

# Work Related Musculoskeletal Morbidity among Tailors: A Cross Sectional Study in a Slum of Kolkata

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## ABSTRACT

### Background

Musculoskeletal disorders comprise the single largest group of work-related illnesses in developing countries. Sedentary working style with wrong posture for long time is considered to be an important risk factor, which is largely modifiable.

### Objective

This study was performed to determine the prevalence and find out the factors associated with Musculoskeletal disorders among the workers involved in tailoring occupation.

### Method

A descriptive community based cross-sectional study was conducted in the urban slums of Chetla, Kolkata on March and April, 2015. One hundred and ten (110) out of 383 resident tailors in the area were chosen by simple random sampling and interviewed by approaching them in their work place. Descriptive statistics and multivariable logistic regression were used

### Result

Using Nordic Musculoskeletal questionnaire, Musculoskeletal disorders was found among 65.45% of tailors. The most commonly affected site was neck (41.8%) followed by lower and upper back. In bivariate analysis, musculo-skeletal disorders was found to be significantly associated with age more than 45 years [OR (95% CI)= 3.35 (1.30-8.60)], working for > 10 years [OR (95% CI)= 7.01 (2.93-16.79)\*], working > 8 hours per day [OR (95% CI)= 2.75 (1.20-6.20)], full time job [OR (95% CI)= 2.41 (1.08-5.39)] and unfavourable workstation ergonomic [OR (95% CI)= 2.40 (1.10-5.40)], whereas in multivariate analysis age, sex, duration in the profession [AOR (95%CI= 4.40 (1.40-14.30)], working hours per day [AOR (95%CI= 7.20 (1.80-27.80)], and unfavourable workstation ergonomic [AOR (95%CI)= 3.50 (1.26-9.80)] remained significant.

### Conclusion

A multidimensional approach including appropriate technique in terms of operators' posture and ergonomically sound workstation are required to avoid the debilitating effect of Musculoskeletal disorders among the workers.

## KEY WORDS

*Ergonomics, musculoskeletal disorders, nordic questionnaire, sewing, slum, tailoring, task light*

## INTRODUCTION

Musculoskeletal disorders (MSD) include a wide range of inflammatory and degenerative conditions affecting the muscles, tendons, ligaments, joints, peripheral nerves, and supporting blood vessels. Work related MSDs (WRMSDs) usually occur when there is a mismatch between the requirements of the job and the physical capacity of the human body, depending upon the physical movement characteristics, ergonomics and mechanical design of work tasks.<sup>1</sup> WRMSDs have been known to affect workers in a wide variety of occupations, and are major causes of lost time from work, workers' disability, increase in compensation claims and health care costs.<sup>2</sup> The pattern of WRMSDs has been reported to vary among different occupational groups.

Tailoring involves monotonous, highly repetitive tasks like cutting, assembly, pressing and finishing, performed in a sitting working posture with upper back curved and head bent over the sewing machine. Working in this awkward posture for a long duration increases the chance of developing WRMSDs in them.<sup>3</sup> The tailoring industry of India is an unorganized sector, mostly run by private establishments. It provides employment for both men and women, majority from the lower socioeconomic classes. The employees of this industry hardly ever benefit from occupational health-and-safety provisions. They lack any type of social security, so their ill-health and poverty go hand-by-hand and create a stupendous pressure from which they can hardly come out.

In spite of these facts, there is dearth of published literature on this topic especially in this part of the country. The present study was conducted to explore the burden of MSD, its pattern, relation with socio-demographic characteristics and ergonomics, among workers engaged in tailoring occupation in an urban slum in Kolkata.

## METHODS

A descriptive community based cross-sectional study was conducted from March to April, 2015 in the slum of Chetla, which is the urban field practice area of All India Institute of Hygiene and Public Health, Kolkata. The Urban Health Centre (UHC) of the Institute caters to an approximately 1,02,045 population spread over 3.9 kilometres.<sup>4</sup> Based on the information available from the occupational health department of the UHC, 414 adult persons engaged in tailoring occupation for at least 2 years and residing permanently at that area were chosen as the sampling frame.

