

Prevalence of Work-related Musculoskeletal Disorders and Ergonomic Risk Assessment among Shopkeepers in Indian Rural Setup: A Cross-Sectional Study

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ABSTRACT

Background: Musculoskeletal disorders are a major occupational health issue that severely impacts quality of life through chronic pain and mobility limitations among grocery store workers and shopkeepers.

Aim: To assess the prevalence of work-related musculoskeletal disorders and risk factor assessment among shopkeepers in rural area.

Study Setting: Rural area in India

Study Design: Cross-sectional

Methods and Materials: Total 165 participants were screened out of which 122 were satisfying the inclusion criteria, out of which 16 were not willing to participate, 6 participants failed to fill out the provided questionnaire hence data for 100 participants was procured and 43 participants did not meet the requirements for inclusion criteria hence excluded. Nordic Musculoskeletal Questionnaire (Marathi) was used to evaluate Work-related Musculoskeletal Disorders. The REBA scale was utilized to assess risk factors.

Statistical Analysis: The analysis was conducted using descriptive statistics. Microsoft Excel was utilized to compute the mean, standard deviations, and percentages.

The data was then displayed in both tabular and graphical formats.

Results: In terms of area-specific afflictions, the highest incidence of musculoskeletal disorders was observed in the lower back (76%) and the knee (40%). This was followed by the upper back, which showed a 30% incidence rate. The other joints were affected thereafter. The REBA scale indicated a score of 11, suggesting a high risk of work-related musculoskeletal disorders. This underscores the need for implementing changes to mitigate this risk.

Conclusion: The study concludes that work-related musculoskeletal disorders are notably prevalent among rural shopkeepers. The findings underscore the necessity for implementing changes to address this issue.

Keywords: Shopkeepers, Work related musculoskeletal disorders, Ergonomics, Cross sectional study.

INTRODUCTION

Musculoskeletal ailments are among the most prevalent work-related illnesses globally.^[1] The general population suffers greatly from Work Related Musculoskeletal Disorders (WRMDs), which have a negative impact on their quality of life.^[2]

Musculoskeletal disorders are typically characterized by persistent pain, as well as dexterity and mobility impairments that make it difficult for patients to work and engage in society.^[3]

Workplace exposure to risk factors has been empirically demonstrated to be associated with musculoskeletal disorders, which are health issues related to the locomotor apparatus, including muscles, nerves, tendons, joints, cartilages, a spinal disc, and related tissue.^[4]

Shopkeepers deal with a variety of stressors which include lifting heavy objects, bending over, doing overhead tasks, and spending extended periods of time in static positions routinely. Workers subjected to manual labor, work in atypical and constrained posture, repetitive and static work, vibrations and unfavorable psychological and social settings have been found to have a significant prevalence of work related musculoskeletal disorders. It has been stated that musculoskeletal problems, which may impact hundreds of millions of individuals worldwide, are the most well-known and prevalent causes of severe chronic pain and physical disability.^[4] Grocery work is among the top 25 occupations for injuries such as neck, rotator cuff syndrome, wrist tendinitis, carpal tunnel syndrome, and back illnesses such as sciatica.^[4] A high force requirement or uncomfortable posture required for the task enhance the risk of this kind of injury. Additionally, the leading cause of the worldwide requirement for rehabilitation is musculoskeletal disorders. They make up about two-thirds of all adults in need of rehabilitation.

The structure of the checkout station and the cashiers repeated hand motions have been the subject of most studies on grocery workers. However, manual material handling is a need for all grocery workers, and they are all subject to physical risk factors for WRMDs.^[5]

The majority of studies conducted on grocery workers have focused on repetitive hand motions by cashiers and layout of the checkout station and not on workers who

are working in grocery store. However, all grocery workers perform manual material handling and are exposed to physical risk factors associated with WRMDs. Examples include heavy lifting of sack of heavy weights, boxes, forceful hand exertions, and awkward back and shoulder postures while stocking shelves.^[5]

Previously the studies were done in different populations like food stall workers, fire workers, bank cashiers and hairdressers in urban areas. Present study focuses on rural population as people in rural area are unaware about musculoskeletal diseases and its consequences which may impact the quality of life of an individual. Also, low literacy rate and lower educational level, different cultural background, poor lifestyle, lack of knowledge are other few factors to add to the development of musculoskeletal disorders.

