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Prevalence of Work-Related Musculoskeletal Disorders and Ergonomic Risk Assessment Among the Grocery Store Workers

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ABSTRACT

Introduction: Musculoskeletal disorders (MSDs) are injuries or disorders affecting muscles, nerves, tendons, joints, cartilage, and spinal discs. Work-related musculoskeletal disorders (WMSDs) are significantly influenced by the work environment and performance, often exacerbated by job conditions. WMSDs affect various body parts associated with movement, including upper and lower limbs and the back, caused or aggravated by work activities. Factors like joint positions, repetitive motions, and high static muscle loads contribute to these issues. Grocery store workers, particularly those involved in manual labor and repetitive tasks, have a high incidence of WMSDs, with prevalent complaints of lower back, knee, and upper extremity pain.

Materials & Methods: This cross-sectional study involved 96 participants aged 18-50, working a minimum of 5 hours daily with at least one year of experience in material handling. Exclusions were made for those receiving treatment for musculoskeletal diseases, with deformities, degenerative conditions, unwilling participants, or cash register workers. Data collection included the Nordic Musculoskeletal Questionnaire (NMQ) in Hindi and photographs of participants in their most attended work postures. The Rapid Entire Body Assessment (REBA) was used to evaluate ergonomic risks.

Results: The study found a high prevalence of musculoskeletal discomfort among grocery store workers, particularly in the lower back, knees, neck, and ankles. The number of working years which shows that 50% of the population lies in the range of 1-5 years followed by 30.02% in 6-10 Years. The number of working hours which shows that 42.7% of subjects work for 6-7 hours and 20.83% for 9-10 hours. The REBA scores indicated that 42.7% of participants were at high risk (scores 8-10), 38.54% at medium risk (scores 4-7), and 14.5% at very high risk (scores 11-15), necessitating immediate ergonomic interventions.

Conclusion: Grocery store workers are at a high risk of developing WMSDs, with significant discomfort in the lower back, knees, ankles, and neck. Limitations include lack of segregation among working patterns, and not considering rest intervals or BMI. Future research should focus on intervention studies, segregating working patterns, and advising preventive measures to mitigate these risks.

Keywords: Work-related musculoskeletal disorders, Ergonomic risk assessment, Grocery store workers, Musculoskeletal disorder prevalence, Nordic Musculoskeletal Questionnaire, REBA (Rapid Entire Body Assessment)

INTRODUCTION

Musculoskeletal disorders (MSD) are injuries or disorders of the muscles, nerves, tendons, joints, cartilage, and spinal discs. Work-related musculoskeletal disorders (WMSD) are conditions in which: The work environment and work performance contribute significantly to the condition; and the condition is made worse or persists longer due to work conditions[1]. WMSDs are disorders affecting various body parts associated with movement, including the upper limbs, lower limbs, and back. These affect the different structures of the body such as tendons, joints, muscles, and nerves, and are primarily caused or aggravated by work-related activities. [3] Risk factors proposed were joint positions such as cramped positions, extreme positions, and steep forward bending of the head. Therefore, the problems can be aggravated by high repetition, high pressure, high static muscles, and joint load [5]. A high prevalence of work-related musculoskeletal disorders (MSDs) has been recorded among workers who are exposed to manual labor, work in unusual and restricted postures, repetitive and static work, vibrations, and poor psychological and social conditions.[6]