Sample size was calculated to be 110, considering prevalence of musculo-skeletal morbidity as 78.5% obtained from previous study in a similar setting,<sup>5</sup> relative error as 10% and desired confidence limit 95% from the sampling frame of 414. Thirty one tailors were excluded

as they were diagnosed cases of MSD before starting this occupation, as per available records. Finally 110 study subjects were selected by using the technique of simple random sampling with replacement from the remaining 383 workers (statistical equation of sample size calculation:  $3.84 pq/l^2$  where p being prevalence,  $q=1-p$ , l= relative error). In case of non-response, simple random sampling was continued to reach the expected sample size.

An interviewer administered structured pretested questionnaire along with a pretested check-list for assessment of the sewing workstation were used for data collection. The questionnaire consisted of three sections; the first part included questions on socio-demographic characteristics (Modified B. G. Prasad's classification 2014 was used for socio-economic status assessment) and background information of the respondents; second part included questions related to occupational variables, like working duration, years of work, hours of working per day and days per week and whether his/her job is part time or full time. The third part of the questionnaire dealt with the presence and pattern of Musculoskeletal disorder, which was assessed by Nordic Musculoskeletal questionnaire.<sup>6</sup> Severity of symptoms and treatment seeking behaviour were also evaluated. Observing the prevailing work practices of the tailors during pre-testing, we prepared a five item checklist for assessment of their workstation, which included provision for additional task light (local lighting), chair with backrest and cushioned/contoured seats, tables with space underneath worker's leg and tilted towards the worker. A scoring system was developed assigning equal weightage for all the items of the checklist where increasing score indicates worsening ergonomics. Greater than the median score was regarded as unsatisfactory ergonomic practice.

After obtaining permission from Institutional Ethics Committee of All India Institute of Hygiene and Public Health, a pilot study was done among tailors in an adjacent slum of Kolkata for pretesting of the questionnaire and necessary corrections were incorporated in the final study tool. The workers were approached in their work place and informed written consent (in Bengali) was obtained after explaining the purpose of the study. After interview, the anthropometric measurements were done following standard operational procedures, followed by assessment of workstation ergonomics using the checklist.

Collected data were compiled on Microsoft Excel worksheets (Microsoft, Redwoods, WA, USA). A logistic regression model was generated using SPSS software, version 19.0 (Statistical Package for the Social Sciences Inc, Chicago, IL, USA), where the dependent variable was MSD (yes/no). The variables already found significant in univariate logistic regression were entered into a multivariable logistic regression model (binary logistic) by "Enter" method. 'Sex', although not significant in bivariate analysis, was added in the model keeping in mind their

biological plausibility. P value less than 0.05 was considered as statistically significant.

After completion of data collection each participant was informed of the hazards of this occupation and methods for prevention and control of WRMSDs through improved ergonomics.

## RESULTS

A total of 110 workers participated in the study. Majority of the workers were between 36 to 45 years of age group (36.4%), with a mean age of 42.3 ( $\pm$  12.2) years, males (55.5%), currently married (57.3%) and Hindu (67.5%) and belonged to class III socio economic class (47.3%) Among the workers, 23.6% were illiterate and 30.9% were educated up to primary level. Smoking, smokeless tobacco and alcohol intake was found among 40%, 39.1% and 22.7% participants respectively.

Musculoskeletal problem in last 12 months was found to be 65.45%. The most commonly affected site was neck (41.8%) followed by lower back (31.8%), upper back (28.2%), shoulder (16.4%), hand/wrist/fingers (12.7%), knee (12.7%) etc. Out of the total 72 workers having MSD, 44 persons (55.5%) complained of incapacitating pain for the last 7 days before interview. About 44.5% of the subjects complained of aching followed by stiffness (27.3%) and weakness (25.5%) of the affected part (Table 1). Self reported severity of symptoms revealed 61.1% of MSDs patients were having mild symptoms that did not affect their work, 18% had moderate symptoms, and 20.9% patients had severe symptoms that affected their daily life and resulted in sickness absenteeism.

