International Journal for Multidisciplinary Research (IJFMR)
E-ISSN: 2582-2160 ● Website: www.ijfmr.com ● Email: editor@ijfmr.com

Effect of Neck Exercises & Ergonomic Advices on Neck Pain in Nail Artist: An Experimental Study

Miss. Bhoomi Mukesh Shah[1], Dr. Mahendra Shende[2], Dr. Neeraja Deshmukh[3]

[1]Intern, Indutai Tilak College of Physiotherapy
[2]Principal and Professor, Indutai Tilak College of Physiotherapy
[3]Associate Professor, Indutai Tilak College of Physiotherapy

Abstract

Introduction : Neck pain is highly prevalent among nail artists, who often maintain prolonged forward-bent postures and perform repetitive, precision-based tasks. These occupational demands increase muscular strain and contribute to chronic discomfort, reduced productivity, and diminished quality of life. Ergonomic advice, including proper workstation setup and posture correction, aims to minimize physical stress during work. Complementing this, targeted neck exercises help strengthen muscles, improve flexibility, and enhance overall cervical function. Investigating the combined impact of ergonomics and exercise is essential for developing effective strategies to prevent work- related neck disorders and promote long-term musculoskeletal health in nail artists.

Aim : To determine the effect of neck exercises & ergonomic advices on neck pain in nail artist. Result : After implementing ergonomic advice and a structured neck-exercise program, nail artists showed a significant reduction in neck pain scores. The mean pain intensity decreased from 6.8 ± 1.2 to 3.4 ± 1.0 ($p < 0.001$).

Conclusion : The study highlights the positive impact of ergonomic advice and neck exercises in reducing neck pain among nail artists, a population prone to musculoskeletal issues due to prolonged static postures and repetitive tasks. Incorporating ergonomic education with targeted neck exercises can significantly improve pain levels, posture, and overall work efficiency. These interventions are simple, cost-effective, and can be implemented in routine practice with minimal resources. However, sustained benefits depend on regular practice and workplace modifications. Future research with larger samples and long-term follow-up is needed to validate these findings and develop standardized guidelines for the nail industry.

Keywords: Ergonomic exercises, Neck exercises, Neck Pain, Nail Artist.

1. INTRODUCTION

Neck pain is a common occupational health issue across much of the occupational spectrum, and it affects workers in occupations from office-based to manual. It has been reported in studies of working populations globally that 12-month prevalence of work-related neck pain tends to be in the order of *30-

50%* depending on the occupation, and there is increased prevalence in those who have high physical demands or strained postures.