In contrast to many occupational diseases that have their origin in exposure to particular hazardous agents, most musculoskeletal disorders (MSDs) are characterized as multifactorial. Findings of scientific research have identified physical, psychosocial/ organizational and individual occupational 'risk factors' for the development of work-related musculoskeletal disorders (WMSDs) [2] The complaints among grocery workers about musculoskeletal disorders (MSDs) have been increasing in the last decade and have become a major health issue. [3] Grocery Stores had the fourth highest incident rate of WMSD between 1992 and 2000. Grocery Store Front End workers (cashiers, counter and rental clerks, pharmacy technicians, retail salespersons, sales and related workers) accounted for 42% of all MSD injury claims in the industry (1994-1998), and of those, 54% were back or neck injuries and 34% were upper extremity related. The causes for injuries such as these are not always known, but research suggests that there are three prominent risk factors in the work process: excessive repetitiveness, high forces, and awkward postures [6] Grocery retail work can be physically demanding as material handler's tasks involve manual lifting, lowering, carrying, pushing and pulling loads. The nature of this work puts them at risk for serious low back pain, shoulder pain, and other musculoskeletal injuries.[7] Most Grocery Store Workers consider lifting loads exceeding acceptable limits and levels, locations from or to which objects are selected or put to be too low, too high, or too deep, and work times exceeding 8 hours to be troubling.[8] Most of the research carried out on grocery workers focused on repeat hand movements by cashiers and the checkout station layout. A high force occurs while a heavy product is lifted. [9]

Few studies also concluded that working in awkward postures or some combinations for long periods can also cause an increase in the risk of work-related musculoskeletal disorders.[10] Inappropriate working tasks can cause low back pain, shoulder pains, and others. Increased risk of attaining musculoskeletal disorder is due to bending or lifting from the back.[11-13] Several simpler methods have been developed for systematically recording workplace exposure to be assessed by an observer and recorded on pro-forma sheets. REBA was developed to assess entire body posture for risk of WRMSDs. REBA has been developed to fill a perceived need for a practitioner's field tool, specifically designed to be sensitive to the type of unpredictable working postures found in health care and other service industries.[10] The Nordic Musculoskeletal Questionnaire (r=0.72) (NMQ) was developed from a project funded by the Nordic Council of Ministers. The aim was to develop and test a standardized questionnaire methodology allowing comparison of low back, neck,

shoulder, and general complaints for use in epidemiological studies.[15] We aim to study 1) to determine the prevalence of work-related musculoskeletal disorders among grocery store workers. 2) The prevalence of work-related musculoskeletal disorder symptoms using the Nordic Musculoskeletal Questionnaire, and 3) assess ergonomic risks using the REBA (Rapid Entire Body Assessment) method in grocery store workers.

MATERIALS & METHODS

A cross-sectional study including 96 participants was carried out in metropolitan settings. The study comprised subjects who were between the ages of 18 and 50 who worked a minimum of 5 hours and a minimum of one year of experience in material handling. We excluded grocery workers who were receiving treatment for musculoskeletal diseases, had deformities, suffered from degenerative conditions, were unwilling to participate in the study, or worked at cash registers. Subjects were given the questionnaire and data was collected in the form of pictures which were taken of them while doing work in their most attended posture owing to job demand.

Nordic Musculoskeletal Questionnaire in Hindi (r=0.72).

The Nordic Musculoskeletal Questionnaire (NMQ) quantifies musculoskeletal pain and activity prevention in 9 different regions.

Rapid Entire Body Assessment(r=0.925)

REBA was developed as a means to assess entire body posture for risk of WRMSDS. Score the Group A (Trunk, Neck, and Legs) postures and the Group B (Upper Arms, Lower Arms, and Wrists) postures for left and right. For each region, there is a posture scoring scale plus adjustment notes for additional considerations. Then score the Load / Force and Coupling factors. Finally, score the Activity. Find the scores from Table A for the Group A posture scores and from Table B for the Group B posture scores. The tables follow the data collection sheet. Score A is the sum of the Table A score and the Load / Force score. Score B is the sum of the Table B score and the Coupling score for each hand. Score C is read from Table C, by entering it with Score A and Score B. The REBA score is the sum of the Score C and the Activity score.

STATISTICAL ANALYSIS

A descriptive analysis was performed. Quantitative results are expressed as mean (standard deviation) and categorical results as number (%).

