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Risk Level Of Physical Factors Associated With Work Related Musculoskeletal Disorders (Wmsds) By Performing Task Analysis Among Textile Mill Workers – A Cross Sectional Study

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Abstract –

Aim: To Identify Risk level of Physical Factors Associated with Work Related Musculoskeletal Disorder by performing task analysis among Textile Mill Workers. Methodology and analysis: A cross sectional study was conducted that 54 participants both male and female using purposive sampling technique. Workers other than textile mills were excluded .The Workplace Ergonomic Risk Assessment (WERA), which is an observational tool was developed to provide a method of screening the working task quickly for exposure physical risk factor associated with Work-related Musculoskeletal Disorders (WMSDs) Results: Study showed that the socio-demographic factors that were examined are age and gender. The average age of study participants was 44.44%.Maximum number of workers were at medium risk level according to Workplace Ergonomic Risk Assessment Tool. Conclusion: The study concluded that there is medium risk level of physical factors associated with work related musculoskeletal disorder by performing task analysis among textile mill workers.

keywords - WERA; observational tool; ergonomic risk assessment; physical risk factor; work related musculoskeletal disorder

INTRODUCTION

"Work-related musculoskeletal disorders" (WMSDs) is a term used to describe a painful or disabling injury to the muscles, tendons or nerves caused or aggravated by work [1]. WMSDs are preventable or at least can be delayed [2]. These work-related disorders of the neck, shoulder, lower back, upper limbs and locomotor organs continue to be of the interest to workers, researchers and companies due to the significant temporary or permanent disability of workers; symptoms such as pain, numbness and tingling; time off from work; reduced productivity; increased worker's compensable costs; and the increasing number of associated cases coming before the courts [3]

Work-related musculoskeletal disorders have become a major problem in many industrialized countries [4]. These disorders are widespread in many countries, with substantial costs and impacts on the workers' quality of life. They also constitute a major proportion of all registered and/or compensation-eligible, work-related diseases in many countries. [5,6]

In Britain, musculoskeletal disorders are believed to represent the largest category of work-related illness. [7] In Europe, WMSDs are the most common work-related health problem, affecting millions of workers. Across the EU 27, 25% of workers complain of backaches and 23% report muscular pains. [8]

Upper extremity musculoskeletal disorders are highly prevalent in manual-intensive occupations such as clerical work, postal services, cleaning, industrial inspections and packaging. [5,6]

In India, 20 million workers are involved in the manufacturing of textiles. Worldwide, India is the second largest producer of textile goods, which account for 20% of the national industrial output. Twenty million workers are employed in 1175 cotton mills across the country [9]

The textiles workers have to perform many tasks ranging from exposure to noise and dangerous substances, to manual handling and working with dangerous machinery. [10] Especially the spinning process in medium and small-scale industries involves a lot of work with the hands with the worker bent over for prolonged duration of time. It involves lifting bundles of cotton, separating them from the bigger bundle and setting them up for spinning. [11]

Many of the industries employ laborers who are involved in all these works. Especially in the small and middle scale industries, large parts of these works involve workers using their hands, lifting weights, bending, standing and sitting in the same posture for prolonged periods of time. [11]

NEED OF THE STUDY

In developing countries, especially those with high rates of unemployment, it is tempting for employers who build up small and middle-sized industries to disregard safety and health. In the private sector in the United States, nearly six million workers experience non-fatal injuries or illnesses.

In India, many studies have reported prevalence of pain and work-related musculoskeletal disorders amongst different job profile including textile industry workers, the exact causative factors for the work-related musculoskeletal disorders is not well documented. Physical risk factors contributing to WMSDs are complex & remains poorly explored.

Therefore, Finding Risk Level of these physical factors associated with Work related Musculoskeletal Disorders will help in designing work station modification, ergonomics and interventions to prevent severe work-related disability among textile mill workers.

