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Musculoskeletal Disorders Among Selected Industrial Workers Of Puducherry

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Abstract

Healthy worker is a key factor for the maintenance and economic growth of an industry. Industrial workers are the worst affected, as they are directly exposed to the physical, psychological and social environments of the industry. The relationship between nutritional status and workplace productivity is well established. Workers who maintain balanced diet that meets their nutritional needs typically exhibit higher energy levels, better cognitive functions and lower absenteeism. The speedy introduction of new industries poor and insecure working condition and the creation of new tools to enhance mass production and other processes brought about serious threat to work health, which were not accepted. Puducherry being an industrial hub has both organized and unorganized sectors. The residents of rural Puducherry have witnessed an increase in the employability of native people working in the industry. Hence, the investigator chose to study the musculoskeletal disorders of selected industrial workers of Puducherry. A total of 523 workers were selected based on random sampling method and the details regarding demographic profile and work pattern was assessed using validated questionnaire. Musculoskeletal disorder and pain were assessed using Nordic Musculoskeletal Questionnaire (NMQ) and Wong - Baker FACES pain rating scale respectively. Anthropometric measurements were recorded using standard methods and BMI was computed Findings showed the majority of workers were in moderate physical activity levels and there is no significant difference between work and gender. Workers between 20-39 years of age stand long hours. Body mass index indicates a low incidence of obesity. Middle and elder adult workers experience more pain, but there was no significant gender difference in pain levels. Musculoskeletal pain and ache in feet, numbness were reported by majority of adults. Overall the finding suggest that while the immediate working condition are fair, there is a need for monitoring their dietary pattern and support to address the long term health risk faced by the workers.

Key words: Industrial workers, musculoskeletal disorder, pain, work patterns, BMI.

INTRODUCTION

Industrial workers are those laboring industries that produce, goods, typically in factories, manufacturing plants and other production facilities. This includes a wide range of occupation from those involving heavy machinery manual labor to those requiring technical skills and specialized knowledge. The manufacturing sector is crucial for economic development globally. However rapid and unplanned industrialization and urbanization, lack environmental and social impact assessment posing serious threats to human environment (Asad et al 2013).

Healthy workers are crucial for the sustainable economic growth of an industry, as they directly contribute to its wealth. However poor and insecure working conditions, along with the introduction of new mass production tools and processes, have created unexpected threats to worker health (Pradhan et al 2007, Sterud et al 2018; Pongvongsa et al 2019; Dutta 2017).

Jang etal (2014) Musculoskeletal disorders (MSDs) pose a significant occupational health challenge, substantially impacting the wellbeing and productivity of industrial workers globally. These disorders, encompassing a range of conditions affecting muscles, tendons, ligaments, nerves and joints are frequently linked to workplace factors. Puducherry being an industrial hub has both organized and unorganized sectors (https://pandr.py.gov.in/sites/default/files/2007-08-introduction-1.pdf). The residents of rural Puducherry have witnessed an increase in the employability of native people working in the industry. Within Puducherry's industrial landscape, the prevalence of MSDs among its workforce demand focused attention. Hence, the study was undertaken to understand the musculoskeletal disorders among selected industrial workers of Puducherry.

METHODS AND MATERIAL

Selection of Area

Puducherry is a thriving hub for manufacturing companies, with diverse industries, including pharmaceutical, textile, plastic , agro and food processing industry and automobile components driving significant economic growth (https://industry.py.gov.in/sites/default/files/industrial-policy-2016.pdf) . Industrial estates in areas such as Korkadu, Villianur, Sedarapet and Mettupalayam are particularly well-known. Specifically, Korkadu is home to five different types of private limited companies . As a native of the village, the investigator employed convenience sampling for this study. Employees in these local industries are also native to the area, providing a relevant and representative sample. Furthermore, the proximity of these industries to the investigators location facilitated the study execution. Due permission was obtained from the Department of Industries and Commerce and from Institutional Ethical committee for conduct of study.

