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PREVALENCE OF MUSCULOSKELETAL DISCOMFORT IN WRIST AND FINGERS AMONG FABRIC DRESS CUTTERS

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ABSTRACT

Background: Fabric dress cutting is a physically demanding activity in the garment industry, involving repetitive wrist and finger movements under poor ergonomic conditions. These contribute to musculoskeletal discomfort, particularly in the hands. The Indian subcontinent, with its large textile workforce, reports a high prevalence of Cutting-Related Musculoskeletal Disorders (CRMSDs).

Objective: To assess the prevalence of musculoskeletal discomfort in the wrist and fingers among fabric dress cutters and identify contributing ergonomic and occupational factors**.**

Methods: A non-experimental, cross-sectional study was conducted among 100 fabric dress cutters from textile shops in Chengalpattu district. Participants were selected through convenient sampling with one year of experience and 8 hours working per day . Data were collected using the Cornell Musculoskeletal Discomfort Questionnaire, focusing specifically on wrist and finger regions.

Outcome Measure: Prevalence of musculoskeletal discomfort was measured through self-reported pain frequency, intensity, and its interference with daily activities. Discomfort levels in specific hand regions were analyzed using descriptive statistics**.**

Results:79.2% of participants reported discomfort, with the right hand showing greater symptoms particularly in Area E (35.11%) and Area C (26.90%) due to dominant hand overuse. The left hand showed lower discomfort, with Area A (21.54%) being the most affected. Contributing factors included poor ergonomics, prolonged static posture, and lack of ergonomic training.

Conclusion: There is a high prevalence of CRMSDs among fabric dress cutters, especially in the dominant hand. Ergonomic interventions, training in posture, and preventive strategies are urgently needed to enhance worker health and productivity.

KEYWORDS: Fabric dress cutters, Musculoskeletal discomfort, Wrist pain, Cornell questionnaire, Cutting related musculoskeletal disorder

INTRODUCTION

Musculoskeletal disorders (MSDs) are a major cause of long-term disability and illness, leading to functional limitations and increased expenditure on healthcare and social resources (1,4,9). These disorders arise due to various factors, among which work-related musculoskeletal disorders (WMSDs) are the most prominent. WMSDs are primarily caused by repetitive strain, awkward posture, and prolonged work demands, affecting muscles, tendons, ligaments, joints, peripheral nerves, and blood vessels (1,2,3,4).

WMSDs are influenced by both physical and psychosocial factors. Physical factors include repetitive movements, forceful exertions, and sustained postures on parallel the psychosocial factors such as occupational stress, reduced coping ability, and decreased focus further exacerbate muscle tension and discomfort (8,9,10,11). Common clinical conditions associated with WMSDs include tendonitis of the shoulder, elbow, and wrist, as well as low back pain, with prevalence varying across demographic factors such as age, sex, and occupation (3,4).

Globally, WMSDs account for approximately 32% of occupational injuries according to the US Bureau of Labor Statistics (2014). In India, the prevalence of WMSDs is significantly higher, estimated at around 76% (4). Regional studies in Tamil Nadu report that approximately 32% of workers in large-scale industries and 43.9% in small-scale industries experience musculoskeletal symptoms in the garment sector (5). Globally, the prevalence of WMSDs among garment workers ranges from 15.5% to 92% (6), while in India it is reported to be approximately 70%–72.2% (4,7).

Fabric dress cutting is a precision-based task requiring meticulous control and continuous muscle effort. Workers utilize tools such as scissors, manual cutters, or electric cutting machines, which demands repetitive and sustained use of the hands, wrists, and shoulders. Due to inadequate rest breaks, forceful exertions while cutting thick fabrics, prolonged static postures, time pressure, and high production demands, fabric dress cutters are at a

heightened risk of developing musculoskeletal disorders (2,3,12). Improper posture, poor cutting techniques, and lack of ergonomic awareness further contribute to repetitive strain injuries, leading to cutting-related musculoskeletal disorders (CRMSDs). Studies indicate that both novice and experienced cutters are vulnerable to such conditions (6,12).

