International Journal of Community Medicine and Public Health
Jana D et al. Int J Community Med Public Health. 2026 May;13(5):2236-2245
http://www.ijcmph.com
pISSN 2394-6032 | eISSN 2394-6040

DOI: https://dx.doi.org/10.18203/2394-6040.ijcmph20261404

Original Research Article

Stitching through strain: a cross-sectional study on distribution and determinants of chronic musculoskeletal and ocular discomfort in rural Zari embroidery workers of West Bengal, India

Dipankar Jana[1]*, Shibani Datta[2], Madhumita Bhattacharyya[3], Bobby Paul[1], Sandipta Chakraborty[1]

[1]Department of Preventive and Social Medicine, All India Institute of Hygiene and Public Health, Kolkata, West Bengal, India
[2]Department of Biochemistry and Nutrition, All India Institute of Hygiene and Public Health, Kolkata, West Bengal, India
[3]Department of Maternal and Child Health, All India Institute of Hygiene and Public Health, Kolkata, West Bengal, India

Received: 26 November 2025
Accepted: 08 April 2026

***Correspondence:**
Dr. Dipankar Jana,
E-mail: dipankarmcdsa@gmail.com

ABSTRACT

Background: Zari embroidery supports many artisans but poses health risks, including musculoskeletal-disorders and ocular discomfort due to repetitive work. Workers experience chronic pain and eye strain, yet these health challenges receive limited attention. This study investigates the factors contributing to these health issues among zari workers in rural West Bengal, India.
Methods: This cross-sectional community-based study was conducted among 330 embroidery workers from March 2023 to January 2024. Cluster sampling selected 30 villages, followed by random selection of 11 participants per village. Data collection involved structured interviews and necessary instruments. Univariate and multivariable logistic regression identified the determinants of chronic musculoskeletal and ocular discomfort.
Results: Out of 330 participants, 271 (82.1%) reported chronic musculoskeletal discomfort, with low back pain (69.7%) and neck pain (57.5%) being the most common sites. Key modifiable determinants of chronic musculoskeletal discomfort included psychological stress (aOR=1.03, p<0.001), longer work duration (uOR=2.68, p=0.02), and extended working hours (aOR=8.04, p<0.001) whereas, for chronic ocular discomfort, reported by 189 (57.2%) participants, where long work duration (uOR=2.32, p=0.01), working at a stretch (aOR=2.20, p=0.02), and night-time work (aOR=4.20, p=0.01) revealed as major determinants.
Conclusions: The study reveals a high prevalence of musculoskeletal and ocular discomfort among zari workers highlighting the urgent need for improved occupational health policies and ergonomic interventions.

Keywords: Musculoskeletal disorders, Chronic musculoskeletal discomfort, Chronic ocular discomfort, Low back pain

INTRODUCTION

Zari embroidery, a centuries-old craft originating in India, involves the use of metallic threads traditionally gold or silver, but now often replaced with synthetic alternatives to create intricate patterns on fabric. This artisanal work is deeply embedded in the cultural heritage of India, particularly in regions like West Bengal, where it plays a vital role in the local economy.

Zari embroidery is not only a source of livelihood for thousands of artisans in rural areas but also a symbol of the rich artistic traditions of the region.[1,2]

The craft of Zari embroidery requires remarkable skill and precision. Artisans, often working in small, dimly lit workshops or even from their homes, spend long hours meticulously stitching elaborate designs onto fabrics used in garments such as sarees, lehengas, and other traditional attire. The intricate nature of this work demands a high level of concentration and dexterity, leading to significant physical strain over time.[3] Despite its cultural and economic significance, the occupational health hazards associated with zari embroidery have been largely overlooked, especially in rural areas where access to healthcare and ergonomic facilities is limited.[4]

Musculoskeletal disorders (MSDs) are prevalent among workers engaged in zari embroidery due to the repetitive and physically demanding nature of the work. Artisans typically work in static positions, often seated on the floor hunched over their workstations for extended periods.[4,5] This posture, combined with repetitive hand and wrist movements, places significant stress on the musculoskeletal system, leading to chronic pain and discomfort in the back, neck, shoulders, and hands.[5,6]

In addition to MSDs, ocular discomfort is another significant health concern for zari embroidery workers. The craft requires intense visual focus on small, detailed patterns, often in poor lighting conditions. This constant visual strain can result in a range of eye-related problems, including headaches, redness, watering, and eye fatigue. Over time, these issues can lead to more serious visual impairments, further compromising the artisans' ability to work and affecting their overall quality of life.[7]

Although, previous research has highlighted various occupational health concerns among zari workers, still there is a notable gap in understanding the specific factors contributing to chronic musculoskeletal and ocular discomfort across both rural and urban settings in the country. Given the heightened vulnerability of rural workers due to limited healthcare access and a lack of ergonomic interventions, we have chosen to focus on the rural setting to better assess and address these critical health challenges. Thus, this cross-sectional study seeks to fill this gap by examining the distribution and determinants of chronic musculoskeletal and ocular discomfort among zari embroidery workers in a rural area of West Bengal.

