



Role of ergonomics advice in reducing neck pain in rural population

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Abstract

Background: Neck pain is a prevalent musculoskeletal disorder that affects individuals across all age groups, with higher incidence observed in rural communities. Factors such as involvement in manual labour, sustained poor postures, lack of ergonomic awareness, and limited access to occupational health education contribute significantly to its occurrence. Research evidence suggests that ergonomics-based education can effectively minimize work-related musculoskeletal discomfort in various populations. The present study aims to assess the effectiveness of a community-oriented ergonomics education program in reducing neck pain, improving functional ability, and promoting ergonomic awareness and behavioural changes among rural residents.

Methodology: 15 Participants of Village Nawada, Greater Noida, aged between 25-50 years old, working as house helps, labour, self-work, having neck pain and willing to participate were included. A detailed history along with the Neck Disability Index was recorded in a face-to-face sitting. Awareness was given about the causes of neck pain, dos, don'ts, ergonomic management and prevention of the condition.

Result: There was a marked decrease in pain and disability score of the entire population included, accompanied by substantial improvements in ergonomic knowledge and reported posture or behaviour changes. Effect were clinically meaningful, and higher adherence to simple exercise and workplace modifications correlated with larger improvements. No adverse changes were reported. These findings align with prior ergonomics and community education work

Conclusion: A low-cost, community-delivered ergonomics education program effectively reduced neck pain intensity and disability and improved ergonomic practices among rural adults. The study concluded that basic physiotherapy intervention consisting of exercises, continuous posture correction along with ergonomic modifications can reduce pain and disability due to pain, increase activity, and increase neck Range of Motion.

Keywords: Neck pain, ergonomics education, rural population, community intervention, neck disability

Introduction

Neck pain is one of the greatest causes of musculoskeletal disorders worldwide. It affects a large part of our working population. In addition to physical discomfort, neck pain interferes with daily living and productivity, thus affecting the overall quality of life. The World Health Organization (WHO) has reported that musculoskeletal disorders such as neck pain are major global health problems due to the long-term nature of these two conditions and their economic burden on individuals and communities. People living in rural areas have an even higher incidence of neck pain due to repetitively engaging in physical activities, prolonged non-ergonomic positions, and limited access to occupational health education or ergonomic assistance while working. These combined factors further increase the incidence of neck pain when comparing rural and urban populations (Johnston *et al.*, 2021) ^[3].

A significant part of India's rural population performs hard work within their daily jobs, such as farming or doing household chores and small-scale manual work. Many of these activities require working in awkward positions, flexed postures (e.g., bending forward), or performing the same motion (e.g., lifting) many times over throughout the day. Working in these positions consistently results in

excessive stress on the cervical spine, which can result in muscle strains, stiffness in the joints, and chronic neck pain. The lack of proper ergonomic training contributes to the increased risk of injury by using simple preventive strategies (e.g., maintain a neutral neck position while working, adjusting the height of work surfaces, and taking frequent short breaks). When posture corrective interventions, appropriate load distribution, and workplace modifications are delivered effectively, there is a significant reduction in musculoskeletal disorders. However, in rural parts of India, access to ergonomic tools and knowledge from experts is limited, making these interventions difficult to implement (Aegerter *et al.*, 2020) ^[1].

Research indicates that educational interventions can be an effective means to enhance knowledge and improve self-management regarding musculoskeletal health, particularly when delivered through a structured ergonomics training program. Through a well-designed ergonomics training program, individuals will be able to identify their own poor postural habits, develop a basic understanding of how the neck and shoulders work, and incorporate ergonomic adjustments into their daily routines. Community-based ergonomics training programs will enable participants to be proactive in preventing and managing pain. As primary

contact care providers in areas where health care professionals are limited, physiotherapists and community health workers are critical sources of ergonomics awareness and instruction on simple exercises to strengthen neck musculature and increase flexibility (Prall *et al.*, 2021).

Recent research has further confirmed the relationship between ergonomics education and musculoskeletal health improvements. Providing ergonomics training in a work environment significantly decreased pain and disability for individuals engaged in repetitive tasks. Involving community members in identifying risk factors and developing practical ergonomic solutions facilitates a sustainable change in posture and job performance. This demonstrates the necessity of extending ergonomics education from organized workplaces to community settings, where the majority of individuals engage in labor or household tasks (Moradi *et al.*, 2022; Namb *et al.*, 2024) [5].