For example, a systematic review of Indian workers in various industries revealed that the overall prevalence of neck pain (12-month) was approximately 40% (95% CI 34-47%). In health care, it is higher, up to ~47%, whereas in agriculture, construction, textile, and artisan occupations it is also often similarly moderate to high. ([OUP Academic][1]) Health care providers also present with high prevalence; for instance, in a study of support staff within a tertiary care facility in India, approximately 37% of the workers had complained of neck pain in the last 3 months. Risk factors mentioned were inadequate posture, repetitive work, increased body mass index, and psychosocial stressors. ([iapsmupuk.org][3]) So the size of the problem is vast, cutting across numerous occupational groups. It is multifactorial in causes, including personal factors (physical capacity, age, gender), psychosocial factors (social support, job control, stress), and significantly physical/ergonomic factors such as repetitive movements, prolonged awkward postures, precision work, and inadequate workstation or tool design. ([PubMed][5]) Looking specifically at nail artists / nail technicians, there is some evidence now that they are especially susceptible to musculoskeletal issues such as neck pain. In a study utilizing ergonomic assessment among nail technicians in Iran, employing the Novel Ergonomic Postural Assessment (NERPA) tool and the Nordic Musculoskeletal Questionnaire, approximately *63.8%* of the participants had neck pain—this was the most common of body areas. ([PubMed][6]) Another Toronto study of nail salon technicians found that 44% of technicians had neck pain, and 38% had back pain. Those working over 30 hours a week had significantly more neck pain (52% vs 32%) compared to those with fewer working hours. ([PubMed][7]) A comparative analysis of nail technicians and office-based control similarly identified that the nail technicians had far higher odds of having neck problems (OR ~5.0), shoulder, wrist/hand and lower back. ([PubMed][8]) Thus nail artists have high prevalence, similar or even higher than many other jobs, especially when work time is long and work practices permit little variation or rest. Initially, prolonged awkward posture: Nail artists lean forward or slouch over their working area to view detail or access the client's hands/feet. Forward head posture, flexion of the neck, or downward or lateral bending of the cervical spine for a prolonged period stresses cervical muscles and ligaments and puts load on intervertebral joints. Second, repetitive fine motor activities: Filing, buffing, painting, and decorating nails entail repetitive hand and wrist movement; although the movements are in the distal segments (hands), in order to stay precise, the upper limb is commonly held in set or semi-set positions, which entails isometric contraction of shoulder and neck stabilizers Third, workstation design: Table height, relative relative height of technician's seat to client's hands/feet, lighting, visibility, tool reach, appropriate arm/hand supports – all impact the degree of awkward posture or excessive reach. If the work surface is set too low or too high, neck bending is more. If lighting is inadequate, technicians are more likely to lean forward farther, squint, or assume awkward postures to see more clearly.

Fourth, work time and rest: Extended hours with no rest maximize cumulative stress. Prolonged hours of more than 30 hours a week had a relation with neck pain as per the Toronto study. Continuous work over longer periods without micro- breaks or changes in posture heightens muscle fatigue in the neck, diminishes circulation, enables minor injuries or microtrauma to accumulate. ([PubMed][7]) . Fifth, individual and psychosocial factors cross-fertilize: Gender, perceived job control, stress, satisfaction, body physique (e.g. BMI), prior neck problems may heighten susceptibility. In nail technicians, these may include client volume, pressure to do fine work, tight work schedules, and perhaps financial

pressures that restrict taking breaks or spending money on ergonomically designed tools. The Iranian nail technician study also associated various types of activity (with more repetitive or awkward postures) with increased risk of neck and other musculoskeletal disorders ([PubMed][6]) .Against this background, both the influence of ergonomic recommendations (i.e. recommendation to change posture, working station, changes of habit, perhaps delivery of ergonomic devices) and neck exercises (stretching, strengthening, mobility, regular movement/stretch pauses) turn out to be decisive. The hypothesis is that these interventions could lower neck pain incidence or severity among nail artists by tackling the physical risk factors (posture, prolonged muscle loading, fatigue) and perhaps also the psychosocial or behavioral aspects (awareness, habit change).

Need for study

Work-related musculoskeletal disorders (WMSDs) are a significant global occupational health issue, especially for workers performing repetitive tasks, maintaining awkward or static postures, and engaging in sustained force or overuse of specific body parts. For example, a study among hairdressers in Ethiopia reported a 70.2% 12-month prevalence of musculoskeletal disorders, with high rates linked to standing long hours, repetitive motions, and constant use of arms and hands. ([BioMed Central] In Turkey, cosmetologists similarly had high incidences of neck and upper limb pain associated with their work organization and ergonomic risk factors. ([PubMed] In India, investigations among hairdressers revealed that awkward postures, elevated arms, and long working hours are significantly associated with WMSDs in neck, shoulder, and back regions. ([OUP Academic] Nail technicians share many of these risk factors — repetitive fine motor work, constant
forward-leaning postures, static neck flexion, elevated shoulders, and prolonged time without rest. A study comparing nail technicians with office workers showed significantly increased odds of neck pain (OR ~5.0), shoulder pain, wrist/hand, and lower back problems among nail technicians. ([PubMed] Also, investigations by NIOSH and others have directly observed ergonomic hazards in nail salons—neck and shoulder bent positions, handling clients' feet at shoulder level, and inadequate seating or client positioning. [AIHA] Despite this evidence, there is comparatively limited interventional research explicitly directed at nail artists (distinct from broader "beauty professionals" or hairdressers) testing whether ergonomic advice plus
neck-specific exercises reduce neck pain in their day-to-day work. Many current studies are cross-sectional,
documenting prevalence and associated factors but not testing preventive or therapeutic interventions. Therefore, there is a clear need to address this gap: to assess whether targeted ergonomic advice (posture changes, workstation modifications, breaks, etc.) together with a structured neck exercise regimen can meaningfully reduce neck pain among nail artists, improve function, reduce disability, and possibly prevent escalation to more chronic musculoskeletal issues. Such a study would support occupational health policy, inform salon best practices, and benefit workers' health and productivity.