WMSDs are closely aligned with global public health and occupational safety priorities, particularly Sustainable Development Goal (SDG) 3, which focuses on ensuring healthy lives and promoting well-being, and SDG 8, which emphasizes safe working environments and productive employment.

Several studies support the association between repetitive occupational tasks and musculoskeletal disorders. Hasan et al. (2023) reported a high prevalence of MSDs among Bangladeshi garment workers due to repetitive movements and awkward postures. Similarly, Khanam et al. (2021) identified that more than 55% of female embroidery workers in India experienced wrist pain due to prolonged static wrist positions and repetitive hand activities. Maurya et al. (2020) highlighted the occurrence of De Quervain's tenosynovitis among tailors due to repetitive wrist and thumb movements. Kanniappan and Palani et al (2020) also reported significant wrist and finger pain among sewing machine operators due to repetitive occupational tasks. These findings provide strong supporting evidence for similar risks among fabric dress cutters.

Despite extensive research on WMSDs in textile workers, most studies focus on generalized musculoskeletal discomfort involving multiple body regions such as the neck, shoulders, and lower back (4,6,12). Limited research has specifically examined discomfort in the wrist and fingers, which are the primary anatomical regions involved in fabric cutting tasks. Early symptoms such as wrist and finger pain often represent the initial stages of musculoskeletal disorders if it is left unnoticed it may lead to to chronic conditions and long-term functional disability.

Therefore, there is a need for focused investigation needed on the prevalence and severity of wrist and finger discomfort among fabric dress cutters. Addressing this gap can facilitate early identification of occupational risk factors and support the development of targeted ergonomic interventions aimed at reducing long-term disability.

This study addresses these gaps by utilizing the Cornell Musculoskeletal Discomfort Questionnaire (CMDQ) to provide a detailed, site-specific analysis of discomfort among fabric cutters in the Chengalpattu district. By comparing the prevalence in dominant and non-dominant hands across multiple anatomical regions, this research aims to establish a foundational dataset for developing precision ergonomic interventions and biomechanically optimized tool designs to reduce occupational strain and improve worker health outcomes.

METHODOLOGY

Ethical consideration:

This study was approved by the SRM Institutional of Ethical committee IEC No: ST0125-2138 on 05.03.2025). A detailed orientation of the survey objectives, procedures, possible outcomes were explained prior to the signing of the informed consent form. This study was conducted in accordance with the Declaration of Helsinki.

Study type and Study setting.

It is an observational cross-sectional study conducted from march 2025 to June 2025, in Potheri, Guduvancherry and urapakkam. This location comes under the village and town panchayat category under Chengalpattu district. According to 2011 census the population ratio in urapakkam, Guduvancherry and potheri is about 73,220, In this locality around 27- 30 registered fabric dress manufactures shops are situated with around 5- 7 people working as dress cutters.

Sample size and Sampling method

A sample size calculation was performed to determine the number of fabric dress cutters required for the study. Assuming a finite population of 100 fabric dress cutters in the selected area, the sample size was calculated using a confidence level of 95% and a margin of error of 5%. Considering maximum variability ($p = 0.5$) to ensure adequate representation, the initial sample size was estimated using the standard formula for proportions. After applying the finite population correction, the final sample size was determined to be approximately 80 participants. This sample size is considered sufficient to provide reliable and generalizable results for the target population of fabric dress cutters. In these two types of sampling method was used, snowball and Convenient sampling method according in which the participants were recruited.

Participants Criteria

The participants of aged 18 years and above were recruited to ensure the legal age consent and occupational maturity. The participants of both men and women with minimum of 1 year of experience and 8 hours cycle of work were recruited in order to ensure the participants are exposed to prolonged exposure repetitive hand activities and reducing variability due to short term employment adaptation. The participants with a history of recent hand injuries, underwent any recent surgical procedure involving hand, wrist were excluded. The participants diagnosed with any neurological disorders which could independently affect hand function, sensation, or pain perception and thereby introduce bias into the study findings.