RESULT

The study included 96 subjects with a mean age of 34 ± 9.66 years, ranging from 18 to 50. 2.08% of subjects are between the ages of 18 and 20, 6.25% between the ages of 20 and 25, 22.91% between the ages of 26 and 30, 23.95% between the ages of 31 and 35, 17.7% between the ages of 36 and 40, 13.54% between the ages of 41 and 45, and 13.54% between the ages of 46 and 50. 48 subjects had work experience ranging from 1 to 5 years, 29 had 6 to 10 years, 13 had 11 to 15 years, and 6 had 16 to 20 years. (Fig 1) The number of working years demonstrates that 50% of the population is between the ages of 1 and 5, with 30.02% falling between 6 and 10. On looking at the working hours they spend we found 42.7% of subjects work for 6-7 hours and 20.83% for 9-10 hours. 12 subjects spend 5 hours working, 41 subjects spend 6 to 7 hours working, 10 subjects spend 8 to 9 hours working, 20 subjects spend 9 to 10 hours, and 13 subjects spend 11 to 12 hours working. (Fig 2) The highest frequency of musculoskeletal discomfort in Low Back in past 12 months (20.48%), Knee (18.07%), Neck (13.25%), Ankle (12.04%), Upper Back (10.84%), Shoulder (7.2%) while it was less pronounced in Elbow (4.81%), Left Wrist (3.61%), Right Wrist/ Hand (2.4%), Both Wrist/Hand (2.4%). (Fig 3) There is highest frequency of musculoskeletal discomfort in last 7 days were Low Back (22.64%), Knee (20.75%), Neck (15.09%), Ankle (13.2%), Upper Back (9.43%), while

it was less pronounced in Elbow (5.66%), Hip (3.77%), Both Wrist/Hand (3.77%) Left Wrist (1.88%), Right Wrist (1.88%), Shoulder (1.88%). (Fig 4) There was the highest frequency of musculoskeletal discomfort in past 12 months while performing day-to-day activity Knee (24.4%), Low Back (20.4%), Ankle/Foot (16.32%), Neck (12.24%), Upper Back (8.16%), while it was less pronounced in Both Wrist/Hand (4.08%) Left Wrist (4.08%), Shoulder (4.08%), Right Wrist (2.85%), Hip (2.04%), Elbow (2.04%). (Fig 5)

The REBA score shows around 42.7% of individuals have a score ranging between 8 To 10, followed by 38.54% ranging from 4 To 7. 14.5% of subjects had a score between 11 To 15 and 4.16% had a score in the range of 2 To 3. It concluded that patients who lie in the range of 8-10 which is interpreted as high risk and requires necessary action soon. 38.54% of patients who lie in the range of 4-7 which indicates medium risk and necessary action & 14.5% of patients who lie in the range of 11-15 which indicates high risk and necessary action now. (Fig 6)

