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REVIEW ARTICLE

Work-Related Musculoskeletal Disorders in Food Packing Workers: A Review of Prevalence and Workplace Factors

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Abstract

Work-Related Musculoskeletal Disorders (WRMSDs) are significant occupational health issues caused by repetitive physical tasks and unfavourable body postures during production, loading, and transportation. These disorders, responsible for 40% of global work-related costs, can result in long-term physical effects, including spinal injuries. Packing workshop activities such as lifting, shifting, and repetitive movements further increase the risk of WRMSDs. This literature review aimed to assess the prevalence of WRMSDs among food packing workers. A systematic search was conducted on Google Scholar and PubMed, focusing on studies published in English from January 1, 2008 to August 1, 2023. The search criteria included the prevalence of WRMSDs, methods of assessment, and risk factors for work-related upper limb musculoskeletal disorders. Key findings included: pharmaceutical packing workers reported the highest prevalence of upper back pain (54.8%) and the lowest prevalence of thigh pain (26.2%); workers in the engineering industry experienced neck pain most frequently (20.2%), followed by shoulder (14.9%), elbow (14.4%), and knee (14.4%) pain. Packing workers in food processing industries reported back pain (24.6%) and neck pain (7.6%) as the most common symptoms and hygienic product workers reported higher musculoskeletal symptoms in packing stations (57.4%) compared to filling (53.7%) and manufacturing (46.3%). Despite these findings, research on WRMSDs in food packing workers is limited. Future studies should focus on prevalence, ergonomic evaluations, and workplace risk factors to develop effective preventive strategies.

Keywords: Work-related musculoskeletal disorders, Ergonomics, Occupational health, Low back pain, Posture

Introduction

Musculoskeletal diseases (MSDs) are significant contributors to work-related disabilities, lost-time illnesses, injuries, and impairments in both developed and industrially developing countries.[1] "Musculoskeletal disorders" refer to a broad spectrum of inflammatory and degenerative ailments affecting the muscles,

tendons, ligaments, joints, peripheral nerves, and supporting blood vessels.[2]

Work-related musculoskeletal disorders (WRMSDs) are common occupational injuries resulting from unfavourable body exposure during various phases of production, loading, and transportation, which can lead to permanent physical effects and spinal cord injuries. WRMSDs affect muscles, tendons, joints, nerves, and soft tissues, and are characterized by accumulation over time, physical and mechanical stress, and discomfort.[3]

Workplace risk factors include physical, psychological, and psychophysical aspects, with individual factors such as age, gender, and body mass index (BMI) also playing a role.[4] Physical risk factors include high forces, repetition, overhead work, prolonged static postures, local contact forces, and vibration.[1,4]

WRMSDs are among the most common types of occupational injuries in both industrialized and developing countries, with developed countries showing the highest occurrence.[3] These disorders contribute significantly to workers' compensation costs, accounting for at least half of all such expenses in many industrialized nations.[4] The increasing trend of mechanization in developed countries has reduced the danger of musculoskeletal problems, but in industrially developing countries, poor working conditions and the lack of effective injury prevention programs contribute to the high rate of MSDs.[5]

WRMSDs are responsible for approximately 40% of all work-related costs globally. However, musculoskeletal disorders account for 7% of all diseases in society, 14% of doctor referrals, and 19% of hospitalizations.[3] They are prevalent in many countries and have serious social and financial impacts, as well as implications for quality of life and work efficiency.[3,5] MSDs were ranked second after occupational respiratory disease by the National Institute of Occupational Safety and Health (NIOSH) based on disease prevalence, severity, and potential prevention.[3]

MSDs can develop three to four times more frequently in certain industries and occupations compared to the general population. High-risk industries include nursing facilities, air transportation, mining, food processing, leather tanning, and both heavy and light manufacturing (vehicles, furniture, appliances, electrical and electronic products, textiles, apparel, and shoes).[2]

Packaging is considered a significant and essential stage in both modern and traditional production processes, with most packing processes in workshops done manually.[3] Physical activities such as lifting and shifting weights, repetitive movements, and unfavourable body positions are typical in packing workshops.[3,6-8] In this context, a significant rate of WRMSD occurrence can be anticipated.[1] Most food industries report a monthly sick leave rate of more than two working days for more than five employees, suggesting widespread musculoskeletal disorders in many body regions among packing workers.[5,3,5,9] Preventing WRMSDs is still in its early stages, and there has been limited research on musculoskeletal disorders among packing workers.

Materials and Methods

Search Strategy

A systematic literature search was conducted using Google Scholar and PubMed, two widely used academic search engines. Google Scholar was chosen for its broad interdisciplinary coverage, while PubMed was selected for its specialized focus on biomedical and occupational health research. The search aimed to identify relevant studies on Work-Related Musculoskeletal Disorders (WRMSDs) among food packing workers, focusing on prevalence, ergonomic risk factors, and assessment methods.

To maximize the relevance of the retrieved studies, a combination of Medical Subject Headings (MeSH) terms and free-text keywords was used. The primary search terms included, “Work-Related Musculoskeletal Disorders,” “WRMSDs,” “Food Packing Workers,” “Occupational Health,” and “Ergonomics.” Additional synonyms and variations, such as “Industrial musculoskeletal disorders,” “Repetitive strain injuries,” and “Ergonomic risk factors in packaging,” were also incorporated. Boolean operators were applied to refine the search: “AND” was used to combine key concepts (e.g., "WRMSDs" AND "food packing workers"), “OR” was used to include synonyms (e.g., "ergonomic risk factors" OR "repetitive strain injuries"), and “NOT” was used to exclude irrelevant topics (e.g., "food packing workers" NOT "agriculture").

Study Selection Process

The study selection process involved multiple steps. First, titles and abstracts of all retrieved articles were screened for relevance based on the inclusion criteria. Next, duplicate records from different databases were

removed. After the initial screening, full-text reviews were conducted to ensure that the selected studies met all eligibility criteria. Following this rigorous process, four studies were finalized for inclusion in the review (Figure 1).

Inclusion Criteria

Studies were selected based on predefined inclusion and exclusion criteria. The inclusion criteria for study selection required articles published between January 1, 2008, and August 1, 2023, written in English, and focusing on cross-sectional studies that assessed the prevalence, ergonomic risk factors, and assessment methods of work-related musculoskeletal disorders (WRMSDs) among packing workers. Studies were excluded if they were published before 2007, were interventional studies assessing treatments rather than prevalence, focused on non-packing workers (e.g. agricultural or office workers), or were published in languages other than English.

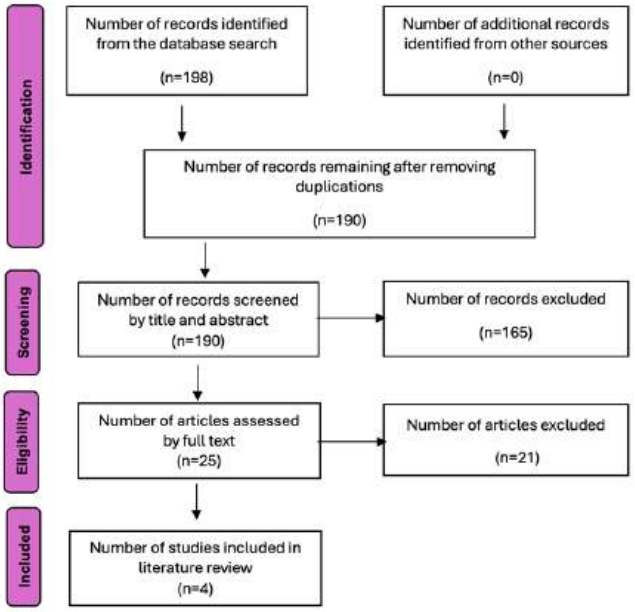

Figure 1: Flowchart of included studies

Results

After the final evaluation, four studies conducted between 2008 and 2023 with a total sample size of 483 workers were selected. The research method in these studies was cross-sectional, and disorders were related to different body parts. The Nordic Musculoskeletal Questionnaire was used as a tool in all the articles to determine the prevalence of musculoskeletal disorders. Rapid upper limb assessment was used in one study to evaluate exposure to risk factors associated with work-related upper limb disorders, with results analyzed using the chi-square test.

In terms of location, 32.9% of the studies were conducted in Iran, 12.42% in Maharashtra, and 54.65% in Kermanshah. The prevalence of WRMSDs was reported involving different body parts among various packing workers. Among pharmaceutical packing workers, the prevalence of upper back pain was higher (54.8%), while thigh pain was lower (26.2%). A study on workers in engineering industries showed that the neck (20.2%), shoulder (14.9%), elbow (14.4%), and knee (14.4%) were the most involved areas. Among the packing workers from various industries in Kermanshah city, back pain (24.6%) and neck pain (7.6%) were the most common WRMSDs. In workers manufacturing hygienic products, packing workers reported a higher prevalence of musculoskeletal symptoms (57.4%), compared to filling (53.7%) and manufacturing workers (46.3%).

Discussion

Prevalence and Risk Factors

The reviewed studies indicate a significant prevalence of Work-Related Musculoskeletal Disorders (WRMSDs) among food packing workers, with varying severity and affected body regions. The high incidence of WRMSDs can be attributed to several ergonomic and occupational factors, including repetitive motions, prolonged static postures, and high-force exertion, which are common in packaging activities. The findings align with previous research which suggests that packaging work often involves prolonged awkward postures and continuous upper limb activity, increasing the risk of musculoskeletal strain.[1,3, 9,10]

The study by Pourmahabadian *et al.,* on pharmaceutical packing workers found the highest prevalence of upper back pain (54.8%) and the lowest prevalence of thigh pain (26.2%). This suggests that prolonged static postures and repetitive upper limb movements contribute significantly to upper back strain, whereas lower limb engagement is comparatively lower in packing tasks. This aligns with ergonomic studies highlighting that repetitive overhead work and constrained postures primarily affect the upper back and shoulders, leading to higher prevalence rates in these regions.[11]

Similarly, the study on engineering industry workers reported neck pain (20.2%) as the most frequent complaint, followed by shoulder (14.9%), elbow (14.4%), and knee (14.4%) pain. These findings suggest that frequent head flexion, reaching, and repetitive gripping actions significantly contribute to neck and

upper limb discomfort. Prior research has shown that workstations with improper height adjustment and inadequate support for upper extremities increase strain on the cervical and shoulder muscles, leading to increased risk of WRMSDs.[3]

In the food-processing industries, back pain (24.6%) and neck pain (7.6%) were the most reported symptoms. The relatively lower prevalence of neck pain compared to other studies could be due to variations in workstation design and task distribution. Workers in these industries may experience more generalized strain rather than specific localized pain, potentially influenced by ergonomic factors such as workstation height, material handling techniques, and shift duration.[2] Additionally, workers manufacturing hygienic products reported higher WRMSDs in packing stations (57.4%), compared to filling (53.7%) and manufacturing (46.3%) roles. Packing workers are often required to perform repetitive manual tasks such as sealing, labelling, and arranging products, which contribute to upper limb strain. Studies have highlighted that workers engaged in rapid, repetitive activities without sufficient recovery time are more susceptible to muscle fatigue and chronic musculoskeletal pain.[11] The increased prevalence of WRMSDs in packing stations compared to filling and manufacturing suggests that continuous manual handling tasks, rather than static postures alone, are a key risk factor.