METHODS

Study type and setting

This community-based cross-sectional study was conducted in the Uluberia-I block of Howrah district, West Bengal from March 2023 to January 2024. Uluberia-I comprises 71 villages with a population of 215,392.[8]

During the pilot phase, Ostagars (who supplied raw materials to workers) revealed that zari workers are concentrated in 52 of these villages, with 158,295 people.

Study population

All zari workers residing in the study area who were permanent residents, aged over 14 years, and had at least one year of experience were included. Those who were sick, bedridden, or unable or unwilling to respond were excluded.

Sampling

The sample size was calculated using the formula given.[9]

$$Sample\ size = Z^2 \times P \times Q/L^2$$

Where Z=1.96 (95% confidence level), P=87% (prevalence of low back pain among embroidery workers, the highest reported musculoskeletal morbidity in rural West Bengal), Q=1-P=0.13, and L=5% absolute error.[10]

$$Sample\ size\ (n) = (1.96^2 \times 0.13 \times 0.87)/(0.05^2) = 174$$

Applying the cluster sampling design effect (1.8), the adjusted sample size was 314. To account for non-compliance, 5% more participants were added, resulting in a final sample size of 330. With 30 clusters, 11 participants per cluster were selected (330÷30=11).

In the first stage, villages (clusters) were the primary sampling units. All 52 villages were listed with their population sizes and cumulative population. Using the probability proportional to size (PPS) technique, 30 villages were selected. In the second stage, a line listing of all zari workers in each selected village was prepared with help from the Ostagars. From each village list, 11 participants were randomly selected and interviewed at their workplace to reach required sample size (Figure 1).

Operational definition

Chronic musculoskeletal discomfort

It refers to injuries or disorders affecting muscles, nerves, tendons, joints, cartilage, and spinal discs, causing pain, sprains, or strains in areas such as the back, neck, shoulder, elbow, wrist, hip, knee, and ankle.[11] If symptoms persist for at least one month cumulatively over the last 12 months considered positive for chronic musculoskeletal discomfort.

Chronic ocular discomfort

It is describing as undesirable eye conditions, including difficulty in sight, redness, watering, blurred vision, eye strain, headaches, and a foreign body sensation.[12] If symptoms persist for at least one month cumulatively over the last 12 months considered positive for chronic ocular discomfort.

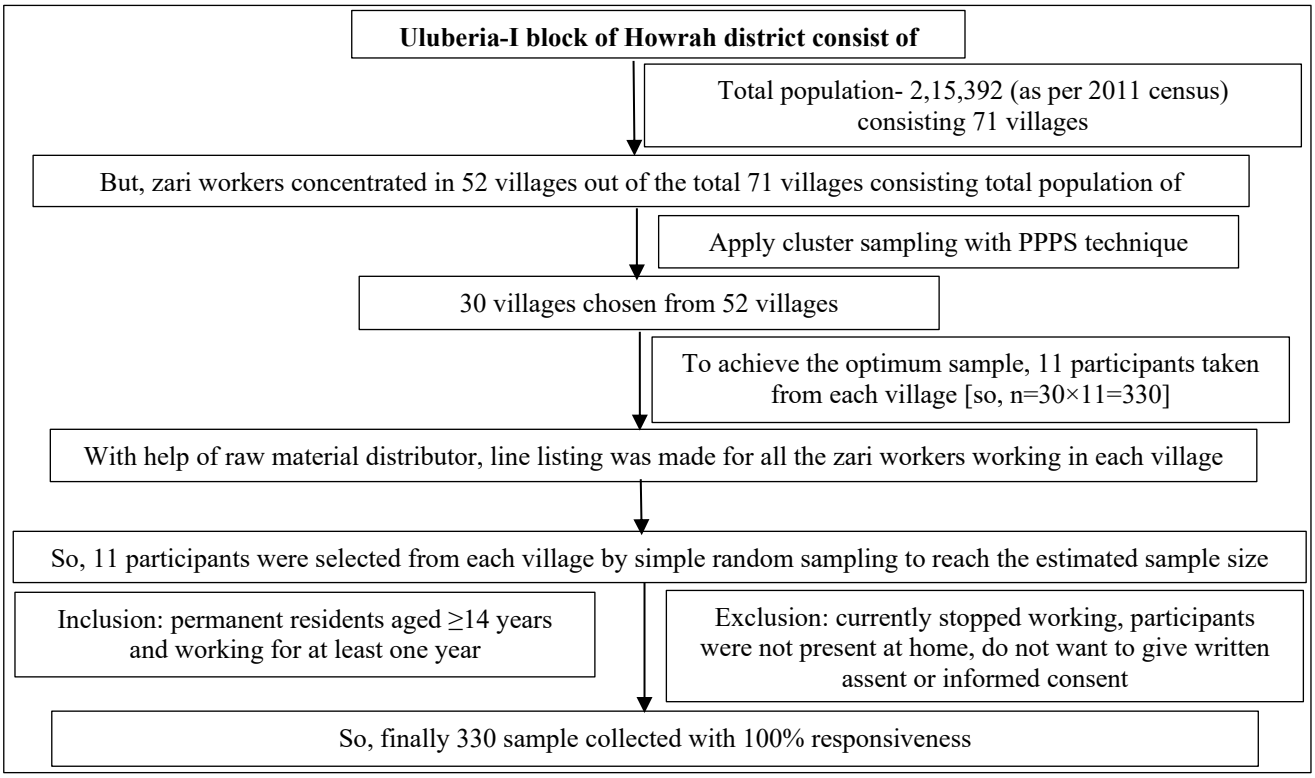

Figure 1: Flow diagram of the selection of the study participants.