MSD was found to be more among the tailors who were found to be working in unfavourable ergonomic arrangements characterised by absence of backrest (73.1% vs. 46.9%), inadequate lighting (69.6% vs. 58.5%), absence of cushioned seat (72.4% vs. 50.0%), flat table (not tilted towards the worker) (71.4% vs. 55%) and table that allows space underneath worker's leg (75% vs. 64.3%). Pattern of different MSD among tailors working in different types of unfavourable ergonomics are enlisted in Table 2. MSD was found to be more among tailors having higher workstation ergonomics score (more than median score, 74.2% vs. 54.2%)

Musculoskeletal morbidity were more common among females as compared to males (69.4% vs. 62.3%), illiterate workers as compared to those who were literate (73.1% vs. 63.1%), unmarried persons (68%) as compared to currently married persons (58.7%), workers residing in nuclear family as compared to joint family (70.9% vs. 60%), and among substance abusers as compared to those who had no history of substance abuse (66.2% vs. 64.1%). Prevalence of Musculoskeletal Disorder was found to be higher among workers engaged in embroidery work (75%) compared to

**Table 1. Musculoskeletal morbidities among the study participants: (n=110)\***

Musculo-skeletal disorders	Morbidity in last 12 months		
	Male	Female	Total (%)
<b>Region (both sides, where applicable):</b>			
Neck	18	28	46 (41.8)
Shoulder	8	10	18 (16.4)
Elbow/forearm	3	4	7 (6.7)
Hand/wrist/fingers	8	6	14 (12.7)
Upper back	15	16	31 (28.2)
Lower back	18	17	35 (31.8)
Knee	8	6	14 (12.7)
Ankle/foot	5	1	6 (5.5)
Total	38	34	72 (65.45)
<b>Symptom( Self-reported):</b>			
Pain	25	24	49 (44.5)
Weakness	17	11	28(25.5)
Stiffness	14	16	30 (27.3)
Tingling	2	4	6 (5.5)
Restricted movement	4	8	12 (10.9)
Total	38	34	72(65.45)

\* Multiple responses

workers sewing clothes (64.4%), or cutting (63.6); obese and pre-obese workers (85.7% and 66.7% respectively) compared to those having normal BMI (62.2%), and those having weight >60 kg (74.2% vs. 60%); However, none of these differences were statistically significant. Morbidity profile was also not found to be associated with socio-economic status.

In univariate logistic regression, Musculoskeletal disorders were more common among those who were >45 years old (OR 3.35, (1.30-8.60)), who were found to be in profession for longer duration (>10 years) [OR = 7.01, (2.93-16.79)], used to work for longer hours (>8 h/day) [OR 2.75, (1.20-6.20)], among those who were engaged in full time job [OR 2.41, (1.08-5.39)] and those having unfavourable workstation ergonomics score (more than median scale, i.e. 3) [OR 2.40 (1.10-5.40)]. All these differences were statistically significant. Multivariable logistic regression model was significant as revealed by the omnibus chi-square statistic ( $\chi^2 = 39.74$ ,  $P < 0.01$ ). This model was a good fit as evident from non-significant Hosmer-Lemeshow statistic ( $P = 0.91$ ). All the independent variables together explained 46.8% variance of dependent variable by using Nagelkerke  $R^2$ . Variables like age [AOR 3.20 (1.01-9.90)], sex [AOR 9.90 (2.10-47.20)], duration in the profession (in years) [AOR 4.40 (1.40-14.30)] and working hours per day [AOR 7.20 (1.80-27.30)] and unfavourable workstation arrangement score[ AOR 3.50 (1.26-9.80) were found to be significant predictors of Musculoskeletal disorders in multivariable analysis [Table 3].

