15–60 years of age working in different 14 commercial tailor shops. This study was conducted in Pantnagar, of U. S. Nagar District of Uttarakhand state, India. The data was collected by developing a precoded questionnaire including questions regarding socio-demographic profile such as age, education, income, years of experience in tailoring profession. The standardized Nordic questionnaire was used to ASSESS the musculoskeletal disorder among all the tailors who were selected for the study at various times in performing activities at the workstation throughout the day. The body map was also used to evaluate the pain in different body part while performing various tailoring activities at the workstation.

3. Result and Discussion

3.1 Socio-demographic profile

A total of 60 male tailors were included in the study and are with 100% response rate. It can be envisaged from the table-1 that majority (51.67%) of respondents belonged to 15- 30 years of age group and the mean age of the respondents involved in tailoring activity was 32.75 years ($\pm 4.38SD$). About 41.67 of the respondents were primary educated and 76.67 % of the respondents were having Less than 5,000/- Rs per month as their net income. Most (45 %) of the respondents were having more or less 30 years of experience, whereas only 8.33 % of respondents were having 30-40 years of experience and he mean years of experience was found to be 20.16 years ($\pm 7.52SD$).

Table 1: Socio- Demographic profile of the respondents

Variable	Frequency(60)	Percentage(100)
Age		
0-15	1	1.67
15-30	31	51.67
30-45	14	23.33
45-60	14	23.33
Education		
Illiterate	15	25
Primary education	25	41.67
Secondary education	20	33.33
Net income		
Less than Rs 5,000	46	76.67
Rs. 5,000-10,000	12	20.00
Rs. 10,000-15,000	2	3.33
Number of years of experience		
1-10 years	12	20.0
10-20 years	16	26.67
20-30 years	27	45.0
30-40 years	5	8.33

3.2 Prevalence of WMSDs

The prevalence of WMSDs among tailors who had reported pain and discomfort in the last 12 month were 51.67% in their lower back, this may be due to their prolong sitting posture

they used to adopt for various activity and the shoulder, neck and upper back constituting 38.33%, 31.67% and 28.33% respectively, were most affected body part. Twenty three (38.33%) of the tailors had experience trouble in their lower back in the last 30 days and

Table 2: Prevalence of WMSDs in different body part.

Prevalence of WMSD in body parts	Last 12 month n (%)	Last month n (%)	Last 7 days n (%)
Neck			
Yes	19(31.67)	14(23.33)	9(15.00)
No	41(68.33)	46(76.67)	51(85.00)
Shoulder			
Yes	23(38.33)	18(30.00)	8(13.33)
No	37(61.67)	42(70.00)	52(86.67)
Elbow			
Yes	11(18.33)	9(15.0)	4(6.67)
No	41(81.67)	51(85.00)	56(93.33)
Wrist			
Yes	14(23.33)	11(18.33)	9(15.0)
No	46(76.67)	41(81.67)	51(85.00)
Upper back			
Yes	17(28.33)	14(23.33)	7(11.67)
No	43(71.67)	46(76.67)	53(88.33)
Lower back			
Yes	31(51.67)	23(38.33)	13(21.67)
No	29(48.33)	37(61.67)	47(78.33)
Hips			
Yes	11(18.33)	5(8.33)	4(6.67)
No	49(81.67)	55(91.67)	56(93.33)
Knees			
Yes	16(26.67)	8(13.33)	6(10.00)
No	44(73.33)	52(86.67)	54(90.00)
Ankle / feet			
Yes	16(26.67)	7(11.67)	5(8.33)
No	44(73.33)	53(88.33)	55(91.67)

30% suffering from pain and discomfort in shoulder. In last 7 days most affected body part from pain and discomfort were lower back (21.67%) and neck (15%). These findings were agrees with the previous studies.