Visual impairment

It is classified by the ICD-11 (2018) into distance and near vision impairment.

Distance vision impairment is categorized as mild if visual acuity is worse than 6/12–6/18, moderate if worse than 6/18–6/60, severe if worse than 6/60–3/60, and blindness if worse than 3/60. Near vision impairment refers to near visual acuity worse than N6.[13]

Joint family

Apart from the father, mother, and their son/daughter, if the family composition is made of grandfather or grandmother or both, consider it as a joint family

Socioeconomic scale

The modified BG Prasad scale was used to categorize the participants into class I–V. Further classes I-II were clubbed into upper, III as middle, and IV-V as a lower socioeconomic class.[14]

Body mass index (BMI)

It is calculated as weight in kg divided by height in meters^2 and categorized per the WHO classification: underweight (<18.5), normal (18.5–24.9), overweight (25.0–29.9), and obese (≥30).

Education

The number of years of completed schooling was recorded. Participants' education levels were categorized as non-formal education (0 years), below secondary (up to class 9), and secondary and above (class 10 or higher).

Substance use

Participants currently using any type of substance, including chewing tobacco, smoking tobacco, alcohol, or ganja, were recorded under substance use.

Housing condition

It is categorized based on the type of building: pucca (cement roof, floor, and walls), kuccha (mud and straw), or semi-pucca (a combination of both).

Workplace surroundings

Workplace surroundings were classified as "damp" if the area was wet or dark, otherwise as "dry."

Lighting

It is considered adequate if, during daylight, participants could read or see clearly in two-thirds of a room. This was assessed along with artificial lighting.[15]

Ventilation

considered adequate if the workspace had sufficiently large windows and doors (at least 1/3 of floor area) and windows opening to outdoor spaces with properly functioning artificial ventilation (e.g., ceiling or standing fans).

Perceived stress scale (PSS-4)

measured perceived stress over the past month, with higher scores indicating greater stress. Participant responded to four questions reflecting their recent thoughts and feelings.[16]

Data collection

A face-to-face interview was conducted using a predesigned, pretested, structured questionnaire (in Bengali) that included the following components.

Questions related to participants' demographic details, socioeconomic status, and behavioral patterns.

Environmental conditions (observation facilitated by an interview checklist). This included the type of house, surrounding environment, preferred place of work, lighting, and ventilation.

Working profile covered work experience, daily working hours, consecutive working hours without breaks, and night shifts.

Occupation-related health hazards included the modified Nordic musculoskeletal questionnaire (NMQ), validated by experts, assessed musculoskeletal pain in nine regions over the past 12 months, defining chronic discomfort as symptoms lasting at least one cumulative month; and an open-ended questionnaire assessed participants perceived ocular discomfort, classified as chronic if reported for at least one cumulative month within the past 12 months.

Visual acuity assessment, in which distance vision was assessed using a Snellen chart from 6 meters (20 feet), with each eye tested separately according to scientific guidelines.

Near vision was evaluated with a Jaeger chart at 15 inches, both eyes open. Assessments were conducted with participants wearing their visual aids, if applicable.

Anthropometric assessment, in which height and weight were measured using a non-stretchable measuring tape and a calibrated weighing scale.

Statistical analysis

Data were analyzed using Microsoft Excel 2016 and statistical package for the social sciences (SPSS) version 28 (IBM SPSS statistics). Descriptive statistics were reported as mean (±SD), median (IQR), or frequency (%) with 95% confidence interval (CI). Univariate and multivariable logistic regression regression yielded odds ratios (OR) and adjusted OR (AOR) with 95% CI. Variables with $p<0.25$ in univariate models were included in the final multivariable model.

RESULTS

The study participants had a median age of 40 years. Most of the participants were Muslim (76.7%) and currently married (87.3%). The median income of participants was 2,000 rupees. Only 5.5% earned over 5,000 rupees. Most (68.2%) participants belong to the lower socioeconomic class.

Substance use was reported by 37% of participants, mostly chewing tobacco (67.2%) and betel nut (39.8%). 92.4% worked in their own house. Poor lighting and ventilation affected 43.3% and 38.2% of participants, respectively (Table 1).

