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Prevalence Of Upper Extremity Musculoskeletal Disorders And Ergonomic Risk Factors Among Kauna Handicraft Workers

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Abstract

Background: Kauna handicraft industries are a well-known small-scale industry in Manipur, functioning within the state's unorganized sector. Many workers in this field spend long hours in uncomfortable postures at partially constrained workstations.

Objective: To assess the relationship between upper extremity musculoskeletal disorders and exposure to ergonomic risk factors among handicraft workers.

Materials and Methods: A detailed survey on discomfort was carried out using a modified Nordic questionnaire to assess the prevalence of upper limb musculoskeletal disorders. Postural analysis was conducted through the Rapid Upper Limb Assessment (RULA) method.

Results: The analysis indicated that musculoskeletal disorders (MSDs) in the upper extremities were a major concern among Kauna handicraft workers, as their tasks involved highly repetitive movements. The distribution of Rapid Upper Limb Assessment (RULA) scores for risk factor exposure revealed that 80% of female Kauna workers faced a high risk and required intervention. Additionally, the majority of participants reported experiencing pain in the neck and shoulders.

Conclusion: The observation and analysis of the results determined that the health of Kauna handicraft workers was greatly affected by poor body posture and excessive workload. The study found that the neck and shoulders were the most commonly affected areas among female Kauna handicraft workers.

Keywords: Musculoskeletal disorder, Occupational hazard, Upper Extremity

INTRODUCTION

Handicraft manufacturing stands as a prime example of an occupation prone to musculoskeletal disorders (**Mukhopadhyay and Srivastava, 2010; Zaheer and Khalid, 2012).** Kauna handicraft industries represent a vital part of Manipur's rich cultural heritage and thriving small-scale industries. Kauna, a type of water reed found abundantly in Manipur, is used to craft a variety of eco-friendly products, including mats, baskets, bags, and cushions. This traditional craft has been passed down through generations and remains an essential source of livelihood for many artisans, particularly in rural areas. Despite its cultural and economic significance, the Kauna handicraft industry operates largely within the unorganized sector, where artisans work in small, informal setups with minimal infrastructural support. Most workers engage in long hours of intricate weaving and crafting in partially constrained workstations, often sitting on the floor or in uncomfortable postures. The lack of ergonomic work environments and proper seating arrangements leads to physical strain and health concerns over time **(Meena et al, 2012; Das et al., 2020)**. Many artisans suffer from musculoskeletal issues, fatigue, and posture-related discomfort due to prolonged sitting and repetitive hand movements.

This study hypothesized that Upper extremity musculoskeletal disorders among handicraft workers have significant association with Exposure to Ergonomic risk factors. The objective of this study was to determine the association of Upper extremity musculoskeletal disorders and Exposure to Ergonomic risk factors among woman kauna handicraft workers.

METHODS

Study Design and Participants

This study was conducted among **160 Kauna handicraft workers** from **Imphal East and Imphal West districts** of Manipur. The research aimed to assess the ergonomic risks associated with their working postures, focusing on musculoskeletal disorders prevalent among these workers. A **cross-sectional study design** was adopted, wherein data were collected using structured questionnaires and direct observations of participants at their workstations.

Data Collection Methods

Data collection was carried out through **two primary methods**:

1. **Structured Questionnaire**
   A structured questionnaire was designed to gather comprehensive information about the workers' demographics and work-related factors. The questionnaire was divided into two sections:
   - **Part I:** Focused on **socio-demographic characteristics** and various **work-related factors** (task duration, nature of work, and breaks taken).
   - **Part II:** Included the **Nordic Musculoskeletal Questionnaire (NMQ)** to assess the prevalence and frequency of upper limb musculoskeletal disorders among workers. The

NMQ is a widely used tool for identifying musculoskeletal symptoms in different body regions over specified timeframes (e.g., past week, past year).

2. **Direct Observations and Postural Analysis**
   Direct observation of workers was conducted to assess their **postural ergonomics** using the **Rapid Upper Limb Assessment (RULA)** tool. This method allowed for real-time assessment of workers' body postures while engaged in various Kauna handicraft activities.

Postural Analysis Using Rapid Upper Limb Assessment (RULA)

The **RULA method** was used to evaluate **postural loading and biomechanical factors** affecting the entire body, with an emphasis on the **upper limb, neck, and trunk**. RULA is a **pen-and-paper observational method**, offering an efficient way to screen **ergonomic risks** in the workplace.

