

Socio Demographic and Occupational Risk Factors as Determinants of Musculoskeletal Disorders among Women in Unorganized Sectors

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Abstract

Introduction: Informal sectors provide employment opportunities to women to a large extent. Musculoskeletal discomforts (MSD) have been reported in majority of the informal sectors which needs specific attention. The present study aims to identify the socio demographic, individual and occupational risk factors that contribute to the MSDs.

Methods: A cross sectional survey of 693 women employed in three different units namely dyeing, fish processing and food processing units was carried out. A pretested interview schedule was used to collect data and details of MSD were gathered adapting Nordic questionnaire. Data was analyzed using chi square, ANOVA and binary logistic regression to identify the confounding factors contribution to MSDs.

Results: The mean age of the participants was 33.46±13.20 years. The mean work experience was 11±10.96 years. Bivariate logistic regression analysis indicated that work experience had higher Odds (2.3; CI =1.1- 4.4) for neck discomfort. Low back pain for women above 45 years was likely to occur 5 times more when compared to women below 25 years of age (OR=5.1; CI=1.73 to 15.58). Work experience had higher odds (3.39; CI=1.5-7.2) for discomforts in legs. The sector in which the women were employed contributed to higher level of MSD. Work hours exceeding 8 hours also was one of the contributing factors for MSD.

Conclusion: The study highlights the impact of age, work hours, years of work on prevalence of MSD among women. Ergonomic workspaces can minimize the rate of MSDs among women in informal sectors.

Key words: low back, women, fish processing, food processing, unorganized.

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Introduction

Informal or unorganized sectors have congested work spaces, poor working conditions that co-exist with extreme environmental conditions such as temperature and humidity. Majority of the workers employed in informal sectors are women. The sectors include garment units, textiles units, food processing units, fish processing units, handicraft units, weaving and construction units. Workers in these sectors are more prone to work related musculoskeletal disorders (1,2). Work-related musculoskeletal disorders, or WRMSDs, are commonly occurring ailments that mainly impact tendons, muscles, joints, ligaments, nerves, and bones. Musculoskeletal symptoms might include discomfort, pain, and swelling, all of which can become incapacitating. The most frequent occupational risk factors for these work-related musculoskeletal problems include weight lifting, repeated motions, static body positions, and prolonged muscular contractions forceful effort, repetitive work, inappropriate posture, lack of recovery time, vibration, kind of hand grasp (3).

Individual characteristics that contribute significantly to the prevalence of these conditions include age, gender, body mass index, obesity, diabetes, smoking, and anthropometry (4,5,6 7). Psychosocial factors, such as job dissatisfaction, perceived stress/workload, monotonous work, limited social support, limited job control, feeling depressed, time constraints, etc., have also received significant attention from researchers (8).

Musculoskeletal symptoms impact individuals of all ages, from 20 to 80 as a result of which they are increasingly viewed as a rising public health concern. According to a recent survey in multiple nations among various categories of workers, the prevalence of work-related musculoskeletal complaints ranged from 55% to 85. In addition, a survey on worldwide burden of disease, carried out between 2010 to 2016 cites that musculoskeletal pain ranked sixth, out of the ten diseases and was the major cause of physical injuries and impairments. Thus musculoskeletal disorders have severe global ramifications for public health, society, and the economy. Studies on musculoskeletal discomforts (MSD) among women working in the informal sector are limited and often lack an analysis of the relationship between occupational settings and socio-demographic

profiles. Therefore, the present study aims to assess the prevalence of MSD among this population and to examine the extent to which socio-demographic and occupational factors contribute to these discomforts.

Materials and Methods

Study design

This study is a cross-sectional survey of women workers employed in informal units which are a major employment providers. Women working in three different sectors—dyeing, fish processing, and food processing—were randomly selected for the study, as these sectors employed more than 50% of the women workers in their respective units. A total of twelve units were randomly chosen, with four units from each sector. From each of the twelve units, a minimum of 10% of the workers were selected, resulting in a total sample size of 809 individuals.