Participants had a median work experience of 17 years. The median daily working hours were 7 hours. The median uninterrupted working time was 2 hours, with 74% working more than 1.5 hours continuously each day. The Median perceived stress score was 5. For BMI, 16.7% of participants were underweight, while 26.3% were overweight or obese.

A majority of participants, 271 (82.1%), experienced chronic musculoskeletal discomfort in various body areas over the past 12 months. Among these participants, 89 (32.8%) were unable to work for at least one day due to severe discomfort, and 87 (32.1%) sought medical attention for their severe discomfort during the same period. About 84.8% female and 77.3 % male reported chronic discomfort. Regarding specific areas of discomfort, 72.0% of females and 65.5% of males reported discomfort in the low back area, while 58.8% of females and 55.5% of males reported discomfort in the neck area (Figure 2 and Table 2).

Additionally, 57.3% of participants reported experiencing chronic ocular discomfort. Based on distance and near vision assessments, 18.5% had distance vision impairment, and 30.3% had near vision impairment (Table 2).

Univariate logistic regression showed a significant association between increased psychological stress and chronic musculoskeletal discomfort (uOR=1.26, $p<0.001$). Other factors significantly linked to discomfort included longer work duration (uOR=2.68, p=0.02), increased daily working hours (uOR=2.26, p=0.02 and uOR=2.32, p=0.01), lower BMI (uOR=0.44, p=0.03), ocular discomfort (uOR=2.08, p=0.01), poor lighting (uOR=2.14, p=0.01), and night time work (uOR=2.67, p=0.03).

After adjusting for potential confounders, psychological stress (aOR=1.03, $p<0.001$), Female sex (aOR=2.72, p=0.04), and longer working hours (aOR=8.04, $p<0.001$

and aOR=3.59, p=0.004) remained significantly associated with chronic musculoskeletal discomfort (Table 3).

Further, univariate logistic regression found a significant association between increased age (uOR=1.07, p<0.001) and psychological stress (uOR=1.18, p<0.001) with higher chances of chronic ocular discomfort. Additionally, marital status (uOR=2.18, p=0.02), education level (uOR=3.83, p<0.001 and uOR=2.35 and p<0.01), long work duration (uOR=2.32, p=0.01 and uOR=2.13 and p<0.003), lighting (uOR=1.67, p=0.02) and night time work (uOR=3.32, p=0.01) were significantly associated with ocular discomfort. After adjusting, increased age (aOR=1.07, p<0.001), Working at a stretch (aOR=2.20, p=0.02), and night time work (aOR=4.20, p=0.01) remained significant predictors of chronic ocular discomfort (Table 4).

Table 1: Sociodemographic, behavioral and environmental characteristics among study participants (n=330).

Characteristics	Number (%)
Age (years)	
15-30	61 (18.5)
31-60	256 (77.6)
>60	13 (3.9)
Median age-40 (32-40), range-16-70	
Sex	
Male	119 (36.1)
Female	211 (63.9)
Religion	
Hindu	77 (23.3)
Muslim	253 (76.7)
Marital status	
Currently married	288 (87.3)
Currently unmarried	19 (5.8)
Widow/divorced	23 (7.0)
Type of family	
Joint family	128 (38.8)
Nuclear family	202 (61.2)
Income of the participants	
<1000	52 (15.8)
1000-2500	165 (50.0)
>2500-5000	95 (28.8)
>5000	18 (5.5)
Median income-2000 (1000,3000), range-300-9000	
Socioeconomic status	
Class II (3944-7888)	19 (5.8)
Class III (2367-3943)	86 (26.1)
Class IV (1183-2366)	171 (51.8)
Class V (below 1183)	54 (16.4)
Education status	
Non-formal education	65 (19.7)
Upto primary	175 (50.0)
Upto secondary	79 (24.0)
Higher secondary and above	21 (6.3)
Substance use*	
Yes	122 (37.0)
No	208 (67.0)
Housing condition	
Pacca	124 (37.5)
Semi pucca	186 (56.4)
Kutcha	20 (6.1)
Surrounding of working area	
Dry	298 (90.3)
Damp	32 (9.7)

Continued.

Characteristics	Number (%)
Working place**	
Varanda/separate room	235 (71.2)
Living room	95 (28.8)
Lighting	
Inadequate	143 (43.3)
Adequate	187 (56.7)
Ventilation	
Inadequate	124 (38.2)
Adequate	208 (61.8)

*22 participants had history smoking tobacco consumption and 5 participants taken either smoking ganja or alcohol. Most of the participants was taken multiple substance; **92.4% workers working in their own house rest working at local factory