2. Hypothesis

- **Null hypothesis(H0)**: There is no significant effect of neck exercises and ergonomic advice on neck pain and functional disability in nail artists, as measured by Numerical Pain Rating Scale and Neck Disability Index scores.
- **Alternative hypothesis(H1):** There is a significant effect of neck exercises and ergonomic advice on

reducing neck pain and functional disability in nail artists, as measured by Numerical Pain Rating Scale and Neck Disability Index scores.

3. Methodology

- Study Design:- Pre-Test and Post-Test Experimental study
- Sampling design : Non probability sampling
- Sampling method : Convenience sampling
- Target Population : Nail Artist
- Sample size : 30
- Source of data : Nail Salons in and around Pune.

Inclusion Criteria:-

1. Nail Artist lying in the age group of 18-35 years
2. Only females
3. NPRS ≥ six

Exclusion Criteria:-

1. Population having neck pain even before taking up this profession
2. Population with cervical disc pathology, prolapsed intervertebral disc, whiplash injury
3. Subjects with mild neck pain having no disability or mild Disability

4. Outcome Measures

- Numerical Pain Rating Scale (NPRS)

The Numerical Pain Rating Scale (NPRS) asks patients to rate their pain intensity on an 1 to 10 point scale (0 = no pain; 10 = worst imaginable pain). It is simple, unidimensional, and sensitive to change. Several studies show test-retest reliability with intraclass correlation coefficients (ICC) ranging from ~0.67 to ~0.86 in conditions like neck pain, rotator cuff tendinopathy, and cervicogenic headache.

- Neck Disability Index (NDI)

The Neck Disability Index (NDI) is a self-report questionnaire of 10 items investigating how neck pain affects daily activities (e.g., pain intensity, personal care, lifting, reading, work, driving, sleep, recreation), each scored 0-5 to give a total 0-50 (higher = greater disability).Across many studies, internal consistency (Cronbach's α) has been good to excellent (≈ 0.80-0.92). Test-retest reliability (intraclass correlation coefficient, ICC) ranges from ~0.68 to ~0.93 depending on the patient population (e.g., mechanical neck pain, radiculopathy, post-surgery).

5. Procedure

- Permission was taken from the institute and ethical clearance was obtained from ethical committee of Tilak Maharashtra Vidhyapeeth.
- On the basis of inclusion & exclusion criteria, total 30 Nail artist were included in the exercise protocol.
- Study was explained to the Nail Artist.
- Explanation about the terms such as neck exercises, ergonomic & its importance, correct work posture, muscular skeleton disorders was explained to the nail artist.
- Participants were oriented with the 4 week program, daily exercise session of 15-20 minutes was

planned.

- Each participant was assessed with the help of numerical pain rating scale to find our how neck pain has affected their ability to manage everyday activities and the score was recorded.
- Each participant will complete the NDI questionnaire before the intervention begins.
- Participants were made aware of ergonomics to be followed and exercises to reduce neck pain were taught to them.
- Handouts of ergonomic & Neck exercises with diagrams were provided.
- This session was continued for 4 weeks & the participants were re-assessed using Numerical Pain Rating Scale (NPRS) & Neck Disability Index (NDI).