Participants and inclusion criteria

A total of 809 individuals participated in the study (Figure 1). The following inclusion criteria was applied to the data:

- Individuals who were employed in the main activities of the processing units for at least a year alone were considered for the study. Women who were employed in the office work were not included in the study since their work environment is different from the main processing area. This reduced the sample size to 756.
- Participants who were willing to disclose the information related to the prevalence of musculoskeletal discomforts alone were included. This further reduce the sample size to 693.

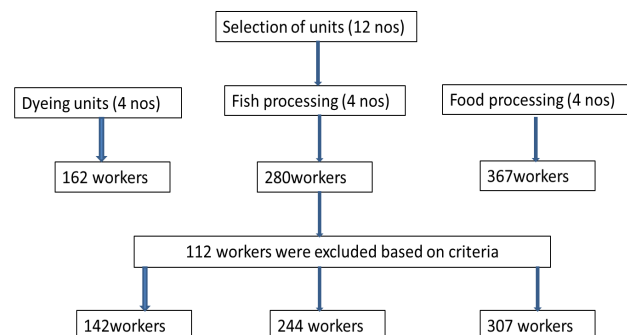


Figure 1: Selection of participants

Data collection

A pretested interview schedule consisted of two sections – Section ‘A’ and ‘B’. Section A had selected demographic variable like age, marital status, level of education, details of family and occupational details like age of entry, work experience and work hours. Section B included the details of the musculoskeletal discomforts which was adopted from the Nordic questionnaire⁽⁹⁾. A body map was shown to the workers to identify the prevalence of discomforts and its periodicity. All the workers were interviewed during the work hours. The study was carried out after the approval from the institution Committee (No. B4/UGC/50-C30AT/ E-GOI- DST/E-28ZK dt. 3.4.23), proprietors and with the oral consent from the workers.

Analysis of data

The data collected from the participants were analysed using SPSS 29 version. Descriptive statistics, analysis of variance and chi-square test were used to find the difference / association between the workers employed in different units. Further analysis was carried out on musculoskeletal discomforts of body parts that reported highest prevalence using bivariate logistic regression to study the impact of socio demographic and occupational factors on the periodicity of musculoskeletal discomforts of workers between two groups namely the group that reported prevalence of discomforts during the past 12 months for more than 30 days (everyday) and other group of

workers who did not report discomforts everyday during the same period.

Results

The results of the cross sectional study of women in informal sectors is presented in Table 1. The mean age of the total sample was 33.46 ± 13.20 years. Further analysis by the units indicated that women working in fish processing units were much younger (22.23 ± 8.08 years) when compared to food processing (38.22 ± 11.37) and dyeing units (42.43 ± 10.71). Majority of the women workers in fish processing were young. There was a significant difference between the mean age of the workers employed in these units. Chi square analysis indicates that there is a significant difference between the different age groups in the three selected units. More than three fourth of the women in all the units were unmarried. With reference to the educational level, majority of the workers were educated upto high school level. This may be one of the reasons for women taking up work in such informal sectors. The overall mean work experience was 11 years and there existed a significant difference between the three units. Further analysis of the work experience indicates that majority of women in fish processing units (76 percent) had less than five years of experience. Analysis of the age of entry also confirms that women venture into such informal sectors at young age with low level of education.