Explanation of WRMSDs in Packaging Workers

The observed prevalence of WRMSDs among food packing workers can be explained by several biomechanical and physiological factors. Repetitive tasks lead to cumulative trauma on muscles, tendons, and ligaments, causing microtears and inflammation over time. Prolonged standing and static postures contribute to reduced blood flow to muscle groups, leading to fatigue and discomfort. Additionally, excessive force exertion, such as lifting heavy boxes or pushing conveyor belts, increases strain on the musculoskeletal system, particularly in the lower back and shoulders.[4,5,11]

Awkward postures, such as forward bending and wrist flexion during packaging, can lead to localized muscle fatigue and nerve compression, increasing the risk of conditions such as carpal tunnel syndrome and cervical strain.[4,8,10,12] Ergonomic deficiencies in workstation design, including improper desk height, lack of adjustable seating, and inadequate lumbar support, further exacerbate WRMSDs.[6,7,13] These findings highlight the need for improved ergonomic interventions in the packaging industry.

Implications for Prevention and Workplace Interventions

Given the significant burden of WRMSDs among food packing workers, targeted ergonomic interventions are necessary to mitigate risk. Implementing proper workstation design, such as height-adjustable tables and ergonomic chairs, can reduce awkward postures and provide necessary lumbar support. Employers should also introduce periodic rest breaks, job rotation strategies, and stretching programs to minimize muscle fatigue and improve worker endurance.

Worker education on proper lifting techniques, posture correction, and early symptom recognition can help prevent the progression of musculoskeletal disorders. Additionally, integrating assistive devices such as automated lifting tools, conveyor systems, and ergonomic packaging stations can significantly reduce manual strain. These interventions have been shown to lower WRMSD prevalence in other industrial settings and should be prioritized in food packaging environments.[9]

Future research should focus on developing industry-specific ergonomic guidelines and evaluating the long-term effectiveness of intervention programs. The integration of wearable sensors and motion tracking technology may also provide valuable insights into real-time ergonomic risks and facilitate personalized interventions for workers.

Conclusion

The prevalence of WRMSDs among food packing workers highlights the urgent need for ergonomic interventions and occupational health strategies. Repetitive movements, prolonged static postures, and high-force exertion contribute significantly to musculoskeletal strain, with upper back, neck, and shoulder pain being the most commonly reported symptoms. Workplace modifications, ergonomic training, and assistive devices can play a crucial role in reducing WRMSD risks and improving worker well-being. Future research should continue to explore innovative solutions for minimizing musculoskeletal disorders in the packaging industry.

Conflict of Interest

Nil

References

1. Pourmahaba M, Akhavan M, Azam K. Investigation of risk factors of work-related upper-limb musculoskeletal disorders in a pharmaceutical industry. Journal of Applied Sciences 2008;8(7):1262-1267.
2. Chordiya S, Nikhade N. Prevalence of musculoskeletal disorders in workers in an industry in Ahmednagar District, Maharashtra. International Journal of Clinical and Biomedical Research 2019;52(8):38-41.
3. Ismaila SO, Salami YA, Kuye SI, *et al.* Ergonomic evaluation of packaging workers' posture in a food manufacturing company. Journal of Engineering Studies and Research 2020;26(1):31-40.
4. Zizi A, Hosseini SH, Jafari MJ, *et al.* Prevalence of musculoskeletal disorders in packing workers of Kermanshah industries. Iran Occup Health 2013;10(3):1-10.
5. Hosseini SH, Jafari MJ, Mehrabi Y, *et al.* Ergonomic evaluation of packing workers in Kermanshah industries using RULA method. J Health Syst Res 2012;8(6):1010-1017.
6. Nag A, Vyas H, Shah P, *et al.* Risk factors and musculoskeletal disorders among women workers performing fish processing. Am J Ind Med 2012; 55(9):833-843.
7. Harcombe H, McBride D, Derrett S, *et al.* Physical and psychosocial risk factors for musculoskeletal disorders in New Zealand nurses, postal workers and office workers. Inj Prev 2010;16(2):96-100.
8. Jung HO, Han SW. Analysis of differences in variables related to health and safety according to the employment type of Korean workers. Int J Occup Saf Health 2022;12(1):1-8.
9. Coates R, Malvika C, Alvina, *et al.* Prevalence of work-related musculoskeletal disorders among dairy farmers in Malur Milk Co-operative society, Kolar District, Karnataka, India. Int J Occup Saf Health 2023;13(4):504-511.
10. Sompan R, Keeratisiroj O, Aungudornpukdee P, *et al.* Prevalence of work-related musculoskeletal disorders and ergonomic risk assessment among production workers of pig slaughterhouse in the town municipality of Ang Thong, Thailand. Int J Occup Saf Health 2024;14(1):69-76.
11. Ghasemkhani M, Mahmudi E, Jabbari H. Musculoskeletal symptoms in workers. Int J Occup Saf Ergon 2008;14(4):455-462.
12. Sakzewski L, Naser-ud-Din S. Work-related musculoskeletal disorders in dentists and orthodontists: a review of the literature. Work 2014;48(1):37-45.
13. Parno A, Sayehmiri K, Parno M, *et al.* The prevalence of occupational musculoskeletal disorders in Iran: A meta-analysis study. Work 2017;58(2):203-214.

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ORIGINAL ARTICLE

Effect of Subtalar Joint Mobilization and Myofascial Trigger Point Release on Pain and Disability in Plantar Fasciitis

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Abstract

Background: Plantar fasciitis, a degenerative condition marked by collagen degeneration in the plantar fascia, affects over 50% of individuals across genders. It often results from overuse, trauma, or repetitive strain, leading to micro-tears. Risk factors include limited dorsiflexion, excessive plantar flexion, foot pronation, prolonged weight-bearing, high body mass index, subcalcaneal spurs, and subtalar joint dysfunction. The fascia's role in stabilizing body structures is vital for addressing this condition. Myofascial Trigger Point Release (MTrP) has recently shown promise in reducing pain and improving function.

Aim and Objectives: This study evaluates the impact of subtalar joint mobilization and MTrP, alongside conventional therapy, on pain and disability in plantar fasciitis patients and compares their effectiveness.

Methods: After IEC approval from RV College of Physiotherapy, participants were screened using the windlass test and divided into two groups. Group A received subtalar joint mobilization with conventional therapy, while Group B received MTrP with traditional treatment. Interventions were administered thrice weekly for four weeks, with VAS and FADI scores recorded pre and post-intervention.

Results: Sixty-four (n = 64) Participants (18-45 years) were analyzed using R software. Both groups showed significant reductions in VAS (Group A: 7.00 to 4.53, Group B: 7.06 to 3.59) and improvements in FADI (Group A: 73.16 to 61.78, Group B: 76.28 to 57.84). Group B demonstrated more significant pain and disability reduction ($P < 0.0001$).

Conclusion: MTrP combined with conventional therapy is more effective than subtalar joint mobilization, warranting further research to explore long-term benefits in plantar fasciitis management.

Keywords: Plantar fascia, Subtalar mobilization, Ankle joint, Pain, Disability

Introduction

The foot, essential for support and locomotion, relies on its arches as elastic springs for walking, running, and jumping. The plantar fascia, a thickened fibrous structure on the sole, plays a key role in these functions. The fascia originates from the medial tubercle of the calcaneum. It extends to the heads of the metatarsal bones, providing attachment to the skin and deeper structures, maintaining the longitudinal arches, and offering shock absorption.[1]

Plantar fasciitis results from stretching and collagen degeneration of the plantar fascia at its calcaneal origin, characterized by the absence of inflammatory cells and considered a degenerative pathology. Risk factors include reduced dorsiflexion, increased plantar flexion, excessive foot pronation, prolonged weight-bearing activities, elevated body mass index (BMI), sub-calcaneal spurs, and subtalar joint dysfunction.[1]

The fascia's role in supporting and stabilizing structures is critical yet often overlooked. Degenerative changes in the body, whether muscular, nervous, or circulatory, are reflected in the fascia. Myofascial Trigger Point Release (MTrP) helps stretch and loosen the fascia, increasing pain-pressure thresholds locally and reducing referred pain fields.[2] This hands-on therapy breaks down scar tissue, relaxes muscles and myofascial, and restores good posture, addressing fascial entrapment patterns caused by deficient circulation and nutrient supply. Direct pressure on sarcomeres during MTrP release relaxes muscles, increases sarcomere length, reduces muscle tension, and decreases pain.[2,3]

The subtalar joint, a synovial articulation between the talus and calcaneus, plays a crucial role in foot inversion and eversion. Subtalar joint mobilization helps control pain, improve mobility, and decrease traction stress on the plantar fascia, enhancing foot function. Manual therapy, including soft tissue manipulation and joint mobilization, is effective in treating plantar heel pain.[1]

Conservative management options such as cryotherapy, therapeutic ultrasound, electrical stimulation, whirlpool, and NSAID administration *via* iontophoresis are reported to be successful. Therapeutic ultrasound increases tissue temperature and improves fascia extensibility, with non-thermal effects modulating inflammatory responses. Stretching exercises are designed to increase soft tissue extensibility, promote wellness, and reduce injury risk.[4,5,6] Elasticity, visco-elasticity, and plasticity are properties of soft tissue that facilitate stretching and recovery.

This study compares the effectiveness of subtalar joint mobilization and Myofascial Trigger Point Release, combined with conventional therapy, on pain and disability in plantar fasciitis patients.

Materials and Methods

This study compared the effectiveness of subtalar joint mobilization and myofascial trigger point release (MTrP) combined with conventional therapy for treating plantar fasciitis, a degenerative condition marked by collagen degeneration at the calcaneal tuberosity. Factors such as reduced dorsiflexion, increased plantar flexion, excessive foot pronation, weight-bearing activities, elevated BMI, and subtalar joint dysfunction influence this condition. Sixty-four participants aged 20-45 with plantar fasciitis were divided into two groups. Group A received subtalar joint mobilization with conventional therapy, and Group B received MTrP with traditional treatment, including stretching, therapeutic ultrasound, and cryotherapy.

Participants were screened using the windlass test and met the criteria, including the presence of an identifiable MTrP within the calf muscle and tenderness at the origin of the plantar fascia. Exclusion criteria included red flags to manual therapy, calcaneal spur, diabetes, post-menopausal status, previous foot and ankle surgery, recent trauma or fracture, deformities, neurological disorders, and pregnancy.

Pain and disability were measured using the Visual Analog Scale (VAS) and Foot and Ankle Disability Index (FADI) pre-and post-intervention. The VAS measures pain intensity on a 0-100 mm line, is reliable for tracking treatment outcomes, and correlates well with other pain scales.[7] The FADI assesses functional limitations in foot and ankle disorders, with strong reliability and sensitivity, particularly in chronic ankle instability.[8] Subtalar joint mobilization involved traction and inversion/eversion movements, while MTrP involved vertical downward pressure on MTrP until muscle resistance was perceived, followed by longitudinal strokes.

Sample Size Estimation

The sample size was determined based on an assumed prevalence of plantar fasciitis 0.5 due to the unavailability of specific literature data. With a significance level (α) of 0.05 ($Z\alpha/2 = 1.96$) and a power (1-β) of 80% ($Z1-\beta = 0.842$), the margin of error (D) was set at 15% (0.15). $\acute{\alpha} = 0.05$. Thus, each group (Group A and Group B) consisted of 32 participants, resulting in a total sample size of 64.

Data Analysis

Data collected for the study was entered into MS Excel and analyzed using R software version 4.2.1. Descriptive statistics were employed to present categorical variables as frequency tables with percentages and quantitative variables as means with standard deviations or medians with interquartile ranges, along with 95% confidence intervals. Results were also illustrated using bar graphs, pie charts, tables, and scatter diagrams.