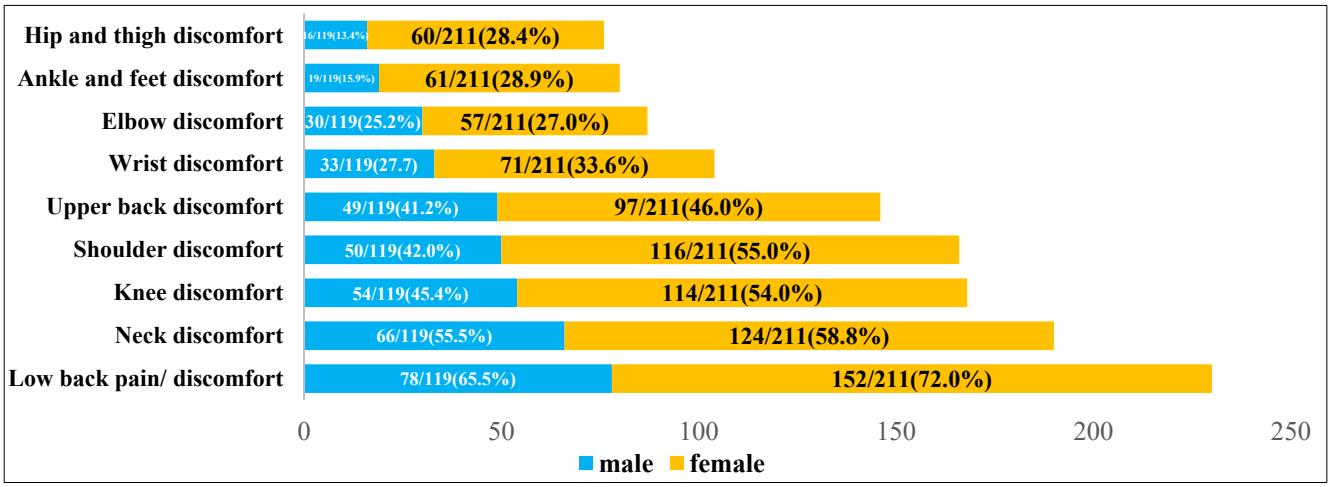

Figure 2: Perceived discomfort in different body parts along with gender wise distribution (n=330).

Table 2: Working profile, perceived stress, body mass index, musculoskeletal and ocular discomfort among study participants (n=330).

Characteristics	Number (%)
Work experience (years)	
<10	55 (16.6)
10-19	129 (39.1)
20-29	79 (23.9)
≥30	77 (23.3)
Median (IQR)-17 (10-25), range (1-50)	
Daily working hours	
<5	82 (24.8)
5-9	146 (44.2)
>10	102 (30.9)
Median (IQR)-7 (4.75,10), range (2-15)	
At a stretch working (hours)	
≤1.5	83 (25.2)
>1.5-3	177 (53.5)
>3-4.5	51 (15.5)
>4.5	19 (5.8)
Median (IQR)-2 (1.5,3) range (1-6)	
Working during night	
Yes	282 (85.4)
No	48 (14.6)
PSS-4	
Mean (±SD)-5.1 (±2.8), median (IQR)-5 (3-7), range-(0,14)	

Continued.

Characteristics	Number (%)
BMI	
Underweight	55 (16.7)
Normal	188 (57.0)
Overweight and obese	87 (26.3)
Chronic discomfort with any body part within the last 12 months	
Yes	271 (82.1)
No	59 (17.9)
Unable to work because of severe discomfort in the last 12 months	
No	241 (73.0)
Yes	89 (27.0)
Health-seeking to a physician in the last 12 months	
No	243 (73.6)
Yes	87 (26.4)
Chronic ocular discomfort	
Present #	189 (57.3)
Absent	141 (42.7)
Distant vision	
No impairment	269 (81.5)
Mild impairment	33 (10.0)
Moderate impairment	28 (8.5)
Near vision	
Normal (N6)	230 (69.7)
N8	51 (15.5)
N10	30 (9.1)
N12	17 (5.2)
N18	2 (0.6)

#55.1% had difficulty in vision, 33.9% had headache, 16.9% had watering of eye, and 16.1% had redness of eye (multiple response present)

Table 3: Determinants of musculoskeletal discomfort: univariate and multivariable logistic regression (n=330).

Variables	Number (%)	OR (95% CI)	P value	AOR (95% CI)	P value
Age					
Mean (±SD)-40.5 (±11.5)	-	1.02 (0.99-1.05)	0.07	1.02 (0.99-1.06)	0.09
PSS-4					
Mean (±SD)-5.1 (±2.8)	-	1.26 (1.12-1.43)	<0.001	1.03 (1.15-1.57)	<0.001
Sex					
Female	179 (84.8)	1.64 (0.92-2.90)	0.08	2.72 (1.03-7.20)	0.04
Male	92 (77.3)	1	-	1	-
Education of the participants					
No formal education	58 (89.2)	2.01 (0.69-5.87)	0.19	0.80 (0.23-2.83)	0.74
Below primary to middle	176 (80.4)	0.99 (0.44-2.21)	0.99	0.65 (0.26-1.62)	0.36
Secondary and above	37 (80.4)	1	-	1	-
Working duration (years) $					
≥30	69 (89.6)	2.68 (1.15-6.25)	0.02	-	-
15-29	112 (83.0)	1.51 (0.81-2.80)	-	-	-
<15	90 (76.3)	1	-	-	-
Working hours per day					
≥10	87 (85.3)	2.26 (1.09-4.69)	0.02	8.03 (2.49-25.94)	<0.001
5-9	125 (85.6)	2.32 (1.19-4.52)	0.01	3.59 (1.49-8.65)	<0.004
<5	59 (72.0)	1	-		-
BMI category					
Undernourished	44 (80.0)	0.46 (0.17-1.20)	0.11	0.67 (0.21-2.06)	0.48
Normal	39 (79.3)	0.44 (0.20-0.95)	0.03	0.50 (0.20-1.24)	0.13
Overweight and obese	78 (89.7)	1	-	1	-
Ocular discomfort					
Yes	164 (86.8)	2.08 (1.17-3.68)	0.01	1.43 (0.74-2.78)	0.28

Continued.