Procedure for RULA Assessment

1. **Observation of Work Postures**
   - Workers were observed from a **sagittal view** (side profile).
   - The postures **maintained for the longest duration** during work were considered for analysis.
   - Angles of joint movements were measured using a **goniometer** to ensure precision.
2. **Scoring System in RULA**
   - **Upper Limb Assessment (Posture Score A)**:
     - Postures of the **upper arm, lower arm, forearm, and wrist** were analyzed and assigned scores based on RULA guidelines.
   - **Neck, Back, and Leg Assessment (Posture Score B)**:
     - The postures of the **neck, back, and legs** were observed, scored, and categorized.
   - **Additional Scores**:
     - **Static and repetitive loading**, **force exerted**, and **load-handling factors** were also assessed and included in the final ergonomic risk score.
3. **Final Risk Score and Interpretation**
   - The scores obtained from Posture Score A and Posture Score B were **summed up** to generate the **final RULA score**.
   - This score indicated the **level of ergonomic risk** and determined whether immediate or long-term corrective measures were required.

Reliability of RULA Assessment

The **RULA tool** has demonstrated **high inter-rater reliability**, making it a **valid and reliable** method for assessing ergonomic risk factors in occupational settings. Its ability to identify posture-related strain helps in making informed decisions regarding necessary **interventions and ergonomic improvements** for Kauna handicraft workers.

By utilizing a combination of **questionnaire-based surveys** and **direct postural observations**, this study provided valuable insights into the **ergonomic challenges** faced by Kauna handicraft artisans and the need for workplace modifications to mitigate associated musculoskeletal risks.

RESULTS AND DISCUSSION

Table 1: General Profile of Women Kauna Handicraft Workers

N=160

S. No.	Parameters	Frequency	Percentage (%)	Mean ± SD
1.	**Age**			
	≤ 30	17	10.62	
	31-45	49	30.62	2.65 ± 0.88
	46-60	67	41.87	
	61 and above	27	16.87	
2.	**Educational status**			
	Illiterate	47	29.37	
	primary education	79	49.37	1.96 ± 0.80
	secondary education	27	16.87	
	graduation and above	7	4.37	
3.	**BMI**			
	Underweight	27	16.87	
	Normal	71	44.37	2.21 ± 0.71
	Overweight	62	38.75	

Table 1 depicted the following:

Age Distribution: The majority (**41.87%**) were aged **46-60 years**, followed by **31-45 years (30.62%)**. The youngest group (≤30 years) had the least representation (**10.62%**). The mean age was **2.65 ± 0.88** (categorically coded).

Educational Status: Nearly half (**49.37%**) had **primary education**, while **29.37%** were **illiterate**. Only **4.37%** had education beyond secondary level, with a mean education level of **1.96 ± 0.80**.

BMI Classification: Most workers had a **normal BMI (44.37%)**, while **38.75%** were **overweight** and **16.87%** were **underweight**. The mean BMI was **2.21 ± 0.71**.

The findings suggest that **middle-aged women with lower education levels dominate the workforce**, with many being overweight or underweight.

Socio Economic Status of Woman Kauna Handicraft Workers

The socio-economic status of women engaged in Kauna handicraft work varies across different economic strata. Notably, none of the workers belong to the upper high, high, or below-poverty-line (BPL) categories, suggesting an absence of extreme wealth or poverty within this group. The majority (60.63%) fall within the lower-middle class, indicating a modest economic position. Additionally, 22.5% are categorized as poor, reflecting financial challenges faced by a significant portion of workers. A smaller percentage (16.88%) belong to the upper-middle class, suggesting relatively better financial stability compared to the rest.

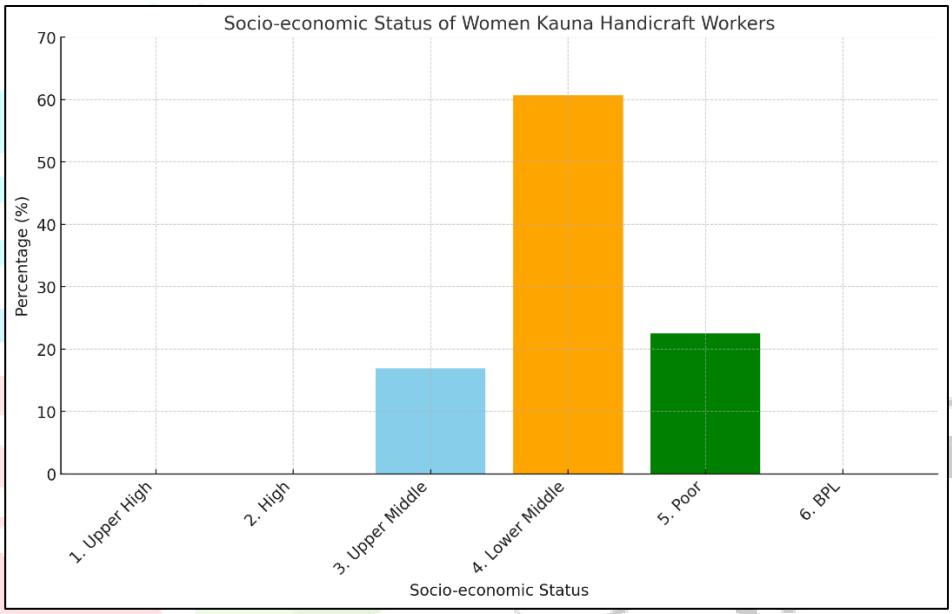

Figure 1: Distribution of Woman Kauna Handicraft Workers by Socio-Economic Status