In this study, the questionnaire used is Marathi Version of Nordic Musculoskeletal Questionnaire (NMQ) which is validated, simple to use, administer and proven to be reliable in a variety of languages with acceptable psychometric properties.^[6]

The other tool used in this study is Rapid Entire Body Assessment (REBA). It's a tool for evaluating the risk of bio-mechanical musculoskeletal disorders at the workplace. It helps in quantifying bio-mechanical risks, including uncomfortable postures, repetitive motions, and physical exertion. REBA uses a scoring system for evaluating postural assessments, encompassing static, dynamic, changing, or unstable positions.^[7]

The present study aimed to determine the prevalence of WRMDs and risk factors associated along with it among the shopkeepers dwelling in rural area. As the level of awareness in rural setting differs from that of an urban one it is important to assess and mitigate the factors causing WRMDs.

MATERIALS & METHODS

The study was a cross-sectional observational study conducted for 6 months. The study received ethical clearance by the

Institutional Ethical Committee of Dr. A.P.J. Abdul Kalam College of Physiotherapy. Purposive sampling method was used for the study. After that purpose of study was clearly explained to shopkeepers and informed consent was filled and signed by the participants who were willing to participate in the study.

Selection Criteria:

Inclusion Criteria: Age: 18-50 years, both male and female, working hours more than or equal to 7 hours per day, literate population, more than 2 years of work experience, subjects who are willing to participate in study otherwise they will not give exact information that was helpful to the study.

Exclusion Criteria: Subject who are not willing to participate, subject with recent fracture, injury, surgery, subject who did not respond within study period, subjects working at 2 different places at same time, having lifestyle disorder (diabetes, hypertension, obesity, thyroid)

Total 165 shopkeepers dwelling in the area were screened out of which 122 were satisfying the inclusion criteria, out of which 16 were not willing to participate, 6 participants failed to fill out the provided questionnaire hence data for 100 participants was procured and 43 participants did not meet the requirements for inclusion criteria hence excluded. After obtaining the written informed consent form, demographic data was obtained using Data collection sheet.

After filling the demographic details, Participants were asked to fill questions from the Marathi version of Nordic Musculoskeletal Questionnaire. This Questionnaire assessed any trouble, ache, pain discomfort numbness in last 12 months in 9 body parts like neck, shoulder, elbows, upper back, lower back, wrists/hand, hips/thighs, knees, ankles/feet. The questionnaire also assessed whether due to trouble the participant has prevented to do the normal work in last 12 months, and it also assessed the trouble felt by participant during the last 7 days.

The next outcome measure was Rapid Entire Body Assessment (REBA) which was analyzed by Physiotherapist. In the REBA scale, the body segments are divided into two groups, namely group A and group B.

Group A includes the back (torso), neck and legs analysis, while group B includes the upper arms, forearms and wrists analysis, along with score of Load forces, Coupling factors and activity score.

Data was collected and analyzed.

STATISTICAL ANALYSIS AND RESULT

Data was collected, entered and analyzed using Microsoft Excel, tabulated, and subjected to statistical analysis using descriptive statistics. Mean scores and Percentage were calculated using Microsoft Excel and the data was presented in tabular and graphical format. Various statistical measures such as mean, standard deviations (SD), frequency were utilized to analyze the data.