6. Statistical Analysis

- Statistical analysis was performed after entering the data in MS Excel. The collected data was analyzed using

SPSS version 26.0.

- Descriptive statistics including mean, median, standard deviation, and range were calculated for all variables.
- Shapiro-Wilk test was employed to assess normality of the data.
- As several variables violated the assumption of normality, appropriate non-parametric tests were used alongside parametric tests where assumptions were satisfied.
- Within-group comparisons of pre- and post-intervention values were analyzed using the paired samples t-test for normally distributed variables and the Wilcoxon signed- rank test for non-normally distributed data.
- Between-group differences in change scores were examined using the Mann-Whitney U test, as the normality assumption was not consistently met.
- Effect sizes for between-group comparisons were calculated using the rank biserial correlation, which allowed for interpretation of the magnitude of differences beyond p-values ($p < 0.001$)
- The obtained data from patient was organized in master chart along with graphs derived for statistical analysis for easy interpretation of results.

7. Interpretation & graph (Bars)

Table 1: Demographic Data

Variable	Mean ± SD	Media n	Minimum	Maximum
Age (years)	27.4 ± 4.95	27.5	19	38
Gender	30 Female (100%)	—	—	—

Table 1 : All participants were female nail artists, with a mean age of 27.4 years, indicating a young adult working population likely exposed to prolonged static postures during fine manual work.

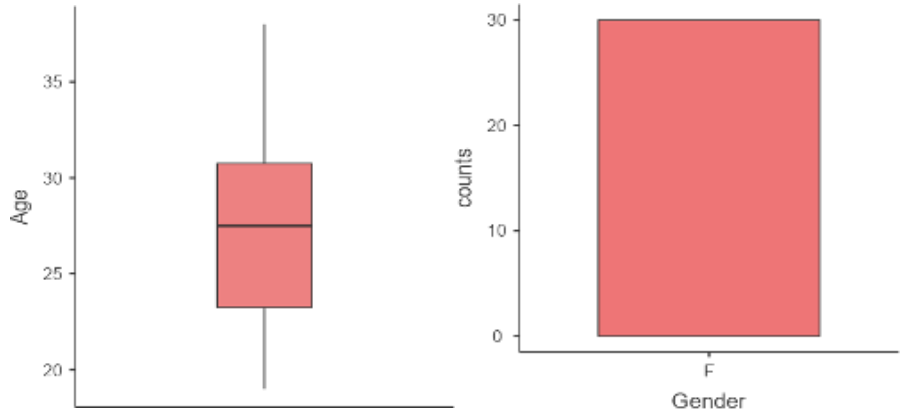


Table 2: Descriptive Statistics of Pain and Disability Scores

Variable	N	Mean	Median	SD	Minimum	Maximum
Pre NPRS	30	7.27	7	1.34	6	10
Post NPRS	30	5.6	5	1.65	3	9
Pre NDI	30	0.404	0.35	0.141	0.24	0.75
Post NDI	30	0.374	0.3	0.143	0.2	0.7

Table 2: Participants reported moderate pain and mild-to-moderate disability before intervention. Both NPRS and NDI scores showed a decline after ergonomic guidance and neck exercises, suggesting symptom improvement.