AIM

- To Identify Risk level of Physical Factors Associated with Work Related Musculoskeletal Disorder by performing task analysis among Textile Mill Workers.

OBJECTIVE

- To Find Risk level of Physical Factors Associated with Work Related Musculoskeletal Disorder by Performing Task Analysis Using Workplace Ergonomics Risk Assessment Tool among Textile Mill Workers.

Methodology

The study design is cross sectional and study type observational study. It was conducted in Jalgaon. The duration for the study was 6 months. The method selected for sampling was purposive sampling and the sample size was 54.

Selection criteria

- Inclusion criteria

1. Textile mill workers.
2. Both male and female.
3. Co-operative and willing to participate.

- Exclusion criteria

1. Workers other than textile mills.

Procedure

To conduct the study permission was taken by the ethical committee. An observational study was administered and subjects were screened on the basis of inclusion - exclusion criteria. A brief demographic data was obtained and a written consent will be taken from all the participants, and the nature and purpose of the study was explained to them. Physical risk factors associated with work related musculoskeletal disorders were assessed using the Work Ergonomic Risk Assessment (WERA). After data collection, data entry was done. statistical analysis was done using InStat (version 3.05)

Outcome Measure

- The Workplace Ergonomic Risk Assessment (WERA), which is an observational tool was developed to provide a method of screening the working task quickly for exposure physical risk factor associated with Work-related Musculoskeletal Disorders (WMSDs) [1].
- The WERA tool cover the six physical risk factors including posture, repetition, forceful, vibration, contact stress and task duration and it involves the five main body regions (shoulder, wrist, back, neck and leg).
- It has a scoring system and action levels which provide a guide to the level of risk and need for action to conduct more detailed assessments.
- This tool has been tested on its reliability, validity and usability during the development process [1-2].
- As the WERA tool is a pen and paper technique that can be used without any special equipment, it also can be done in any space of workplaces without disruption to the workforce.

The procedure for using WERA is explained in five steps:

1. Observe the task/job.

- Observe the task/job to formulate a general ergonomic workplace assessment, including the impact of work layout and environment, use of equipment, and behavior of the worker with respect to risk taking. If possible, record data using photograph or a video camera.

2. Select the task/ job for assessment.

- Decide which task/job to analyze from the observation in step one. The following criteria can be used: -
- Most frequently repetitive work of task/job.
- Extreme, unstable, or awkward posture
- The task/job known to cause discomfort by worker.

Required the greatest forces, contact stress and use of vibration tool

3. Score the task/job.

- Using the WERA tool, score for each items of risk factor include Part A and B (Item No. 1-9).
- Part A (Item No. 1-5) consist five main body areas include the shoulder, wrists, back, neck and legs. This part cover two physical risk factor for each body parts include posture and repetition.
- Part B (Item No. 6-9) consists a four physical risk factors include forceful, vibration, contact stress and task duration.

4. Calculation of exposure scores.

- Calculate the score for each item (Part A and B) and the total final score. Mark the numbers at the crossing point of every pair of circled number (columns vs. rows).
- In part A, for the Item No. 1-5 based on pair of the posture and repetition. For example: Item No. 1 - Shoulder Posture (1a) vs. Shoulder Repetition (1b)
- In part B, for the Item no 6-8, the rows side based on the posture following in part A. For example: Item No. 6 – Forceful (6) vs. Shoulder Posture (3a). And for the Item No. 9, the rows side based on the Forceful (6). After score for each items of risk factor (Item No. 1-9), calculate the total final score.

5. Consideration of actions level: The total final score will be indicated whether the task is accepted –

- Final score of 18 - 27 indicates low risk level: Still accepted.
- Final score of 28 - 44 indicates medium risk level: Further investigate & required change.
- Final score of 45 – 54 indicates high risk level: Not accepted in which need to immediately change.