Table 1: Socio demographic and occupational profile of the women workers in the selected units

Parameters	Total sample (n=693)	Dyeing unit (n=142)	Fish processing (n=244)	Food processing (n=307)	P value
Age (years)^a	33.46±13.20	42.43±10.71	22.25±8.08	38.22±11.37	236.19 ^c
Less than 25 ^b	252(36.4)	5(3.5)	199(28.7)	48(6.9)	3.48 ^d
25-45 ^b	214(30.9)	78(54.9)	39(5.6)	165(23.8)	
Above 45 ^b	227(32.8)	59(41.6)	6(9)	94(13.6)	
Marital status					
UnMarried ^b	548(79.1)	113(79.6)	199(81.6)	236(76.9)	40.30 ^d
Married ^b	101(14.6)	23(16.2)	45(18.4)	33(10.7)	
Separated/ widow ^b	44(6.3)	6(4.5)	--	38(12.4)	
Education					
Illiterate ^b	29(4.2)	13(9.2)	9(3.7)	7(2.3)	1.24 ^d
High school ^b	535(77.2)	115(81.0)	138(56.6)	282(91.9)	
Higher secondary ^b	129(18.6)	14(9.9)	97(39.8)	18(5.9)	

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Work experience (years)^a	11.44±10.96	22.16±11.67	4.2±4.3	11.98±9.6	212.79 ^c
Less than 5 ^b	296(42.7)	12(5.6)	234(76.2)	101(32.9)	2.88 ^d
5 to 10 ^b	124(17.9)	16(7.5)	52(16.9)	72(23.5)	
Above 10 ^b	273(39.4)	26.8(86.9)	21(6.9)	134(43.6)	
Age of entry(years)^a	21.98±8.69	19.52±5.70	18.19±7.10	26.11±9.20	77.55 ^c
Less than 20	571(82.4)	109(76.8)	197(80.7)	114(37.1)	1.59 ^d
20-25	41(5.9)	17(12.0)	18(7.4)	56(18.2)	
Above 25	81(11.7)	16(11.3)	29(4.2)	137(44.6)	

a= Mean ±SD

b= Data expressed as frequency (percentage)

c=one way anova

d=chisquare test

Table 2 presents data of the musculoskeletal discomforts of women workers employed in different units. The discomforts were assessed using a five point scale with no discomfort as 1 and extreme discomfort as 5. It could be observed from the table that forty four per cent of the workers reported moderate

discomforts in low back and the severe discomfort by twenty five percent. Moderate level of discomfort was reported in legs (39%), upper arm (32%) and shoulders (32%). Severe discomfort was expressed by almost ten per cent of the workers in all the body parts. Extreme discomfort was reported by less than three per cent of the workers as this discomfort will result in complete cessation from the task. Statistical analysis indicates that there is a significant difference in the levels of discomforts among different body parts.

Table 2: Musculoskeletal discomforts of workers employed in different units

Body parts	Rating of discomforts (n=693)					Mean ±SD	F value
	No discomfort	Mild discomfort	Moderate discomfort	Severe discomfort	Extreme discomfort		
Neck	182 (26.3)	250 (36.1)	191(27.6)	62(8.9)	8(1.2)	2.23±0.97	174.646
Shoulder	121(17.5)	260(37.5)	228(32.9)	76(11.0)	8(1.2)	2.41±0.93	34.106
Upper arm	227(32.8)	181(26.1)	226(32.6)	54(7.8)	5(0.7)	2.18±1.00	175.397
Low back	50(7.2)	139(20.1)	309(44.6)	179(25.8)	16(2.3)	2.96±0.91	63.087
buttock	402(58.0)	151(21.8)	62(8.9)	77(11.1)	1(0.1)	1.74±1.02	1.235
Thigh	233(33.6)	230(33.2)	138(19.9)	88(12.7)	4(0.6)	2.13±1.03	273.447
legs	93(13.4)	215(31.0)	270(39.0)	105(15.2)	10(1.4)	2.60±0.95	40.469

Further analysis of musculoskeletal discomforts of workers by their units as indicated in the Table 3 clearly depicts that in dyeing units where workers adopt awkward postures for dyeing resulted in severe discomforts in low back (33%), buttock (54%) and thighs (45%). Analysis of the discomforts of the workers employed in fish processing units indicated that the low back (29%), thighs (25%) and legs (17%) were the regions

that experienced moderate level of discomforts. The lower extremities experienced higher levels of discomfort due to long hours of standing at work. Workers employed in food processing units reported higher levels of moderate discomfort in neck(38%), shoulder(45%), low back(52%, legs (51%) and upper arm (46%). Figure 2 presents the mean discomforts of different body parts by the units in which they were employed.