Selection of sample

A random sampling method was employed to select participants from all designated units. The sample size, determined by employee willingness, resulted in 523 participants from total workers of 1800. Data were collected from male and female workers after working hours, near the main gate, with prior authorization from manufacturing company authorities. Participation was voluntary and active.

Selection of research tool

A well-structured and validated Questionnaire, administered through interview schedules, was used to collect data on workers demographic profile and nature of work and health status of workers.

Pain scale assessment (Donna Wong & Connie Baker) & (Nordic Musculoskeletal Questionnaire)

To assess the pain scale severity of the workers Wong - Baker FACES pain rating scale that was developed by Donna Wong & Connie Baker in 1983 was used ,which is a visual tool used to help individuals describe their pain intensity. Its consist of a series of face ranging from a happy face at 0 , representing no hurt, to crying face at 10 representing hurts worst. Workers were asked to choose the face that suits the pain and the details were recorded. Nordic Musculoskeletal Questionnaire (NMQ) is a standard widely used tool for assessing musculoskeletal pain (Kuorinka etal ,1987). It's designed to evaluate the prevalence and consequences of musculoskeletal pain. The NMQ divide the body into nine anatomical regions were Neck, Shoulder, Upper Back, Elbow, Lower Back, Wrist/Hands, Hips/Thighs, knees, Ankles/ Feet. The details in the present study was elicited through interview method.

Computing the Body Mass Index of selected workers:

In this study, height and weight were measured using standard method and BMI was computed using the formula BMI = Weight (kg) /[Height (m)]$^{2.}$ BMI <18.5 to 24.9kg/m^2 was classified as underweight, 25.0 to 29.9 kg/m^2 were classified as overweight while those with as BMI greater or equal to 30.0 were classified as obese on WHO standards of classification (World Health Organization., 2016). BMI is widely used indicators of body fatness which can help, identify workers at risk for health condition associated with underweight, overweight and obesity, diabetes and musculoskeletal disorder.

Statistical analysis

Using SPSS 20 version the association between gender and pain severity among selected workers was assessed using Chi square analysis.

Results and Discussion

Table 1: Demographic Profile of selected workers

Demographic Profile		Number of workers (N=523)	Percent (%)
Gender	Male	263	50.3
	Female	260	49.7
	Total	**523**	**100.0**
Age	20-39 Yrs	301	57.6
	40-59 Yrs.	182	34.8
	60-65Yrs.	38	7.3
	Above 75 Yrs	2	.4
	Total	**523**	**100.0**
Marital Status	Married	481	92.0
	Single	42	8.0
	Total	**523**	**100.0**
Family Type	Joint Family	233	44.6
	Nuclear Family	290	55.4
	Total	**523**	**100.0**
Religion	Hindu	472	90.2
	Christian	49	9.4
	Muslim	2	.4
	Total	**523**	**100.0**
Education	Primary	383	73.2
	Secondary	85	16.3
	High School	44	8.4
	Higher Secondary	11	2.1
	Total	**523**	**100.0**
Occupation	Manager	6	1.1
	Supervisor	11	2.1
	Machine Operator	386	73.8
	Cleaning Worker	50	9.6
	Security	26	5.0
	Driver	22	4.2
	Office person	22	4.2
	Total	**523**	**100.0**
Working time	8 hrs (ILO,1919)	523	100.0

Monthly income in Rs	10000 - 15000	120	22.9
	16000-20000	386	73.8
	21000-25000	11	2.1
	Above 25000	6	1.1

Out of 523 workers, 50.3 percent were male and 49.7 percent were female. Among 523 workers, a majority of 57.6 percent belong to age group 20-29 years, categorized as young adult, contributing a significant proportion of workforce. And four percent belong to above 75 years. The majority of 92.0 percent of workers were married and 44.6 percent were in joint family. Majority of 90.2 percent were Hindu, followed by Christian and Muslim.

