IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Prevalence Of Levator Scapulae Muscle Syndrome In Hairdressers By Using Levator Scapulae Muscle Length Test And Neck Disability Index

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Abstract

Background: Hairdressers are routinely required to maintain prolonged static positions, perform repetitive upper-extremity tasks, and sustain forward neck postures, which increases their risk of developing musculoskeletal disorders, particularly involving the levator scapulae muscle. Continuous mechanical stress on this muscle may result in pain, restricted neck movement, and functional impairment, collectively referred to as levator scapulae syndrome. Identifying muscle tightness and related disability at an early stage is important for preventing long-term complications and maintaining occupational performance. This study evaluates levator scapulae syndrome using the Levator Scapulae Muscle Length Test and examines associated functional disability through the Neck Disability Index (NDI) among hairdressers, with the aim of guiding ergonomic and physiotherapeutic interventions for this vulnerable occupational group.

Objective: To evaluate levator scapulae muscle shortening using the levator scapulae muscle length test and to assess neck-related functional disability using the Neck Disability Index among hairdressers in pune.

Method: An observational study was carried out on 126 hairdressers aged 24–35 years in Pune using a convenience sampling approach. Eligible participants underwent bilateral assessment of levator scapulae muscle length, and functional disability was measured using the Neck Disability Index. Collected data were analysed using Kinovea software.

Result : Right-side levator scapulae muscle shortening was observed in 55.6% of participants; however, this finding was not statistically significant ($p = 0.2123$). On the left side, muscle shortening was present in 32% of participants and demonstrated a statistically significant association with occupational exposure ($p = 0.00038$). Bilateral muscle shortening was identified in 15.1% of cases, with no significant difference noted ($p = 0.995$). Analysis of NDI scores indicated a moderate level of neck disability, emphasizing the need for preventive and ergonomic interventions in this population.

Conclusion :A substantial proportion of hairdressers exhibited levator scapulae muscle shortening, most likely related to repetitive work demands and prolonged postural loading. Although right-side predominance was not statistically significant, the findings underscore the importance of ergonomic awareness and early preventive measures to reduce musculoskeletal health risks among hairdressers.

Keywords : Musculoskeletal disorder, Hairdressers,, Postural stress, Repetitive Movements, Muscle Shortening, Occupational Health.

INTRODUCTION

The demand for beauty and personal care services has risen significantly, leading to an increased need for various cosmetic products. However, the nature of work performed in beauty salons may negatively influence the workers' physical health and functional capacity. Tasks involving prolonged non-neutral postures, repetitive upper-limb movements, inadequate rest breaks, fast-paced work environments, general fatigue, and long hours of standing contribute to a higher susceptibility to musculoskeletal complaints among salon workers.[1]

According to the U.S. Department of Labour, work-related musculoskeletal disorders (WMSDs) refer to injuries or dysfunctions involving the muscles, nerves, tendons, joints, cartilage, and spinal discs that arise from workplace-related risk exposures. These conditions exclude injuries caused by sudden incidents such as slips, falls, or motor vehicle accidents.[2]

Hairdressers, in particular, face considerable occupational hazards related to WMSDs due to the repetitive and precision-based nature of their work. Prolonged twisting, continuous repetitive movements, and spending extended periods in awkward postures significantly increase their risk. In addition, long working hours, insufficient breaks, standing throughout the day, missed meals, and attending to a large volume of clients further elevate the mechanical stress placed on their joints and soft tissues.[3–4]

The routine activities of hairdressers require extensive and repeated use of both upper limbs. Poor workstation setup, improper salon ergonomics, and inadequately designed tools may further amplify the physical strain experienced by these professionals.[5] Hairdressers often report pain or injuries affecting the lower back, neck, shoulders, arms, wrists, and feet.[5–6]

Many hairstylists with 5–10 years of experience commonly report numbness or pain in the upper extremities, including the hands, wrists, and shoulders. Some of these issues are linked to ergonomic deficiencies in the equipment used, while others may stem from individual working techniques.[7] Common postural deviations among hairdressers include: excessive shoulder flexion or abduction (often resulting from working with the elbows above shoulder level), trunk flexion due to improperly adjusted chair height, forward neck bending beyond 20°, and various awkward wrist deviations during cutting or styling tasks.

According to a Brazilian survey on the prevalence of WMSDs among hairdressers, 71% of employees had symptoms related to these conditions. The study identified both psychosocial stressors and physical fatigue—such as lack of recognition at work, discomfort during tasks, and persistent body/neck/shoulder strain—as important contributors.[6] The body regions most frequently affected were the lower back (76.3%), shoulders (60.2%), and neck (46.3%). The elbow/forearm (14.9%), hip/thigh (16.6%), and upper back (4.6%) were the least affected..[8]

In another study conducted by Jens Wahlström, it was observed that hairdressers spent a significant portion of their workday with highly elevated arms, placing them at risk for neck and shoulder disorders.[9] Working with the arms elevated ≥60° for prolonged durations is recognized as a strong risk factor for such musculoskeletal issues. Hairdressers typically maintained this posture for approximately 13% of their total working time.[10]