Occupational Tool:

1) Pincher

2) cutter

Statistical Analysis

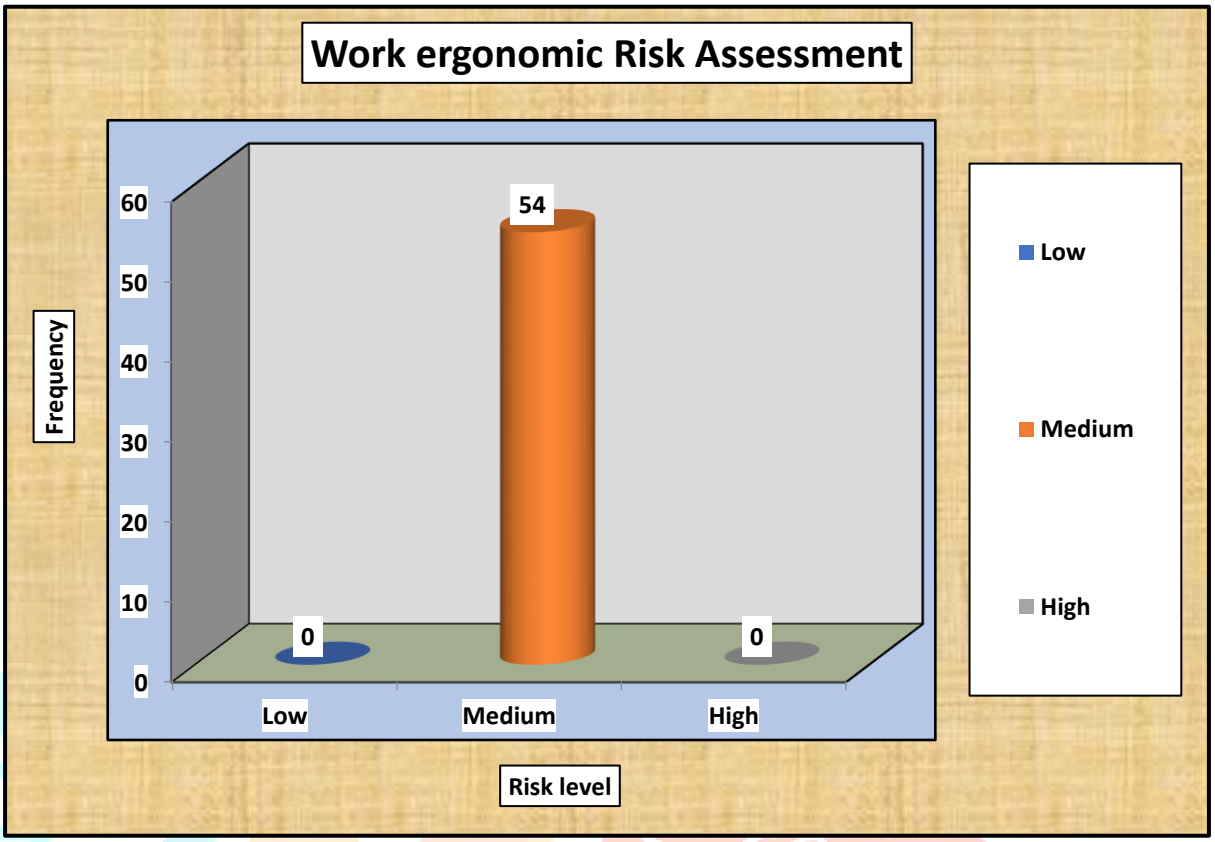
- All data was collected and entered into Microsoft excel.
- Descriptive statistics were applied to categorical variables where frequency (n) and percentage was expressed in %. Frequency and percentage were computed.
- All the results are shown in tabular as well as graphical format to visualize the statistically significant difference more clearly.