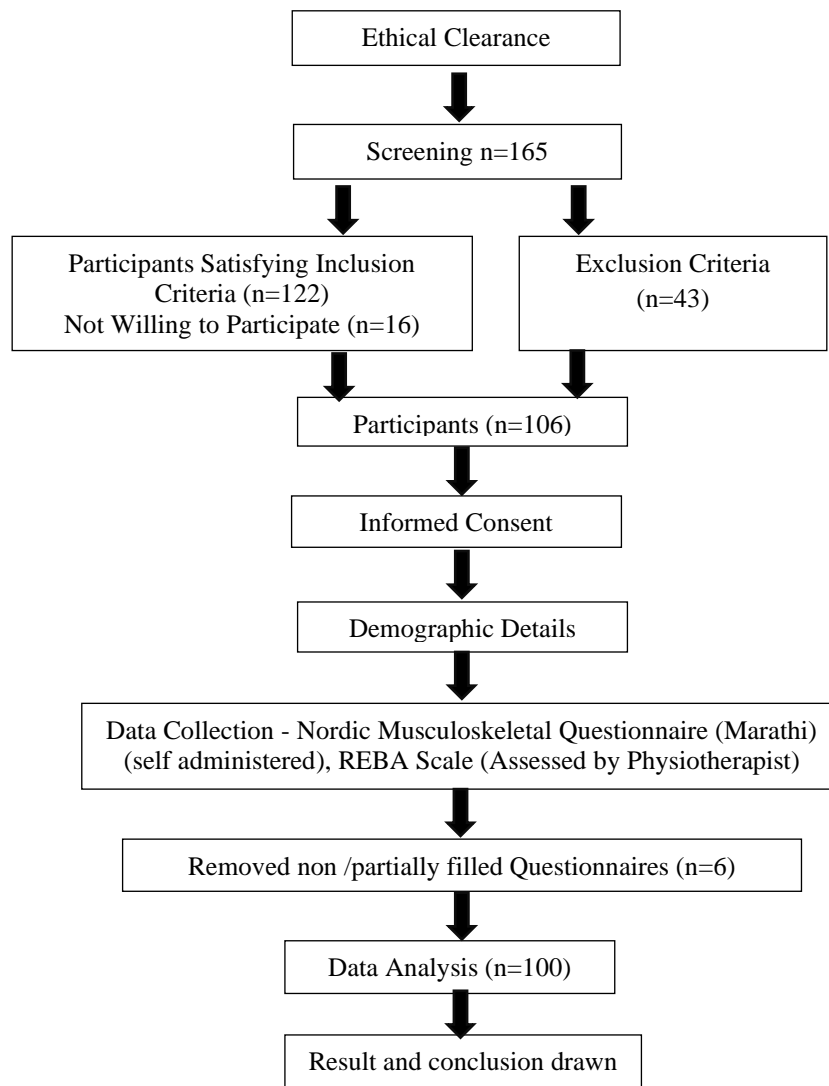


Fig 1: Flow chart of the procedure

Table 1: Socio-demographic characteristics of the surveyed shopkeeper

Demographic data of participants	Mean \pm SD
Age (years)	34.64 \pm 8.65
Height (cm)	159.93 \pm 8.81
Weight (kg)	59.8 \pm 9.31
BMI (kg/m ²)	23.28 \pm 2.68
Working hours	9.39 \pm 0.77

Table 2: Gender and Education wise distribution of participants

Gender	Number of participants	Percentage
Male	47	47%
Female	53	53%
Married		
Male	25	25%
Female	18	18%
Unmarried		
Male	22	22%
Female	35	35%
Higher education		
Secondary school	27	27%
Higher Secondary school	41	41%
Tertiary/ graduation	32	32%

Table 3: Assessment of Work Related Musculoskeletal Disorders (WRMDs)

Region	Have you at any time during the last 12 months had trouble (ache, pain, discomfort, Numbness) in:		Have you at any time during the last 12 months been prevented from doing your normal work (at home or away from home) because of the trouble		Have you had trouble at any time during last 7 days?	
	No.	Percentage	No.	Percentage	No.	Percentage
Neck	26	26%	26	26%	21	21%
Shoulder	25	25%	23	23%	21	21%
Elbow	6	6%	6	6%	6	6%
Wrist/hands	6	6%	6	6%	6	6%
Upper back	30	30%	30	30%	24	24%
Lower back	76	76%	76	76%	70	70%
One or both hips	3	3%	3	3%	3	3%
One or both knees	40	40%	40	40%	35	35%
One or both ankles/feet	5	5%	5	5%	5	5%