Data collection procedure.

The researcher recruited the participants according to the inclusion and exclusion criteria, then the participants were briefly explained about the need and procedure of the study. The data were collected was carried out through in-person, face-to-face interactions with the participants, ensuring direct communication and clarification of responses. The participants demographic data was collected which consist of Age, gender, years and hours of

working. Participants who self-reported the presence of pain during screening were included for subsequent assessment. The intensity of pain, interference of pain in work was analyzed using the Cornell musculoskeletal hand questionnaire.

RESULT

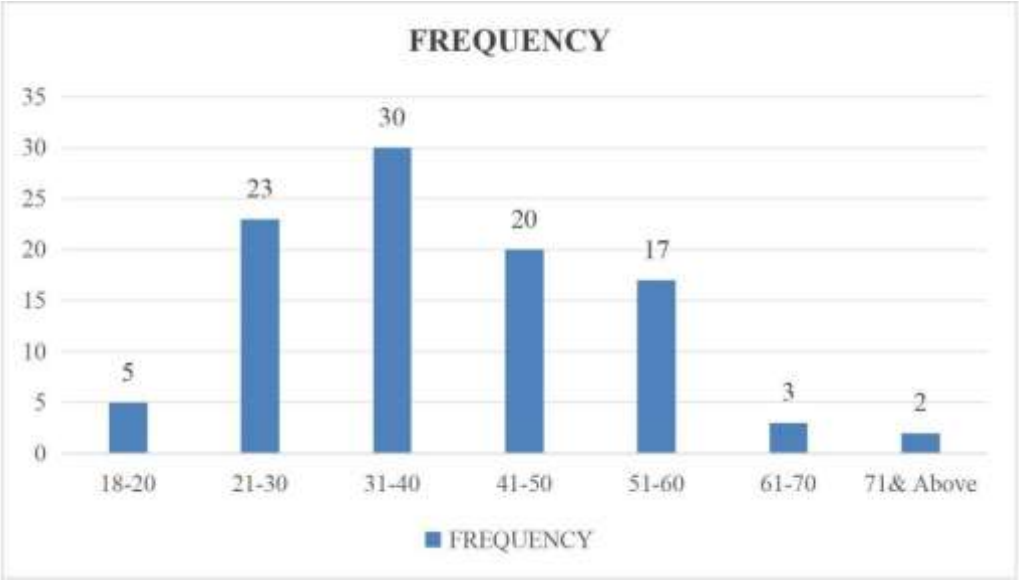
Table I. Table illustrates the frequency of participants age group

Age group	Freq	%	Mean ± SD	Min- Max
18–20	5	5%	39.47 ± 12.06	**18-75**
21–30	23	23%		
31–40	30	30%		
41–50	20	20%		
51–60	17	17%		
61–70	3	3%		
71 & Above	2	2%		
Total	100	100%		

Table I shows the frequency of participants age group Age 18-20 is 5%, Age 21-30 is 23%, Age 31-40 is 30%, Age 41-50 is 20%, Age 51-60 is 17%, Age 61-70 is 3%, Age 71& above is 2%.

Bar diagram I

Bar diagram illustrates the frequency of participant's age



Bar diagram I shows the frequency of participants age group Age 18-20 is 5%, Age 21-30 is 23%, Age 31-40 is 30%, Age 41-50 is 20%,
Age 51-60 is 17%, Age 61-70 is 3%, Age 71& above is 2%.