Table 2: Distribution of respondents on the basis of self-reported prevalence of musculoskeletal pain/discomfort

N=160

		Yes f (%)	No f (%)
1.	**Neck**	131 (81.87%)	29 (18.12%)
2.	**Shoulder**	160 (100%)	_
3.	**Elbow**	_	160 (100%)
4.	**Wrist/hands**	_	160 (100%)
5.	**Upper back**	97 (60.62%)	63 (39.37%)
6.	**Lower back**	34 21.25	126 (78.75%)
7.	**Hips/thighs**	_	160 (100%)

8.	**Knees**	44 (27.5%)	116 (72.5%)
9.	**Ankles/feet**	_	160 (100%)

Table 2 presents the self-reported prevalence of musculoskeletal pain and discomfort among 160 women Kauna handicraft workers. The findings reveal a high prevalence of musculoskeletal discomfort, particularly in the shoulders, neck, and upper back, indicating significant ergonomic strain associated with their work.

- Shoulder pain was reported by all participants (100%), making it the most commonly affected area.
- Neck pain was also highly prevalent, with 81.87% of workers experiencing discomfort.
- Upper back pain was reported by 60.62% of the participants, further emphasizing postural strain.
- Lower back pain was less frequent, affecting 21.25% of workers.
- Knee pain was experienced by 27.5% of participants, suggesting potential strain from prolonged sitting or squatting positions.
- No workers reported pain in the elbows, wrists/hands, hips/thighs, or ankles/feet.

These results indicate that upper body musculoskeletal disorders are a major concern among Kauna handicraft workers, likely due to prolonged repetitive tasks, awkward postures, and inadequate ergonomic conditions. Immediate ergonomic interventions and posture modifications are recommended to reduce the high prevalence of discomfort and improve overall occupational health.

Table 3: Distribution of women kauna handicraft workers by RULA score

N=160

Part of the body	**RULA SCORE**							**Mean (SD)**
	1	**2**	**3**	**4**	**5**	**6**	**7±**	
Upper arms (%)	_	100	_	_	_	_	_	_
Lower arms (%)	7.5	90.62	1.87	_	_	_	_	1.94 ±0.30
Posture A score	_	_	16.875	83.125	_	_	_	3.83 ±0.37
Neck (%)	_	6.87	93.125	_	_	_	_	2.93 ±0.25
Trunk (%)	_	11.875	88.125	_	_	_	_	2.88 ±0.32
Legs (%)	_	100	_	_	_	_	_	
Posture Score B	_	_	_	19.37	80.62	_	_	4.80 ±0.39
Grand score (%)	_	_	_	_	_	16.87	83.12	**6.83 ±0.37**

The **RULA (Rapid Upper Limb Assessment) scores** presented in **Table 3** highlight substantial ergonomic risks among **women Kauna handicraft workers**. A significant **83.12% (133 cases)** recorded a **score of 7**, signaling **high-risk postures** that necessitate **immediate ergonomic intervention**. These results are consistent with previous studies on manual labor occupations. **Veisi et al. (2016)** observed similar findings among **Iranian hand-woven shoe-sole workers**, reporting **notable deviations** in **upper arm, neck, and trunk postures**, with an average **RULA score of 6.83 (SD 0.37)** and a **consistent leg posture score of 2**, indicative of **awkward working positions**.

CONCLUSION

This study highlights a significant association between upper extremity musculoskeletal disorders and ergonomic risk factors among women Kauna handicraft workers. The workforce is predominantly middle-aged, with low educational levels, and many are overweight or underweight. Socio-economically, most belong to the lower-middle class, with a notable portion facing financial challenges. A high prevalence of musculoskeletal discomfort was observed, particularly in the shoulders (100%), neck (81.87%), and upper back (60.62%), emphasizing severe ergonomic strain. RULA scores further indicate substantial ergonomic risks, with 83.12% scoring 7, necessitating urgent intervention. These findings underscore the need for ergonomic improvements, postural modifications, and occupational health interventions to enhance worker well-being and productivity.

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