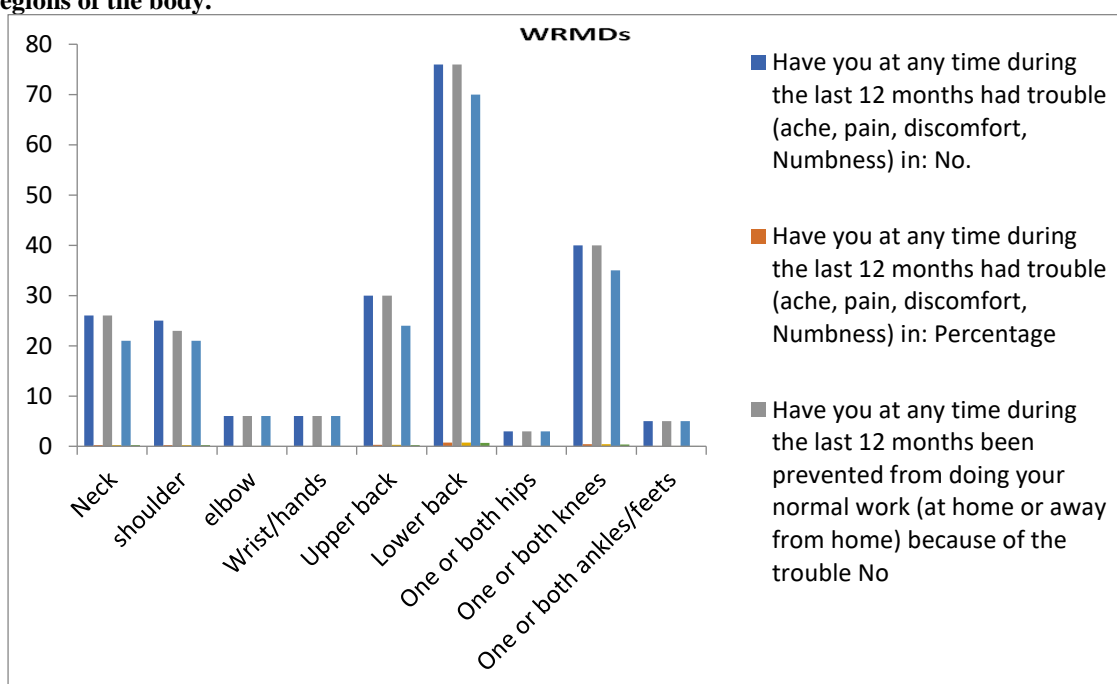
Analysis of prevalence of pain, ache, discomfort or numbness during the last 12 months revealed that the prevalence of WRMDs was highest in Low back (76%) and Knee (40%) followed by Upper Back (30%) and Neck (26%) followed by other regions denoted in table number 3. This denotes the prevalence of no. of people who have been prevented from carrying out normal activities during the last 12 months because of trouble in the 9 regions of the body.

Table 4: REBA Assessment

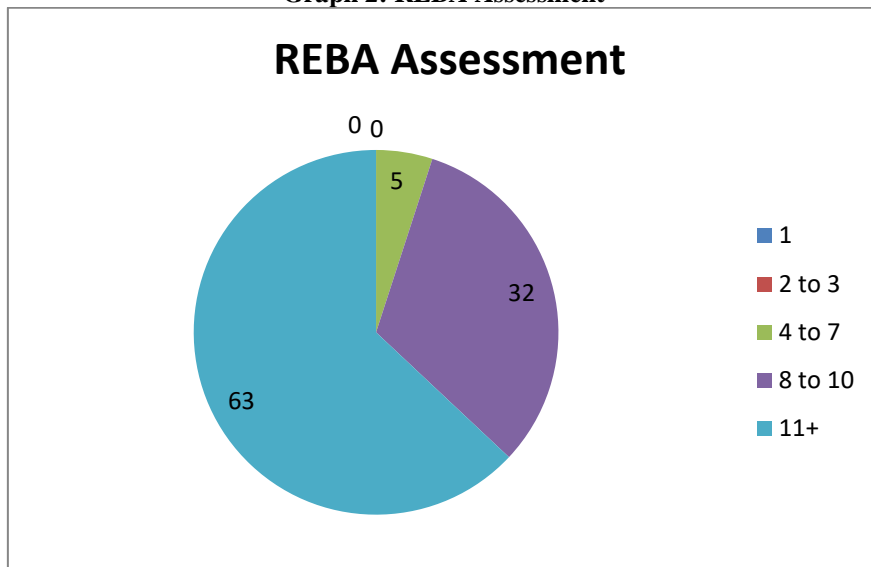
Score	Number of people	Percentage
1	0	0%
2- 3	0	0%
4 – 7	5	5%
8 – 10	32	32%
11+	63	63%

In this study average scoring for REBA was found to be 11 ± 1.70 which implies high risk of WRMDs and these further needs investigation and implement change.

Graph 1: Prevalence of pain, ache, discomfort or numbness during the last 12 months and past 7 days in 9 regions of the body.