A 2014 study found a positive association between work experience and neck pain disability. Increased time spent in neck flexion during work cycles was strongly correlated with neck-related symptoms. Job analyses also revealed statistically significant links between forward neck flexion, upper arm elevation, and neck disorders.[11] Harms-Ringdahl further reported that individuals without prior symptoms developed pain after sustained loading of the cervical spine in a flexed posture.[12]

The levator scapula muscle, positioned deep to the trapezius, originates from the transverse processes of the upper four cervical vertebrae and inserts along the superior medial border of the scapula. With a relatively large cross-sectional area, this muscle elevates and downwardly rotates the scapula when the neck is stable. Conversely, when the scapula is fixed, it contributes to ipsilateral neck bending and rotation. Due to the anterior shear forces acting on the cervical spine—exacerbated by increased cervical lordosis or repetitive forward-flexed head posture—the levator scapula may become overactive as it attempts to counterbalance these forces.[13]

Levator scapula syndrome is characterized by pain localized near the upper medial border of the scapula.[14] The muscle often becomes tight and tender, leading to restricted mobility in the cervical and scapular regions.[15] Patients typically present with neck discomfort accompanied by active myofascial trigger points.[16] The levator scapula commonly exhibits two primary trigger points: one near the region where it emerges from beneath the upper trapezius, and another located near its insertion at the superior angle of the scapula.[17]

LEVATOR SCAPULAE MUSCLE LENGTH TEST:

• Prior to measurement, marking will be done at the lateral epicondyle of the humerus and central axis of shoulder rotation with subject in sitting position.

• At the time of measurement, the subjects head will be flexed to induce lateral bending and rotation in contralateral direction.

• The examiner will the lightly press the medial part of scapula to prevent elevation of the superior angle.

• Now the subject will be asked to flex the shoulder joint to the point where muscle tightness is felt.

• The angle between vertical line along central axis of shoulder and lateral epicondyle of the humerus will be measured by software .

Fig no. 1
Levator Scapulae Muscle Length Test of Rt Side

Fig no. 2
Levator Scapulae Muscle Length Test of Lt Side

Methodology

Type of study : observational study

Sample population: Between age group of 24 to 35 years both male and female in pune

Sample size: 126

Inclusion criteria	Exclusion criteria
Age group 24 – 35 years.	Recent history of fracture around shoulder complex within 6 months.
Both males and females.	Individuals with shoulder pain and stiffness
Individuals work for 8-9 hour per day [15]	Congential deformity
Individuals work experience atleast more than 2 years. [15]	Musculoskeletal disorder : scoliosis, kyphosis, torticollis
Individuals with trigger point on muscle	Neurological disorder

Procedure
Permission was obtained from the department and clearance from the ethical committee.
The subjects who met the inclusion criteria and agreed to participate in the study gave their written consent.
The participant was evaluated for trigger points and tenderness after completing the consent form, and the assessment proforma was completed.
The participant was asked to use the NPRS scale to rate their level of pain.
The functional evaluation was carried out by filling out the neck disability index after the Levator Scapulae muscle length test.
After being moved to the laptop, the photos were examined using the Kinovea program.

OUTCOME MEASURES

Numerical pain rating scale (NPRS) (ICC=0.72)
Neck disability index (NDI) (r=0.97)
Levator scapulae muscle length test (r =0.98) [18]
Kinovea software(ICC=1) [19,20]

STATISTICAL ANALYSIS AND INTERPRETATION

The analysis included 126 hair stylists who served clients between the ages of 24 and 35.