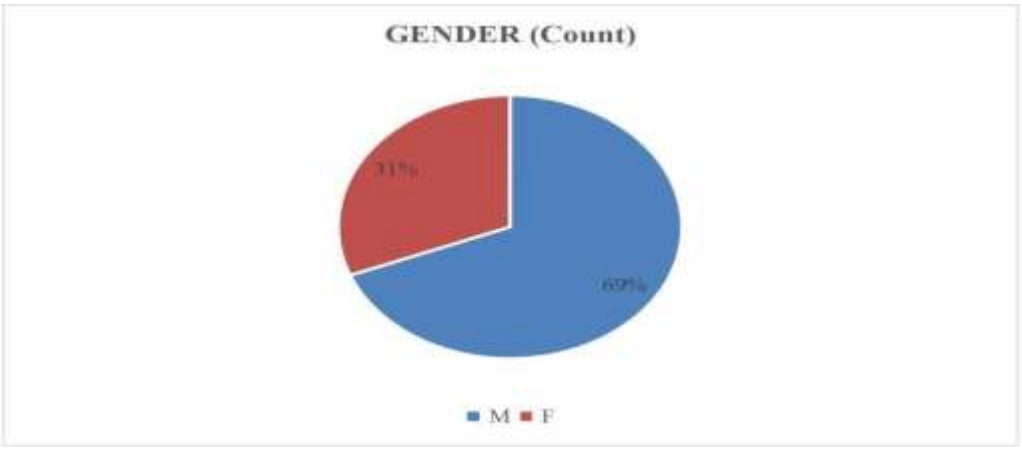
Table II. Table Illustrates the Gender Frequency

Gender	Freq	%
Male	69	69
Female	31	31

Total	100	100

Table II shows the gender frequency of the participants in which men are 69% and women are 31%.

Pie Diagram I
Pie Diagram Illustrates the Gender Frequency



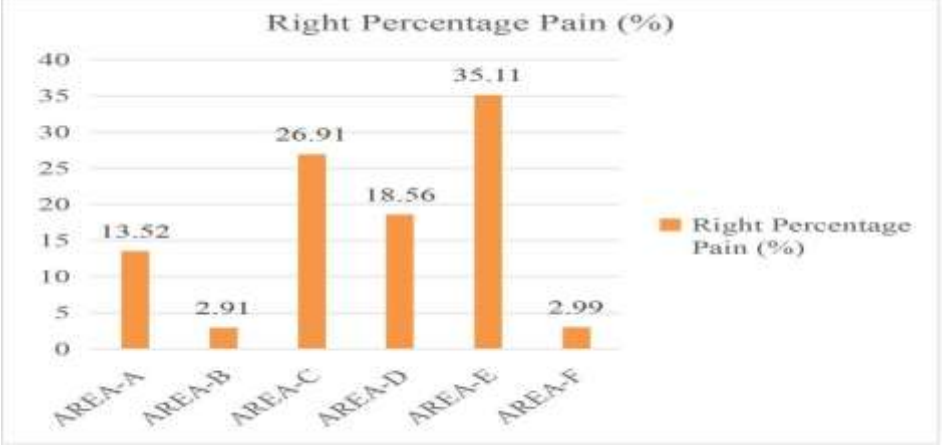
Pie Diagram I shows the gender frequency of the participants Men 69% and women 31%.

Table III. Table Illustrates the Prevalence Rate of Pain in Right Hand Area

Right Hand Area	Mean	Prevalence of Discomfort %
Area-A	3.37	13.52
Area-B	0.72	2.90
Area-C	6.7	26.90
Area-D	4.62	18.55
Area-E	8.75	35.11
Area-F	0.74	2.98

Table III shows that prevalence of discomfort % in right hand, Area A is 13.52% Area B is 2.90% Area C is 26.90% Area D is18.55 Area E is 35.11 Area F is 10.59%.

Bar diagram II



Bar Diagram Illustrates the Prevalence Rate of Pain in Right Hand Area

Bar Diagram II shows that prevalence of discomfort % in right hand, Area A is 13.52% Area B is 2.90% Area C is 26.90% Area D is 18.55 Area E is 35.11 Area F is 10.59%.