Table 3: Musculoskeletal discomforts of women workers employed in dyeing, fish processing and food processing units

Body parts	No discomfort	Mild discomfort	Moderate discomfort	Severe discomfort	Extreme discomfort	Mean ±SD	Chi square value
Dyeing unit (n=142)							
Neck	-	53 (37.3)	68 (47.9)	21(14.8)	-	2.77±0.69	24.35**

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Shoulder	-	78(54.9)	58(40.)	6 (4.2)	-	2.49±0.58	58.36**
Upper arm	-	68(47.9)	68(47.9)	6(4.2)	-	2.56±0.58	54.14**
Low back	1(0.7)	15(10.6)	78(54.6)	48(33.8)	-	3.22±0.65	100.64**
buttock		11(7.7)	53(37.3)	77(54.2)	1(0.7)	3.48±0.65	107.55**
Thigh	-	13(9.2)	64(45.1)	64(45.1)	1(0.7)	3.37±0.66	93.54**
legs	-	53(37.3)	71(50)	18(12.7)	-	2.75±0.67	30.69**
Fish processing units (n=244)							
Neck	150 (61.5)	81(33.2)	6(2.5)	7(2.9)	-	1.46±0.68	353.25**
Shoulder	113(46.3)	43(17.6)	32(13.1)	47(19.3)	993.7)	2.03±1.05	127.76**
Upper arm	181(74.2)	41(16.8)	14(5.7)	6(2.5)	2(0.8)	1.38±0.77	466.61**
Low back	47(19.3)	85(34.8)	71(29.1)	32(13.1)	9(3.7)	2.47±1.07	75.26**
buttock	238(97.5)	6(2.5)	-	-	-	1.02±0.12	917.45**
Thigh	77(31.6)	78(32)	62(25.4)	24(9.8)	3(1.2)	2.17±1.02	92.92**
legs	68(27.9)	102(41.8)	42(17.2)	25(10.2)	7(2.9)	2.18±1.05	116.11**
Food processing units (n=307)							
Neck	32(10.4)	116(37.8)	117(38.1)	34(11.1)	8(2.6)	2.58±0.91	171.64**
Shoulder	31(10.1)	91(29.6)	139(45.3)	42(13.7)	4(1.3)	2.66±0.88	187.18**
Upper arm	46(15.0)	72(23.5)	144(46.9)	42(13.7)	3(1.0)	2.62±0.93	178.48**
Low back	2(0.7)	39(12.7)	160(52.1)	99(32.2)	7(2.3)	3.23±0.72	295.19**
buttock	164(53.4)	134(43.6)	9(2.9)	-	-	1.50±0.56	132.08**
Thigh	156(50.8)	139(45.3)	12(3.9)	-	-	1.53±0.57	121.03**
legs	25(8.1)	60(19.5)	157(51.1)	62(20.2)	3(1.0)	2.86±0.86	226.01**