Results

Table 1: Descriptive statistics of age, BMI, VAS, FADI-pre and post-test

Variable	Mean	SD	Median	IQR	95% CI for mean
Age (yrs.)					
Group A	29.03	8.11	25.50	12.50	(26.11, 31.86)
Group B	30.94	7.94	29.00	13.50	(28.08, 33.86)
BMI (kg/m²)					
Group A	23.46	2.82	23.24	2.55	(22.44, 24.88)
Group B	22.11	2.94	22.35	3.57	(21.05, 23.17)
VAS (Group A)					
Pre-test	7.00	0.76	7.00	2.00	(6.725, 7.275)
Post-test	4.53	0.88	5.00	1.00	(4.214, 4.848)
VAS (Group B)					
Pre-test	7.06	0.76	7.00	1.00	(6.789, 7.336)
Post-test	3.59	0.76	4.00	1.00	(3.321, 3.866)
FADI (Group A)					
Pre-test	73.16	8.92	75.00	12.75	(69.94, 76.37)
Post-test	61.78	8.05	63.00	10.75	(58.88, 64.68)
FADI (Group B)					
Pre-test	76.28	6.14	77.00	6.75	(74.00, 78.56)
Post-test	57.84	8.00	58.00	11.75	(54.96, 60.73)

BMI: body mass index; VAS: Visual Analog Scale; FADI: Foot and Ankle Disability Index

Descriptive analysis of age, BMI, VAS, and FADI:

Table 1 summarizes the descriptive statistics for both groups' age, BMI, VAS, and FADI. Group A had a mean age of 29.03 ± 8.11 years, while Group B was slightly older at 30.94 ± 7.94 years. BMI was higher in Group A (23.46 ± 2.82 kg/m²) compared to Group B (22.11 ± 2.94 kg/m²), with moderate variability in both groups.

VAS scores showed a reduction in pain post-test for both groups. Group A's mean VAS decreased from 7.00 ± 0.76 to 4.53 ± 0.88, while Group B's dropped from 7.06 ± 0.76 to 3.59 ± 0.76, indicating more significant pain relief in Group B.

FADI scores improved post-test, with Group A decreasing from 73.16 ± 8.92 to 61.78 ± 8.05 and Group B from 76.28 ± 6.14 to 57.84 ± 8.00, suggesting better functional recovery in Group B. Overall, both groups showed improvement, with Group B demonstrating more significant pain reduction and functional gains. In the data that was subjected to the normality test, Kolmogorov- Smirnov test, it was observed that age, BMI, FADI and VAS are distributed normally, whereas PDQ-8, MDS-UPDRS, and CGSI are non-normal. Based on this information, the Wilcoxon-Signed Ranked Test was used for non-normal data, and the paired t-test was used for normally distributed parameters.

The Kolmogorov-Smirnov (K-S) normality test indicated that in Group A, both age (K-S = 0.2081, $P = 0.0011$) and BMI (K-S = 0.2023, $P = 0.0018$) were non-normally distributed, In contrast, in Group B, age (K-S = 0.1277, $P > 0.1000$) and BMI (K-S = 0.1248, $P > 0.1000$) followed a normal distribution. The VAS scores exhibited non-normal distributions in both groups for pre-test and post-test measures ($P < 0.0001$). The FADI scores in Group A showed normal distributions for both pre-test (K-S = 0.1354, $P > 0.1000$) and post-test (K-S = 0.1021, $P > 0.1000$). In Group B, FADI pre-test scores were non-normal (K-S = 0.1697, $P = 0.0197$), whereas post-test scores followed a normal distribution (K-S = 0.1015, $P > 0.1000$).

Inferential Statistics

Table 2: Within-group comparison

Variable	Median	WSRT-statistic	*P* value	Inference
VAS (Group A)				
Pre-test	7	528	< 0.0001	Highly Significant
Post-test	5			
VAS (Group B)				
Pre-test	75	528	< 0.0001	Highly Significant
Post-test	63			
FADI (Group A)				
Pre-test	7	528	< 0.0001	Highly Significant
Post-test	4			
FADI (Group B)				
Pre-test	77	528	< 0.0001	Highly Significant
Post-test	58			

Non-parametric test (Wilcoxon Signed Rank Test [WSRT],VAS - Visual Analog Scale, FDI - Foot and Ankle Disability Index). $P < 0.05$ was considered statistically significant.

The difference in means of VAS and FADI was tested using the student's unpaired t-test/Wilcoxon rank-sum test for between-group comparisons, subject to the normality assumption, the student's paired t-test/ Wilcoxon signed-rank test was applied for within group comparisons based on normality. A 95% confidence interval for the mean difference was also computed. Results were considered statistically significant when $P \leq 0.05$. The findings were interpreted based on the P value and the 95% confidence interval for the difference in means.

Unpaired t Test

Table 3: Between-group comparison

Variable	Mean	SD	*t*-value	*P* value	Inference
BMI (kg/m²)					
Group A	23.4	2.82	1.871	0.0651	Not significant
Group B	22.11	2.94			

Table 3 displays the results of a between-group comparison of BMI using Student's unpaired t-test. The t-test shows a t-value of 1.871 with a P value of 0.0651, indicating that the difference in BMI between Group A and Group B is not statistically significant.

Table- 4: Between-group comparison

Variable	Median	Mann-Whitney U-statistic	*P* value	Inference
VAS (Pre-test)				
Group A	7	482	0.725	Not significant
Group B	7			
VAS (Post-test)				
Group A	5	217	< 0.0001	Highly Significant
Group B	4			
FDI (Pre-test)				
Group A	75	386.5	0.0918	Not significant
Group B	77			
FDI (Post-test)				
Group A	63	89	< 0.0001	Highly Significant
Group B	58			

Table 4 presents the Mann-Whitney U-test results for VAS and FADI between groups. Pre-test VAS and FADI showed no significant difference ($P > 0.05$). However, post-test VAS ($U = 217$, $P < 0.0001$) and post-test FADI ($U = 89$, $P < 0.0001$) were highly significant, indicating a greater reduction in pain and improvement in function in group B compared to group A.

Table 5: Between-group comparison of VAS, FADI Scores

VAS- median values	Group A	Group B
Pre- test	7	7
Post- test	5	4
FADI- median values	**Group A**	**Group B**
Pre-test	75	77
Post- test	63	58

Table 5 presents a between-group comparison of VAS and FADI scores using the Mann-Whitney U-test. Pre-test comparisons show no significant differences between groups, while post-test comparisons reveal highly substantial improvements in both measures. The pre-test VAS score between groups A and B was not significantly significant. However, there was a substantial reduction in the pain score of group B as compared to group A ($P < 0.001$). The FADI of the pre-test between both groups was not significant; however, it was highly significant in the post-test.

Discussion

This study evaluated subtalar joint mobilization versus myofascial trigger point release t(MTrP), each combined with conventional therapy, in reducing pain and disability in plantar fasciitis patients. Plantar fasciitis, a degenerative condition marked by collagen degeneration at the calcaneal tuberosity, is influenced by reduced dorsiflexion, excessive foot pronation, and high BMI. Participants were divided into two groups: one receiving subtalar joint mobilization and the other MTrP, both with conventional therapy (stretching, strengthening exercises, ultrasound, and cryotherapy). Pain and disability were measured using the VAS and FADI.

Results indicated significant pain and disability reduction in both groups, with MTrP being more effective. MTrP works by stretching and loosening the fascia, increasing pain-pressure thresholds, and reducing muscle tension and tenderness. Subtalar joint mobilization enhances joint mobility, reducing traction stress on the plantar fascia and improving foot function.

Supporting studies found significant pain relief with MFR and improved pain and disability with subtalar joint mobilization, respectively.[3,6] Another study found that MFR effectively reduces pain and improves function in plantar fasciitis.[3]

The study suggests incorporating MTrP into standard treatment protocols and combining myofascial release with other therapeutic modalities for optimal results. Further research should explore long-term benefits and mechanisms to optimize treatment approaches for plantar fasciitis.

Both groups showed significant pain and disability reduction, with MTrP being more effective. MTrP loosens fascia, increases pain-pressure thresholds, breaks down scar tissue, relaxes muscles, and improves posture, while subtalar joint mobilization enhances mobility and reduces plantar fascia stress. The study supports incorporating MTrP into standard treatment for plantar fasciitis and combining it with joint mobilization for comprehensive care. [9,10]

However, this study has several limitations. The short-term follow-up restricts understanding of long-term effects, and the small sample size limits generalizability. The absence of a control group makes distinguishing treatment effects from natural recovery difficult. Additionally, individual variations in pain perception, adherence to home exercises, and differences in foot biomechanics could have influenced outcomes. Future research should address these gaps by conducting long-term studies, exploring biomechanical and neuromuscular effects, and using more extensive randomized controlled trials to optimize treatment strategies.

Conclusion

This study demonstrates that subtalar joint mobilization and (MTrP) effectively reduce pain and disability in plantar fasciitis, with MTrP yielding superior results. Given its significant impact on pain relief and mobility, MTrP should be incorporated into standard care large-scale, long-term studies are needed to confirm these findings and optimize treatment strategies.

Conflicts of interest

Nil

References

1. Chaurasia BD. Regional and Applied Dissection and Clinical: Lower limb, Abdomen, and Pelvis. 2019.
2. Tandel HI, Shukla YU, *et al.* Effect of Myofascial Release Technique in Plantar Fasciitis on Pain and Function- An Evidence Based Study. International Journal of Science and Healthcare Research 2021;6(2);332-337.
3. Ajimsha MS, Binsu D, Chithra S. Effectiveness of myofascial release in the management of plantar heel pain: A randomized controlled trial. Foot (Edinb) 2014;24(2):66-71.
4. Satish C Pant, Dheeraj Lamba, *et al.* Effect of myofascial release and stretching exercises on plantar fasciitis: a randomized, comparative study. International Journal of Current Research 2018;10(5):69745-69747.
5. Chaitow l, Helge Franke. Muscle energy techniques; Edinburgh- New York: Churchill Livingstone/ Elsevier, 2013.
6. Sarkar B, Kumar Mangalam, *et al.* Efficacy of muscle energy technique as compared to myofascial trigger point release in chronic plantar fasciitis: a double-blind randomized clinical trial. International Journal of Health Sciences & Research 2018;8(6): 128-136.
7. Delgado DA, Lambert BS, Boutris N, *et al.* Validation of digital visual analog scale pain scoring with a traditional paper-based visual analog scale in adults. J Am Acad Orthop Surg Glob Res Rev [Internet]. 2018;2(3):e088. Available from: http://dx.doi.org/10.5435/JAAOSGlobal-D-17-00088
8. Martin RL, Burdett RG, Irrgang JJ. Development of the Foot and Ankle Disability Index (FADI) [abstract]. J Orthop Sports Phys Ther 1999;29: A32-3.
9. Kashif M, Albalwi A, Alharbi A, *et al.* Comparison of subtalar mobilisation with conventional physiotherapy treatment for the management of plantar fasciitis. J Pak Med Assoc 2021;71(12):2705-2709. doi: 10.47391/JPMA.1049. PMID: 35150524.
10. Boob MA Jr, Phansopkar P, Somaiya KJ. Physiotherapeutic Interventions for Individuals Suffering From Plantar Fasciitis: A Systematic Review. Cureus 2023;15(7):e42740. doi: 10.7759/cureus.42740.