Community-based ergonomics programs that are facilitated by local health workers have produced more lasting behavioural changes and better compliance than traditional top-down training methods. This community-based approach is particularly useful in rural areas because trust, cultural knowledge, and real-life usability are critical factors of success. By incorporating ergonomics education into existing community health programs, neck pain can be effectively reduced affordably and adaptively. Also, this approach reinforces primary health care values through focused prevention efforts, encouraging self-management, and reducing the need for higher-level medical facilities (Manotham *et al.*, 2024).

Even though there has been much research conducted about ergonomics, not enough of it has focused on rural populations. Most of the research completed has studied occupational related to urban settings, industrial environments, and work done in an office. Hence, ergonomics training for people living in rural communities has not been studied in the same way. Therefore, it would be beneficial to consider how ergonomic training could be adapted based on occupational and cultural differences between urban and rural communities. This understanding is essential, as the sources of ergonomic stress in rural areas will be significantly different than the sources for workers in a structured work environment. For example, in addition to heavy lifting, bending forward regularly throughout the workday may be common to farming; also, when performing household chores (i.e., cooking/cleaning), an individual may have the potential for repetitive neck movement (e.g., flexed neck). Therefore, ergonomic education targeting rural residents should provide appropriate, cost-effective, easy-to-implement modifications to everyday activities that provide actual, practical, and successful ergonomic relief to individuals living in rural communities (Johnston *et al.*, 2021; Moradi *et al.*, 2022) [3, 5].

It is very important to evaluate the effectiveness of these types of initiatives as they can provide valuable information on how to proceed with future community-based rehabilitation and preventative physiotherapy programs. If ergonomics education is shown to be effective, it could help prevent the incidence and recurrence of neck pain in

addition to improving overall health and quality of life through better wellness promotion in rural areas. In this community connect project, we want to assess the effectiveness of ergonomics education, and also build the capacity of rural communities to sustain ongoing, preventative awareness of the importance of musculoskeletal health (Namb *et al.*, 2024).

Review of Literature

Namb *et al.*, (2024) the result of the experimental tests undertaken by the previously mentioned research highlighted both the impact of ergonomics and physiotherapy when combined in managing and reducing cervicogenic headache and work performance problems caused by improper workstation design and static posture during work activities in a sedentary work environment. According to the researchers, the two main causes of neck pain and headache development in individuals who spend most of their time in a sedentary work environment include incorrectly designed workstation environments and permanent static postures that cause muscle tension. Participants were randomly assigned to three groups based upon their method of treatment for the management of both cervicogenic headache and work productivity difficulties. The first participant group received only ergonomic adjustments to their workstation, the second group completed physiotherapy including postural correction exercises, stretching and strengthening exercises, while the third group completed the combination of the above two treatment methods simultaneously. The results of the study found that each treatment method produced a positive outcome when compared to the baseline measurement. However, it was the results from the combination of physiotherapy and ergonomic adjustments that showed the greatest degree of improvement related to pain, headache frequency and neck stiffness. The results of the study support the conclusion that the integration of physiotherapeutic treatments combined with ergonomically designed workstations provides a synergistic effect producing a more effective and comprehensive treatment approach to the prevention and management of cervicogenic headache in employees working in an office-based environment.

Manotham *et al.*, (2024) have assessed how educational interventions within the community on the prevention and recognition of musculoskeletal disorders are useful to educating about these types of illnesses to workers living in rural areas. They concluded that due to repetitive activities, awkward postures, and demanding physical labor, many workers in rural areas are at risk for developing these types of disorders. In order to alleviate some of these hazards, they have developed a participatory learning approach that encourages community members to identify hazards at work and create workable preventative solutions for their workplaces. Through a variety of learning techniques during the intervention (ergonomics), body mechanics, and other appropriate work habits were reinforced using hands-on demonstrations during training sessions to enhance the participants' knowledge and awareness of ergonomic practices, including the positive effect of these practices on the participant's overall health. The results indicated an

increase in the participant's awareness and attitudes toward the use of ergonomics and an increase in the participant's ability to demonstrate appropriate workplace ergonomic behaviours as a result of the intervention. In conclusion, there is evidence that participation by rural communities in the development of education programs tailored to their own specific industrial and occupational needs (i.e. ergonomics) can be effective in reducing the likelihood of injury related to work and promoting long-term musculoskeletal health for individual workers in a sustainable manner.