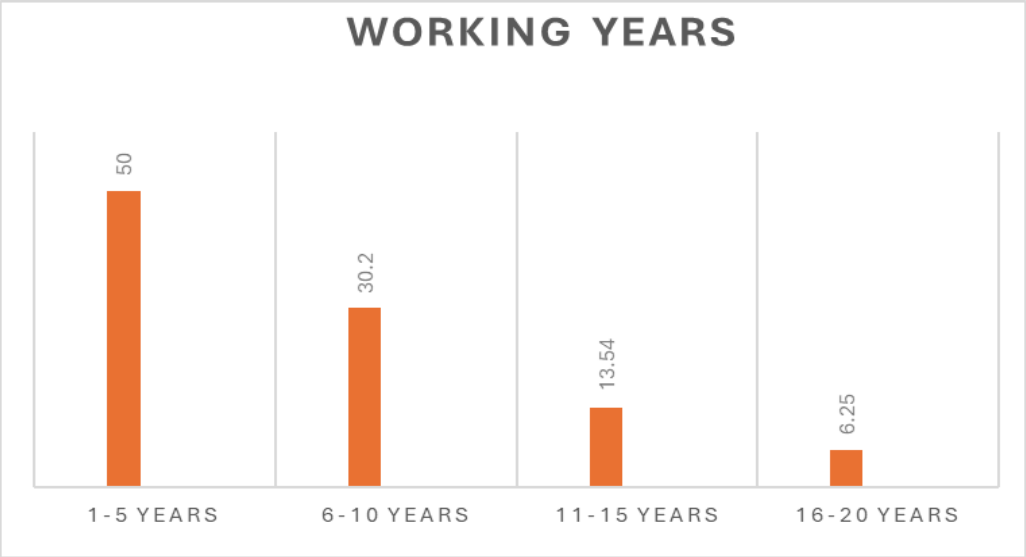

Fig 1: Representation of working experience

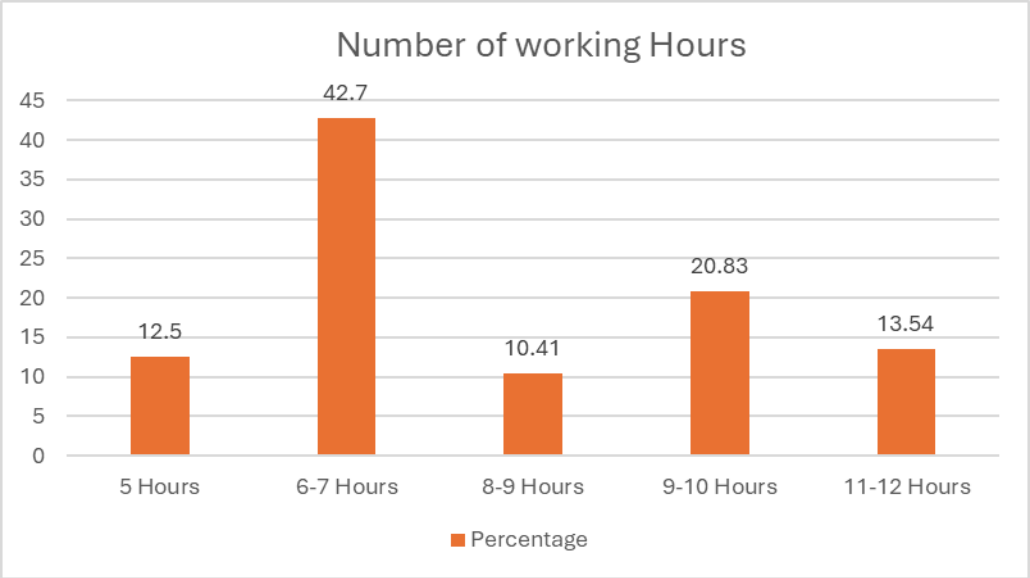

Fig 2: Representation of the number of working hours

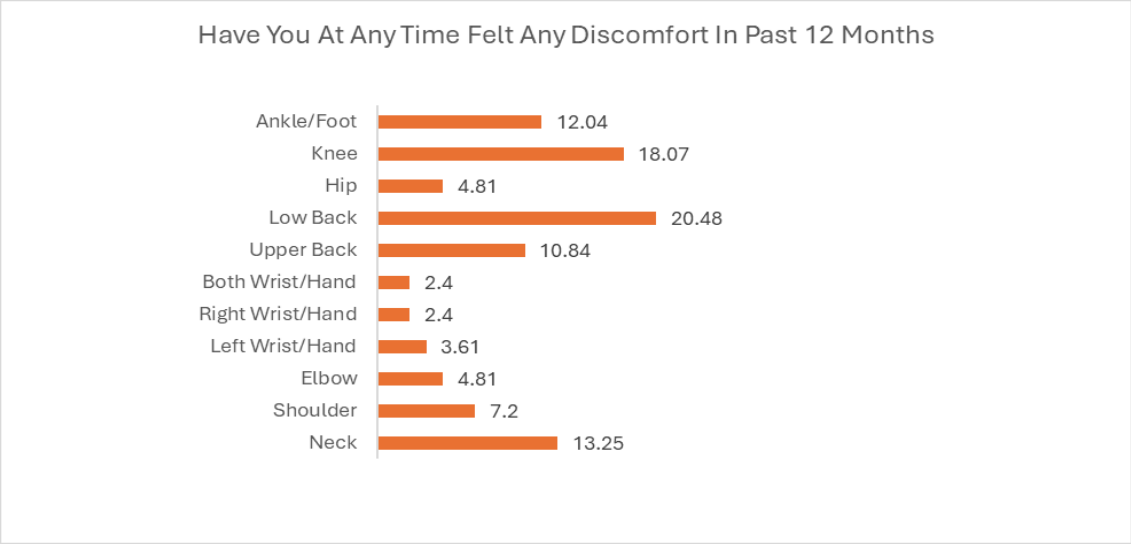

Fig 3: Representation of have you at any time felt any discomfort in the past 12 months