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ORIGINAL ARTICLE

Prevalence and Impact of Musculoskeletal Pain among Female Beauty Service Workers in Ujjain City: A Cross-Sectional Survey

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Abstract

Introduction: Musculoskeletal disorders (MSDs) are prevalent among female beauty service workers due to repetitive movements, awkward postures, and prolonged standing. These risk factors contribute to pain in various body regions, particularly the lower back, neck, and shoulders. Despite the global acknowledgment of this issue, limited data are available on musculoskeletal pain among female beauty service workers in India, particularly in smaller cities like Ujjain.

Methods: This cross-sectional study was conducted among 50 female beauty service workers in Ujjain city. A structured questionnaire was used to assess demographic details, the prevalence of musculoskeletal pain, and associated risk factors. The primary outcome was the prevalence of musculoskeletal pain in specific body regions. Data analysis was done using descriptive statistics, while chi-square tests examined relationships between independent variables and musculoskeletal pain.

Results: The study found that 70% of participants experienced lower back pain, 60% reported neck pain, and 50% had shoulder pain. Prolonged standing (80%), repetitive movements (70%), and poor ergonomics (60%) were significant contributors to musculoskeletal pain. A correlation between years of experience and pain was identified, with workers having over three years of experience being more likely to report pain (64%).

Conclusion: The high prevalence of musculoskeletal pain among female beauty service workers in Ujjain underscores the need for ergonomic interventions and awareness programs to reduce the burden of MSDs in this population. Prolonged standing, repetitive movements, and poor ergonomic practices are significant risk factors that require attention.

Keywords: Musculoskeletal disorders, Ergonomics, Occupational health, Beauticians, Pain

Introduction

Musculoskeletal disorders (MSDs) are a significant public health concern globally, affecting millions of workers across various occupational sectors. The beauty service industry, which includes hairdressers, beauticians, and nail technicians, involves tasks that require repetitive movements, awkward postures, and prolonged periods of standing, all of which contribute to the development of MSDs. Female beauty service employees, in particular, are at a heightened risk due to the physically demanding nature of their work, coupled with the often-limited awareness and application of ergonomic principles in the workplace.[1]

MSDs are defined as injuries or pain in the musculoskeletal system, including the muscles, nerves, tendons, ligaments, and structures that support limbs, neck, and back. The prevalence of these disorders is especially high among workers engaged in tasks that involve repetitive motion, static postures, and handling of tools for extended durations.[2] In the beauty service industry, professionals frequently perform activities such as blow-drying hair, cutting, coloring, waxing, and providing facials, which involve sustained hand and wrist movements, awkward shoulder postures, and significant strain on the back. Over time, these repetitive activities can lead to chronic musculoskeletal pain, particularly in areas like the neck, shoulders, lower back, and wrists.[3]

Recent studies have underscored the high incidence of musculoskeletal pain among workers in service industries. For instance, a 2020 study in India reported that 64% of salon workers experienced chronic musculoskeletal pain, with the lower back being the most commonly affected region.[4] Similarly, research from various countries confirmed that beauty service workers are particularly prone to MSDs, with one 2019 study highlighting that over 75% of hairdressers suffered from neck and shoulder pain due to their work environment.[1] Despite this high prevalence, there is limited data specifically focusing on musculoskeletal pain among female beauty service workers in India, particularly in smaller cities like Ujjain. The city of Ujjain, located in the state of Madhya Pradesh, has a growing beauty service sector, with an increasing number of women employed in salons and parlors. These workers often face long hours of work under suboptimal ergonomic conditions. Due to the lack of standardized ergonomic practices and limited access to health care, many female beauty service employees may not receive adequate guidance on how to prevent or manage MSDs. Consequently, musculoskeletal pain remains a significant yet underreported issue within this population.

This study aimed to assess the prevalence of musculoskeletal pain among female beauty service workers in Ujjain city, as well as the factors contributing to its development. By understanding the extent of this problem and identifying the primary risk factors, this research seeks to provide insights that can guide future interventions and health policies targeting occupational health improvements in the beauty service industry. Furthermore, the findings will highlight the need for ergonomic training and health awareness programs to reduce the burden of MSDs in this vulnerable occupational group.

Materials and Methods

This study was a cross-sectional survey aimed at assessing the prevalence and impact of musculoskeletal pain among female beauty service workers in Ujjain city. A quantitative approach was employed using a structured questionnaire to gather data on demographic characteristics, prevalence, severity, and factors contributing to musculoskeletal pain. The study was conducted in Ujjain city, Madhya Pradesh, India, targeting female beauty service workers employed in various salons and beauty parlours across the city. A purposive sampling method was used to select salons based on their accessibility and willingness to participate in the study. A sample size of 50 female beauty service workers was selected for this survey, determined based on logistical feasibility and the typical workforce size in beauty service establishments in Ujjain city. Although a larger sample would provide more generalizable results, a sample of 50 was adequate for the exploratory nature of this study.

The inclusion criteria for participation were female workers currently employed in a beauty service role, such as hairdresser, beautician, or makeup artist, for at least six months, aged between 18 and 50 years, and willing to participate by providing informed consent. Workers with a history of musculoskeletal disorders unrelated to their occupational activities, those employed for less than six months, and those unable to complete the survey due to language barriers or communication difficulties were excluded.

A structured, self-administered questionnaire was developed based on previously validated tools used in musculoskeletal disorder research. The questionnaire was divided into sections covering demographic information, including age, job role, years of experience, and daily working hours, prevalence of musculoskeletal pain, assessing body regions affected such as the neck, shoulders, back, wrists, and knees, along with pain duration and frequency and risk factors, including ergonomic practices, posture, repetitive movements, and work conditions.

Table 1: Demographic characteristics of the participants

Variable	Categories	Frequency (n)	Percentage (%)
Age (Years)	< 25	15	30%
	25-34	25	50%
	35-44	8	16%
	> 45	2	4%
Total		50	100%
Years of experience	< 1 year	5	10%
	1-3 years	20	40%
	> 3 years	25	50%
Total		50	100%
Job role	Beautician	35	70%
	Hairdresser	10	20%
	Others	5	10%
Total		50	100%
Work hours per day	< 5 hours	10	20%
	5-8 hours	35	70%
	> 8 hours	5	10%
Total		50	100%

The survey was conducted over a period of two weeks in July 2024. Prior to data collection, the study objectives were explained to salon owners and workers, and informed consent was obtained from each participant. The questionnaires were distributed to the participants, who were requested to complete them in the presence of a research assistant to address any queries. Data collected from the questionnaires were entered into Microsoft Excel and analysed using SPSS (Statistical Package for Social Sciences) version 25. Descriptive statistics, such as frequencies and percentages, were used to describe the demographic characteristics of the sample and the prevalence of musculoskeletal pain in different body regions. Inferential statistics were used to examine the relationship between independent variables, such as age, years of experience, and working hours, and the prevalence and severity of musculoskeletal pain. Chi-square tests were conducted to identify significant associations between categorical variables, such as pain presence and years of experience. A P value of < 0.05 was considered statistically significant.

Table 1 presents the demographic data of 50 participants, highlighting key variables such as age, years of experience, job role, and work hours per day. Half of the participants were aged 25-34 years, with 50% having over three years of experience. Most participants worked as beauticians (70%) and worked between 5-8 hours daily (70%).

Table 2: Prevalence of musculoskeletal pain by body region

Body Region	Frequency (n)	Percentage (%)
Neck	30	60%
Shoulders	25	50%
Upper back	20	40%
Lower back	35	70%
Wrists/hands	15	30%
Knees	10	20%

The most common areas affected are the lower back (70%), neck (60%), and shoulders (50%).

Table 3: Risk factors associated with musculoskeletal pain

Risk Factor	Frequency (n)	Percentage (%)	*P* value
Prolonged standing	40	80%	0.02
Repetitive movements	35	70%	0.05
Poor ergonomics (Posture)	30	60%	0.03
Heavy lifting	10	20%	0.10

Risk factors like prolonged standing (80%) and repetitive movements (70%) are strongly associated with musculoskeletal pain. Poor posture (60%) is another notable factor, with significant P-values suggesting relevance.

Table 4: Correlation between years of experience and musculoskeletal pain

Years of Experience	Pain Present (n)	Pain Absent (n)	Total (n)	*P*-value
< 1 year	4	1	5	0.45
1-3 years	15	5	20	0.10
> 3 years	16	9	25	0.05

This table illustrates how years of experience correlate with musculoskeletal pain. Those with over three years of experience have a higher prevalence of pain (16 out of 25). A *P* value of 0.05 indicates a significant correlation in this group.

Discussion

The findings of this study provide important insights into the prevalence of musculoskeletal pain among beauty service workers in Ujjain city, India, and identify key risk factors associated with the pain. These results can be compared to recent studies conducted in similar occupational settings worldwide to understand the commonality of the problem and the variations that may arise due to differences in geographic locations, work environments, and job roles. The current study revealed a high prevalence of musculoskeletal pain, particularly in the lower back (70%), neck (60%), and shoulders (50%), among beauty service employees. These findings are in line with several other studies in the occupational health literature, which report that lower back pain is a common complaint among workers engaged in prolonged standing and repetitive tasks. A study conducted among Indian salon workers reported that 68% of the participants suffered from lower back pain, which is comparable to the 70% reported in this study.[5] Similarly, in a study conducted in Uganda, the prevalence of lower back pain among salon workers was found to be 72%, slightly higher than the current study. The high prevalence of lower back pain is likely due to prolonged standing and awkward postures required in the profession, which aligns with the findings in this study that identified prolonged standing (80%) and poor ergonomics (60%) as significant risk factors.[6] Neck pain was also commonly reported, affecting 60% of participants in this study. This is consistent with a study which showed that beauty service employees, especially those working as hairdressers, are prone to neck and shoulder pain due to awkward and sustained postures during haircutting, shampooing, and other tasks.[7] A similar study in Brazil found that 58% of beauty professionals reported neck pain, comparable to the findings of this study.[8] However, the prevalence of wrist/hand pain (30%) in this study is lower than what was reported in their study of hairdressers, where 45% of participants reported wrist/hand pain. The discrepancy may be due to differences in the type of tasks performed by participants in both the studies. While hairdressers perform repetitive hand movements, such as cutting and blow-drying, that place strain on the wrists, the current study also included beauticians, whose tasks may not involve as much repetitive wrist movements.[9]

The identification of prolonged standing (80%), repetitive movements (70%), and poor ergonomics (60%) as significant risk factors for musculoskeletal pain in this study is consistent with findings from other research on occupational hazards in beauty service professions. The literature repeatedly highlights prolonged standing as a major contributor to musculoskeletal pain. A study conducted in Norway emphasized that prolonged standing significantly increases the risk of lower limb pain and lower back pain. In their research on salon workers, they reported that 75% of their study population identified prolonged standing as a major risk factor for musculoskeletal discomfort. This closely aligns with the current study's finding of 80%, further supporting the notion that prolonged standing is a major occupational hazard in beauty service jobs.[10] Repetitive movements were identified as a risk factor in 70% of participants in this study, which is consistent with the work of another study, which found a similar relationship between repetitive hand and arm movements and musculoskeletal pain in a diverse range of service industry workers, including hairdressers and beauticians. They observed that workers performing repetitive tasks are at a significantly higher risk of developing pain in the neck, shoulders, and wrists. In their study, 68% of participants engaged in repetitive movements reported musculoskeletal pain, which is consistent with the findings of the current study. This study identified poor ergonomics (60%) as another significant risk factor.[11] A study on ergonomic risk factors for musculoskeletal disorders among service workers in France reported that poor posture and awkward working positions increased the risk of pain in the upper limbs and back. They found that 64% of workers experiencing poor ergonomics during tasks such as prolonged bending and awkward hand positions developed musculoskeletal discomfort, which is very close to the 60% reported in this study. This highlights the universal nature of ergonomic risk factors across different occupational environments and geographic locations.[12]

The current study also examined the correlation between years of experience and musculoskeletal pain, finding that workers with more than three years of experience reported a higher prevalence of pain (64%) compared to those with fewer years of experience. This finding is in line with a study on the association between work experience and musculoskeletal pain among hairdressers. They found that pain was more prevalent among workers with longer years of experience, due to cumulative exposure to risk factors such as

prolonged standing and repetitive movements over time. The study reported that workers with more than five years of experience had a 70% higher likelihood of developing chronic musculoskeletal pain, similar to the 64% reported in the current study for those with over three years of experience.[13] Interestingly, a study in the Netherlands found a weaker correlation between years of experience and musculoskeletal pain, with only a 30% increase in risk for those with more than five years of experience. The authors attributed this lower rate to better ergonomic interventions and awareness programs that had been implemented in the region.[14] This highlights the importance of ergonomic training and preventive measures, which could explain the differences between regions in the impact of years of experience on pain prevalence.