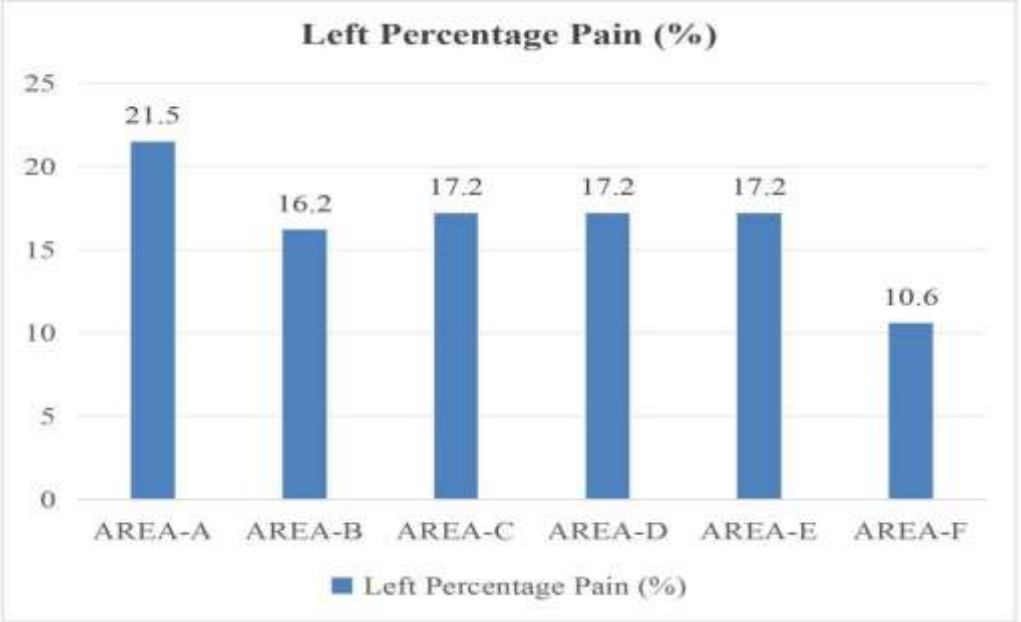
Table IV. Table Illustrates the Prevalence Rate of Pain in Left Hand Area

Left Hand Area	Mean	Prevalence of Discomfort %
Area-A	0.60	21.54
Area-B	0.45	16.15
Area-C	0.48	17.23
Area-D	0.48	17.23
Area-E	0.48	17.23
Area-F	0.30	10.59

Table IV shows that prevalence of discomfort % in left hand, Area A is 21.54% Area B is 16.15% Area C, D & E is 17.23% Area F is 10.59%.

Bar Diagram III

Bar Diagram Illustrates the Prevalence Rate of Pain in Left Hand Area



Bar Diagram III shows that prevalence of discomfort % in left hand, Area A is 21.54% Area B is 16.15% Area C, D & E is 17.23% Area F is 10.59%.

Table V Table Illustrates the Prevalence Rate of Pain in Right & Left Hand Area

Area	Right Hand	Left Hand
Area -A	13.52	21.54
Area-B	2.90	16.15
Area-C	26.90	17.23