Results

- Total 54 samples were collected for the study and analysis was carried out.
- In our study, the mean age of participants was 44.44 ±12.96
- Other variables such as experience in years and BMI by their frequency and percentage are shown below:

Variable	Groups	Frequency	Percentage
Age (in years)	21-30	10	18.52
	31-40	24	44.44
	41-50	13	24.07
	above 50	7	12.96
Gender	Male	45	83.33
	Female	9	16.67
Experience (in years)	Below 5	5	9.26
	5-10	48	88.89
	Above 10	1	1.85
BMI	Underweight	1	1.85
	Normal	39	72.22
	Overweight	13	24.07
	Obesity	1	1.85

Work ergonomic Risk Assessment



Discussion

- The present study aimed to find risk level of physical factors associated with Work related Musculoskeletal Disorders (WMSDs) Performing task analysis among textile mill workers.
- The socio-demographic factors that were examined in this study were age and gender. The average age of study participants was 44.44%. More than half were male participants.
- After taking the whole assessment, maximum number of workers were at medium risk level according to Workplace Ergonomic Risk Assessment Tool.
- Vivi Anisa Putri, Leli Hesti and Nurfitri Bustamam in 2017 found that ergonomic risk assessment using WERA showed the subjects had high and moderate risk including contact stress, work duration, neck posture, wrist repetition, posture and repetition of the shoulder.[11]
- This is the study where workers with low back pain were taken and their results are 110 subjects have moderate risk level and rest of the 29 subjects having low risk level. The result of ergonomic risk measurements using WERA found that the most dominant assessment component with high ergonomic risk was contact stress. It was caused by a movement that requires tailors to turn the wheel that is not adjusted to facilitate the tailor's grip[11].
- In addition, the rotating motion of the wheel is done repeatedly. Tailors also did not wear protective gloves while using a sewing machine. Prolonged and repeated contact between soft tissues, e.g. on

the fingers, palms, thighs, and soles of the feet, with objects or hard surfaces of a work device can cause contact stress.[11]

- Such contacts may cause localized emphasis on certain areas that may inhibit blood flow, nerve function, tendon, and muscle movement as well as a local irritation (United States Department of Labor, 2016). Based on working posture, 79.1% of the subjects have a moderate ergonomic risk. An awkward posture, especially in sitting position, will increase the pressure on the spine[11]

- Our study involves the five main body regions (shoulder, wrist, back, neck and leg) and six physical risk factors including posture, repetition, forceful, vibration, contact stress, and task duration. And we found that half of the workers have medium risk level.
- The relationship of the individual WERA body part scores to the development of pain or discomfort is statistically significant for the wrist, shoulder, neck, wrist and back regions. They were more physical exhausted & were having decreased strength due to less physical activity.
- In spinning and weaving section there is a loud noise because of machines and operators which can cause ear pain due to noise pollution. It causes painful inflammation of the tympanic membrane as well as pain from increased middle ear pressure (causing bulging of the tympanic membrane).[20]
- Hearing starts with the outer ear. When a sound is made outside the outer ear, the sound waves or vibrations, travel down the external auditory canal and strike the eardrum (tympanic membrane).[19]
- At Raymond Company, the ambient noise levels are approximately 90 decibels (dB), posing a significant risk of noise pollution for workers. In response, some employees have taken preventive measures by wearing earplugs, effectively reducing the noise exposure by 40-45%.
- The risk level for **shoulder** posture and repetition is assessed as medium. This is because the shoulder is moderately bent and stretched beyond its usual position, resulting in a medium score.

- Moreover, there is moderate repetition in movements with occasional pauses during work. While there are pauses, adjustments to the tasks are required to reduce the risk. Therefore, the overall score for repetition risk level remains at a medium level.

- The risk level for **wrist** joint posture and repetition is evaluated as high for posture and moderate for repetition. Workers are observed to have their wrists excessively bent upwards or downwards with twisting during the weaving process, posing a high risk to their wrist posture.

- In mending section, they using the pincher and cutter to remove unwanted threads from the cloth (rim), the wrist position is rated at a medium risk level, which is still considered very high in terms of the overall working risk position.