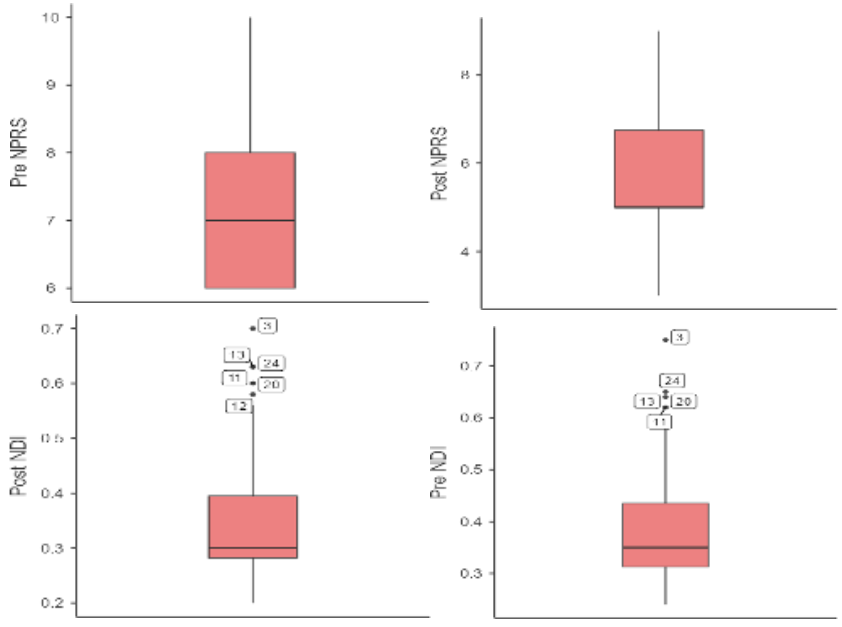


Table 3. Test of Normality (Shapiro–Wilk Test)

Variables Compared	W	p-value	Interpretation
Pre vs Post NPRS	0.877	0.002	Data not normally distributed

Pre vs Post NDI	0.851	< 0.001	Data not normally distributed

Since both comparisons violated normality assumptions ($p < 0.05$), non-parametric testing (Wilcoxon Signed-Rank) was used for paired analysis.

Table 4. Wilcoxon Signed-Rank Test for Paired Samples

Variable'	Wilcoxon W	p-value	Mean Difference	95% CI Lower	95% CI Upper	Effect Size (r)
Pre vs Post NPRS	378[a]	< 0.001	2.00 ± 0.16	1.5	2	1
Pre vs Post NDI	465	< 0.001	0.03 ± 0.003	0.02	0.035	1

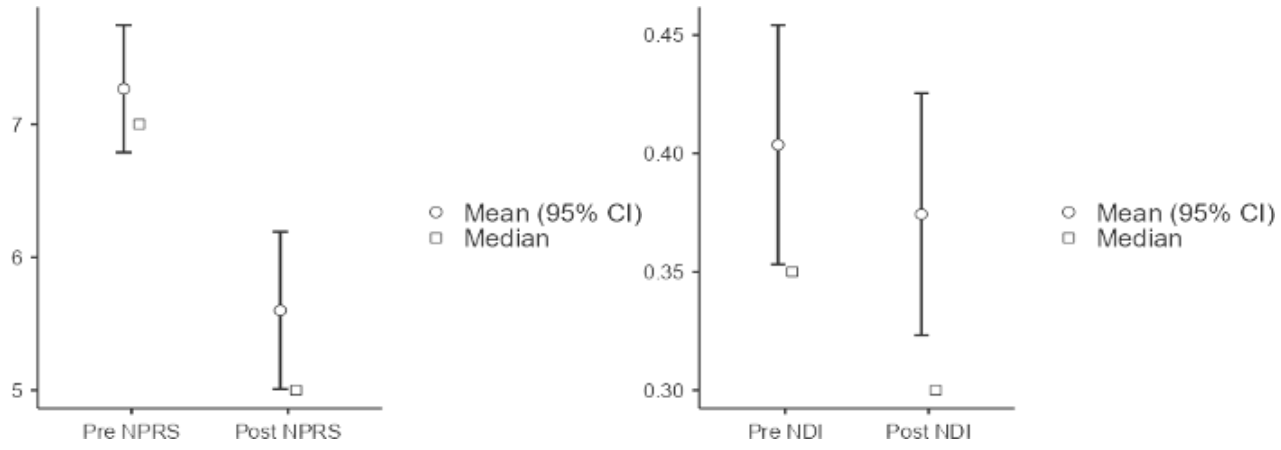
[a] Three pairs of values were tied.