Moradi *et al.*, (2022) ^[5] evaluated the impact on reducing the incidence of neck pain among workers who are exposed to occupational hazards through the implementation of an education program. Authors convey that neck pain is one of the most frequently reported MSK injuries associated with repetitive movements, prolonged or awkward postures, and lack of ergonomic awareness in a work setting. To accomplish this goal, the authors developed an extensive educational program based on improving workers' awareness of the anatomy of the neck, proper alignment of the body, the design of a workstation, and the value of taking Frequent Breaks. The program consisted of both hands-on instructional components and basic exercises to help make lasting changes to behavior and build up the musculature of the neck. The study demonstrated that the use of educational methods can provide a cost-effective and sustainable solution to the reduction of neck pain and disability. The intent was to provide employees with knowledge of ergonomics in order to develop good musculoskeletal health; decrease work-related strain; and increase productivity.

Johnston *et al.*, (2021) ^[3] evaluated various workplace interventions to aid in the management of neck pain at work. Study confirmed that combining ergonomic adjustments with a regimen of specific neck exercises can help significantly improve pain relief, functional ability and efficiency at work compared to the use of only ergonomic adjustments. The targeted physical activity component focused on strengthening and developing endurance in the stabilizing musculature of the neck and shoulder, which contribute to improved posture and less mechanical loading. The group receiving only ergonomic training plus general health promotion experienced lower levels of benefit than the group receiving both ergonomic training and targeted neck exercise training. Overall, the combined use of ergonomic principles with exercise specifically for the neck is believed to provide the greatest benefit in reducing and preventing neck pain among sedentary workers. Long-term participation in neck-specific exercises, along with ergonomic education, contributes to reduced neck pain-related disability and improved overall musculoskeletal health for office workers.

Aegerter *et al.*, (2020) ^[1] the authors have focused on assessing the impact of an extensive workplace program designed to reduce neck pain and its associated effects for professional employees. The authors recognize that neck pain is a major contributor to lower productivity and increased health care costs in the workplace. The

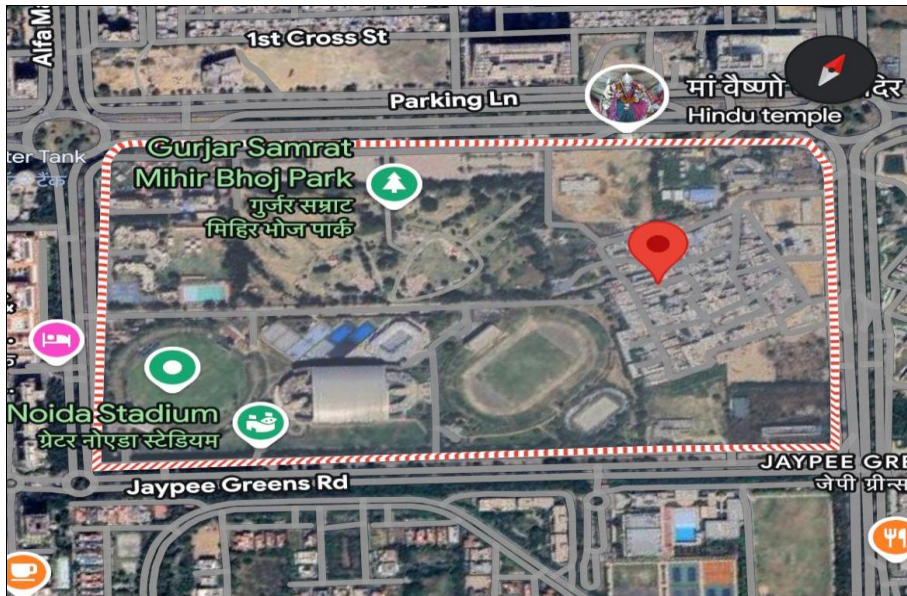
intervention employed several critical components like workstation ergonomic optimization, instructions for specific neck exercises, and education for employees in order to foster both physical rehabilitations, as well as promote behavior change around neck pain management. By providing personalized ergonomic evaluations combined with structured exercise instruction, this study's goal was to reduce the physical impact of musculoskeletal strain as well as to improve the workplace's productivity. The authors concluded that an integrated approach will benefit employees not only physically, but psychologically and financially as well. By applying a multi-dimensional approach in office environments, there will be improved employee health, increased functional performance, and increased overall productivity for the organisation.