Chart 1
Distribution Of Age

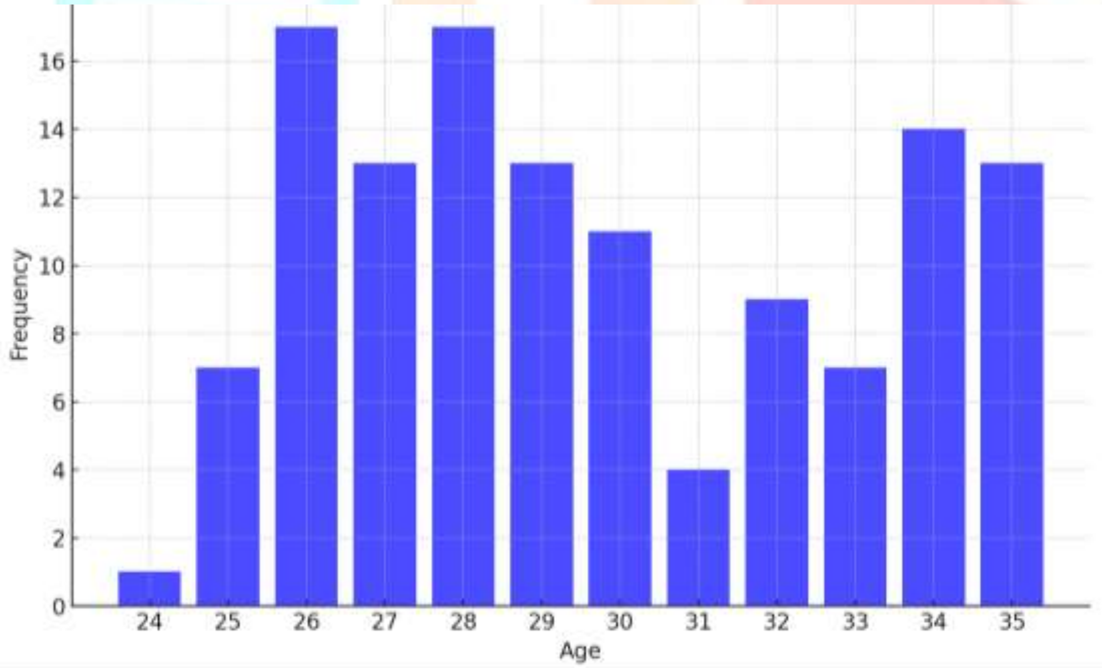
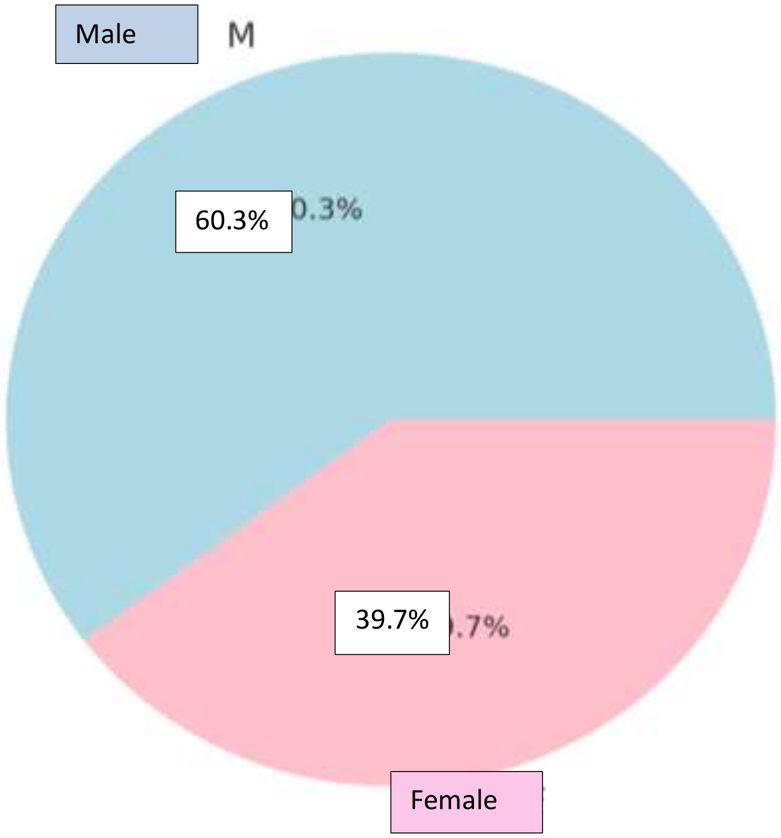


Chart no. 1 shows the age distribution of the hairdressers where the X axis Represents the different age values Y axis represents count of individuals corresponding to each age value.

Table 1. shows the age distribution

Age	No. Of Hairdresser
24 -25	8
26 -27	30
28-29	30
30-31	15
32-33	16
34-35	27

Pie chart .2
Distribution of Gender



Pie chart no.2 depicts the gender distribution of the hairdresser.

Table 2. shows the gender distribution of hairdressers

Gender	Hairdresser
Female	50
Male	76

Chart. 3
Distribution Of Working Hour

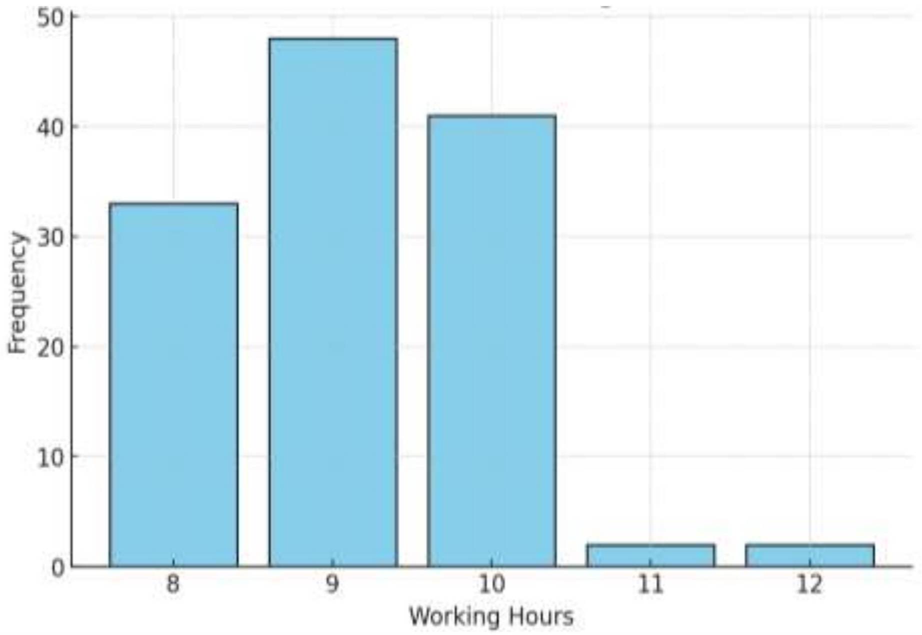
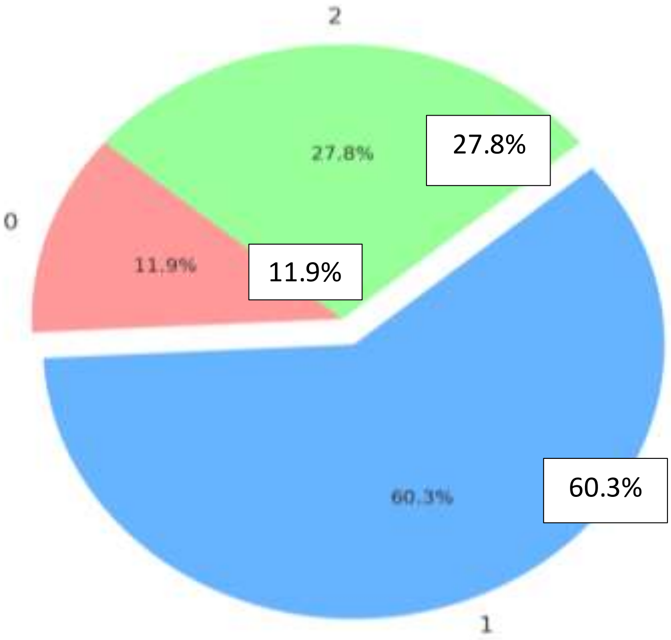