Conclusion

The results of this study are largely consistent with findings from recent research in similar occupational settings across different regions. The high prevalence of musculoskeletal pain, particularly in the lower back, neck, and shoulders, is a common issue for beauty service employees worldwide. Multiple studies consistently report prolonged standing, repetitive movements, and poor ergonomics as significant risk factors. The correlation between years of experience and pain prevalence suggests that long-term exposure to these occupational risks exacerbates the likelihood of developing chronic musculoskeletal pain. Differences in the prevalence of specific pain areas, such as wrist/hand pain, and the impact of work experience may be attributed to variations in job roles and the implementation of preventive measures, highlighting the need for targeted ergonomic interventions in the beauty service industry.

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References

1. Mishra S, Sarkar K. Work-related musculoskeletal disorders and associated risk factors among urban metropolitan hairdressers in India. J Occup Health 2021;63(1):e12200.
2. Soares CO, Pereira BF, Pereira Gomes MV, *et al.* Preventive factors against work-related musculoskeletal disorders: narrative review. Rev Bras Med Trab 2020;17(3):415-430.
3. Gowda H, Mascarenhas SP, Patil DP, *et al*. Hand function assessment in beauticians. Int J Health Sci Res 2016;6(12):121-126.
4. Tomar S, Tiwari RR, Verma G. Musculoskeletal symptoms and associated factors among beauty salon workers in Udupi, Karnataka, India. Work 2022;73(1):301-307.
5. Gupta R, Singh P, Kaur R. Prevalence and risk factors of musculoskeletal disorders among beauty salon workers in India. J Occup Health 2022;64(3):e12345
6. Munabi-Babigumira S, Kitara DL, Kilama J. Musculoskeletal disorders and associated factors among salon workers in Uganda. Afr Health Sci 2018;18(2):456-63.
7. Waersted M, Hanvold TN, Veiersted KB. Computer work and musculoskeletal disorders of the neck and upper extremity: A systematic review. BMC Musculoskelet Disord 2019;20(1):79.
8. Mussi G, Gouveia N. Prevalence of musculoskeletal pain among Brazilian beauty professionals. Rev Bras Epidemiol 2020;23:e200005.
9. Fischer S, Alschuler K, Curtin C. Work-related musculoskeletal disorders among hairdressers: A review of prevalence, causes, and interventions. J Occup Rehabil 2021;31(4):675-85.
10. Hanvold TN, Waersted M, Mengshoel AM, *et al.* Work with prolonged standing as a risk factor for musculoskeletal symptoms: A systematic review. Int Arch Occup Environ Health 2020;93(7):821-35.
11. Oakman J, Neupane S. Musculoskeletal pain and psychosocial risk factors: Investigating relationships in a diverse worker population. Work 2021; 68(4):1023-32.
12. Roquelaure Y, Bodin J, Descatha A, *et al.* Occupational factors contributing to musculoskeletal disorders of the upper limbs and back in service workers. Ergonomics 2018;61(7):923-34.
13. Boschman JS, Frings-Dresen MHW, Sluiter JK. Musculoskeletal disorders and work experience in hairdressers: A cohort study. Occup Environ Med 2019;76(4):274-80.
14. Anema JR, Schellart AJ, Cassidy JD, *et al.* Can cross-border differences in return-to-work rates be explained? A multilevel analysis of musculoskeletal pain claims in the Netherlands. Occup Environ Med 2020;77(3):180-8.

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ORIGINAL ARTICLE

Association Between Gadget Use and Neck Pain among Bus Conductors in Karnataka

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Abstract

Background and purpose: Neck pain is a prevalent condition and a significant cause of disability worldwide, affecting 30-50% of the population annually. Occupational factors, including prolonged static postures and repetitive movements, contribute to its onset. This study aimed to assess the prevalence of neck pain in bus conductors using electronic gadgets (ticketing machines) in Bangalore, India.

Methodology: A cross-sectional study was conducted among 300 bus conductors aged between 35-45 years, selected using a convenient sampling method. The participants were chosen based on their usage of electronic gadgets for at least one year, excluding those with a history of previous trauma or cervical radiculopathy. The data were collected using the Neck Disability Index (NDI) questionnaire from the participants.

Results: The findings revealed that 63% of conductors reported minimal disability, while 37% experienced moderate disability. Individuals aged between 35-40 years (57%) showed a higher prevalence of neck pain and disability, particularly those with over 10 years of experience, and working eight hours per day. The prolonged use of electronic gadgets contributed to increased neck discomfort. Statistical analysis revealed significant associations between neck pain severity and age, work experience, and duration of gadget usage (P <0.01).

Conclusion: The study concluded that bus conductors, particularly those with long working hours and prolonged gadget use are at a higher risk of developing neck pain and related disability. Future research is recommended to identify additional risk factors and to develop preventive measures to mitigate musculoskeletal discomfort in such professions.

Keywords: Neck pain, Bus conductors, Ticketing machine, Posture, Occupational health

Introduction

Neck pain, a common global problem, is an important source of disability. In 2020, it affected 203 million people.[1] In the general population, the one-year neck pain prevalence has been estimated as 29% and 40% among men and women, respectively.[2] Neck pain primarily results from diseases of the cervical spine and soft tissues of the neck.[3] It can be due to an injury, any mechanical or muscular issue, a trapped nerve caused by a bulge in the discs between the vertebrae, arthritis, and can range from mild discomfort to severe burning pain.[4] It can be caused by factors such as increased work hours, work pressure, high job demand, poor job content, low job satisfaction, age, poor lifestyle like smoking, lack of exercise, poor nutrition.[5] Clinical symptoms commonly associated with neck pain include, pain and stiffness in the neck, headache, dizziness, and radiating pain to shoulders and the upper limbs that develop gradually with recurrent episodes.[1] Good posture is a state of muscular and skeletal balance that protects the supporting structures of the body from injury and allows the muscles to function most efficiently. Poor posture is a faulty relationship of the body's parts that increases strain on the supporting structures and reduces the efficiency of the body's balance over its base of support.[6]

Occupational factors like muscle load in a prolonged static position and repetitive work may be one source for pain development. Physical activity and gender are few other variables that could be linked to musculoskeletal discomfort.[7] Musculoskeletal pain (MSP) has become more common in industrialized nations in the recent years. In terms of disability, musculoskeletal problems rank third among those aged 45 years and above and are a major cause for physical and occupational disability in individuals under 45 years.[8] Poor posture is commonly observed in various professions such as dentistry, teaching, nursing, security services, bus conductors, lab technicians, and salesmen. However, there is a dearth of literature on the presence of neck pain among professionals who stand for prolonged durations.

Bus conductors typically stand for long durations - often around seven hours a day, for several years. They frequently keep their neck in a flexed position while issuing tickets to the passengers and move throughout the bus to perform their duties.[9] Since the neck remains in a flexed position for extended periods, there is an increased risk of pain and discomfort in the neck region due to the strenuous work load.

The recent increase in the use of electronic gadgets may further contribute to neck pain due to the additional weight of these devices on the neck in bus conductors. Several studies have reported the prevalence of neck pain in various professions, including dentistry (34%), teaching (42.5%), nursing (31-48%), and computer-based office work (36.7%). Therefore, the present study aimed to investigate the neck pain prevalence among bus conductors using electronic gadgets (ticketing machine).

Materials and Methods

The study included conductors working for Karnataka State Road Transport Corporation (KSRTC), and Bangalore Metropolitan Transport Corporation (BMTC), Bangalore. A convenient sample of 300 bus conductors were recruited for this cross-sectional study. Bus conductors of both the genders, in the age range of 35-45 years were chosen. The bus conductors using electronic gadgets for one year were included in the study. Participants already diagnosed with neck pain, participants with pain due to cervical radiculopathy, participants with pain over the neck region associated with LBP, those with traumatic or surgical records, with any previous history of trauma and non-consenting participants were excluded from the study.

Measuring tools - Neck Disability Index (NDI)

The Neck Disability Index (NDI) is a widely used condition-specific questionnaire designed to assess the impact of neck pain on daily life and functional activities. It is a self-reported measure that helps clinicians and researchers evaluate the severity of disability and tracks changes over time. The NDI consists of 10 items, each addressing a different aspect of daily life affected by neck pain: Pain intensity, Personal care, Lifting objects, Reading, Headaches, Concentration, Work performance, Driving, Sleeping and Recreational activities. Each item is scored from 0 to 5, with 0 indicating no disability and 5 indicating complete disability in that category. The total score ranges from 0 to 50 and is often expressed as a percentage: 0 - 4 (0 - 8%): No disability; 5 - 14 (10–28%): Mild disability; 15 - 24 (30 - 48%): Moderate disability; 25 - 34 (50 - 68%): Severe disability; 35 - 50 (70 - 100%): Complete disability. Higher scores indicate greater functional impairment due to neck pain. The NDI is a validated and reliable tool for assessing neck-related disability with moderate to high sensitivity (typically 0.60 - 0.80) and high specificity (typically 0.70 - 0.90), making it

useful for monitoring improvement or worsening of symptoms over time.

Procedure

The study included conductors who provided informed consent and satisfied the inclusion and exclusion criteria. Demographic data including the name of the participant, age, gender, occupation related queries such as, number of working hours, years of experience as a bus conductor, duration of usage of electronic gadget, contact address, phone number, mail address, were collected from each participant.

The NDI was introduced to the participants. The questionnaire was then distributed and the study participants were requested to complete the questionnaire. The data collected from the completed forms was used to gather information on the prevalence of neck pain. Based on the responses, the prevalence of neck pain among bus conductors using electronic gadgets was analyzed and interpreted.

Figure 1: Ticketing machine

Data analysis

The statistical software namely SAS 9.2, SPSS 15.0, Stata 10.1, MedCalc 9.0.1, Systat 12.0 and R environment ver.2.11.1 were used to analyze the data, while Microsoft word and Excel were used to generate graphs and tables. Descriptive statistics like range, mean and standard deviation were used to analyze the data from NDI. Frequency and percentage were used to assess the prevalence of neck pain. Chi square was used to determine the association of NDI with the baseline characteristics of bus conductors using electronic gadgets (Ticketing machine).

Figure 2: Participant wearing the electronic gadget

Results

A cross-sectional study with 300 bus conductors was undertaken to investigate the neck pain prevalence using NDI. Table 1 presents the data on gender distribution, age (in years), experience in the field (in years), working hours (in days), distribution of years of gadget usage by the conductors.