** P<0.001

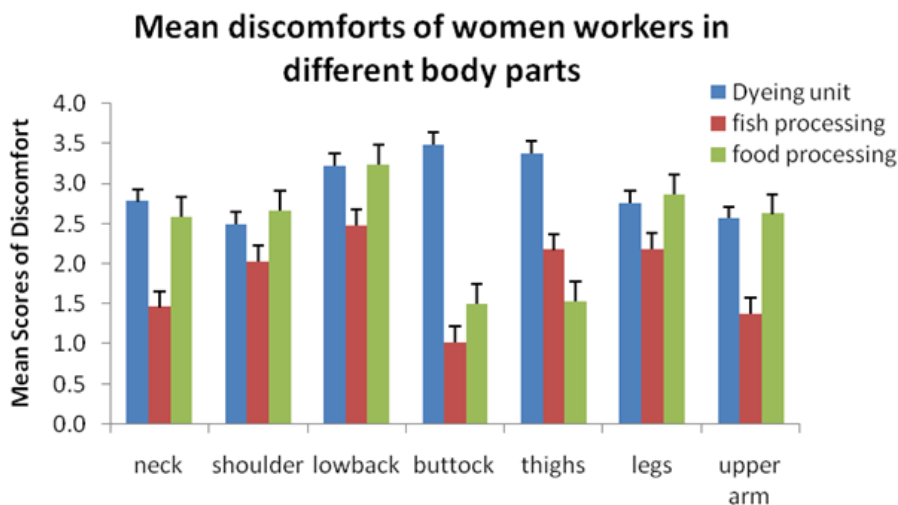


Figure 2: Mean discomforts of women workers in different body parts

Table 4 presents the bivariate logistic regression between the selected variables namely age, sector, marital status, education, work experience, age of entry and work hours on the musculoskeletal discomforts reported every day for the past 30 days in different body parts.

Participants who were educated below high school experienced pain by 1.6 times higher than those

with high school education and above. Participants who entered at age 20 or older had a prevalence rate 1.2 times higher than those who entered before age 20. Analysis of work experience by the discomforts revealed that women having 5 to 10 years had 2.3 times higher shoulder pain when compared to women with less than five years of service. Similarly women with more than 10 years of service are more

likely to have 3.3 times higher shoulder pain, 2.5 times higher low back pain, 3.3 times higher leg pain and 1.19 times higher upper arm pain. Longer work hours (more than 8 hours / day are consistently associated

with higher pain and follows a similar trend to work experience for shoulder and leg pain. (OR=1.25 for < hours).

Table 4: Bivariate logistic regression for prevalence of musculoskeletal discomforts by select variables

Body parts	Variables	Category	Odds Ratio	95.0% C.I.for EXP(B)		p value
				Lower	Upper	
Neck	Age(yrs)	Less than 25	1			
		25-45	0.376	0.130	1.087	0.071
		Above 45	0.577	0.166	2.001	0.386
	Education	Above high school	1			
		Up to high school	1.641	1.030	2.613	0.037
	Marital status	Unmarried	1			
		Married	0.237	0.103	0.543	0.001
		Separated	0.576	0.274	1.214	0.147
	Sector	Dyeing	1			
		Fish processing	0.007	0.002	0.026	0.000
		Food processing	0.574	0.310	1.064	0.078
	Age of entry(yrs)	Less than 20	1			
		20-25	1.244	0.628	2.465	0.531
		Above 25	0.813	0.404	1.637	0.563
	Work experience (yrs)	Less than 5	1			
5 to 10		2.310	1.172	4.552	0.016	
Above 10		1.976	0.944	4.135	0.071	
Work hours	less than 8	1				
	8 to 10	1.666	0.891	3.117	0.110	
	above 10	1.047	0.527	2.077	0.896	
Shoulder	Age(yrs)	Less than 25				
		25-45	1.729	0.764	3.912	0.189
		Above 45	1.590	0.547	4.617	0.394
	Education	Above high school	1			
		Up to high school	1.659	1.058	2.601	0.027
	Marital status	Unmarried	1			
		Married	0.948	0.515	1.745	0.864
		Separated	0.593	0.271	1.297	0.191
	Sector	Dyeing	1			
		Fish processing	0.044	0.017	0.111	0.000
		Food processing	0.124	0.055	0.278	0.000
	Age of entry(yrs)	Less than 20				
		20-25	1.412	0.716	2.784	0.319
		Above 25	1.010	0.503	2.026	0.978
	Work experience (yrs)	Less than 5				
5 to 10		2.350	1.367	4.039	0.002	
Above 10		3.306	1.679	6.510	0.001	
Work hours	less than 8	1				
	8 to 10	1.084	0.503	2.336	0.838	
	above 10	1.474	0.662	3.280	0.342	