Chart no.3 Is Showing the distribution of working hours of hairdresser. The X-axis represents the number of working hours, while the Y-axis represents the frequency of occurrences.

Table 3. Represent working hour of hairdressers

Working Hour	Hairdressers
8	33
9	48
10	41
11	2
12	2

Chart.4
Distribution Of Trigger Points Of Levator Scapula (Rt)

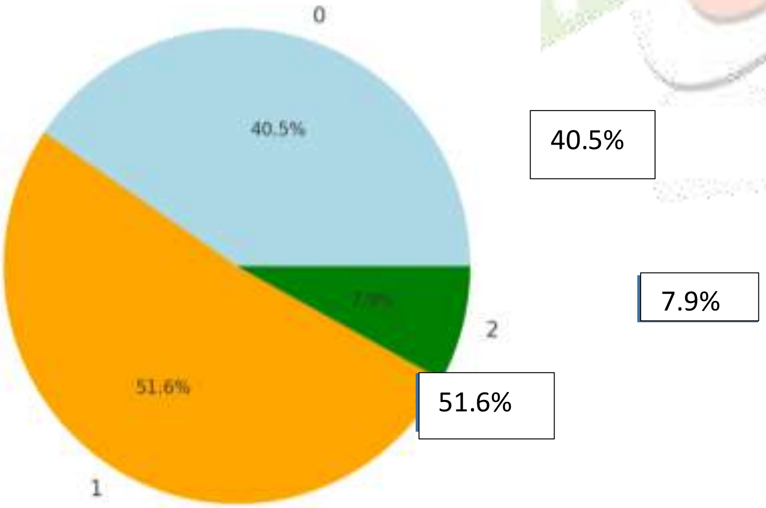


The following pie chart representing the distribution of trigger points of the levator scapula (RT). The largest portion belongs to "1" with 60.3%, followed by "2" with 27.8%, and "0" with 11.9%.

Table 4. Representing the distribution of trigger points of the levator scapula muscle (RT) side.

No.of trigger point in rt	Hairdressers
0	15
1	76
2	35

Chart.5
Distribution of trigger points of levator scapula (lt)



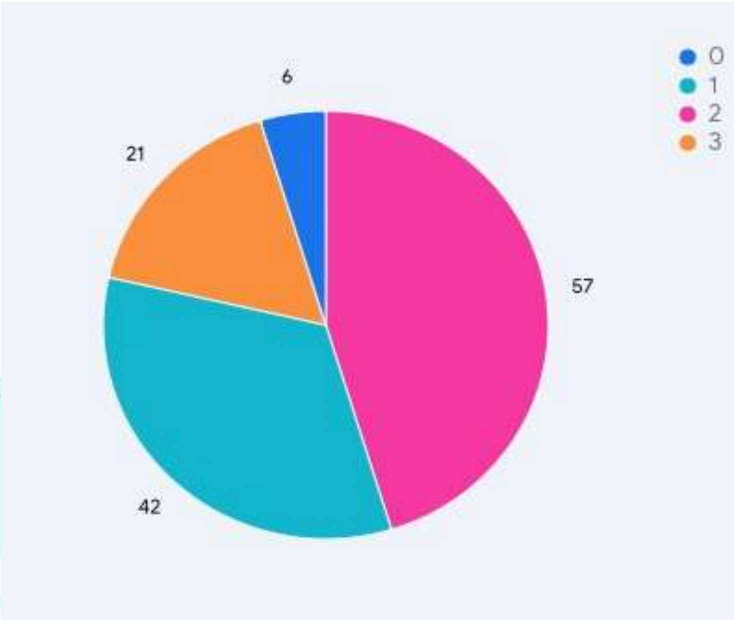
The following pie chart representing the distribution of trigger points of the levator scapula (RT).

The largest portion belongs to "1" with 51.6%, followed by "2" with 7.9%, and "0" with 40.5%.

Table.5 Representing the distribution of trigger points of the levator scapula muscle (LT) side.