With regard to the educational level of workers, it was found that majority of 73.2 percent had primary education and 16.3 percent had secondary education indicating the choice of work at industry as machine operators(73.8percent), cleaning worker(9.6 percent) and in other low level of management such as security ,driver and office person. A majority of workers (96.7 percent) reported to earn a monthly income between Rs. 10000 – 20000.

Type of work

Among selected workers , it was found that, almost an equal percent of 16 percent of workers of both genders were doing sedentary type of work. A majority of 44 percent female between the age group of 40-59 years were heavy workers involved in filling work and machine operating. The result indicate that there is no statistically significant difference in job activity levels across the age and gender groups.

A study by Johnson et al., (2019) explored the types of jobs held by different age groups and found that younger workers (20-39years) were more likely to be engaged in jobs that require moderate physical activity, such as administrative and sales position.

Table – 2 Body Mass Index of selected workers

BMI Category	Age of workers													
	20-39 years N = 301				40 – 59 years N = 182				60-65 years N = 38				Above 75 years N= 2	
	Male		Female		Male		Female		Male		Female		Male	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Under weight	13	9.0	25	15.9	30	30.0	22	26.8	8	47.1	6	28.6	1	50.0
Normal	88	61.1	110	70.1	51	51.0	48	58.5	7	41.2	13	61.9	1	50.0
Overweight	32	22.2	12	7.6	15	15.0	6	7.3	1	5.9	1	4.8	0	0
Obese	11	7.6	10	6.4	4	4.0	6	7.3	1	5.9	1	4.8	0	0
Total	144	100	157	100	100	100	82	100	17	100	21	100	2	100
Pearson Chi-Square	14.839				3.836				1.683					

The Body Mass Index computed among selected workers reveals that none of the female workers above 75 were obese. In addition, the prevalence of obesity was less among all age groups. The prevalence of overweight among young adults (20-39 years) were more in males when compared to females. Majority of male and female workers were normal. According to the centers for disease control and prevention (CDC), the Prevalence of obesity increases with age of 20-39 and 40 -59 years. The CDC National Health and Nutrition Examination Survey (NHANES) data from 2017-2018 showed that 13 percent of adults aged 20-39 and 40-59 years adults of having obese 11 percent in young to older adults. There is a statistically significant relationship among age and BMI among males when compared to females.

Table 3. PAIN SCALE ASSESSMENT OF SELECTED WORKERS

Pain Scale	Age of Workers															
	20-39 years N = 301				40 – 59 years N = 182				60-65 years N = 38				Above 75 years N= 2			
	Male		Female		Male		Female		Male		Female		Male		Female	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
0	0	0	54	34.4	0	0	25	30.5	0	0	0	0	0	0	0	0
0(no hurts)	12	8.3	12	7.6	12	12.0	4	4.9	0	0	15	71.4	1	50.0	0	0
2(its hurt little)	32	22.2	26	16.6	26	26.0	14	17.1	1	50.0	1	4.8	1	50.0	0	0
4 (its hurt a little more)	51	35.4	38	24.2	38	38.0	17	20.7	3	17.6	2	9.5	0	0	0	0
6(its hurt a whole a lot)	32	22.2	20	12.7	16	16.0	11	13.4	5	29.4	1	4.8	0	0	0	0
8(its hurt a whole alot)	17	11.8	6	3.8	8	8.0	10	12.2	6	35.3	0	0	0	0	0	0
10(its hurt worst)	0	0	1	0.6	0	0	1	1.2	2	11.8	2	9.5	0	0	0	0
Total	144	100	157	99.9	99	100	82	100	17	100	21	100	2	100	0	0
Pearson Chi Square	65.110 P = 0.000				41.391 P=0.000				23.708 P=0.000							

The pain experienced by workers was assessed using the Wong-Baker FACES pain rating scale. Among young adults a significant of females (34.4%) report no pain. Thirty five percent and 22.2 percent males predominantly report pain levels at 4 and 6 respectively, while females had a more even distribution. Similar to the younger age group, a substantial portion of females (30.5%) report no pain, while none of the males reported pain among the age group of 40-59 years. Males in this age group predominantly report pain levels at 4 and 2.The pain scale and gender shows that there is a significant association between male and female with that of pain scale at $p< 0.05$ level.