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Low back	Age(yrs)	Less than 25	1			
		25-45	2.200	0.930	5.206	0.073
		Above 45	5.195	1.731	15.589	0.003
	Education	Up to high school	1			
		Above high school	1.208	0.787	1.854	0.387
	Marital status	Unmarried	1			
		Married	0.732	0.443	1.212	0.225
		Separated	0.738	0.241	2.257	0.594
	Sector	Dyeing	1			
		Fish processing	9.113	3.940	21.079	0.000
		Food processing	37.061	17.026	80.672	0.000
	Age of entry(yrs)	Less than 20	1			
		20-25	0.956	0.493	1.854	0.894
		Above 25	0.786	0.353	1.752	0.556
	Work experience (yrs)	Less than 5	1			
		5 to 10	3.099	1.744	5.507	0.000
		Above 10	2.554	1.130	5.771	0.024
	Work hours	less than 8	1			
8 to 10		0.891	0.448	1.772	0.741	
above 10		0.748	0.348	1.605	0.456	
Legs	Age(yrs)	Less than 25	1			
		25-45	1.637	0.699	3.835	0.257
		Above 45	3.949	1.326	11.762	0.014
	Education	Up to high school	1			
		Above high school	0.638	0.400	1.018	0.060
	Marital status	Unmarried	1			
		Married	1.460	0.854	2.495	0.167
		Separated	1.760	0.567	5.458	0.328
	Sector	Dyeing	1			
		Fish processing	0.211	0.095	0.467	0.000
		Food processing	2.989	1.576	5.668	0.001
	Age of entry(yrs)	Less than 20	1			
		20-25	1.162	0.584	2.310	0.669
		Above 25	1.235	0.575	2.653	0.589
	Work experience (yrs)	Less than 5	1			
		5 to 10	2.334	1.266	4.305	0.007
		Above 10	3.393	1.587	7.253	0.002
	Work hours	less than 8	1			
8 to 10		1.290	0.673	2.473	0.443	
above 10		1.254	0.598	2.630	0.549	

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Upper arm	Age(yrs)	Less than 25	1			
		25-45	2.281	0.793	6.558	0.126
		Above 45	2.109	0.592	7.511	0.249
	Education	Up to high school	1			
		Above high school	0.919	0.557	1.517	0.741
	Marital status	Unmarried	1			
		Married	0.662	0.288	1.520	0.331
		Separated	1.082	0.489	2.395	0.846
	Sector	Dyeing	1			
		Fish processing	0.012	0.004	0.039	0.000
		Food processing	0.118	0.060	0.232	0.000
	Age of entry(yrs)	Less than 20	1			
		20-25	1.171	0.582	2.356	0.658
		Above 25	0.832	0.418	1.655	0.601
	Work experience (yrs)	Less than 5	1			
		5 to 10	1.102	0.524	2.316	0.798
		Above 10	1.903	0.866	4.179	0.109
	Work hours	less than 8	1			
8 to 10		0.664	0.334	1.323	0.244	
above 10		0.728	0.343	1.541	0.406	

When comparing the age it could be inferred that shoulder pain was 1.72 times higher for women in the age group of 25 to 45 when compared to women with less than 25 years. Low back pain was 5 times higher for women above 45 years and leg pain was higher by 3.9 times for women above 45 years. Pain in the upper arm was 2.28 times higher for women above 25 years when compared to women below 25 years. Women with low education had 1.65 times higher prevalence of shoulder pain when compared to women with higher education level. Women who entered into work between the age of 20 to 25 years have higher prevalence of shoulder pain (1.42 times), leg pain (1.23 times) and 1.17 times higher for upper arm. Married women experienced 1.4 times higher leg pain than unmarried women. Women employed in dyeing units had higher prevalence of low back pain than those employed in food and fish processing units