In terms of distribution of scores of NDI, % of conductors with minimal disability were 189 (63%) and with moderate disability were 111 (37%).

Table 1: Distribution of gender, age (in years), experience in the field (in years), working hours per day, years of gadgets usage among conductors

Components	N=300	Number of conductors	%
Gender	Male	227	75.7
	Female	73	24.3
Age (in years)	35-40	171	57.0
	41-45	129	43.0
Experience (in years)	1-5	1	0.3
	6-10	136	45.3
	11-15	142	47.3
	16-20	19	6.3
	>20	2	0.7
Working hours per day	6	26	8.7
	7	122	40.7
	8	152	50.7
Years of using the gadget	1-2	39	13.0
	2-3	159	53.0
	3-4	102	34.0

Table 2: Comparison of NDI scores according to age in years

Age in years	Number	NDI Score classification					*P* value**
		Minimal disability*	Moderate disability*	Severe disability	Crippled	Bed bound	
35-40	171	124 (72.5%)	47 (27.5%)	0	0	0	χ^2=16.300;
41-45	129	65 (50.3%)	64 (49.6%)	0	0	0	*P* <0.001

*In numbers, frequency of NDI scores with percentage **Clinical significance at $P \leq 0.01$

Table 2 depicts the distribution of NDI scores according to age in years. The NDI score of 171 conductors in age group of 35-40 and 129 conductors in 41-45 years of age group demonstrated minimal to moderate disability.

Discussion

Neck related problems are common among professionals required to stand for prolonged durations. Among 300 conductors studied, 227 were male conductors (75.7%) and 73 were female conductors (24.3%). About 171 conductors (57%) were aged between 35-40 years. Based on the mean age of 37.40 years, which is the most productive age, the study findings indicate that neck pain is more common among men (54%) compared to women (46%). The cervical and lumbar regions of the spine are the most movable and experience most loading stress.[3] Among the participants, 152 conductors (50.7%) reported working eight hours per day, while 159 (53%) had been using electronic gadgets for 2-3 years. Additionally, 142 conductors (47.3%) had 11-15 years of work experience. Prolonged static neck positions and repetitive movements associated with their work are recognized as risk factors for neck pain.[10]

Wearing a Head Mounted Display (HMD) modifies the neck posture, placing the musculoskeletal system of the head and neck under increased levels of stress.[11] Thus, longer working hours in a standing posture, combined with the use of an electronic gadget around the neck over several years, can cause greater discomfort and neck pain. In this study, among the 300 bus conductors included, 89 (63%) presented with minimal disability while 111 (37%) presented with moderate disability.

Neck pain is highly prevalent and is a common source of disability in the working age population.[12] According to this study, 171 conductors in the age range of 35-40 years were more prone to disability, as indicated by their NDI scores. Thus, musculoskeletal disorders have become the leading cause of physical and occupational disability among individuals under 45 years of age, largely due to the increasing incidence of musculoskeletal pain, particularly neck pain, which has reached a prevalence of 42.5% in recent years (mean age 38).[8] Based on the NDI scores, 227 male conductors (59%) who worked eight hours per day (57.2%), with an experience of more than 10 years (55.2%) and using the electronic gadget for 2-3 years (75.5%) were found to be prone to minimal disability. As previously mentioned, neck pain is more prevalent among men. Factors such as repetitive, frequent, or awkward posture-related work activities, extended work hours, insufficient rest periods, lack of social support, and limited ergonomic awareness are all associated with the development of severe musculoskeletal issues and disorders.[13]

The NDI is widely used to measure neck pain. Among its 10 components, some do not directly measure neck pain but rather provide information about the activities and functions of daily living. Also, the scoring system denotes the disability rather than pain. However, there is evidence supporting the association between neck pain and related functional disability.[12,14] This study found that conductors aged between 36-40 years, working eight hours per day, with over a decade of work experience and using electronic gadgets for 2-3 years, reported a higher prevalence of neck pain and associated disability.

Limitations

There may be differences in neck pain prevalence between conductors working in air-conditioned Volvo buses and those in non-air-conditioned buses. The time of the day could also impact the presence and severity of neck pain. Additionally, conductors who take frequent rest breaks during their shifts may influence the study outcomes. The utilization of electronic gadgets may be minimized with the availability of bus passes. Furthermore, the load on the neck is not constant throughout the day, as the ticketing machine is often held in the hand while issuing tickets.

Further Recommendations

Future studies focusing on the identification of risk factors and implementing preventive strategies in managing neck pain in bus conductors can be undertaken. Further studies can be conducted on different populations with working hours exceeding eight hours, and can also explore the prevalence of other musculoskeletal disorders (MSDs) among bus conductors.

Conclusion

This study aimed to investigate the prevalence of neck pain among bus conductors using the ticketing machine. It can be concluded that conductors in the age group of 36-40 years, with over a decade of work experience, working for almost eight hours in a day and using the ticketing machine around the neck for 2-3 years showed high neck pain prevalence and its related disability.

Conflict of Interest

Nil

References

1. Wu Ai-Min, Cross M, Elliot JM *et al.* Global, regional, and national burden of neck pain, 1990–2020, and projections to 2050: a systematic analysis of the Global Burden of Disease Study 2021. The Lancet Rheumatol 2024;6(3):e142 - e155.
2. Ariens GAM, Van Mechelen W, Bongers PM, *et al.* Physical risk factors for neck pain. Scand J Work Environ Health 2000;26(1):7-19.
3. Naheed T, Akbar N, Akbar N, *et al.* Neck pain- a problem with major effects. Pak J Med Sci 2006; 22(2):188-190.
4. Kazeminasab S, Nejadghaderi SA, Amiri P, *et al.* Neck pain: global epidemiology, trends and risk factors. BMC Musculoskelet Disord 2022;23(1):26.
5. Greggi C, Visconti VV, Albanese M, *et al.* Work-Related Musculoskeletal Disorders: A Systematic Review and Meta-Analysis. J Clin Med 2024; 13(13):3964.
6. Britnell SJ, Cole JV, Isherwood L, *et al.* Postural health in women: The role of physiotherapy. J Obstet Gynaecol Can 2005;27(5):493-510.
7. Hanvold TN, Veiersted KB, Waersted M. A prospective study of neck, shoulder, and upper back pain among technical school students entering working life. J Adolesc Health 2009;46:488-494.
8. Korkmaz NC, Cavlak U, Telci EA. Musculoskeletal pain associated risk factors and coping strategies in school teachers. Sci Res Essays 2011;6(3):649-657.
9. Gilks AW. Bus conducting - a study in occupational health. Occupational Medicine 1958;7(4): 143-152.
10. Kulcu DG, Gulsen G, Altunok TC, *et al.* Neck and low back pain among dentistry staff. Turk J Rhuematol 2010;25:122-9.
11. Knight JF, Baber C. Effect of head mounted displays on posture. Hum Factors 2007;49(5):797-807.
12. Côté P, Cassidy JD, Carroll L. The Saskatchewan Health and Back Pain Survey. The prevalence of neck pain and related disability in Saskatchewan adults. Spine (Phila Pa 1976) 1998;23(15):1689-98.
13. Suthar N, Kaushik V. The impact of physical work exposure on musculoskeletal problems among tribal women of Udaipur district. International NGO Journal 2011;6(2):043-047.
14. Hains F, Waalen J, Mior S. Psychometric properties of the neck disability index. J Manipulative Physiol Ther 1998;21(2):75-80.

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CASE REPORT

Enhancing Balance and Coordination in Alcohol-Induced Cerebellar Ataxia: A Case Study

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Abstract

Alcohol-induced cerebellar ataxia (ACA) is a common acquired ataxia characterized by cerebellar degeneration resulting from long-term exposure to alcohol. However, the role of physiotherapy in the treatment of ACA is unclear. The aim of this study was to evaluate the effect of physiotherapy on ataxia, balance, and coordination in an individual with alcohol-induced cerebellar ataxia. A 35-year-old male diagnosed with alcohol-induced cerebellar ataxia underwent physiotherapy program involving balance, coordination and gait training exercises in an in-hospital environment for two weeks, twice daily for 35-40 minutes. The outcome measures used were Berg Balance Scale (BBS), Comprehensive Coordination Scale (CCS), and Scale for Assessment and Rating of Ataxia (SARA). Measurements were taken pre-intervention and post-intervention. The scores improved significantly for all the three outcome measures, indicating improvement in balance, coordination and ataxia. ACA is a debilitating condition that can majorly influence one's life. This case report suggests that exercise-based physiotherapy interventions can be beneficial in improving balance, coordination, and gait impairment associated with ACA.

Keywords: Cerebellar ataxia, Incoordination, Imbalance, Exercises

Introduction

Alcohol-induced cerebellar ataxia (ACA) is one of the most common types of acquired ataxias.[1] Acute effects of alcohol include gait instability, antero-posterior oscillations in Romberg's test and dysarthria in various degrees. Two synaptic locations are most vulnerable to the acute effects of alcohol: the synapses on granule cells (GCs) and on Purkinje cells (PCs), which represent the cerebellar cortical output.[2] Chronic alcohol consumption leads to alcohol dependency, which causes cerebellar degeneration. The disease generally evolves over weeks or months, but it may also occur abruptly. However, a study showed that daily consumption of 150 g of alcohol for 10 years was associated with significant cerebellar atrophy on CT scan in 30% of patients.[3]

Gait and postural instability are hallmark cerebellar symptoms associated with chronic alcoholism. Characteristic gait disturbances include pronounced swaying, irregular steps, a compensatory short stride, broad-based stance, and reduced walking speed. Lower

limb ataxia is frequently evident, particularly during heel-to-shin testing. In more advanced stages, patients may also exhibit upper limb ataxia and dysarthria. Gait impairment may gradually worsen over weeks to months or rapidly progress to a disabling stage, especially in cases involving malnutrition.[4] The aim of physiotherapy in alcohol induced cerebellar ataxia is to alleviate the symptoms and explore the maximum functional capacity of patient. This case report is focused on exercise- based physiotherapy intervention in a patient with ACA.

Case Study

A 35-year-old male was admitted to the psychiatry ward with chief complaints of difficulty in walking and mood disturbances for several months. He had a history of alcohol use for about 10 years. Although he had undergone de-addiction treatment in the past, he resumed consuming alcohol after a period of recovery. Eight months ago, he was diagnosed with cerebellar ataxia secondary to cerebellar atrophy, along with alcohol dependence syndrome (ADS). He was re-admitted due to an increase in symptoms. The patient was referred for physiotherapy in view of gait imbalances. Prior to inclusion, written consent was obtained from the patient. Physiotherapy intervention was administered for a total of two weeks. He had been abstinent for the two weeks preceding the intervention.

Clinical findings

On examination, patient was conscious, cooperative and well oriented to time, place and person. He was moderately built and poorly nourished. Higher mental functions were evaluated using Montreal Cognitive Assessment (MoCA) scale which showed moderate cognitive impairment. Speech was scanning in nature. Tone was normal in all the extremities and reflexes were found diminished at knee and ankle bilaterally. The muscle power of major muscle groups in both the upper and lower limbs was 4 out of 5, as measured using the Medical Research Council (MRC) grading system. Sensations were intact and balance was observed to be good in sitting but severely impaired in standing. Berg Balance Scale was used to further assess the balance. Coordination was observed to be severely impaired. Right upper extremity was more affected than left. He performed the non-equilibrium tests with great difficulty and was unable to do equilibrium tests without support. The Comprehensive Coordination Scale (CCS) was used to assess coordination, in which he scored 51 out of 69. Romberg test and sharpened Romberg tests were positive. Dysdiadokokinesia was also noted. Gait analysis demonstrated lower limb ataxia, reduced gait speed, swaying to left side and a wide base of support. Patient was unable to walk independently and required at least one person's support. Functionally, the patient was moderately dependent in performing activities of daily living (ADL) tasks.