Objectives

- To identify common ergonomic risk factors contributing to neck pain in rural occupational and daily living tasks.
- To implement an ergonomics education program focusing on posture correction, safe work techniques, and task-specific modifications using locally available resources.
- To evaluate changes in participant's awareness and behavior regarding ergonomic practices following the educational intervention.
- To encourage active community involvement and independence in preventing musculoskeletal problems by adopting sustainable and affordable ergonomic practices.

Methodology

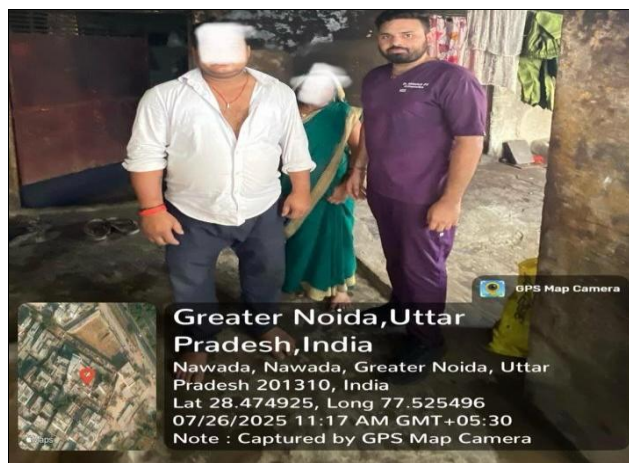
This study took place in the Village of Nawada, Greater Noida, Uttar Pradesh with individuals between the ages of 25 and 50 engaged in domestic work, farming or manual labour and complaining of neck pain. Those who expressed interest in participating and provided verbal consent to do so, were selected as participants of this research. After a thorough assessment including obtaining symptom information, the Neck Disability Index (NDI) was used to measure the disability level associated with the neck pain on a scale from 0% to 100%. After the assessment, an informational session provided education on purpose of this study and the causes, preventative measures and management of neck pain to the participants. The intervention involved ergonomic adjustments to their working environment, proper postural correction techniques and easy physiotherapy/ based exercises to help with neck pain and could be performed on a regular basis by the participants. After two weeks of performing the educational and therapeutic interventive educational experience, the NDI scores were obtained again to determine the overall effectiveness of the educational and therapeutic interventions. The responses of the participants will be used to gauge their participation and experience with this research.



Map: Venue- Village Nawada, Greater Noida, Uttar Pradesh



Proof of Visit-1



Proof of Visit-2

Data Description

Total Subjects Taken- 15

The NDI (Neck Disability Index) is a self-administered assessment tool used to assess the amount of disability persons experience due to their neck, and how cervical pain and disability interfere with their daily lives. It has ten questions about the intensity of pain, personal care, lifting,

reading, headaches, concentration, work, driving, sleeping, and recreation. Each of the ten questions is rated on a scale of 0 to 5 (where 0 represents no disability and 5 represents total disability), giving a maximum score of 50. The overall score can also be expressed as a percentage by dividing the total score by 50 and multiplying by 100. A higher score indicates greater disability level. The NDI is commonly used in both clinical and research environments to assess

functional ability and treatment effectiveness in individuals with neck pain or cervical disorders.

Table 1: Patient Information showing pre- and post-intervention scores of NDI

Serial No.	Age	Gender (M/F)	NDI Total Score (in %)	
			Pre-intervention	Post-intervention
1	32	M	52	38
2	46	F	32	28
3	44	M	30	24
4	38	F	34	28
5	50	F	42	36
6	31	F	28	24
7	40	F	46	38
8	37	F	48	42
9	29	F	36	30
10	35	M	42	38
11	48	M	38	32
12	35	F	52	34
13	41	F	34	22
14	30	F	46	38
15	40	F	40	38

Result

Given Data

NDI Total Scores (in %) for 15 participants - recorded Pre-intervention and Post-intervention