Variables	Number (%)	OR (95% CI)	P value	AOR (95% CI)	P value
No	107 (75.9)	1		1	-
Lighting					
Inadequate	126 (88.1)	2.14 (1.16-3.95)	0.01	1.80 (0.88-3.66)	0.10
Adequate	145 (77.5)	1	-	1	-
Work at night					
Yes	256 (83.4)	2.67 (1.07-6.64)	0.03	2.20 (0.69-6.98)	0.17
No	15 (65.2)	1	-	1	-

Dependable variable: chronic musculoskeletal discomfort (present/absent). Model adjusted for those variables had p<0.25 in univariate logistic regression, including age, PSS-4, sex, education, working hours per day, BMI category, ocular discomfort, lighting, and work at night. Cox and Snell R2=0.15 and Nagelkerke R2=0.25. Hosmer–Lemeshow test (p value=0.981); hence, no sufficient evidence to reject the model. OR: odds ratio, AOR: adjusted OR, CI: confidence interval, SD: standard deviation. $ variable: working duration does not include in the final model for the assumption of avoiding singularity when same model accommodated variable; working hours per day and this is the best fitted model

Table 4: Determinants of ocular discomfort: univariate and multivariable logistic regression (n=330).

Variables	Number (%)	OR (95% CI)	P value	AOR (95% CI)	P value
Age					
Mean (±SD)-40.5 (±11.5)	-	1.07 (1.04-1.09)	<0.001	1.07 (1.04-1.10)	<0.001
PSS-4					
Mean (±SD)-5.1 (±2.8)	-	1.18 (1.09-1.29)	<0.001	1.07 (0.97-1.19)	0.14
Sex					
Female	74 (62.2)	1.37 (0.86-2.17)	0.17	1.44 (0.71-2.95)	0.30
Male	115 (54.5)	1	-	1	-
Marital status					
Currently married	172 (59.7)	2.18 (1.12-4.21)	0.02	2.28 (0.97-5.34)	0.06
Others	17 (40.5)	1	-	1	-
SES					
Upper and middle SEC	65 (61.9)	1.32 (0.82-2.12)	0.24	2.05 (0.95-3.70)	0.10
Lower SEC	124 (55.1)	1	-	1	
Education of the participants					
No formal education	45 (69.2)	3.83 (1.72-8.52)	<0.001	2.15 (0.80-5.76)	0.12
Below primary to middle	127 (58.0)	2.35 (1.22-4.53)	<0.01	1.84 (0.84-4.05)	0.12
Secondary and above	17 (37.0)	1		1	
Working duration (years) @					
≥30	56 (72.7)	3.62 (1.95-6.74)	<0.001	-	-
15-29	83 (61.5)	2.13 (1.31-3.59)	<0.003	-	-
<15	50 (42.4)	1		-	-
Working at a stretch					
>2	102 (66.3)	1.56 (0.92-2.65)	0.09	2.20 (1.24-4.43)	0.02
≤2	91 (51.7)	1	-	1	-
Lighting					
Inadequate	92 (64.3)	1.67 (1.07-2.61)	0.02	1.41 (0.84-2.38)	0.19
Adequate	97 (51.9)	1	-	-	-
H/o night time work					
Yes	182 (59.3)	3.32 (1.33-8.32)	0.01	4.20 (1.40-12.6)	0.01
No	7 (30.4)	1	-		-

Model adjusted for those variables had p<0.25 in univariate logistic regression, including age, PSS-4, sex, marital status, socioeconomic status, education, working at a stretch, lighting, and work at night. Cox and Snell R2=0.21 and Nagelkerke R2=0.29. Hosmer–Lemeshow test (p value=0.129); hence, no sufficient evidence to reject the model. OR: odds ratio, AOR: adjusted OR, CI: confidence interval, SD: standard deviation. @ Variable: working duration does not included in the final model over the assumption of avoiding singularity when same model accommodated variable; working at a stretch and this is the best fitted model

DISCUSSION

In our study, 271 participants (82.1%) reported experiencing chronic musculoskeletal discomfort in various body parts. Of the total participants, 69.7% suffered from low back pain, making it the most common site of discomfort, followed by neck pain (57.5%). A similar prevalence was reported by Durlov et al, who found

that 68% of participants experienced low back pain.[17] Sharma et al also reported 76.3% prevalence of low back pain in their study participants.[18] The highest rates of low back pain discomfort were reported by Gangopadhyay et al (87.0%) and Pal et al (88.5%).[3,10] A similar prevalence of neck pain was observed by Paul et al, who found that 57.6% of participants had neck pain, while Gangopadhyay et al reported the highest prevalence of neck pain, with 80% of participants affected. The higher prevalence of back and neck discomfort in the study by Gangopadhyay et al. Despite being conducted in a similar setting, the difference may be due to their study taking place a decade ago, when the craft was more popular and workers typically worked longer hours to increase earnings.