**Table 2. Relation of MSD and its pattern with ergonomic characteristics among study participants**

(n=110)

Items	Ergonomic Characteristics	Total workers No. (%)	Workers with MSD No. (%) n=72	MSD characteristics (site of involvement a)
<b>Lighting</b>	No provision for additional task light (local lighting) for workers	69 (62.7)	48 (69.6)	Neck > lower back > upper back > others
<b>Chair</b>	Chair without Back rest	78 (70.9)	57 (73.1)	Lower back > neck > upper back > others
	Chair without cushioned/ contoured seat	76 (69.1)	55 (72.4)	Lower back > neck > upper back > others
<b>Table</b>	Flat table (not tilted towards the worker)	70 (63.6)	50 (71.4)	Neck > lower back > upper back > others
	Table not allowing space underneath worker's leg	12 (10.9)	9 (75)	Neck > lower back > upper back > others

\*Prevalence in descending order

[N.B.: Others: shoulder, elbow, forearm, hand, wrist, finger, knee, ankle]

**Table 3. Bivariate and Multivariable logistic regression of correlates of Musculoskeletal morbidity**

(n=110)

Co-variables	Total workers	Musculoskeletal symptoms present No. (%)	Odds ratio (CI)	Adjusted Odds Ratio (CI)
<b>Age</b>				
>45 years	38	31 (81.6)	3.35 (1.3-8.6)*	3.2 (1.01-9.99)*
≤45 years	72	41 (56.9)	1	1
<b>Sex</b>				
Female	49	34 (69.4)	1.37 (0.62-3.05)	9.9 (2.1-47.2)*
Male	61	38 (62.3)	1	1
<b>Year of working</b>				
>10 years	67	55 (88.1)	7.01 (2.93-16.79)*	4.4 (1.4-14.3)*
≤10 years	43	17 (39.5)	1	1
<b>Timing of job</b>				
Full time	59	44 (74.6)	2.41 (1.08-5.39)*	2.8 (0.73-10.95)
Part time	51	28 (54.9)	1	1
<b>Working Hours per day</b>				
>8 hours	64	48 (75)	2.75 (1.2-6.2)*	7.2 (1.8-27.8)*
≤8 hours	46	24 (52.2)	1	1
<b>Workstation ergonomics #</b>				
Unsatisfactory	62	46 (74.2)	2.4 (1.1-5.4)*	3.5 (1.26-9.8)*
Satisfactory	48	26 (54.2)	1	1

\*Statistically significant at the level  $p < 0.05$ 

#Workstation ergonomics: median score of the scale=3, higher than median score considered as unfavourable ergonomics

## DISCUSSION

The textile industry is the largest manufacturing sector in India, accounting for around 20% of India's industrial output and 37% of its total exports.<sup>7</sup> Therefore adequate importance should be given to the welfare of the millions of workers employed in this sector, especially those working in tailoring industry, which is one of the pillars of this sector. Compared to other industries, this industry is relatively safe with little scope of serious accidents, but the health risks that the tailors face come from more subtle hazards whose effect accumulates over time, the most notorious being MSD.<sup>3</sup>

In this study, the prevalence of MSD among the tailors was reported to be 65.45%, most common site being neck,

followed by lower back, upper back and shoulder. Apart from age, sex and duration in the profession, MSD was significantly associated with more than 8 hours job per day, and it remained significant after adjusting with other variables. How-Ran Guo et al. in his study among factory workers reported complaints of Musculoskeletal disorders of mainly neck, back, shoulders, hands, and wrists.<sup>8</sup> Sokas et al. compared sewing machine operators to a subset of the general population matched for age, race, and gender and weighted toward lower socioeconomic groups and minority populations and found that sewing machine operators had a higher prevalence of self-reported upper back and upper-extremity pain.<sup>9</sup> Bandyopadhyay et al.

and Saha et al. found that the prevalence of MSD among small scale garment industry workers were 78.5% and 69.64% respectively and neck was the commonest site of involvement in both the studies which was in congruence with the present study.<sup>5,10</sup> Long hours of stooping down with neck flexed and continuous eye straining due to inadequate task lighting probably explained the high prevalence of neck involvement among the studied workers.