No of trigger point in Lt	Hairdressers
0	51
1	65
2	10

Chart.6
Distribution of tenderness level

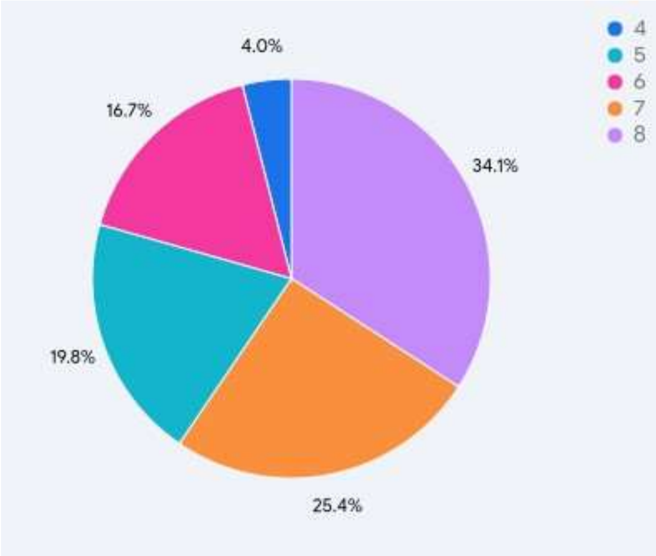


This pie chart represents the distribution of tenderness levels

Table 6. shows the tenderness levels of levator scapulae muscle

Tenderness Level	Hairdressers
0	6
1	42
2	57
3	21

Table.7
Distribution of NPRS

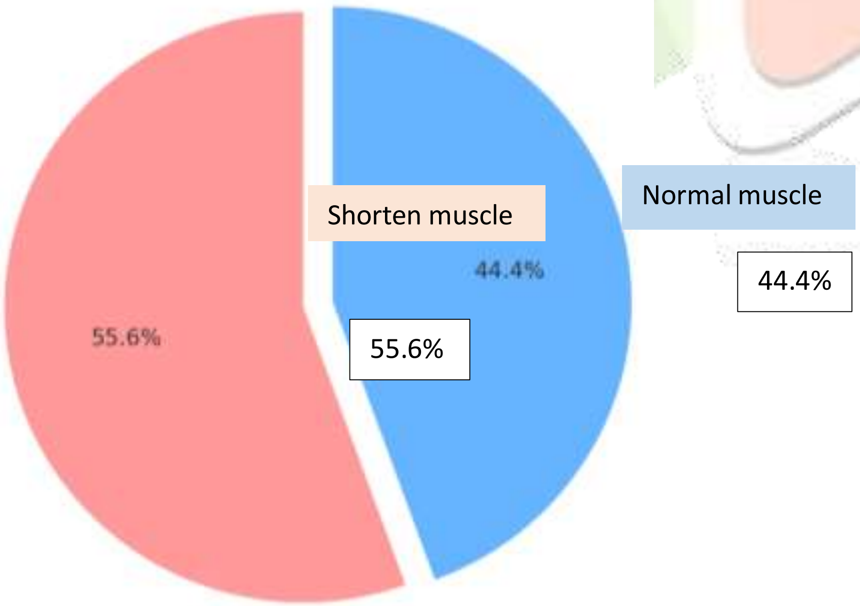


Pie chart 7. Represent the distribution of numerical pain rating scale value

Table 7. Shows the numerical pain rating scale value

NPRS	Hairdressers
4	5
5	25
6	21
7	32
8	43

Chart. 8
Distribution of rt side levator scapulae muscle shortening

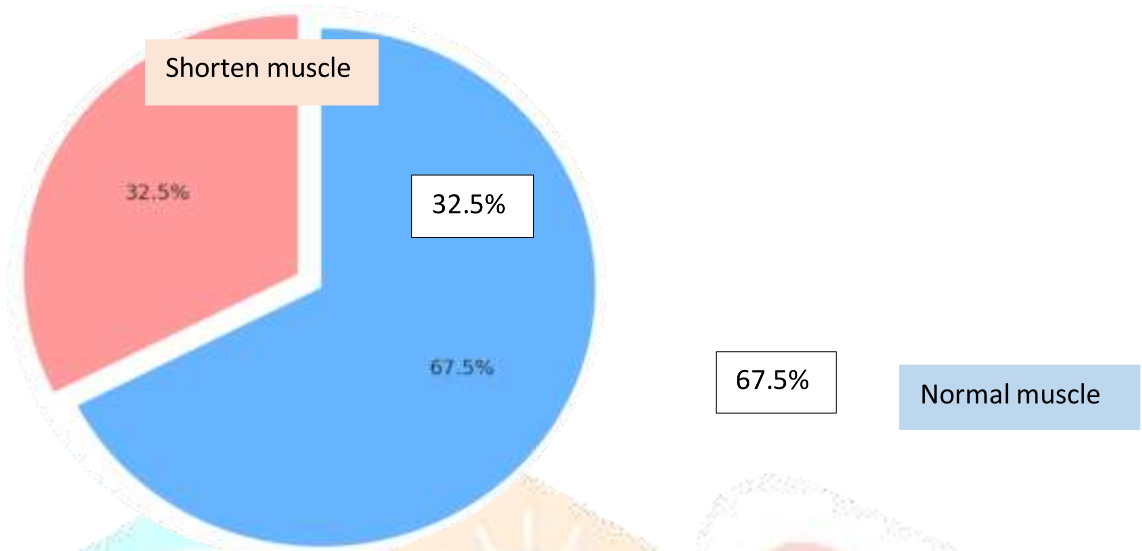


The pie chart represents the normal muscle length and shorten muscle length of levator scapulae muscle RT side.