Again, in our study, 57.3% of participants reported ophthalmological morbidity, with 55.1% experiencing vision difficulties, 33.9% suffering from headaches, 16.9% having eye redness, and 16.1% experiencing eye watering. In comparison, a study by Mondal et al reported that 31.7% of participants had ophthalmological issues, primarily conjunctivitis (21.0%) and vision difficulties (8.5%).[19] Ganguly et al found that 21.8% of participants experienced visual disorders.[20] Sarna et al reported that 53% of participants had weak eyesight and 72% had an eye infection.[21] Another study conducted in Mumbai by Sharma et al found 54.3% ophthalmological morbidity, with 33.3% experiencing diminished vision, 13.7% having cataracts, and 3.1% showing eye redness.[18] These differences may be due to several factors, including variations in sample size and demographic characteristics, which affect the generalizability and prevalence rates across studies. Also, differences in the type of work (e.g., fine intricate design) and intensity of visual demand could also contribute, along with methodological differences such as self-reported symptoms in our study versus clinical diagnoses in others. Temporal differences in the timing of studies, with some conducted decades earlier, may also reflect changes in work conditions, awareness, and healthcare access over time.

In our study, psychological stress, female gender, long working durations, and extended daily working hours were identified as contributing factors to the development of chronic musculoskeletal discomfort. Chakraborty et al reported that dissatisfaction with earnings and monotonous job patterns were significantly associated with low back pain, neck and shoulder pain, and wrist and forearm pain among participants in rural West Bengal, findings that align with our study.[23] Female workers were found to be more prone to musculoskeletal symptoms than males, a trend also supported by Nag et al.[22] Additionally, it was observed that as age increased, the percentage of female workers discontinuing their jobs more than male workers, with higher rates of musculoskeletal morbidity likely explaining this trend**.** Sharma et al, Pal et al, and Gangopadhyay et al reported associations between musculoskeletal symptoms and long working durations.[3,10,18] Similarly, Gangopadhyay et al and Chakraborty et al identified long daily working hours as a predictor of musculoskeletal symptoms.[10,23]

Our study also found that increasing age, long working durations, working without breaks, and night shifts were significant factors contributing to the development of chronic ocular discomfort. There is a scarcity of data on predictors of ocular discomfort among zari workers. Additionally, untreated age-related conditions such as presbyopia, cataracts, refractive errors, and other potential ocular pathologies likely contributed to this morbidity.

Strengths

The study's community-based approach, with data collected at participants' workplaces, provided a detailed understanding of the population. Using probability sampling enhances the generalizability of findings to Uluberia-I and similar communities. Notably, this is the first study in this occupation to address both musculoskeletal and ocular discomfort patterns together. The identification of factors contributing to chronic ocular discomfort is a novel and valuable addition to the literature.

Limitations

The study's design limited the understanding of predictor temporality. Recall bias is one of the major limitations that could have interfere the data accuracy. Limited literature on ocular morbidity predictors among zari workers hindered comparisons. Additionally, the study couldn't assess worker ergonomics due to design constraints.

CONCLUSION

This community-based study reveals a high prevalence of chronic musculoskeletal and ocular discomfort among artisans leads to declines of traditional craft gradually, with its production is at risk of disappearing. Without timely efforts to preserve these communities, their precision and skills may not be passed down to the next generation, ultimately leading to the loss of this unique form of craftsmanship. This study provides valuable insights into the predictors of ocular discomfort, a largely under-researched area in this occupation, along with several modifiable factors contributing to musculoskeletal discomfort. By addressing these factors and emphasizing the urgent need for improved occupational health policies, ergonomic interventions, and better healthcare access, we can help sustain this community and ensure the survival of their craft for future generations.

Recommendations

Zari workers should incorporate regular rest breaks, ideally a 5-minute break after every 30 minutes of work, to reduce fatigue and improve productivity. Engaging in regular physical exercise is highly recommended to strengthen muscles, alleviate musculoskeletal pain, and prevent non-communicable diseases. Those experiencing ocular issues, such as vision problems or chronic headaches, should consult an ophthalmologist for eye examinations, corrective measures, and necessary treatments.

The State and Central Governments should consider modifying existing policies and ensuring that all Zari workers are enrolled in social security schemes, such as the Employees' State Insurance Scheme (ESI), to safeguard their health and financial well-being. Furthermore, a multisectoral approach is crucial to revitalizing the zari craft, fostering economic growth, and enhancing working conditions for artisans in this traditional occupation.