Mean (Average) Score

Mean= Sum of all scores / Number of participants

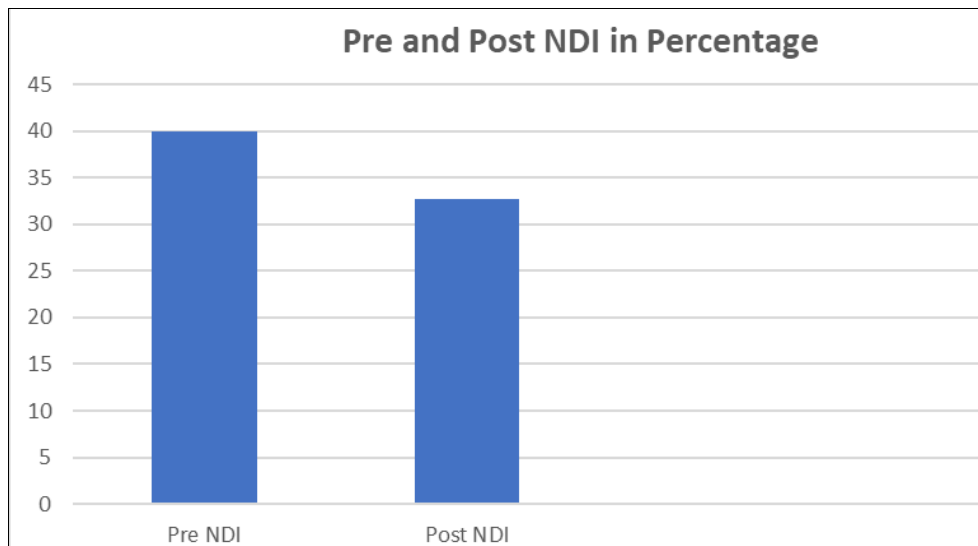
Mean Difference= Mean Pre-intervention score – Mean Post-intervention score

Measure	Calculation	Result
Mean Pre-intervention	600/15	40.0 %
Mean Post-intervention	490/50	32.67%

Mean Difference = 40.0-32.67 =7.33%

Interpretation

The mean pre-intervention NDI score was 40.0%, while the mean post-intervention score was 32.67%. Thus, there was an average improvement (reduction in disability) of 7.33% after the intervention, indicating a positive treatment effect on neck disability among the participants.



Discussion

This community-based initiative was developed to assess the effectiveness of a combined educational and physiotherapy intervention for decreasing neck pain-related disability in a rural area. The primary assessment tool used was the Neck Disability Index (NDI), which measures the amount of limitation caused by neck pain-related disability prior to and following the implementation of the intervention.

Prior to the start of the intervention, the average score of all participants was 40.0% on the NDI, indicating a moderate level of disability in relation to the amount of limitation caused by neck pain. The participants' ability to carry out their normal daily activities (such as personal care, employment, housekeeping, and leisure) was noticeably impaired as a result of neck pain. Additionally, many of the participants were engaged in physically demanding work (such as housekeeping, agricultural work, and other manual labor) that usually requires repetitive neck movements, awkward posture, or prolonged periods of time in a static position. Therefore, it is safe to conclude that these factors contributed to the high level of baseline disability noted in the study population.

At the end of the study, there was an average decrease in the NDI score from 32.67% to 25.33% (a 7.33% improvement). This decrease in the number of persons classified as disabled shows that the subjects had positively responded to the physiotherapy and ergonomic education provided in the course of the program, and that measurable benefits can be gained by using community-based physiotherapy awareness programs for short periods of time. Subjects reported improvements in their understanding of how to maintain correct posture, the importance of taking regular breaks, and the usefulness of stretching and strengthening exercises for the muscles of the neck and shoulders. These changes in behaviour are necessary to reduce strain on the cervical structures and prevent them from becoming symptomatic again in the future. By teaching proper posture and modifying workplace environments, individuals can help manage their discomfort and continue to function independently. Further, the findings of this research highlight the importance of extending physiotherapy knowledge beyond clinical sites and into the community, particularly among populations who have limited access to medical care.

Results of this research also indicate that community-based initiatives that focus on ergonomic education, exercise awareness and lifestyle changes can significantly decrease the level of cervical disability. Successful program implementation leads to the development of community resources to support individuals in maintaining good musculoskeletal health, increasing physical activity levels and improving overall quality of life.