Table 8. Represent the shorting of levator scapulae muscle length test of RT side
The p-value from the chi-square test is approximately 0.2123. Since this value is greater than 0.05, we fail to reject the null hypothesis, there is no statistically significant difference in the proportions of shortened vs. normal muscles

LSMST RT	Hairdressers	Percentage (%)
Shorten muscle	70	55.6%
Normal muscle	56	44.4%

Chart. 9
Distribution of Lt side levator scapulae muscle shortening



The pie chart represents the normal muscle length and shorten muscle length of Lt

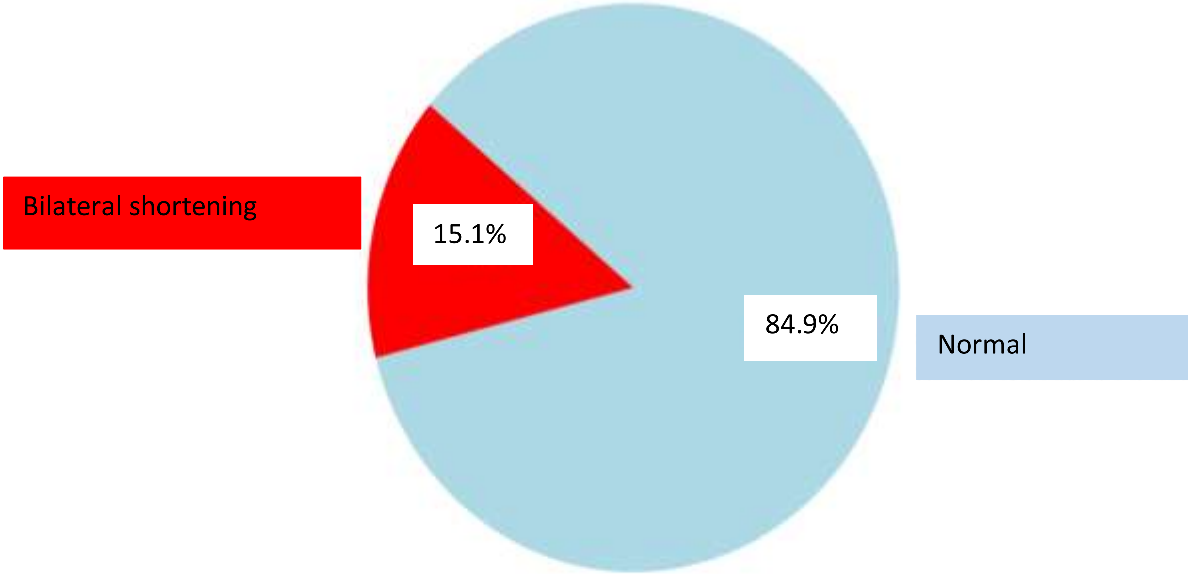
Table 9 . The pie chart represents the normal muscle length and shorten muscle length of levator scapulae muscle LT side

LSMST LT	Hairdressers	Percentage (%)
Shorten muscle	41	32%
Normal muscle	85	67%

The p-value for this data is 0.00038, indicating a statistically significant difference between muscle shortening and normal muscle conditions among hairdressers for the LT side.

Chart.10

Distribution of bilateral muscle shortening of levator scapulae muscle



The pie chart showing the distribution of bilateral muscle shortening 15.1% (19 cases) have bilateral shortening 84.9% (107 cases) do not have bilateral shortening.

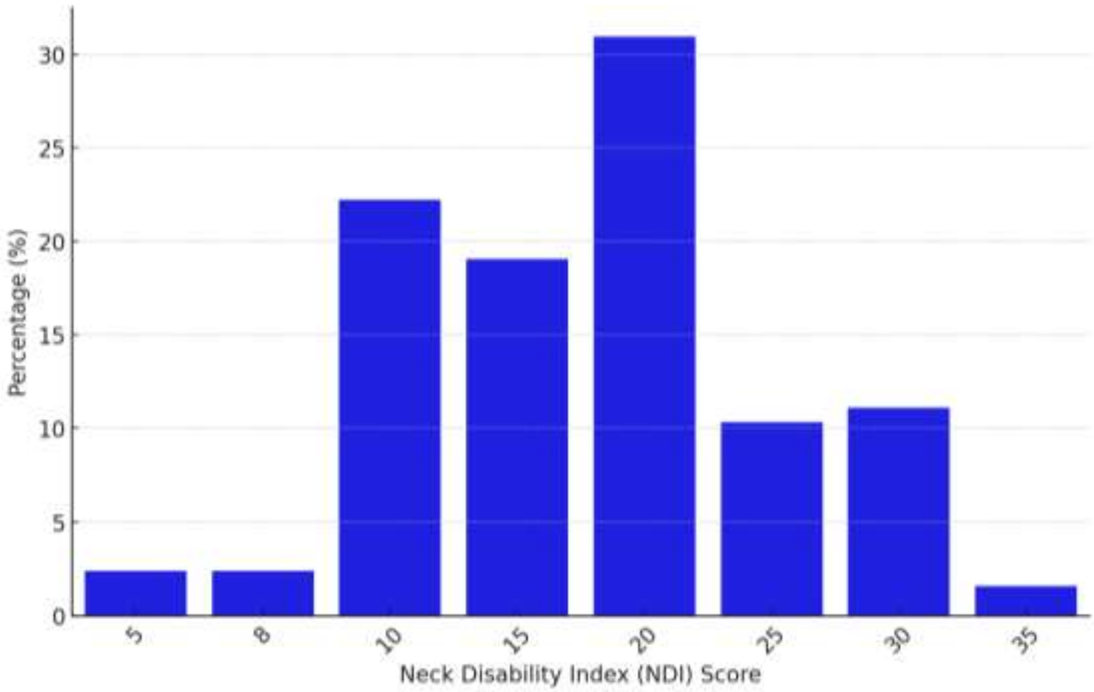
Table 10. shows the bilateral muscle shortening of levator scapulae muscle