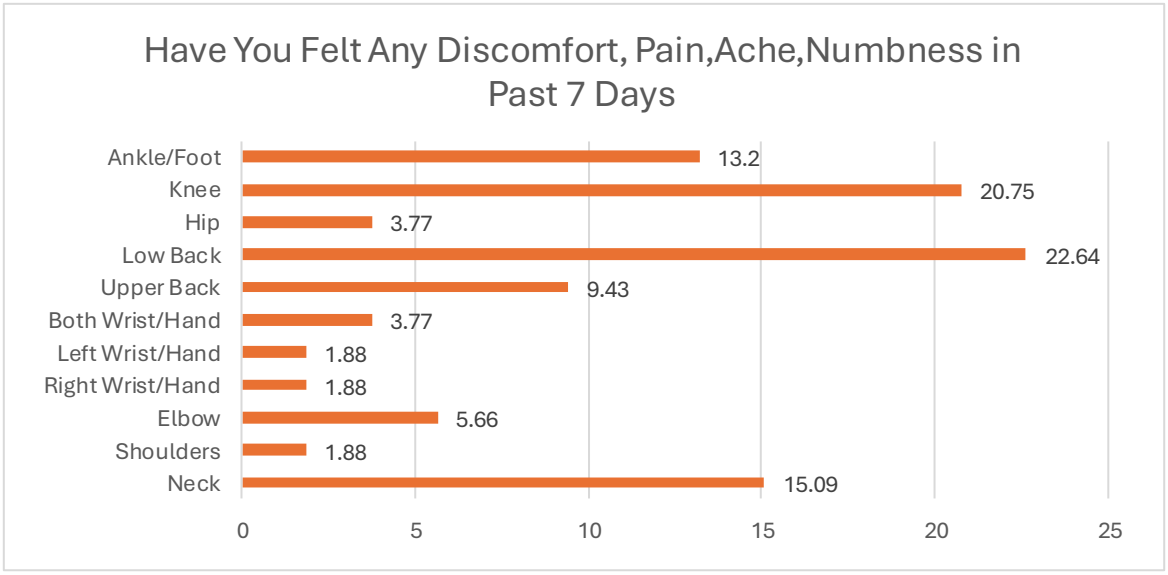

Fig 4: Representation of Have You Felt any discomfort, pain, ache, or numbness in the past 7 Days