3.3 Frequency of pain

The frequency of pain was categorized as always, sometimes and frequently. The intensity of pain of the tailors was measured to increase the prevalence of muscular skeletal disorders among tailors. Table 3 revealed that forty five percent of tailors experienced pain sometimes in which 23.33% of the tailors were of the 15-30 years group. Approximately 38% of the tailors experienced pain frequently, in which 20% were from 45-60 years of age group. There had been contradictory reports on the relationship between WMSDs and age among tailors. Aghili *et al.* found association between the prevalence of WMSDs and increasing age of sewing machine operators. A fonso *et al.* reported increase prevalence of WMSDs among sewing machine operators in younger age group. Other studies had reported high prevalence of WMSDs among younger workers due to factors like inexperience, lack of knowledge, skill and increased workload may be responsible for high prevalence of WMSDs among younger workers. The lower back (41%) and shoulder (23%, 25%) were the most affected body part of the tailors experiencing always, sometimes and frequently from pain respectively (Figure 1).

3.4 Body Map- Pain in different body parts

The pain realization in different parts of the body like neck, shoulder, arm, wrist, lower back, fingers while doing main activities like cutting, stitching, finishing and ironing etc. were assessed by using body map. It was revealed in figure 2 that none of the respondents had fatigue while dealing with customers, taking measurement, and inspection of the garments because the respondents did not apply any kind of force in these activities. Therefore the main four activities were assessed.

3.4.1 Cutting the fabric: It was found that nearly 34% of the tailors experience pain in neck as they bending their neck to

cut the fabric and 23% reported no pain during activity because they usually did not cut the fabric at the workstation.

3.4.2 Stitching the fabric: In stitching activity it was found that lower back (40%) and neck (39%) were most painful body part at the workplace because they adopt awkward posture by bending their lower back and neck for long working hours.

3.4.3 Finishing the stitched garment: It was found that about 67% of the tailors did not have pain during this activity and nearly 17% tailors had discomfort in the neck during handling the finishing machine.

Table 3: Frequency of pain and the independent variable age

Frequency of pain	Age									
	0-15		15-30		30-45		45-60		Total	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	frequency	Percentage	Frequency	percentage
Always	-	-	2	3.33	2	3.33	6	10.0	10	16.67
Sometimes	1	1.67	14	23.33	9	15.0	3	5.0	27	45.0
Frequently	-	-	4	6.67	7	11.67	12	20.0	23	38.33

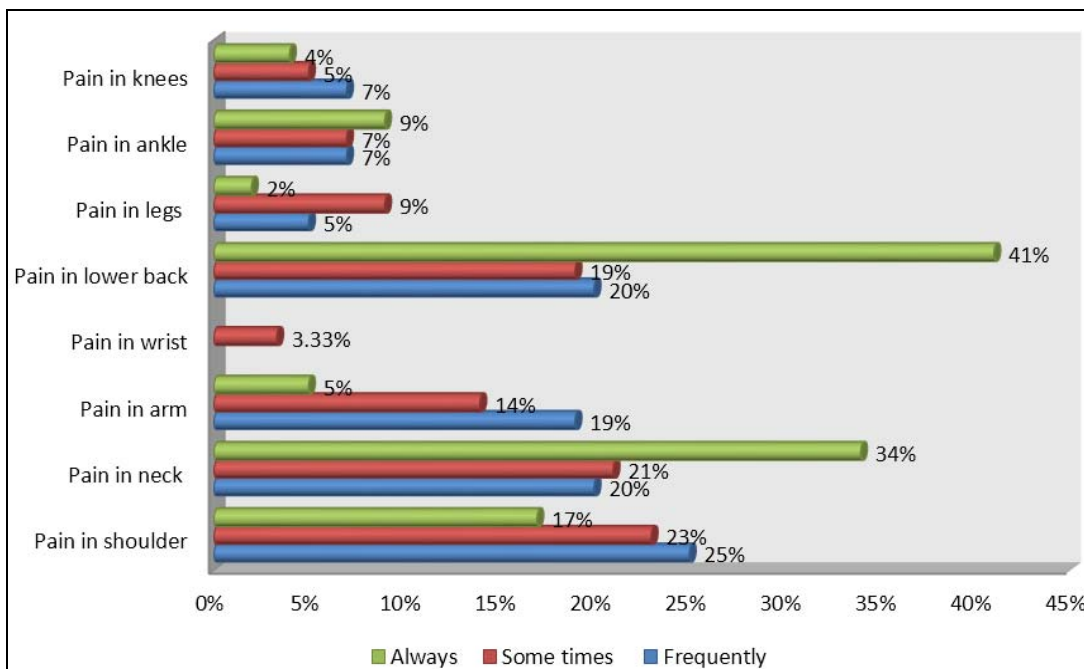


Fig 1: frequency of pain in different body parts

3.4.4 Ironing the stitched garment: In ironing activity, it was revealed that neck (48%) and lower back (40%) were most affected body part of the tailors as they perform this activity by sitting on floor in squatting posture.