LSMLT (B/L)	Hairdresser
Bilateral shortening	19
Normal	107

The p-value for the given data is approximately 0.995, indicating no statistically significant

Chart.11

Percentage distribution of neck disability index



This is the percentage distribution of the Neck Disability Index (NDI) scores. The most common scores are 20, 15, and 10, with 20 being the most frequent, making up around 30% of the total data.

Table .11. Show the neck disability index among hairdressers

Neck disability index score in %	Hairdressers
5	3
8	3
10	28
15	24
20	39
25	13
30	14
35	2

The statistical results for the Neck Disability Index (NDI) scores:
Mean (Average) Score: 18.05
Standard Deviation: 7.04
P-value (One-sample t-test vs. mean = 15): 0.0000035 (very small, indicating a statistically significant difference from 15)
Since the p-value is much smaller than 0.05, we can conclude that the NDI scores are significantly different from 15 on average.

Chart.12

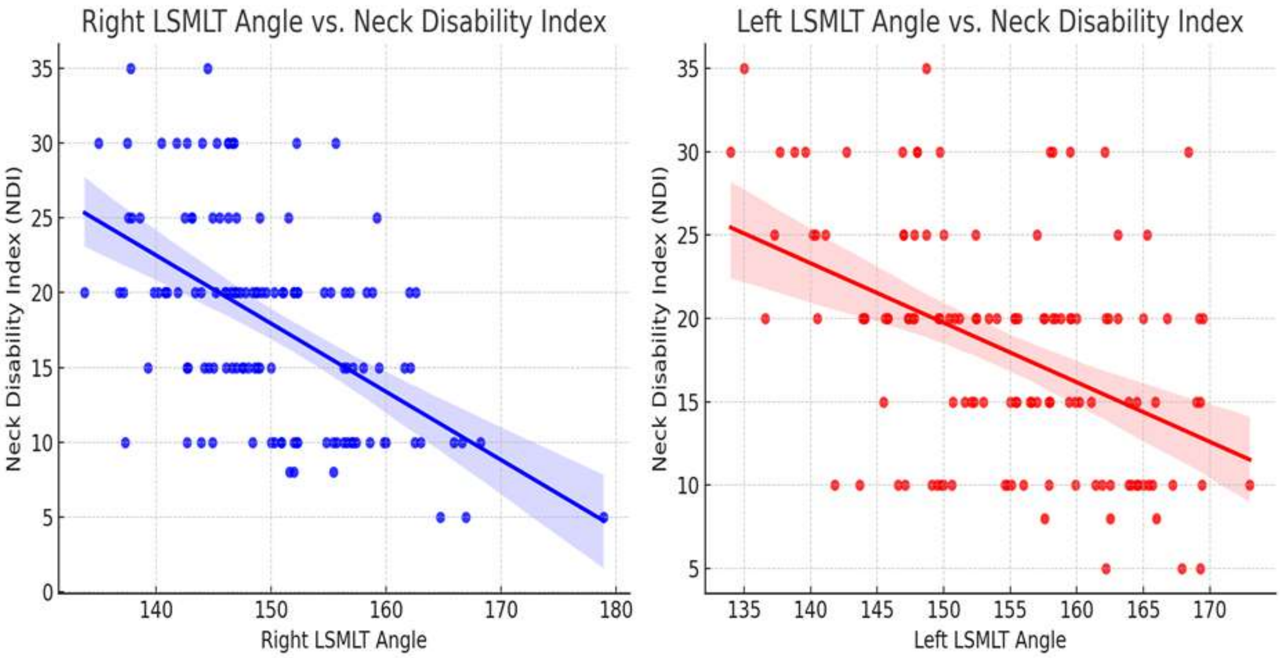


Chart 12.shows the scatter plots with regression lines for the relationships between the neck disability index (NDI) and the right and left LSMLT angles.