Discussion

In the unorganized sector, musculoskeletal disorders are a serious problem, MSDs can be acute or chronic in nature, incapacitating and many times

escalating the bills for health systems particularly in the case of chronic pain. Employees who work long hours or sit still are more susceptible to MSDs⁽¹⁰⁾. Older age⁽¹¹⁾ and long years of working are significant risk factors for MSDs. Female workers in several occupation have higher prevalence of MSDs when compared to their male counter parts^(5,12,13). Several epidemiological studies have cited higher prevalence rates of MSD with increasing age and long years of work⁽⁶⁾. MSDs are complex and multifactorial disorders including genetic, morphological, psychological, and biomechanical aspects. Long-term, consistent muscle activation without much change in exposure can cause ischemia and hypoxia, which can build up metabolites and eventually cause damage to tendons and muscle fibers. Awkward postures⁽⁶⁾, monotonous, repetitive duties⁽¹⁴⁾, long workdays without breaks, poor equipment and furniture, and pressure are some of the factors that might lead to MSD symptoms in the workplace. The observation of the postures adopted by the women workers in the informal sector is one of the major contributing factor for increased level of MSD. Work environment and precision task may also be one of the confounding factors.

The findings of the present study indicate that the sector in which the women workers were employed had a greater impact on the prevalence of MSD especially in the low back^(1, 15,16). A study on the bamboo workers which is also an informal sector also reports higher prevalence in the low back with a frequency of 4.5 and for palm and fingers was 3.73⁽²⁾. A study on the hair dresses showed the highest prevalence rate was observed in shoulder 53.7% ($n=350$) followed by 53.4% ($n=348$) neck and 53.2% ($n=347$) low back⁽⁸⁾. The present study also confirms the findings that age of the worker, age of entry and work hours and work experience has an impact on the prevalence of MSD on the workers. The findings of the present study is in accordance with a similar study conducted among the handicraft workers which revealed that age, work experience, prolonged work hours, sustained awkward posture, continuous work without break, extensive work pressure, and poor job control increased the risk of MSD symptoms in different body regions, while with a higher level of education, MSDs in the neck and lower back regions reduced^(17, 18,19, 20). MSD can further be aggravated by lack of proper furniture to carry out the task, awkward posture adopted by the workers, long hours of maintaining the posture, lack of adequate rest breaks/ work pause and lack of awareness on provision of better work environment^(21, 22, 23, 24).

The present study highlights that socio-demographic factors—such as age, marital status, education level, and work experience—as well as occupational factors like work hours, age at job entry, and work environment, significantly influence the levels of musculoskeletal disorders (MSDs) experienced by women workers.

The findings underscore the need for targeted strategies to minimize musculoskeletal discomforts in the workplace. These include improving the work environment through the provision of ergonomic, multi-user workstations, ensuring recommended lighting levels, adequate ventilation, and noise reduction, and promoting the use of personal protective equipment (PPE).

Additionally, workplace policies should emphasize the importance of adequate rest breaks and job rotation, which can be addressed through public health education and sensitization of both employers and workers.

Encouraging workers to access available social security schemes can also contribute to improving occupational health and safety. Implementing and regularly monitoring these interventions will help create a healthier and more sustainable work environment in the long term.

Limitations of the study

There may have been recollection bias because the MSD prevalence was determined by self-reporting. Furthermore, the severity of MSD was only subjective and not objective. Data were gathered from workers in different types of units and had women workers in different age groups.

Conclusion

The study elucidates the factors contributing to higher level of MSDs among women in informal sectors. Socio demographic, individual and occupational factors associated with higher level of prevalence of MSD need to be addressed to minimize the risk factors through managerial solutions. Ergonomic interventions are imperative to evade adverse consequences on the occupational health of women employed in informal sector. Sensitisation of the workers and the management on positive impact of ergonomically designed workspace will help in alleviating the MSDs in the near future. Governments, companies, legislators, and stakeholders should work together to preserve the health and well-being of the workers in these factories.

Conflict of interest: Nil

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