Graph 2: REBA Assessment



DISCUSSION

The research findings indicate a high incidence of WRMDs among the shopkeepers. The lower back and knee were identified as the most impacted areas, followed by other regions. This could be attributed to the repetitive activities such as bending, standing, carrying weights, and prolonged standing hours. Shopkeepers are often engaged in tasks that involve writing or computer work for documentation which may result in them adopting bent neck postures for extended periods.

A comparable study conducted by Amensisa Hailu Tesfaye et al. (2024) reported an 81.1% prevalence of work-related musculoskeletal disorders among shopkeepers over the previous 12 months. The prevalence reported over the past 7 days was 75.2% among the participants.

The most commonly reported issue in our study was low back pain, affecting 76% of the participants. In contrast, studies conducted in Ethiopia and India reported lower prevalence rates of 46.6% and 57.33% respectively. However, it's worth noting that the Indian study focused on a population with chronic osteoarthritis, while our study encompassed all body parts.

The majority of the discomfort reported in present study was associated with the lower back, potentially due to prolonged static sitting in incorrect postures. Most

shopkeepers were observed sitting on chairs or stools lacking adequate back support, which could be the primary cause of their low back pain.^[8] Additionally, some shopkeepers are required to bend and lift heavy objects as part of their job duties. Serving customers often involves standing for extended periods, which could explain the occurrence of knee and ankle pain.

Our study included both male and female participants, with females outnumbering males. Both genders reported experiencing musculoskeletal pain in various body regions. We found a significant correlation between the incidence of WRMDs and gender, with women being more susceptible. This finding is corroborated by previous studies conducted in Ethiopia^[9] and India.^[10]

This gender disparity could be attributed to differences in physiology, morphology, or societal roles between men and women. Women, despite being of the same size as men, are more prone to WRMDs due to their weaker type 1 muscle fibres and overall lesser muscle strength.^[11]

Moreover, while men and women work in similar environments, most workplaces are designed to suit men's anthropometric measurements and physical strengths, such as surface height, tool design, and equipment size. This could exert additional strain on women's bodies. Furthermore, 15

of the 18 married women were having children and often juggle work with household responsibilities like cooking, cleaning, childcare, and laundry, which could add to their physical and psychological stress, thereby increasing their likelihood of developing WRMDs.

The majority of the working hours recorded in our survey ranged between 9 and 12 hours. This prolonged duration of work without sufficient breaks can lead to excessive stress on the body. Other affected body regions include the upper back (30%), neck (26%), and shoulder (25%), with minimal effects on the elbow (6%), wrists/hands (6%), hips (3%), and ankle (5%).

Our data suggests that shopkeepers who spend a significant amount of time seated are more prone to work-related musculoskeletal issues. This could be due to the strain prolonged sitting places on muscles, tendons, and ligaments, and the increased disc pressure it causes. This can lead to pain, discomfort, and injuries associated with postural stress disorders, joint compression, and soft-tissue injuries. Extended periods of sitting also result in a monotonously low total energy expenditure, which could lead to a situation where the energy required by the body for the back region is significantly lower than what is recommended for a healthy lifestyle. In this context, conditions like osteoporosis and muscle atrophy can eventually develop due to a low metabolic rate and reduced blood circulation. Additionally, prolonged sitting reduces the amount of oxygen reaching the organs and muscles, thereby contributing to the development of WRMDs.

The risk factor assessed by a therapist in this study reveals a high population score of 11, indicating a high risk and the need for change. Given that shopkeepers often work in sub-optimal setups, it is necessary to make modifications in the shop for improved work efficiency.

The following are evidence-based strategies for the prevention and management of WRMDs: Early Intervention: During the

recovery phase, changes to work schedules, early symptom identification through prompt reporting systems with regular workplace surveillance and risk assessment can be performed.^[12] Ergonomic intervention: Workstation and ergonomic equipment adjustments can prevent awkward postures and repeated strain, regular rests and micro pauses can reduce tissue loading. Organizational Measures: Redesigning work processes to eliminate high-risk movements, education about safe work practices and appropriate body mechanics.^[13] Exercise Programs: Regular stretching improves flexibility and eases tense muscles, exercises to strengthen specific muscle groups enhance tissue tolerance.^[14]

CONCLUSION

The study concludes that Work-Related Musculoskeletal Disorders are significantly prevalent among the shopkeepers in rural area along with REBA score of 11 which implies high risk of work-related musculoskeletal disorders and these further needs implement change.

Declaration by Authors

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