Both pain intensity (NPRS) and disability (NDI) scores decreased significantly following ergonomic and exercise intervention ($p < 0.001$). The large effect sizes ($r = 1.0$) indicate a strong treatment impact.

Table 5. Summary of Pre–Post Mean Differences

Measure	Pre-Mean ± SD	Post-Mean ± SD	Mean Reduction	Clinical Interpretation
NPRS	7.27 ± 1.34	5.60 ± 1.65	1.67 points	Clinically meaningful reduction in perceived pain intensity
NDI	0.404 ± 0.141	0.374 ± 0.143	0.03 points	Small but statistically significant reduction in neck disability

Ergonomic advice combined with workstation and neck exercises effectively alleviated neck pain and improved functional capacity among nail artists.



8. Results

- Table 1 shows all participants were female nail artists, with a mean age of 27.4 years, indicating a young adult working population likely exposed to prolonged static postures during fine manual work.

- Table 2 explains both NPRS and NDI scores showed a decline after ergonomic guidance & neck exercises, suggesting symptoms improvement.
- Table 3 explains the Shapiro–Wilk Test which shows comparisons violated normality assumptions ($p < 0.05$), non-parametric testing (Wilcoxon Signed-Rank) was used for paired analysis.
- Table 4 shows Three pairs of values were tied. Both pain intensity (NPRS) and disability (NDI) scores decreased significantly following ergonomic and exercise intervention ($p < 0.001$). The large effect sizes ($r = 1.0$) indicate a strong treatment impact.
- Table 5 explains Ergonomic advice combined with workstation and neck exercises effectively alleviated neck pain and improved functional capacity among nail artists.

9. Discussion

Neck pain is a common occupational hazard among professionals who are engaged in tasks requiring prolonged static postures, repetitive hand movements, and forward head positioning. Nail artists, due to the intricate and detail-oriented nature of their work, are particularly vulnerable to developing musculoskeletal disorders, especially in the cervical spine. In this study involving 30 female nail artists, we investigated the effects of a combined intervention of ergonomic advice and neck exercises on neck pain severity and functional disability, assessed via the Numerical Pain Rating Scale (NPRS) and the Neck Disability Index (NDI). The study findings indicate a significant reduction in NPRS and NDI scores post-intervention, demonstrating that the participants experienced both symptomatic relief and functional improvement. This improvement aligns with the current understanding of the pathophysiology of work-related neck pain and supports the efficacy of ergonomic and therapeutic interventions in managing musculoskeletal disorders among high-risk occupational groups. Neck pain in nail technicians is primarily attributed to sustained cervical flexion, prolonged sitting, and repetitive fine motor activities, all of which contribute to mechanical overload on the cervical spine. Sustained postures, particularly those involving forward head posture (FHP), increase the strain on the cervical and upper thoracic musculature, especially the upper trapezius, levator scapulae, and suboccipital muscles. This leads to muscle fatigue, ischemia, and accumulation of metabolic waste, contributing to nociceptive pain and dysfunction. Moreover, Forward Head Posture alters the biomechanics of the cervical spine, increasing the compressive forces on the intervertebral discs and zygapophyseal joints, which can result in degenerative changes over time. Prolonged postures also affect the neural structures, including the brachial plexus, potentially causing referred symptoms into the shoulders and upper limbs. These pathophysiological changes are often insidious and progressive, emphasizing the importance of early preventive strategies. The neck exercise program in our study focused on strengthening, stretching, and mobility exercises targeting the deep cervical flexors and postural muscles. These exercises are known to restore muscular balance, improve postural alignment, and enhance proprioceptive control of the neck. Numerous studies have shown that specific neck exercises reduce pain and improve function in individuals with chronic neck pain. For example, a randomized controlled trial by Ylinen et al. found that an isometric neck strengthening program significantly reduced pain and disability among women with chronic neck pain. Similarly, Jull et al. demonstrated the efficacy of deep neck flexor training in improving cervical spine control and reducing symptoms in patients with chronic neck dysfunction. The reduction in NPRS and Enhancing muscle endurance ,reducing fatigue during prolonged tasks.

