

Evaluation of Musculoskeletal Pain and Posture in Embroidery Workers of Mumbai - A Cross-Sectional Study

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ABSTRACT

Background and Purpose: Embroidery, a fine craft, requires individuals to sit in a static posture for prolonged period which may predispose to musculoskeletal disorders. The primary aim of this study was to evaluate the musculoskeletal pain and posture amongst embroidery workers.

Methodology: Thirty-nine embroidery workers were recruited. A self designed questionnaire was used to evaluate the demographic characteristics, work profile and musculoskeletal pain in the workers. Static working posture was evaluated using Rapid Upper Limb Assessment. Dynamic working posture was evaluated using Assessment of Repetitive Task Tool. Statistical analysis was performed using SPSS version 16.

Results: Out of 39 participants, 27 (69.23%) were males and 12 (30.77%) females with mean age of 32.7±9.06years respectively. Majority participants complained of pain in low back (53.85%) followed by neck (38.46%), fingers (33.33%) and shoulder (28.21%). Static working posture evaluation using Rapid Upper Limb Assessment showed that 58.97% workers were at medium risk of developing musculoskeletal disorders. Whereas, dynamic posture evaluation using Assessment of Repetitive Task Tool concluded 66.67% workers were at high risk and required further investigations urgently.

Conclusion: Low back and neck were found to be the most commonly affected sites of musculoskeletal pain amongst embroidery workers of Mumbai. None of the workers reported to have acceptable posture.

Key words: Assessment of Repetitive Task Tool, Embroidery workers, Posture, pain, Rapid Upper Limb assessment,

INTRODUCTION

Work, an integral segment of everyday routine of an individual, comes at a certain price. Health and work are intimately linked. Work related musculoskeletal disorders lead to occupational health-related problems and cause socioeconomic burden on the worker as well as the society. Work related musculoskeletal disorders (WMSDs) are described as disorders of the muscles, nerves, tendons and joints associated with exposure to risk factors in the workplace which further result in pain and functional impairment of musculoskeletal system. [1, 2]

Embroidery is a fine craft that involves decorating fabric or other materials

using a needle to apply thread or yarn. Maintenance of static posture for prolonged period is essential in this type of occupation which may result in musculoskeletal disorders. [3] The varied risk factors linked with musculoskeletal disorders include rapid work pace, repetitive movement patterns, insufficient recovery time, heavy exertion, improper body mechanics, use of tools and awkward posture. [4, 5] Workers employed in these industries have to bear the brunt of unhygienic working conditions coupled with lack of health or safety measures. [6]

A number of reviews have examined the evidence of work stress factors as perilous cause for musculoskeletal pain in recent years. The major attributes

responsible for morbidity among the embroidery workers are low educational level, poor social status, meagre payment, long working hours, poor lighting and ventilation, continuous awkward postures and lack of system for periodic health check-up. [7-9] Maintenance of awkward static posture along with repetitive fine movements may lead to physically demanding challenges predisposing an individual to musculoskeletal discomfort in these workers. [8, 9]

India's textile sector is one of the oldest with a potential to grow in the coming years. However, lack of awareness regarding proper work station ergonomics and maintenance of correct posture has been noted amongst these workers. [9] This has in turn resulted in numerous health related issues, amongst which musculoskeletal pain being a major concern. Little has been published about the known or suspected health risks of embroidery workers, despite the fact that it involves a large human resource.

This study will focus on analysing the factors contributing to musculoskeletal pain which are commonly encountered by this community, which will in turn help in formulating effective coping strategies and preventing further issues. The purpose of the study was to assess pain and working posture amongst embroidery workers in Mumbai.

MATERIALS & METHODS

After seeking approval from the Institutional Research Review Committee, a total of 39 embroidery workers across Mumbai were contacted personally in their respective work organizations. The participants were explained about the need and purpose of the study. Written informed consent was obtained from each participant. Embroidery workers with minimum one-year experience were recruited in the study. Participants with any congenital musculoskeletal disorders, traumatic injury, pre-existing neuromuscular disorder and any

known medical or surgical condition were excluded from the study.