Diagnostic assessment

The diagnosis of cerebellar ataxia secondary to cerebellar atrophy and alcohol dependency syndrome was made by a registered medical practitioner. The alcohol dependency was confirmed using AUDIT questionnaire which is a valid and reliable tool developed by WHO to measure the level of alcohol consumption.[5] The patient scored 24 out of 40 which indicates Alcohol Use Disorder (AUD).

Magnetic resonance imaging (MRI) of the brain suggested mild prominence of sulcal spaces, basal cistern and ventricles. Diffuse cerebral atrophy and diffuse cerebellar involvement were seen and paleocerebellum was more involved than neocerebellum. Calcifications were seen in bilateral parietal lobes. Nerve conduction studies conducted to rule out other pathologies suggested normal conduction in both motor and sensory nerves of lower extremities.

Balance, coordination and gait were assessed using Berg Balance Scale (BBS), Comprehensive Coordination Scale (CCS) and Scale for Assessment and Rating of Ataxia (SARA), respectively. The patient scored 13 out of 56 on BBS, 51 out of 69 on CCS and 19 out of 40 on SARA when assessed before intervention.

The intervention included patient and family education, medical management and physiotherapy management. Pharmacologically, the patient received oral thiamine, lorazepam and baclofen. Counselling was provided for de-addiction. Physiotherapy intervention focused on improving balance, coordination and gait. The following activities were prescribed to the patient and progressively advanced based on the patient's response.

Coordination exercises

Frenkel's exercises were performed in supine position for lower extremities. Heel-to-shin and shin-to-toe exercises were performed on both limbs. In bedside sitting, rhythmic and alternate tapping of the hands and feet was performed with verbal and visual cues from the

therapist. The activities were progressively increased in complexity and speed.

Balance exercises

In the sitting position, trunk movements were facilitated in all directions, followed by trunk rotations. Progression was made by performing the movements with eyes closed and reducing base of support (BOS) by taking feet together and crossing the arms. Perturbation training was given in all directions and was progressed from eyes open to eyes closed. Sit to stand training was given initially with hand support and later without support. Standing without support was encouraged and timings were noted. Progression was done from wide base to narrow base with feet together. Tandem stance was performed from wide base to narrow base with minimal support and verbal cueing. Marching in place was done with two hand support initially, and then progressed to one hand support. Star excursion activity was performed in the second week of intervention.

Gait training

Forward walking was practiced within the ward with the support of one person. The base of support was gradually reduced by having the patient walk in a straight line. Progression was made by increasing the speed of walking. Assistance was reduced slowly and gradually. Backward walking and sideways walking were performed. An obstacle course was set up by placing objects on the floor, and the patient was instructed to navigate through it without falling.

All the exercises were performed for a total of 35-40 minutes twice daily, once under the supervision of a therapist and another under the supervision of a family member. The patient and family were counseled for a home exercise program.

The outcome measures employed to evaluate the progress were Berg Balance Scale (BBS), Comprehensive Coordination Scale (CCS) and Scale for Assessment and Rating of Ataxia (SARA). The measurements were recorded pre-intervention and post two weeks.

Over the period of two weeks, patient showed improvement in the walking ability and ability to perform ADL. Balance during standing and walking showed notable improvement. On the BBS, the patient initially scored 13 (indicating a high fall risk), which improved to 28 (indicating a medium fall risk), out of a total score of 56. Coordination was assessed using the CCS, where the patient's score improved from 51 to 60, out of a total of 69 over a period of two weeks. Gait impairment was evaluated using the SARA, where the score improved from 19 to 14 out of 40, indicating a reduction in ataxia (Table 1).

Table 1: Comparison of pre and post intervention scores

Scales	Baseline	Post intervention
Berg Balance Scale (BBS)*	13	28
Comprehensive Coordination Scale (CCS) **	51	60
Scale for Assessment and Rating of Ataxia (SARA) ***	19	14

*BBS of total score 56, higher scores indicate better balance and lower fall risk **CCS- higher scores indicate better coordination, ranging from 0 to 69, ***SARA total score ranging from 0 (no ataxia) to 40 (most severe).

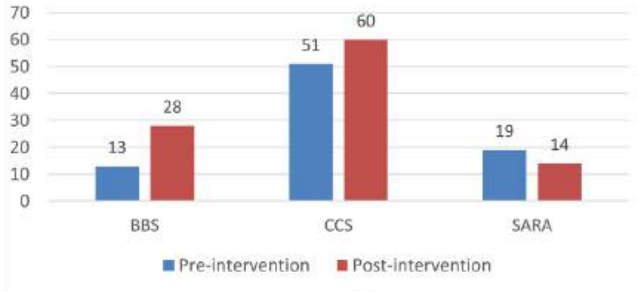

Figure 1: Comparison of pre- and post-intervention scores

The goal of physiotherapy was to improve the walking capacity and facilitate functional independency. In the present case, physiotherapy exercises for two weeks enabled the patient diagnosed with alcohol induced cerebellar ataxia to improve balance, coordination and gait, thereby improving the activities performed in daily living. A systematic review and meta- analysis conducted in 2023 concluded that therapeutic exercises are beneficial in improving balance among patients with acquired cerebellar ataxia but do not significantly enhance functional independence.[6] It was also observed that there is only low to moderate level of evidence available for this intervention. Elshafey MA *et al.,* conducted a randomized controlled trial on 40 children affected with cerebellar ataxia in which intervention group received core stability program in addition to the standard physical therapy program.[7] The study concluded that the intervention group showed significant improvements in ataxia severity, balance, and coordination compared to the control group.

The patient in the present case was encouraged to perform exercises with family supervision. Research demonstrates that home balance exercise program for six weeks proved to be beneficial in improving locomotor functions in people with cerebellar ataxia.[8] Another study was conducted to evaluate the long-term benefits of coordination training in degenerative cerebellar disease. They assessed motor performance and ADLs one year after four weeks of intensive coordination training. The results demonstrated that, despite a gradual decline in motor performance and an increase in ataxia symptoms, the improvements in motor performance persisted.[9]

Exercises have shown to improve motor functions through adaptive plasticity and cortical reorganization. A systematic review reported that exercises help in improving cerebellar dysfunction in adults, through the mechanism of neuroplasticity.[10] Neuroplasticity occurs with an increase in the production of neurotrophins that generate changes in cell growth and signaling. The main neurotrophins involved in the process are glial cell derived neurotrophic factor (GDNF), nerve growth factor (NGF), neurotrophin 3 (NT3), neurotrophin 4 (NT4) and brain-derived neurotrophic factor (BDNF). Physical exercises have shown to increase the production of these neurotrophic factors leading to an improvement in motor as well as cognitive functions.[11]

Clinical implications

The findings of this study suggest that targeted physical therapy interventions, including coordination, balance, and gait training exercises, can provide measurable improvements in patients with cerebellar ataxia. A randomized controlled trial explored the benefits of specific coordination exercises on cerebellar ataxia.[12] The study found that exercises like finger tapping, heel-to-shin tasks, and alternating hand movements improved motor control and coordination. These exercises engage both the motor cortex and cerebellar regions of the brain, helping to retrain impaired pathways. Evidence reports that balance training utilizing both static and dynamic postural tasks significantly improved balance and reduced fall risk in individuals with cerebellar ataxia.[13] Training typically includes tasks such as standing on one leg, heel-to-toe walking, and use of stability balls or balance boards. Targeted rehabilitation is effective in reducing fall risk and improving daily activities which is commonly associated with cerebellar ataxia.[14]

The intervention successfully improved the intended parameters but had a few limitations. The long-term effects of the exercises could not be evaluated, and patient compliance was poor initially. However, adherence improved overtime after multiple sessions of counseling. The effect of poor compliance might have altered the overall outcomes. Future studies with long term follow-up can be performed to determine the carry over effects of exercise on cerebellar ataxia.

Conclusion

This case report suggests that exercise-based physiotherapy interventions can be beneficial in improving balance, coordination, and gait impairment associated with ACA.

Conflict of Interest

Nil

References

1. Shanmugarajah PD, Hoggard N, Currie S, *et al.* Alcohol-related cerebellar degeneration: not all down to toxicity?. Cerebellum Ataxias 2016;3:17.
2. Dar MS. Ethanol-induced cerebellar ataxia: cellular and molecular mechanisms. Cerebellum 2015;14:447-65.
3. Haubek A, Lee K. Computed tomography in alcoholic cerebellar atrophy. Neuroradiology 1979;18:77-9.
4. Mitoma H, Manto M, Shaikh AG. Mechanisms of ethanol-induced cerebellar ataxia: underpinnings of neuronal death in the cerebellum. Int J Environ Res Public Health 2021;18(16):8678.
5. Quintero LA, Jiménez MD, Solís JL, *et al.* Psychometric properties of the Alcohol Use Disorder Identification Test (AUDIT) in adolescents and young adults from Southern Mexico. Alcohol 2019;81:39-46.
6. Winser S, Chan HK, Chen WK, *et al.* Effects of therapeutic exercise on disease severity, balance, and functional Independence among individuals with cerebellar ataxia: A systematic review with meta-analysis. Physiother Theory Pract 2023;39(7): 1355-75.
7. Elshafey MA, Abdrabo MS, Elnaggar RK. Effects of a core stability exercise program on balance and coordination in children with cerebellar ataxic cerebral palsy. J Musculoskelet Neuronal Interact 2022;22(2):172-178.
8. Keller JL, Bastian AJ. A home balance exercise program improves walking in people with cere-

bellar ataxia. Neurorehabil Neural Repair 2014; 28(8):770-8.

9. Ilg W, Brötz D, Burkard S, *et al.* Long-term effects of coordinative training in degenerative cerebellar disease. Mov Disord 2010;25(13):2239-46.
10. Martin CL, Tan D, Bragge P, *et al*. Effectiveness of physiotherapy for adults with cerebellar dysfunction: a systematic review. Clin Rehabil 2009;23(1):15-26.
11. de Sousa Fernandes MS, Ordônio TF, Santos GC, *et al*. Effects of physical exercise on neuroplasticity and brain function: a systematic review in human and animal studies. Neural Plast 2020;2020(1): 8856621.
12. Milne SC, Roberts M, Williams S, *et al.* Goal-directed rehabilitation versus standard care for individuals with hereditary cerebellar ataxia: A multicenter, single-blind, randomized controlled superiority trial. Ann Neurol 2025;97(3):409-24.
13. Mancini M, Silva-Batista C, Shah VV, *et al.* Prefrontal cortical activity during gait is altered in premanifest and early spinocerebellar ataxia. medRxiv 2024:2024-11. Available from: https://doi.org/10.1101/2024.11.14.24317186;
14. Milne SC, Corben LA, Georgiou-Karistianis N, *et al*. Rehabilitation for individuals with genetic degenerative ataxia: a systematic review. Neurorehabil Neural Repair 2017;31(7):609-22.