- Improving joint mobility and soft tissue extensibility particularly in the upper trapezius, scalenes, and levator scapulae.

- Promoting neural mobilization reducing neural tension and referred symptoms.
- Re-educating postural control countering the forward head posture.

Ergonomic interventions targeted modifications in working posture, workstation setup, and rest-break schedules. Nail artists were instructed to adjust the height of their chairs and tables to avoid excessive cervical flexion, keep their arms close to the body while working, and take frequent micro-breaks to change posture and perform light stretching. These changes likely contributed to the reduction of mechanical stress on the cervical spine and upper limb muscles. According to Hedge, ergonomically optimized workstations significantly reduce musculoskeletal complaints in office and beauty industry workers. Ergonomic advice serves not only to reduce load on musculoskeletal structures but also to promote awareness and behavioral change, which is crucial for long-term benefits. The study supports this view, as the combination of ergonomic modification and exercise led to better outcomes than would be expected from either intervention alone. . This is consistent with findings from a study by Shariat et al. , which emphasized that multi-component interventions (posture correction, ergonomics, and exercises) are more effective in reducing neck pain among office workers than single-component programs. Neck pain is highly prevalent among nail salon workers. . According to a study by Roelofs et al., up to 58% of nail technicians report neck pain, primarily due to poor ergonomics and repetitive tasks. Another study by Hu et al. in Asian nail salons found high rates of musculoskeletal complaints, with the cervical and upper back regions being the most affected.

The study adds to this body of evidence by demonstrating that targeted neck exercises and ergonomic education can reduce both subjective pain (NPRS) and functional limitations (NDI). The findings are in line with a study by Sihawong et al. , which found that a 4-week exercise and ergonomic program led to significant reductions in neck pain and work disability among sedentary workers. While our sample size (n=30) was relatively small and limited to female participants, the homogeneity of the sample allows for focused conclusions within this demographic. Nail artistry is predominantly female-dominated, and the work patterns are relatively consistent, which may have contributed to the consistency in response to the intervention.

10. Limitation & Future scope

Limitations

- **Sample size & representativeness**

Small numbers of nail artists may be used, often from one salon or region, which limit generalizability to all nail artists.

- **Short follow-up duration**

Most studies measure outcomes only in the short term (weeks to a few months). Long-term sustainability of pain reduction or functional gains is uncertain.

Future Scope

- Longitudinal studies

Conduct studies with longer follow-ups (6-12+ months) to assess durability of effects of ergonomic advice and

exercise on neck pain.

- Randomized controlled trials (RCTs) -RCTs comparing ergonomic advice + exercises vs advice alone vs usual care among nail artists, to isolate the effect size.

11. Conclusion

The study highlights the positive impact of ergonomic advice and neck exercises in reducing neck pain among nail artists, a population prone to musculoskeletal issues due to prolonged static postures and repetitive tasks. Incorporating ergonomic education with targeted neck exercises can significantly improve pain levels, posture, and overall work efficiency. These interventions are simple, cost-effective, and can be implemented in routine practice with minimal resources. However, sustained benefits depend on regular practice and workplace modifications. Future research with larger samples and long-term follow-up is needed to validate these findings and develop standardized guidelines for the nail industry.