Table 4. NORDIC MUSCULO SKELETAL DISORDER AMONG SELECTED WORKERS

	Age of Workers															
	20-39 years N = 301				40 – 59 years N = 182				60-65 years N = 38				Above 75 years N= 2			
	Male		Female		Male		Female		Male		Female		Male		Female	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
No hurts	100	69.4	106	67.5	75	75.0	58	70.7	12	70.6	11	52.4	0	0	0	0
Neck	8	5.6	7	4.5	0	0	3	3.7	0	0	1	4.8	2	100	0	0
Shoulder	9	6.3	9	5.7	5	5.0	3	3.7	2	11.8	2	9.5	0	0	0	0
Elbow	17	11.8	10	6.4	8	8.0	6	7.3	2	11.8	1	4.8	0	0	0	0
Wrist/hands	4	2.8	8	5.1	7	7.0	3	3.7	0	0	2	9.5	0	0	0	0
Upper back	5	3.5	6	3.8	4	4.0	2	2.4	0	0	2	9.5	0	0	0	0
Lower back	1	0.7	4	2.5	1	1.0	3	3.7	1	5.9	1	4.8	0	0	0	0
Hip/thighs	0	0	3	1.9	0	0	1	1.2	0	0	1	4.8	0	0	0	0
Knees	0	0	2	1.3	0	0	3	3.7	0	0	0	0	0	0	0	0
Ankles/feet	0	0	2	1.3	0	0	0	0	0	0	0	0	0	0	0	0
Total	144	100	157	100	100	100	82	100	17	100	21	100	2	100	0	0
Pearson Chi Square	81.994 P= 0.000				41.865 P=0.000				14.568 P=0.000							

This table presents the prevalence of musculoskeletal pain across different age groups and genders. The Pearson Chi-Square test results indicate a statistically significant association ($p < 0.05$) between age and pain distribution**,** meaning that musculoskeletal pain patterns are significantly influenced by age and gender.

Among young adults high rates of elbow (11.8 percent)and shoulder pain(6.3 percent) suggest repetitive strain injuries (RSI) from tasks like lifting or repetitive manual labor. Ergonomic interventions (proper posture, stretching, and breaks) are essential for injury prevention.

With regard to middle aged workers the gradual increase in elbow (8 percent) wrist/hands (7 percent) and upper back pain(4 percent) suggests chronic stress from prolonged work exposure suggesting for more ergonomic adjustments (wrist supports, improved workstation setups) are needed to prevent cumulative damage.

A study by Sangroula (2020) has presented high prevalence of overweight/obesity among workers in iron and steel industries of Bara District. More importantly, findings of the study have pinpointed towards socioeconomic, sociodemographic, lifestyle, and dietary factors that may increase the risk of overweight or obesity in workers. Many of the workers lacked physical exercise and we were moderate to sedentary workers. The workers who had more diverse food had increased overweight and obesity, and the higher calories and, in absence of physical exercise, may have resulted in increased overweight and obesity.

CONCLUSION

Middle and elder adult workers experience more pain, but there was no significant gender difference in pain levels. Majority of adults reported musculoskeletal pain in elbow. This study concludes that among selected industrial workers musculoskeletal pain increases significantly with age. Pain locations shift from repetitive strain injuries in younger workers to degenerative joint pain in older workers. Females in older age groups report more musculoskeletal pain, possibly due to osteoporosis and hormonal changes. Workplace modifications, ergonomic adjustments, and preventive healthcare interventions are crucial to managing pain across all age groups. Overall the finding suggest that while the immediate working condition are fair, there is a need for monitoring their dietary pattern and support to address the long term health risk faced by the workers.

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