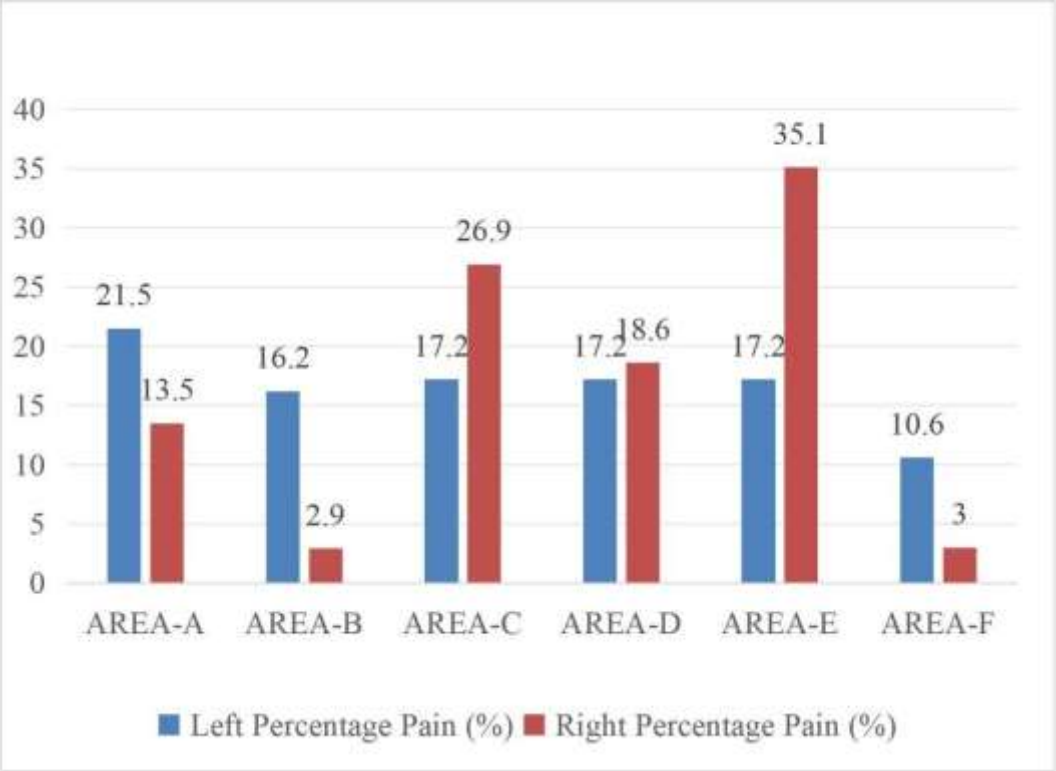
Area-D	18.55	17.23
Area-E	35.11	17.23
Area-F	2.98	10.59

Table V shows that prevalence of pain % comparison between both right hand, Area E has highest discomfort is 35.11% and for left hand Area A is 21.54%.

Bar Diagram IV

Bar Diagram Illustrates the Prevalence Rate of Pain in Right & Left Hand Area

Bar Diagram IV shows that prevalence of pain % comparison between both right hand , Area E has highest discomfort is 35.11% and for left hand Area A 21.54%.



DISCUSSION

This study sought to examine the prevalence of musculoskeletal discomfort in the wrist and fingers among fabric dress cutters, a population known for repetitive manual tasks and prolonged static postures. Demographic analysis showed that of the participants between 18- 20 years of age were 5 %, 21- 30 years of age were 23 %, 31- 40 years of age were 30 %, 41 – 50 years of age were 20 %, 51- 60 years of age were 17 %, 61- 70 years of age were 3 %, 2 % of the participants were 71 years of age and above, the above analysis clearly depicts that workforce were mostly middle aged exposed to chronic stress. The gender break down also states that 69% of them were men and 31 % of them were women.

The results indicate that Area E showed the highest level of right-hand discomfort (35.11%), followed by Area C (26.90%) Area A (13.52%) and Area D (18.55%). This pattern is consistent with prior literature highlighting that repetitive strain, awkward wrist angles, and forceful exertion during fabric cutting increase the risk of cumulative trauma disorders (CTDs) in the upper limbs. These findings reflect prior research indicating that right-hand dominance significantly contributes to unilateral overuse injuries in precision- hand activities. activities, such as textile production. The results states that participants significantly report pain in their right hand as they use dominant hand too often and operate in poor ergonomic conditions.

In contrast, left-hand discomfort remained considerably lower, with the highest prevalence in Area A (21.54%) and the lowest in Area F (10.59%). This asymmetry underscores the load imbalance between dominant and non- dominant limbs during cutting tasks and further reinforces the role of task- specific biomechanics in musculoskeletal strain development.