- Furthermore, the repetitions occur frequently, with over 20 repetitions per minute, contributing to the moderate risk level for repetition.[14]

- The risk level for **back** component posture and repetition is deemed medium. The back is observed to be moderately bent forward within the range of 0 to 20^0 degrees and 20^0 to 60^0 degrees. This posture is sustained for a duration of 4 to 8 minutes, leading to its classification as medium risk.[14]
- The risk level for **neck** component posture and repetition is assessed as medium. The neck is moderately bent forward, exceeding 20^0 degrees,[14] with movement interspersed with some pauses. As a result, this posture is classified as moderate risk.
- In the **leg** component, workers are observed to have their legs moderately bent forward or to be seated with their feet bent on the floor. This position is sustained for a duration of 2 ½ hours, leading to its classification as moderate working risk.
- The **Forceful** component presents a high-risk level in the spinning and weaving section due to the requirement for workers to lift heavy loads, with weights exceeding 10 kg.
- Forceful exertions are the amount of muscular effort expended to perform work. Exerting large amounts of force can result in fatigue and physical damage to the body. The amount of force exerted when moving or handling materials, tools, or objects depends on a combination of factors i.e. 3-4 times load is handled per day during work shift.[17]
- In the **vibration** component, the risk level is considered high due to prolonged exposure to vibration tools for over 4 hours per day.
- Vibration exposure is of concern when it is continuous or of very high intensity. Using vibrating tools such as sanders, grinders, chippers, routers, impact guns, drills, chain saws, and circular saws can cause exposure to hand arm vibration. These exposures may result in fatigue, pain, numbness, tingling, increased sensitivity to cold and decreased sensitivity to touch in the fingers, hands and arms.[17]
- In the weaving and spinning section, we observed that workers are experiencing whole-body vibrations.
- Whole body vibration commonly results from sitting or standing on work surfaces that vibrate. Examples of such surfaces include vibrating vehicles, equipment and platforms. Whole body vibration may be associated with general discomfort and lower back pain.[17]
- In **Contact stress** component the risk level is medium because of hard and sharp shape of tool handle. i.e. cutter and pincher.
- Pressure points result from the body pressing against hard or sharp surfaces. Certain areas of the body are more susceptible because nerves, tendons, and blood vessels are close to the skin and underlying bones. These areas include the sides of the fingers, palms, wrists, and forearms, elbows, and the knees.[17]

- In **task duration** the task lasted for more than 4 hours per day which is categorized as high-risk level. They work for 8 hours.
- According to workplace ergonomic risk assessment tool, we found that workers have medium risk level. So, the present study accept hypothesis.

Limitations

- The major limitation is small sample size.
- Findings of the study cannot be generalised because female participants are lesser than the male participants.

Future scope

- Further research should also include individuals with other industrial workers.
- Management should be planned to reduce harms of occupational tools in textile mill workers.

Conclusion

The study concluded that there is medium risk level of physical factors associated with work related musculoskeletal disorder by performing task analysis among textile mill workers.

Clinical Implication

- This study will help in planning intervention strategies for designing work station modification, ergonomics and to prevent severe work-related disabilities.
- These workers should perform stretching of main physical body regions.
- Clinical fitness programme for workers must include cardiovascular fitness and strengthening.