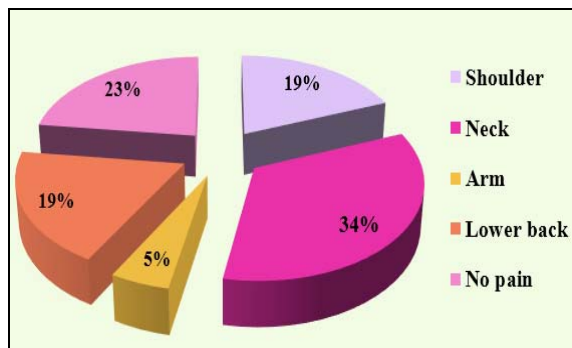


Fig 2: Pain while cutting the fabric

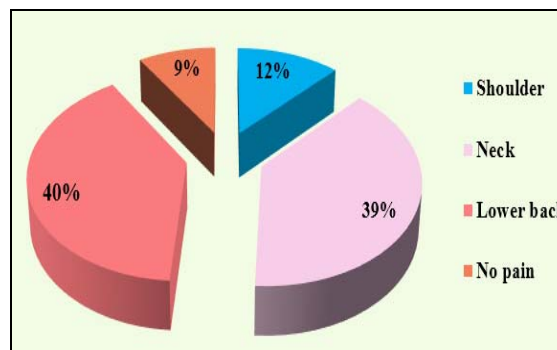


Fig 3: Pain while stitching the fabric

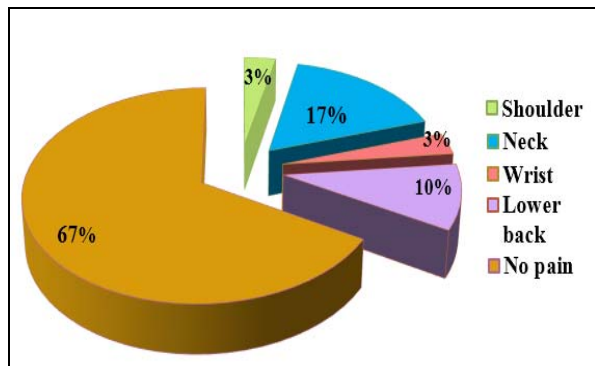


Fig 3: Pain while finishing the stitched garment

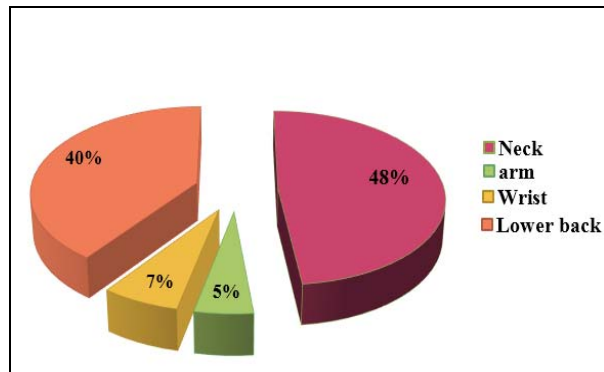


Fig 4: Pain while ironing the stitched garment

Figure 2, 3, 4, 5 Pain in different body parts

4. Conclusion

Tailors are manual workers who work at the workstation for long period of time with repetitive activities like cutting, stitching, finishing and ironing the garment etc. and mainly adapting awkward posture repeatedly in each continuous process of preparing garment. It was concluded from standardized Nordic questionnaire that tailors suffer from high prevalence WMSDs, mainly in neck, shoulder and lower back, which lead to poor morale and high absenteeism amongst the respondents. Therefore, awareness about various risk factors and WMSDs in work environment is essential.

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