The majority of participants reported symptoms such as pain, numbness, and difficulty in performing tasks requiring hand grip and wrist movement- particularly after prolonged periods of cutting. Several occupational risk factors were identified through observational data and participant feedback. These include: Poor workstation ergonomics, especially inappropriate table height. Lack of ergonomic training. Inadequate rest breaks. Forceful hand movements required to cut thick or layered fabric. These factors align with known contributors to Cutting-Related Musculoskeletal Disorders (CRMSDs) and echo the ergonomic challenges described in the reference study on upper limb dysfunction among repetitive hand tool users.

The results of this study go in line with the article of Hasan **MA et al., (2023)** stated 79.2% of fabric dress cutters reported musculoskeletal discomfort, consistent with earlier findings in similar occupational groups. This high prevalence suggests a need for interventions aimed at risk reduction and prevention[7]. Musculoskeletal disorders (MSDs) affect the muscles, tendons, ligaments, and peripheral nerves and are commonly associated with repetitive work-related activities. During peak festival seasons, cutters are often required to perform prolonged and excessive work, leading them to adopt comfortable but non-neutral postures. These sustained awkward positions place excessive stress on the flexor and extensor muscle groups, resulting in muscle fatigue, inflammation, and overuse injuries. Consequently, workers may develop tendinopathies such as tenosynovitis and carpal tunnel syndrome, particularly in the dominant hand. Chronic recurrent strain increases the pressure inside muscles, which can slow down blood flow and nerve conduction which cause numb, tingle, or lose your ability to move your fingers. Micro-injuries build up over time, causing soft tissues and joint capsules to break down, resulting in pain and stiffnesses worse.

The biomechanical process of cutting fabric demands repetitive and strong wrist flexion and extension, sometimes in unsupported postures. The utilization of instruments such as rotary cutters or scissors without ergonomic design generates stress on the MCP and IP joints. The wrist, when not positioned neutrally, experiences constant stress that can end up in compressive neuropathies, especially median nerve compression. Moreover, extended static positions restrict muscle perfusion and oxygen delivery, leading to fatigue and pain. Prolonged holding during cutting tasks primarily activates the flexor muscles, leading to an imbalance with the extensors and increasing the risk of overuse injuries. Poor recovery worsens this imbalance, raising the possibility of strain and musculoskeletal discomfort.

Santos W et al. (2005) states that the crucial role of ergonomic awareness and workplace arrangement in reducing the incidence of CRMSDs[10]. Inappropriate table height, poor wrist support, and the lack of anti-fatigue techniques add to the bio-mechanical strain experienced by fabric cutters. Basic ergonomic modifications, such adjustable tables, cushioned grips, and tool redesign, can significantly reduce hand and wrist pain. Regular training programs must be implemented to instruct employees on proper posture, tool usage, and stretching techniques. Ergonomic based ecofriendly equipment can significantly decrease the symptoms and have an active plan for worker well-being

CONCLUSION

This study concludes that 79.2 % of participants reported discomfort in wrist and fingers, in which the right hand was predominantly affected due to repetitive cutting actions, hand dominance, and prolonged static postures. On contrast, left- hand discomfort was minimal in comparing to right hand, with the highest prevalence recorded in Area A (21.54%). This study also concludes that occupational hazard is significantly increasing due to lack of ergonomic awareness. Physiotherapists play a crucial role in prevention; however, preventive measures are often underutilized, this study puts forward a request among physiotherapist to conduct periodic ergonomic camp as a part of their outreach community activity from low to high physical demand industries sector in enhancing their awareness on work related musculoskeletal disorder, work life balance in creating a harmonious work place.

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This research was self-funded by the authors. No external financial supper was received for the conduct of the study.

Conflct of interest We do not have any conflict of interest. Data availability statement We confirm that the data supporting the findings of the study will be shared upon reasonable request.

Statement: The data are not publicly available due to ethical restrictions; however, anonymized data may be made available from the corresponding author upon reasonable request and subject to ethical approval

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