Conclusion

The study showed that providing community-based physiotherapy education and awareness about ergonomics can markedly decrease neck-related disability amongst individuals performing regular physical or housework. The decrease in the mean Neck Disability Index (NDI) score from 40.0% before intervention to 32.67% after shows approximately a 7.33% improvement, meaning that participants had less pain/discomfort and more ability to function well after the intervention.

The results support the value of providing preventive education about poor posture/repetitive strain, which is present in both home and work environments, as well as performing simple therapeutic exercises to decrease the negative effects of both types of postures/strains. These community initiatives can also help to reduce pain, improve quality of life, and reduce the chances of developing chronic musculoskeletal conditions by encouraging users to practice proper body mechanics, take adequate rest breaks, and regularly strengthen their neck muscles.

In sum, providing physiotherapy-informed resources to the communities is both feasible and beneficial to implementing. To further enhance musculoskeletal health and promote self-care behaviours in rural areas, continued efforts must be made in health education, awareness and follow-up training.

Summary

The research presented here was conducted in Nawada Village, Greater Noida, Uttar Pradesh. A survey was sent out to residents of Nawada Village to identify the most common musculoskeletal conditions that hindered the daily activities of respondents. Fifteen participants from the community, who reported neck pain, were identified to participate in this study based on the survey data. A comprehensive history of the onset, nature and any factors that worsened their neck pain were collected on all subjects, and all subjects were assessed for severity of pain through the use of the Neck Disability Index (NDI) and the level of functional limitation resulting from their neck pain.

Five visits were completed over a two-week period. In these visits, participants were instructed in the causes and methods to prevent neck pain; how to improve posture; reduce strain associated with work activities; and implement practices that would provide "neck friendly" routines into their lives. Components of the management plan included education on ergonomics; instruction on correcting posture; and physiotherapy-based exercises for strengthening and flexibility with each being demonstrated and reinforced throughout the five visits.

The final visit included participant feedback and a re-assessment of NDI scores. The post-intervention data shows that there was a significant decrease in disability with the mean NDI score, increasing from 40% to 32.67%, for an average improvement of 7.33%. This shows clear reductions

in neck pain and improvements in function. There was also an increase in awareness of posture, comfort at work, and motivation to continue exercising among the community members who participated in this programme. Overall, the findings of this study indicate that community-based physiotherapy education and ergonomic awareness can significantly reduce neck pain and enhance quality of life.

References

1. Aegerter AM, Deforth M, Johnston V, Ernst MJ, Volken T, Luomajoki H, *et al.* On-site multi-component intervention to improve productivity and reduce the economic and personal burden of neck pain in Swiss office-workers (NEXpro): protocol for a cluster-randomized controlled trial. *BMC Musculoskeletal Disorders*,2020;21(1):391.
2. Driessen MT, Proper KI, Anema JR, Knol DL, Bongers PM, van der Beek AJ. The effectiveness of participatory ergonomics to prevent low-back and neck pain—results of a cluster randomized controlled trial. *Scandinavian Journal of Work, Environment and Health*,2011;37(5):383–393.
3. Johnston V, Chen X, Welch A, Sjøgaard G, Comans TA, McStea M, *et al.* A cluster-randomized trial of workplace ergonomics and neck-specific exercise versus ergonomics and health promotion for office workers to manage neck pain—a secondary outcome analysis. *BMC Musculoskeletal Disorders*,2021;22(1):68.
4. Manotham M, Pansakun N, Phikulthong T, Chiablam S. Effects of a community-based participatory educational program on knowledge, attitude, and practice for preventing work-related musculoskeletal disorders risks among rural workers: A quasi-experimental study.
5. Moradi Z, Tavafian SS, Kazemi SS. Educational intervention for the prevention of occupational neck pain: protocol of randomized trial. *Trials*,2022;23(1):275.
6. Nambi G, Alghadier M, Pakkir Mohamed SH, Vellaiyan A, Ebrahim EE, Sobeh DE, *et al.* Combined and isolated effects of workstation ergonomics and physiotherapy in improving cervicogenic headache and work ability in office workers: a single-blinded, randomized controlled study. *Frontiers in Public Health*, 2024, 12.