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GUEST EDITORIAL

The Integration of Clinical Expertise and Teaching Roles in Physiotherapy Education: Recognizing Dual Professional Pathways and International Qualifications

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The landscape of physiotherapy education exists at a critical intersection of clinical practice and academic expertise. This unique position is formally recognized in the International Standard Classification of Occupations (ISCO), which assigns distinct codes to physiotherapists (ISCO 2264) and university educators (ISCO 2310).[1,2] For qualified physiotherapists who transition into teaching roles, this dual classification represents an official acknowledgment of their specialized contribution to the profession. This intersection raises important questions: How do physiotherapy qualification prepare clinicians for teaching roles? How should educational institutions recognize diverse qualification pathways, including international credentials like the clinical doctorate?

The UGC Qualification Framework: A Structured Progression

The University Grants Commission (UGC) has established a clear qualification and progression framework for physiotherapy educators.[3] This structured pathway begins with Assistant Professor position requiring both a Bachelor's and Master's degree in Physiotherapy (with at least 55% marks at the Master's level). From this foundation, progression to Associate Professor requires eight years of teaching experience, while professor position demands eleven years of experience, including five years as Associate Professor. At the highest level, Principal/Director/Dean roles require fifteen years of experience, with five years as Professor.[3,4]

This framework acknowledges an important reality; the qualifications that prepare physiotherapists for clinical practice also provide a foundation for teaching. However, the "desirable" status of doctoral qualifications (traditionally the Ph.D.) across senior positions leaves room for considering alternative advanced qualifications that may equally prepare candidates for educational leadership.[5,6]

Why Physiotherapists Make Effective Educators: The Skills Transfer

The justification for physiotherapists transitioning to teaching roles lies in the natural transfer of clinical skills to educational competencies.[7,8] Patient education parallels student instruction, clinical reasoning informs teaching methodology, treatment planning aligns with curriculum development, and professional leadership extends to academic administration.[9] As Richardson and Jensen *et al.,* have documented, this transfer creates a synergistic relationship between clinical expertise and educational effectiveness.[6,10] The inclusion of competency-based education in physiotherapy has added value and given importance to clinical skills. Outcome-based education models and clinical skill evaluation methods emphasize the need for expertise as teachers, instructors, and facilitators.[11]

The evidence supporting this connection is robust. Studies by Jones *et al.,* reveal that physiotherapists bring valuable real-world perspectives that enhance student learning, while Chipchase *et al.* demonstrated how clinical backgrounds facilitate the integration of evidence-based practice into curriculum development.[5,12] This transfer of skills addresses a core need in physiotherapy education - bridging theoretical knowledge with practical application.[12,13]

International Qualifications: The Post-Professional DPT Context

While the Ph.D. remains the traditional pathway to academic advancement, the emergence of clinical doctorates particularly the Post-Professional Doctor of Physical Therapy (DPT) - presents a compelling alternative that merits serious consideration.[14,15] The DPT focuses on advanced clinical practice, evidence-based implementation, and professional leadership, complementing rather than replicating the research emphasis of traditional Ph.D. programs.[16]

International examples demonstrate the value of recognizing these qualifications. In Australia, Jones and Sheppard document how entry-level clinical doctorates have enhanced graduate preparedness, while Singapore's integration of clinically-focused doctorates has strengthened both research outcomes and clinical relevance in physiotherapy programs.[15,17] The European Region of the World Physiotherapy has successfully implemented a qualification framework that accommodates diverse educational pathways across 37 countries.[18] These examples illustrate that alternative qualification routes can maintain and often enhance educational standards.

The UGC Perspective: Room for Recognition

The UGC framework already contains the flexibility needed to incorporate international qualifications. By listing the Ph.D. as "desirable" rather than mandatory, it acknowledges that other qualifications may equally prepare candidates for educational roles.[3] This openness creates an opportunity to recognize clinical doctorates like the DPT as valid alternatives for teaching positions, particularly given their emphasis on advanced practice and clinical leadership.[19]

Recent literature supports this perspective. Deusinger *et al.,* demonstrated that DPT-qualified educators effectively integrate clinical expertise with educational competencies, while Threlkeld *et al.,* provided a comprehensive framework for analyzing the educational preparation provided by clinical doctorates.[16,19] This research suggests that the DPT produces educators well-equipped to meet the evolving needs of physiotherapy education.

Global Perspectives on Qualification Recognition

The international landscape offers valuable models for qualification recognition. New Zealand has implemented a flexible regulatory approach that maintains standards while accommodating diverse international qualifications.[20] African physiotherapy education systems have successfully integrated various qualification frameworks while raising overall educational quality.[21] India's physiotherapy profession is gaining autonomy through the Allied and Healthcare Professionals Commission, emphasizing competency-based education, similar to global clinical doctorate programs, to develop skilled professionals. The country is creating a model that complements traditional academic pathways to address national healthcare needs.[22]

Perhaps most instructive is Brazil's competency-based evaluation mechanism for international qualifications, which focuses on the outcomes of educational preparation rather than rigid equivalence requirements. This approach acknowledges that different qualification pathways can develop the same essential competencies needed for effective teaching.

Proposed Framework for Recognition

Drawing from international practices and the existing UGC structure, a three-tiered approach is suggested to recognize diverse qualifications in physiotherapy education.

First, institutions should implement competency-based assessment frameworks that evaluate qualifications based on outcomes what an individual can effectively do rather than relying solely on title or equivalency.[22,23] This allows for recognition of teaching competencies developed through various educational paths.

Second, the UGC could formally recognize advanced clinical doctorates as acceptable qualifications for senior teaching roles.[8] This would reflect current practices in many institutions that value clinical experience and leadership alongside academic credentials.

Third, professional bodies should develop clear quality assurance systems that uphold educational standards while being inclusive of different qualification routes.[14,24] These systems should prioritize teaching quality, research, and leadership over specific types of degrees.

Benefits to Physiotherapy Education

The recognition of diverse qualification pathways, including international credentials like the DPT, would yield significant benefits for physiotherapy education.

- Enhanced clinical relevance: Educators with advanced clinical qualifications bring specialized expertise directly into the classroom, strengthening the connection between theory and practice.[10]
- Diverse perspectives: International qualifications introduce varied approaches to patient care, research methodologies, and educational strategies, enriching the learning environment.[24,25]
- Professional development pathways: Multiple routes to academic advancement create more opportunities for talented clinicians to transition into teaching roles, expanding the pool of qualified educators.[13,26]
- Global mobility: Recognizing international qualifications facilitates educator mobility across borders, promoting knowledge exchange and professional development.[27,28]

Conclusion

The dual ISCO classification of teaching physiotherapists acknowledges the unique integration of clinical expertise and educational competencies in our profession. The UGC qualification framework provides a structured progression pathway while leaving room to recognize diverse qualifications. International examples demonstrate that clinical doctorates like the DPT can effectively prepare physiotherapists for teaching roles, often bringing valuable specialized expertise to educational settings.

As we move forward, the question should not be whether to recognize diverse qualification pathways, but how to do so in a way that maintains high standards while acknowledging the unique contributions of different educational routes. The framework exists; what we need now is the willingness to implement it. By embracing diverse qualification pathways, including international credentials like the DPT, we can strengthen physiotherapy education while advancing our profession as a whole.

Author's Note: This editorial reflects the views and interpretations of the author based on current literature and professional experience in physiotherapy education.

Conflicts of Interest

Nil

References

1. World Health Organization. International Classification of Health Workers. Geneva: WHO; 2021.
2. International Labour Organization. International Standard Classification of Occupations: ISCO-08. Geneva: ILO; 2022.
3. University Grants Commission. UGC Regulations on Minimum Qualifications for Appointment of Teachers and Other Academic Staff in Universities and Colleges. New Delhi: UGC; 2018.
4. American Physical Therapy Association. Post-Professional Doctor of Physical Therapy: Pathways and Outcomes. Alexandria: APTA; 2023.

5. Chipchase LS, Williams MT, Robertson VJ. Factors affecting curriculum content and the integration of evidence-based practice in entry-level physiotherapy programs. J Allied Health 2007;36(1):17-23.

6. Jensen GM, Hack LM, Nordstrom T, *et al.* National study of excellence and innovation in physical therapist education: Part 2 A call to reform. Phys Ther 2017;97(9):875-88.

7. World Confederation for Physical Therapy. Policy Statement: Education. London: WCPT; 2021.

8. Rapport MJK, Stelzner D, Rodriguez J. The Doctor of physical therapy degree: A new curriculum for a new degree. Phys Disabil Educ Relat Serv 2007;26(1):63-76.

9. Broberg C, Aars M, Beckmann K, *et al*. A conceptual framework for curriculum design in physiotherapy education–an international perspective. Adv Physiother 2003;5(4):161-8.

10. Richardson B. Professional Development: 2. Professional knowledge and situated learning in the workplace. Physiotherapy 1999;85(9): 467-74.

11. Timmerberg JF, Chesbro SB, Jensen GM, *et al.* Competency-based education and practice in physical therapy: It's time to act! Phys Ther 2022;102(5):pzac018.

12. Jones M, McIntyre J, Naylor S. Are physiotherapy students adequately prepared to successfully gain employment? Physiotherapy 2010;96(2):169-75.

13. Smith R, Duffy J. Developing a competent and flexible workforce using the Calderdale Framework. Int J Ther Rehabil 2010;17(5): 254-62.

14. Sandstrom RW. The meanings of autonomy for physical therapy. Phys Ther 2007;87(1): 98-106.

15. Jones A, Sheppard L. Physiotherapy education: A proposed evidence-based model. Adv Physiother 2009;10:9-13.

16. Threlkeld AJ, Jensen GM, Royeen CB. The clinical doctorate: a framework for analysis in physical therapist education. Phys Ther 1999;79(6):567-81.

17. Hussey J, Wong WP, Connell A. Physiotherapy education in Singapore: a new degree programme through collaboration between Trinity College Dublin and Singapore Institute of Technology. Phys Ther Rev 2013;18:45-62.

18. European Region of the World Confederation for Physical Therapy. European Qualification Framework for Lifelong Learning in Physical Therapy. Brussels. ER-WCPT; 2021.

19. Deusinger SS, Crowner BE, Burlis TL, et al. Meeting contemporary expectations for physical therapists: Imperatives, challenges, and proposed solutions for professional education. J Phys Ther Educ 2014;28:56-61.

20. Skinner M. Physiotherapy education in New zealand. Phys Ther Rev 2007;12:122-8.

21. Frantz JM. Challenges facing physiotherapy education in Africa. The Internet Journal of Allied Health Sciences and Practice 2007;5(4):7. Available from: https://nsuworks.nova.edu/ijahsp/vol5/iss4/7/

22. Swaminathan N. Physiotherapy education in India: Is it time for reform? J Soc Indian Physiother 2021;5(2):35.

23. Higgs J, Hunt A, Higgs C, *et al*. Physiotherapy education in the changing international healthcare and educational contexts. Adv Physiother 1999;1(1):17-26.

24. Gordon J, Hazlett C, Ten Cate O, *et al*. Strategic planning in medical education: enhancing the learning environment for students in clinical settings. Med Educ 2000;34(10):841-50.

25. Tsushima H, Takahashi M. Entry-level educational systems for physical therapy in Japan. Phys Ther Rev 2007;12(2):117-21.

26. Rodger S, Webb G, Devitt L, *et al.* Clinical education and practice placements in the allied health professions: an international perspective. J Allied Health 2008;37(1):53-62.

27. Redenbach D, Bainbridge L. Canadian physiotherapy education: The University of British Columbia example. Phys Ther Rev 2007;12 (2):92-104.

28. Oliveira AL, Nunes ED. Physiotherapy: A historical analysis of the transformation from an occupation to a profession in Brazil. Braz J Phys Ther 2015;19(4):286-93.