12. Acknowledgement

I am delighted to present this synopsis as part of my final year research project and wish to extend my heartfelt thanks to everyone who supported me throughout this work. I would like to express my sincere gratitude to my guide, Dr. Mahendra Shende (PT), for his invaluable guidance, encouragement, and continuous support throughout the course of this research. His expert advice, constructive feedback, and patience have been instrumental in the successful completion of this study. I also extend my heartfelt thanks to TMV's Indutai Tilak College of Physiotherapy for providing the necessary facilities and an encouraging academic environment to carry out this work. My sincere appreciation goes to all the participants who took part in this study for their time, cooperation, and willingness to contribute to this research. I am also grateful to my family, friends and classmates for their assistance, motivation, and moral support during this project.

References

1. Work-related musculoskeletal disorders among various occupational workers in India: a systematic review and meta-analysis | Journal of Occupational Health | Oxford Academic
2. Predictors for chronic neck and low back pain in office workers: a 1-year prospective cohort study"
3. Prevalence and risk factors for neck pain among health care workers. | Indian Journal of Community Health 4.Prevalence of musculoskeletal pain among professional drivers: A systematic review | Journal of Occupational Health | Oxford Academic
5. The burden and determinants of neck pain in workers: results of the Bone and Joint Decade 2000-2010 Task Force on Neck Pain and Its Associated Disorders - PubMed
6. Nail job and women's health: Assessment of ergonomics and occupational hazards - PubMed
7. Health and Safety in Nail Salons: A Cross-Sectional Survey - PubMed
8. Work-related symptoms in nail salon technicians - PubMed
9. BMC Sports Science, Medicine and Rehabilitation: Effectiveness of isometric exercises on disability and pain of cervical spondylosis: a randomized controlled trial — 24 patients; isometric exercise vs conservative management; significant reduction in Neck Disability Index and Neck Pain & Disability Scale after 4 weeks. ([BioMed Central]
10. Journal of the Pakistan Medical Association: Comparative effects of isometric and isotonic global neck muscles strengthening exercise programme on pain, range of motion, strength, function and quality of life in patients with chronic mechanical neck pain — 22 patients; both isometric and isotonic protocols improved pain, ROM, quality of life. ([PubMed][2])
11. Journal of Occupational Health: Effectiveness of Physical Exercise on Pain, Disability, Job Stress, and Quality of Life in Office Workers with Chronic Non-Specific Neck Pain: A Randomized

Controlled Trial — 60 participants; compared physical exercises + ergonomic modifications vs ergonomic modifications alone; showed significant improvements in pain, disability etc. ([PubMed][3])

12. Textile worker RCT: Ergonomics training with exercise and manual therapy in textile workers — 60 workers; intervention vs ergonomic training alone, with significant improvements in neck pain, sleep quality, fatigue etc. ([PubMed][4])
13. Study on Scapular Functional and Cervical Isometric Exercises in Chronic Mechanical Neck Pain — 30 participants; combining scapular exercises with cervical isometrics improves pain, cervical ROM, functional limitations. ([PubMed][5])
14. Study: The effect of ergonomic intervention on neck/shoulder and low back pain — large longitudinal cohort study (~492 subjects) with different levels/types of ergonomic intervention; results mixed but educational and ergonomic interventions had some effect. ([PubMed][6])
15. The meta-analysis Effects of isometric training on the treatment of patients with neck pain — 18 studies, total~868 subjects; isometric training reduced pain (VAS), improved disability (NDI) etc. ([PubMed][7])
16. Comparative study: A comparative study on dynamic neck exercise versus isometric neck exercises with theraband in chronic neck pain — among university students; showed both interventions effective, some metrics favouring dynamic exercises. ([jcdr.net][8])
17. Study among beauty professionals: Musculoskeletal disorders among beauty service professionals — investigated the prevalence of WMSDs among beauticians, hairdressers and cosmetologists, suggesting need for ergonomic training in such groups including nail artists. ([Lippincott Journals][9])
18. Implementation of neck/shoulder exercises among industrial workers: Implementation of neck/shoulder exercises for pain relief among industrial workers: a randomized controlled trial — ~537 adults; strength training 3x/week reduced neck and shoulder pain vs control.