This study revealed age over 45 years and duration of work over 10 years were significantly associated with increased Musculoskeletal disorder which was corroborated by the findings of a study conducted by Helsing, which pointed out that lower back area pain was increased from 38% to 73% with increased work records.<sup>11</sup> A study on occupational and physical therapists by King et al. revealed people with higher work records or people of higher age in these occupations, reported more absence from work and experienced more severe pain symptoms.<sup>12</sup> Wang et al. study results indicated that both personal and work-related factors were associated with increased prevalence of upper-body MSD among sewing machine operators which also supports the findings of the present study.<sup>13</sup> Jahan et al. found significant differences in Musculoskeletal disorders for gender, age group, and marital status whereas in the present study marital status had no significant association with MSD.<sup>3</sup> The development of such disorders in people of higher ages and higher work records imply that these disorders were work related diseases which had developed over time due to repeated non-standard movement and inappropriate body position during work.

In our study, it was found that women were suffering from Musculoskeletal disorders more than men, which is in congruence with the study of Ostergren et al.<sup>14</sup> Female predominance of MSD was also revealed in two different studies done in Kolkata slum area.<sup>5,10</sup> Further literature review revealed that gender had a strong relationship with Musculoskeletal pains of cervical and lumbo-sacral spine which could be attributed to gender related biological differences e.g. muscle strength and distribution, and increased incidence of osteoporosis after menopause etc.<sup>15-17</sup> According to the European Foundation's 1996 European Union-Wide Survey, women were more likely to have difficulties in taking breaks, days off, or holidays.<sup>18</sup> In another study conducted by Wang et al. among Los Angeles garment producing workers, it was established that work records and gender were associated with Musculoskeletal disorders.<sup>13</sup> In our study setting, majority of the women workers had to perform their household activities in addition to their work, had little time to take rest, and to attend to personal health problems, which might have made them more susceptible to MSD than their male counterparts.

Workstation ergonomics, as revealed by our study was significantly associated with MSD, even when adjusted with other socio-demographic and work related variables.

The findings are similar to those by Nag et al. who observed that unsatisfactory man-machine incompatibility,<sup>19</sup> work posture and fatigue were major problems of the sewing machine operators. Habib et al. found that significant ergonomic risk factors were the combination of awkward postures of the neck and back, repetitive hand and arm movements, poor ergonomic workstations and prolonged working hours without adequate breaks.<sup>20</sup> As those are modifiable risk factors, burden of MSD can be reduced by minor ergonomic adjustments of workstation, which is affordable in maximum cases.

In this study a statistically significant association was found between duration of work per day (>8 hrs) and timing of job (part/full time) with MSD, the result being in congruence with findings obtained by Bandyopadhyay et al. and Saha et al. and in their studies at slums of Kolkata.<sup>5,10</sup> So these evidences further emphasize the role of occupational variables in development of MSD warranting scope of large cohort studies to prove causal association in future.

The findings of our study need to be interpreted in the light of certain limitations. Sample size was small (n=110), possibility of recall bias could not be ruled out, and being a cross-sectional study, temporal association could not be established.

## CONCLUSION

Present study highlights the burden of MSD among the workers engaged in tailoring occupation as well as their discomfort related to ergonomically deranged workstation. Although majority of MSD are benign and self-limiting in nature, the consequences of its persistent presence lead to chronic (and persistent) disabling pain, sickness absence, work disability, and increasing health care costs. If not corrected early, this health problem can seriously undermine their physical capacity hence leading to permanent physical disability. All these can adversely affect their earning power, thus setting a vicious cycle of no work, no money, malnutrition and weakness. Intervention at the work site like providing the workers with improvised workstation combined with ergonomic education and training, frequent, short breaks to stretch and/or change position in between their working hours, and job/task rotation through tasks that do not require constant leg pressure and awkward leg posture would go a long way in reducing the incidence of MSD among them. Concerted efforts by the government and nongovernmental agencies as well as the employers to bring them under the umbrella of an organized sector with provision of social security measures and quality health care coverage would be helpful to mitigating their suffering.

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