A self-structured questionnaire was constructed to evaluate the characteristics and musculoskeletal pain in embroidery workers. The face and content validity of the questionnaire was obtained from the senior physiotherapy faculty. The first part of the questionnaire comprised of the demographic details such as age, gender and dominance. The second part of the questionnaire evaluated the work profile of the embroidery workers. It included total number of years in this profession, working days per week and total number of hours working daily. The third part of the questionnaire assessed the presence of musculoskeletal pain in different body regions. The participants were asked to mark the site of pain on the given body image as per the order of severity followed by which intensity of the pain was noted on Numeric Pain Rating Scale. [10]

The working posture was evaluated using two tools: The Assessment of Repetitive task (ART) tool for dynamic movements/postures and the Rapid Upper limb Assessment (RULA) Tool was used to assess the static posture. [11, 12]

ART comprises of four sections to be evaluated - frequency and repetition, force, awkward postures and additional factors. In total, 12 factors are examined in ART; each one receives its own score and then a final score is computed. The ART technique also examines psycho-social factor which is not involved in the total scoring system. However, it was analyzed separately for the embroidery workers. ART categorizes the repetitive task into - low, medium and high risk levels. [13] The ART method is a practical approach, easy and convenient method for ergonomic evaluation in the repetitive work task. [14]

The RULA tool, a screening tool, based on observation method is used to assess exposure to load factors due to posture of the neck, trunk and upper limb along with muscle use and forces. [15] The RULA tool allows the left and right upper

limbs to be assessed separately, yielding a Grand Score and Action Level for each side of the body. Interpretation of which was: 1 or 2- acceptable; 3 or 4- investigate further; 5 or 6- investigate further and change soon; 7-investigate and change immediately. [12]

Statistical Analysis:

Data collected was subjected to statistical analysis using SPSS software for Windows, Version 16.0. Chicago, SPSS Inc. Descriptive statistics were given.

RESULTS

Out of 39 participants 27 (69.23%) were males and 12 (30.77%) females with mean age of 32.7±9.06 years. The characteristics of participants in terms of their job profile and working hours is given in Table 1.

Pain site and its intensity on Numeric Pain Rating Scale were noted. The mode of intensity of pain was then calculated. Low back (53.85%) was the commonest site of pain, followed by neck (38.46%), fingers (33.33%) and shoulder (28.21%). (Table 2)

Static working posture evaluation using Rapid Upper Limb Assessment (RULA) showed that 58.97% workers were at medium risk and 38.46% at high risk of developing musculoskeletal disorders. (Table 4)

Table 1. Demographic characteristics and job profile of the embroidery workers.

Characteristics of participants	No. of participants (N)	Percentage %
Age (years)		
15-25	12	30.77
26-35	10	25.64
36-45	15	38.46
>46	2	5.13
Gender		
Males	27	69.23
Females	12	30.77
Dominance		
Right	34	87.18
Left	5	12.82
Years of Experience (years)		
1-5	16	41.03
6-10	5	12.82
11-15	8	20.51
16-20	6	15.38
21-25	1	2.56
26-30	3	7.69
Working days (No. of days)		
5	3	7.69
6	29	74.36
7	7	17.95
Working hours (No. of hours)		
5-6	7	17.95
7-8	25	64.1
9-10	6	15.38
11-12	1	2.56

Table 2: Pain profile of the embroidery workers.

Site of pain	No. of participants (N)	Percentage %	Intensity of pain (Mode value)
Low back	21	53.85	5
Neck	15	38.46	4
Finger	13	33.33	5
Shoulder	11	28.21	3
Upper back	10	25.64	4
Knees	8	20.51	3
Buttocks	6	15.38	2
Wrist	5	12.82	3

Table 4: Rapid Upper Limb Assessment (RULA) score in embroidery workers.

Action level	RULA score	Level of MSD Risk	No. of participants (N)	Percentage %
1	1-2	Negligible risk, no action required	0	0
2	3-4	Low risk, action may be needed	1	2.56
3	5-6	Medium risk, further investigation, change soon	23	58.97
4	6+	Very high risk, implement change now	15	38.46

Dynamic posture evaluation using Assessment of Repetitive task (ART) tool showed none had an acceptable posture. It reported that 66.67% workers came under the category of high risk exposure level and 33.33% had medium risk exposure level.

Table 5: Assessment of Repetitive task (ART) tool score in embroidery workers.

Exposure Score	Proposed exposure level	No. of participants (N)	Percentage %
0-11	Low level - Consider individual circumstances	0	0
12-21	Medium level - Further investigation required	13	33.33
22 or more	High level - Further investigation required urgently	26	66.67

Psychological factors, a part of Assessment of Repetitive task (ART) tool was scored separately. It was seen that among thirty nine participants, thirteen (33.33%) reported

frequent tight deadlines, 11 (28.21%) reported lack of support from supervisors and co-workers, 9 (23.08%) reported excessive work demands, 6 (15.38%) reported high levels of attention and concentration and 3 (7.69%) reported insufficient training to do the job successfully. (Table 5)

Table 6: Psychological factors of Assessment of Repetitive task (ART) tool in embroidery workers.