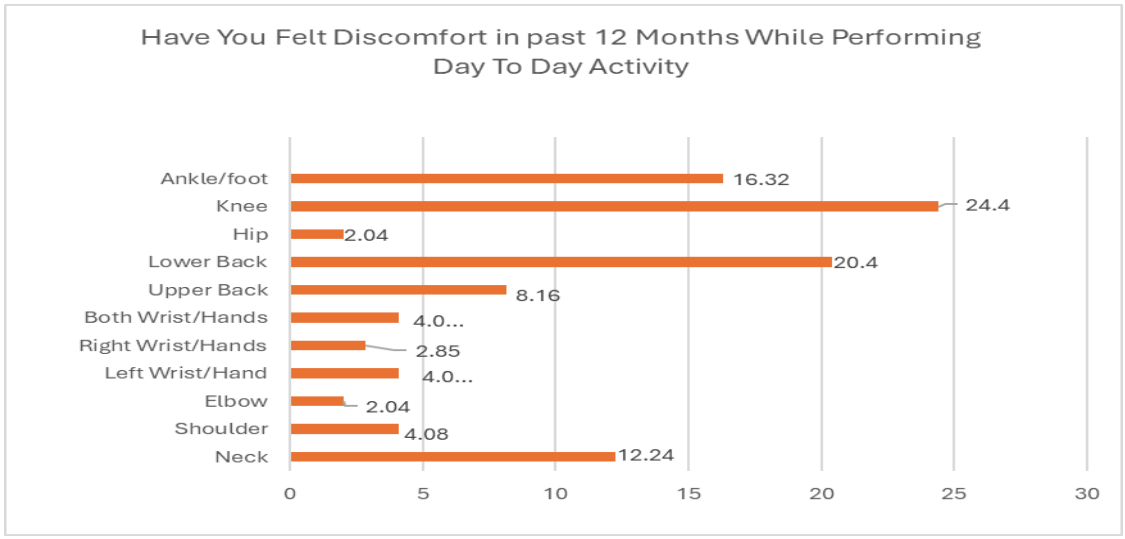

Fig 5: Representation of Have You felt discomfort in the past 12 months while performing day-to-day activities