References

1. Bernard B (ed.), Musculoskeletal Disorders and Workplace Factors; A Critical Review of Epidemiologic Evidence for Work Related Musculoskeletal Disorders of the Neck, Upper Extremity, and Low Back. NİOSH. 1997
2. Detels R, McEwen J, Beaglehole R, Tanaka H (editors), Oxford Textbook of Public Health. Kelsey JL, Sowers M, Musculoskeletal Diseases, 4th Edition, New York: Oxford University Press, 2002;349-68.
3. Wallace RB (editor), Maxcy – Rosenau - Last, Public Health & Preventive Medicine. Keyserling WM, Armstrong TJ, Ergonomics and Work-Related Musculoskeletal Disorders, 14th Edition, Appleton & Lange; Stamford, USA, 1998:645-5
4. Hagberg M, Silverstein B, Wells R, Smith MJ, Hendrick HW, Carayon P, Perusse M, 1995. Work-related Musculoskeletal Disorders (WMSDS):a Reference Book for Prevention, in: Detels R, McEwen J, Beaglehole R, Tanaka H (Eds.), Oxford Textbook of Public Health, 4th Edition, Oxford University Press, New York.
5. Punnett L, Ergonomics and Public Health, 4th Edition, New York: Oxford University Press, 2002. p.1067-82.
6. Cakmak ZA, Tekbas FO, Guler C. Work-related Musculoskeletal Disorders and Preventation of Additional İnjuries, Guler C (ed.), Sağlık Boyutuyla Ergonomi, Ankara: Palme Press, 2004;227-54
7. Palmer K, Cooper C. Repeated movements and repeated trauma affecting the musculoskeletal system. In: Adams PH, Aw T-C, Cockcroft A, et al, eds. Hunter's diseases of occupations, 9th edn. London, 2000.
7 http://osha.europa.eu/en/topics/msds/index_html/facts_html (Available from, 2009 March 25)
8 Mishra AK, Rotti SB, Sahai A, Mohan M, Narayan KA. Byssinosis among male textile workers in Pondicherry: A case– control study. The National Medical Journal of India. 2003;16(2)
9 Jaiswal A. Health Status of Textile Industrial Workers of Utter Pradesh, India. EAA Summer School eBook 1: 217- 223.
10 Vinod H Krishnamoorthy, Deivasigamani Kuberan, Vijayaprasad Gopichandran. Prevalence, Patterns and Disability Due to Musculoskeletal Disorders among Cotton Textile Industry Workers in Tamil Nadu – A Cross Sectional Study Int J Med. Public Health 2019; 9(3):66-70.
11 How-Ran Guo, Ya-Ching Chang, Wen-Yu Yeh, Chun-wan Chen and Yueliang L Guo. Prevalence of Musculoskeletal Disorder among workers in Taiwan: A Nationwide Study. J Occup Health. 2004; 46(6):26-36.

12 Mesganaw Fantahun, Yekoye Abebe. Self-reported disease conditions among workers of the textile mill in Bahir Dar, Northwest Ethiopia. Ethiopian Journal of Health Development. 1999;13(2):151-56

13 Health and environment in sustainable development. (1997). Retrieved March 3, 2014, from Geneva: WHO. Occupational health: The work place. Careers Service website: http://www.who.int/peh/Occupational_health/occupational_health2.htm

14 Holtermann, A. et al. Retrieved March 3, 2012, from BMC Public Health, Career Service website: http://www.biomedcentral.com/1471-2458/10/120

15 Rahman, M.N.A., M.R.A. Rani, and M.J. Rohani, WERA: An Observational Tool Develop to Assess the Physical Risk Factors associated with WRMDs. Journal of Human Ergology, 2011, 40 (2), 19-36

16 Rahman, M.N.A., M.R.A. Rani, and M.J. Rohani, Investigation of work-related musculoskeletal disorders in wall plastering jobs within the construction industry. WORK: A Journal of Prevention, Assessment and Rehabilitation, 2012, 43 (4), 507-514

17 V. Vijaya Lakshmi & Deepika, J, Workplace Ergonomic Risk Assessment (wera) of Female Weavers. A London Journal of Research in Science: Natural and Formal,2020, 20(8), Compilation 1.0, 39-54

18 Waqar Naqvi, Physiotherapy in community health and rehabilitation, Jaypee brothers' medical publishers,2011

19 Anatomy and physiology of the ear – health encyclopedia website https://www.urmc.Rochester.edu.com

20 Earache – ear, nose, and throat disorders-MSD Manuals website https://www.msdmanuals.com