Psychological factors	No. of participants (N)	Percentage %
Little control over how the work done	0	0
Incentives to skip breaks or finish early	0	0
Monotonous work	0	0
High levels of attention and concentration	6	15.38
Frequent tight deadlines	13	33.33
Lack of support from supervisors or co-workers	11	28.21
Excessive work demands	9	23.08
Insufficient training to do the job successfully	3	7.69

DISCUSSION

This study showed that most common site of musculoskeletal pain in embroidery workers was low back followed by neck, fingers and shoulder. Also, evaluation of static and dynamic posture categorized them into risk of developing musculoskeletal disorders.

Embroidery work is a very tedious profession requiring long hours of work being in a static posture. Majority of the participants were on daily wages working 6 days per week for 7 to 8 hours while maintaining static posture for about 4 hours continuously. Majority took a break only for one hour. The risk factors for development of cumulative trauma disorders described by Armstrong were repetition, sustained awkward posture, forceful activities, contact stress and psychological factors. [16] Repetitive work without frequent rest pause restricts the physiological recovery in an individual. Further added to this, there is prolonged positioning of joint, application of excessive strength, unnecessary forceful pressure on soft tissues due to external surfaces and organizational or intrapersonal factors result in increased actual or perceived stress. These were noted as the major risk factors for development of musculoskeletal pain and disorders. [16] Also, the maintenance of angular positions of the body parts accompanied with length of time held in that posture has an adverse effect on musculoskeletal structures in an individual. [17, 18]

Evaluation of static posture using RULA showed – none of the participants showed an acceptable posture. Majority needed further investigations and change in their working posture soon. Most common site for pain noted was low back and neck amongst the subjects. It was observed that all the participants were seating unsupported. During unsupported sitting, pelvis rotates posteriorly and lumbar lordosis decreases, thus increasing pressure on the disk. Forward flexed position of neck creates 3-6 times greater load at C7-T1 joint even for a 30 degree inclination from vertical. [19] With flexion of the lumbar spine the intervertebral disc is compressed anteriorly, which causes a posterior displacement of the nucleus pulposus and increase in intra-discal pressure. [20] When soft tissues are exposed to sustained loading in a single direction without interruption further movement occurs. This slight movement, known as creep, results from rearrangement of collagen fibres and water being squeezed from the soft tissue. If the sustained loading is not excessive the soft tissues recover reasonably quickly. However excessive loading, with limited interruption and frequent repetition, despite the fact that these are normal loads can alter the mechanical properties of the soft tissues. Thus these tissues may become susceptible to fatigue failure, and the insidious development of musculoskeletal symptoms despite no obvious trauma. [21] Once static postures have induced discomfort, the

further deterioration increases linearly with length of time held in that posture which slows down the recovery. [22]

Majority of people were in category of high risk as per the ART tool score which can be attributed to frequent repetitive movements, poor posture and infrequent breaks. Local muscle fatigue is considered limiting factor for monotonous work and long lasting static work. [19, 23] Factors contributing to poor posture at work are improper work station ergonomics which in turn leads to various musculoskeletal disorders. Apart from the factors discussed earlier it is essential to look into the psychological factors commonly seen among embroidery workers: frequent tight deadlines, lack of support from supervisors or co-workers, excessive work demands culminates in increased work pressure causing fatigue injuries.

A proper understanding of the working posture and factors causing musculoskeletal discomfort can go a long way in creating awareness among the masses which is the need of the hour. Availability of such data may help in preventing cumulative trauma disorders. Besides creating awareness, it may be useful in formulation of effective treatment strategies for appropriate rehabilitation.

CONCLUSION

The most common site of musculoskeletal pain in embroidery workers reported was low back followed by neck, fingers and shoulder. Evaluation of both static and dynamic working posture concluded that none of the participants showed an acceptable posture. Majority needed further investigations and change in their working posture.

ACKNOWLEDGEMENTS

We would like to thank all the participants for giving their valuable time for our study.

Source of funding- Nil

Conflict of Interest: Nil

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How to cite this article: Panhale VP, Walankar PP, Doshi D et.al. Evaluation of musculoskeletal pain and posture in embroidery workers of Mumbai - a cross-sectional study. Int J Health Sci Res. 2020; 10(1):121-126.