ACKNOWLEDGEMENTS

Authors would like to thank the Director, All India Institute of Hygiene and Public Health for permitting to conduct this study. They also acknowledge the support received from the community, family members, and participants of the Uluberia-I block of West Bengal.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Ramratan JR, Kumar S, Choudhary AK. Design methods and embroidery processes. Asian Textile J. 2023;32(10):56-62.
2. Singhal D, Bhagat S. Types of Zari used for Brocade Weaving. Textiles Clothing Res Centre E-J. 2017;1(2):18-21.
3. Pal A, Dhara PC. Evaluation of work-related musculoskeletal disorders and postural stress of female "Jari" workers. Indian J Occup Env Med. 2017;21(3):132-7.
4. Punnett L, Wegman DH. Work-related musculoskeletal disorders: the epidemiologic evidence and the debate. J Electromyogr Kinesiol. 2004;14(1):13-23.
5. Kanniappan V, Palani V. Prevalence of musculoskeletal disorders among sewing machine workers in a leather industry. J Lifestyle Med. 2020;10(2):121.
6. Joshi TK, Smith KR. Occupational health in India. Occup Med (Philadelphia, Pa.). 2002;17(3):371-89.
7. Garg P, Raj P, Chellaiyan VG, Singh A. A Cross-Sectional Study on Visual Problems among Zari Artisans of North India. J Surg Specialt Rural Pract. 2023;4(1):23-7.
8. Village Info. List of Villages in Uluberia I Subdivision of Haora (WB). Available at: https://villageinfo.in/west-bengal/haora/uluberia-i.html. Accessed on 20 January 2026.
9. Saha I, Paul B. Essentials of Biostatistics & Research Methodology. Third Edition. Kolkata: Academic Publishers. 2021.
10. Gangopadhyaya S, Chakrabarty S, Sarkar K, Dev S, Das T. Evaluation of low back pain among female chikan embroidery workers of West Bengal. J Industrial Eng Management Innov. 2014;1(1):2-12.
11. Puntillo F, Giglio M, Paladini A, Perchiazzi G, Viswanath O, Urits I, et al. Pathophysiology of musculoskeletal pain: a narrative review. Ther Adv Musculoskelet Dis. 2021;13:1759720X21995067.
12. American academy of ophthalmology. Ocular discomfort. 2024. Available at: https://eyewiki.org/Ocular_Discomfort. Accessed on 20 January 2026.
13. World Health Organization. Vision Impairment and Blindness. Available at: https:// www.who.int/news room/factsheets/detail/blindness-andvisualimpairment. Accessed on 20 January 2026.
14. Sahu M, Das A, Chattopadhyay B, Paul B, Bhattacharyya M. Revised socioeconomic status scales for the year 2021: Updation based on latest base year series 2016. DY Patil J Health Sci. 2021;9(1):22-6.
15. Patil R. Community Medicine: Practical Manual with viva. 2nd edition. New Delhi: Elsevier. 2023.
16. Du L, Yong G, Wang P, Wang X, Ming W, He G. Developing the modified 4-item version of perceived stress scale for functional dyspepsia. BMC Gastroenterol. 2023;23(1):97.
17. Durlov S, Chakrabarty S, Chatterjee A, Das T, Dev S, Gangopadhyay S, et al. Prevalence of low back pain among handloom weavers in West Bengal, India. Int J Occup Env Health. 2014;20(4):333-9.
18. Sharma BH, Mahajan HE. Assessment of health profile of Zari workers with special reference to musculoskeletal disorders in an urban slum of Mumbai, India". Int J Gen Med Pharm. 2013;2(2):47-54.
19. Mondal MM, De A, Lahiri SK. Socio-demographic correlates of morbidity in zari workers of rural West Bengal. Int J Appl Res. 2017;3(6):792-9.
20. Ganguly M, Ganguly A. A study on anthropometric measurement, socio-economic conditions & occupational health problems of Baluchari Shari weavers of Bishnupur. Int J Curr Res. 2015;7(7):17722-9.
21. Sarna T, Shukla A. A study of physical-health and neuroticism among women engaged in the home-based production of chikan embroidery. Soc Indicators Res. 1994;32:179-91.
22. Nag A, Vyas H, Nag PK. Gender differences, work stressors and musculoskeletal disorders in weaving industries. Industrial Health. 2010;48(3):339-48.
23. Chakrabarty S, Sarkar K, Dev S, Das T, Mitra K, Sahu S, et al. Impact of rest breaks on musculoskeletal discomfort of Chikan embroiderers of West Bengal, India: a follow up field study. J Occup Health. 2016;58(4):365-72.

Cite this article as: Jana D, Datta S, Bhattacharyya M, Paul B, Chakraborty S. Stitching through strain: a cross-sectional study on distribution and determinants of chronic musculoskeletal and ocular discomfort in rural Zari embroidery workers of West Bengal, India. Int J Community Med Public Health 2026;13:2236-45.