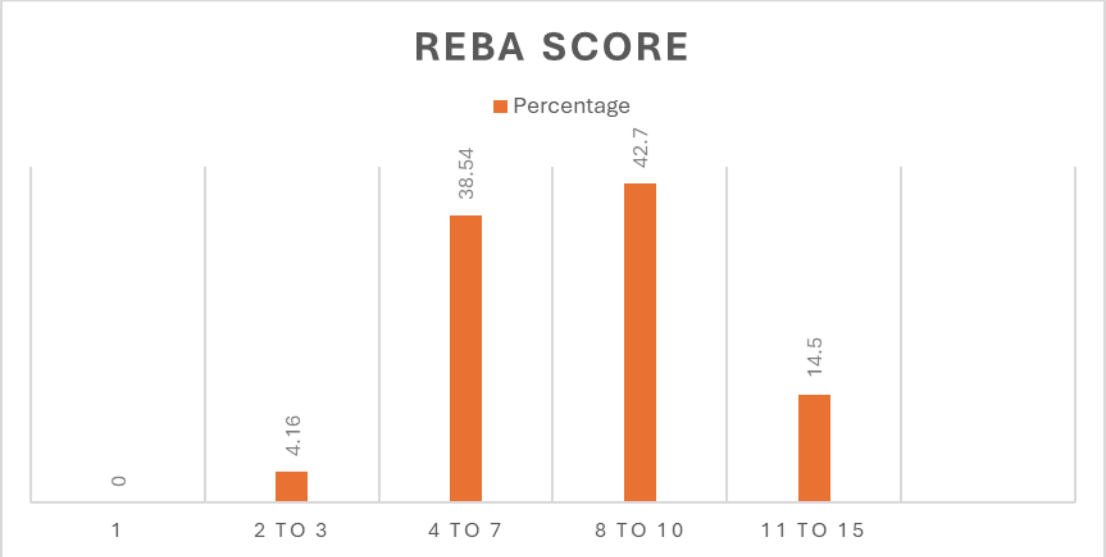

Fig 6: Representation of REBA Score

DISCUSSION

Among the grocery store workers, 44.3% of respondents showed pain in at least one site in the last 12 months which shows that grocery store workers have a high level of MSDs. The highest symptom-affected area was the lower back with a percentage of 21.17%, 21.07% in the Knee, 13.85% in the ankle & 13.52% in the neck. A study done by Cynthia M Clarke in Washington namely workplace injuries and illness among grocery store workers found similar results. They found that the parts of the body that were most frequently injured were the trunk (particularly the back), the upper extremities, and the lower extremities, with 35, 30, and 22 percent of the cases respectively.[16] A study done by Mohd Nasrull Abdul Rahman and Muhammad Fareez Ahmad Zuhaidin in 2017 namely Musculoskeletal symptoms and ergonomic hazards among material handlers in grocery retail industries also used NMQ for assessing the WMSD concluded that the highest body part trouble in the last 12 months was low back pain (88.3%), followed by upper back (68.3%), neck (55.3%), shoulder (36.7%) & ankle (36.7%). He also mentioned that 50.0% of workers had back trouble due to forward bending. Moreover, the Health and Safety Executive (HSE) stated that kneeling and squatting may result in chronic pain and approximately 69.0% to 84.0% had trouble with these situations.[7] A study done by Ronika Agrawal; and Nishit Panjwani on Indian grocery store workers showed different results. They found a high prevalence of 87% amongst grocery store workers with high affection in the lower back followed by knee, ankle/foot, Hips/thighs, and low frequency in the upper back, neck, and shoulders [18] In the past 7 days lower back was the highest trouble affecting the workers with a percentage of (22.64%), Knee (20.75%), Neck (15.09%), & Ankle (13.2%). As mentioned in the study above, the study of musculoskeletal symptoms and ergonomic hazards among material handlers in grocery retail industries concluded that most of the workers were troubled by lower back in 1-7 days. Knees had the highest percentage of discomfort in the last 7 days which was 6.7% in the lower extremity.[7]

In the present study when REBA scores were calculated it was revealed that 42.7% of patients lie in the range of 8-10 which is interpreted as HIGH RISK and requires NECESSARY ACTION SOON. 38.54% of patients lie in the range of 4-7 which indicates MEDIUM RISK and NECESSARY ACTION. 14.5% of patients lie in the range of 11-15 which indicates HIGH RISK and NECESSARY ACTION NOW. A study done by Vann Harold V.

Maligaya, Matthew Martin P. Sanchez, Corrine Andreana, and Alyssa Jean A. Portus namely Ergonomic Assessment of the Working Conditions of Checkout Counter Cashiers in a Grocery Store in the Philippines concluded that Material Handlers at grocery store workers showed a REBA score of 6-8 with MEDIUM RISK.

The most common reason for low back, neck, and knee discomfort in this population is due to repetitive stooping, lifting heavy weights, and material handling. Repetitive stooping and lifting heavy loads in awkward posture leads to lumbar fatigue as maximum force is applied by the lumbar spine while stooping which further leads to core weakness and excessive inappropriate loading and absorption of forces over the lower limb which leads to pain. A study done by Hwang S, Kim Y, Kim Y. Lower extremity joint kinetics and lumbar curvature during squat and stoop lifting, showed that the ankle and knee joints absorbed power and the hip and lumbar joints generated power in the stoop lifting. It also concluded that while stooping knee flexion moment plays an important role. An increased risk of low back pain was observed for workers who worked with the trunk in a minimum of 60° of flexion for more than 5% of the working time, for workers who worked with the trunk in a minimum of 30° of rotation for more than 10% of the working time, and for workers who lifted a load of at least 25 kg more than 15 times per working day. Flexion and rotation of the trunk and lifting at work are moderate risk factors for low back pain, especially at greater levels of exposure.[17]

CONCLUSION

The study revealed a high prevalence of work-related musculoskeletal disorders (WMSDs) among grocery store workers, with significant discomfort reported in the lower back, knees, ankles, and neck. The assessment using the Nordic Musculoskeletal Questionnaire (NMQ) and Rapid Entire Body Assessment (REBA) highlighted the substantial ergonomic risks associated with grocery store work, particularly for those involved in manual material handling and repetitive tasks. These findings underscore the urgent need for ergonomic interventions to reduce the risk of WMSDs among grocery store workers. Addressing factors such as awkward postures, repetitive motions, and heavy lifting can help alleviate the high incidence of musculoskeletal pain and discomfort in this population. However, the study had limitations, including the lack of segregation among different working patterns, and not considering rest intervals or BMI. Future research should focus on intervention studies that address these limitations, segregate working patterns for detailed analysis, and develop preventive measures tailored to the specific needs of grocery store workers. By implementing such strategies, it is possible to improve the overall health and well-being of workers in the grocery retail industry.

Declaration by Authors

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Conflict of Interest: The authors declare no conflict of interest.

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