Right LSMLT Angle vs. NDI (blue plot): Shows a negative correlation, suggesting that as the right LSMLT angle increases, the NDI score tends to decrease. Left LSMLT Angle vs. NDI (red plot): Similarly, there is a negative correlation, indicating that a higher left LSMLT angle is associated with a lower NDI score.
To analyse the relationship between the Neck Disability Index (NDI) scores and Right vs. Left LSMLT Angles
By using Pearson Correlation Test
The p-value for the correlation between NDI and Right/Left LSMLT Angles.
- NDI (Neck Disability Index)
- LSMLT Angle (Right and Left)

Right LSMLT Angle vs. NDI:
Correlation (r) = -0.518 (moderate negative correlation)
p-value = 0.000000000508 (5.08×10^{-10}) (statistically significant)
Left LSMLT Angle vs. NDI:
Correlation (r) = -0.449 (moderate negative correlation)
p-value = 0.000000137 (1.37×10^{-7}) (statistically significant)
Interpretation:
Negative Correlation: As the LSMLT angle (both right and left) increases, the Neck Disability Index (NDI) tends to decrease.
Statistical Significance: Since both p-values are very small (< 0.05), this indicates a significant relationship between LSMLT angles and NDI.
Clinical Relevance: A greater LSMLT angle might be associated with less neck disability, suggesting a potential biomechanical influence on neck function.

Right LSMLT Angle vs. NDI (blue plot): Shows a negative correlation, suggesting that as the right LSMLT angle increases, the NDI score tends to decrease. Left LSMLT Angle vs. NDI (red plot): Similarly, there is a negative correlation, indicating that a higher left LSMLT angle is associated with a lower NDI score.
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Statistical Significance: Since both p-values are very small (< 0.05), this indicates a significant relationship between LSMLT angles and NDI.
Clinical Relevance: A greater LSMLT angle might be associated with less neck disability, suggesting a potential biomechanical influence on neck function.

Discussion

The aim of the study was to investigate the prevalence of levator scapulae syndrome in hairdressers by using kinovea software and neck disability index This study analysed various factors affecting hairdressers aged 24-35, focusing on working conditions, musculoskeletal health, and their relationship with neck disability . The majority of hairdressers in this study were male (76 out of 126) and female (50 out of 126). Their working hours varied, with most working between 8-10 hours daily. These prolonged working hours could contribute to the musculoskeletal issues observed in the study.
The presence of trigger points in the levator scapula muscle was significant, with 60.3% having at least one trigger point on the right side and 51.6% on the left. This suggests a high prevalence of muscular strain, likely due to repetitive postures and prolonged standing. The study assessed pain levels using the Numerical Pain Rating Scale (NPRS), with the majority reporting pain levels of 7-8, indicating moderate to severe discomfort. Similarly, tenderness levels were high, with 57 individuals scoring level 2 tenderness and 21 reporting level 3 tenderness. While the study by Jonathan Aavang Petersen. (2021) Identified that hairdressers have a higher prevalence of neck and shoulder pain compared to non-hairdressing controls, attributing this to repetitive movements and prolonged static postures.[24]
This highlights the physical strain associated with their profession ,it is crucial to recognize ,as Cynthia C. Norkin work in biomechanics emphasizes, that the human musculoskeletal system functions through the coordinated action of multiple muscles. The levator scapulae , responsible for elevating and rotating the scapula downwards, and contributing to neck extension and lateral flexion ,does not operate in isolation[13] , the norkin's principles underscore the concept of synergistic muscle action ,where various muscles work together to achieve a specific movement or maintain posture.
The present study aimed to assess levator scapulae muscle shortening among hairdressers and analyse its statistical significance. The levator scapulae muscle length test (LSMLT) on the right (RT) side, highlighting the proportion of muscle shortening in this occupational group. The results indicate that 55.6% (70 cases) exhibited muscle shortening, while 44.4% (56 cases) had normal muscle length on the right side. However, the p-value from the chi-square test was 0.2123, which is greater than the conventional significance level of 0.05.

This means that there is no statistically significant difference between the proportions of shortened and normal muscles on the right side. This tends to reject the null hypothesis, suggesting that the observed variation in muscle length may be due to random chance rather than a clear occupational effect. Although hairdressers frequently use their right hand for cutting and styling, postural adaptation and muscle activation may vary among individuals .

A pivotal study by Kaj Bo Veiersted (2008**)** analysed the biomechanical workload in the neck and shoulder regions of female hairdressers. Utilizing inclinometers and electromyography, the study found that hairdressers worked with their arms elevated above 60 degrees for approximately 13% of their total working time, leading to significant muscle load in the trapezius muscle. These include the trapezius (upper fibres assessing in shoulder elevation and neck extension , middle and lower fibres in scapular retraction and depression),the sternocleidomastoid (involved in head rotation and flexion) , the scalenes(contributing to neck flexion and lateral bending), and the rhomboids(stabilizing the scapula)[10]. Some hairdressers may unknowingly shift their workload between both upper limbs, reducing the asymmetry in muscle shortening. The duration of work experience, frequency of breaks, and personal ergonomic habits may influence the extent of muscle shortening, potentially reducing statistical differences. From a clinical perspective, even though the p-value is not statistically significant, the relatively high percentage (55.6%) of muscle shortening cannot be ignored. An intervention focusing on working techniques resulted in a reduction of highly elevated arm positions, though no significant effect was observed on muscular load or neck and shoulder symptoms.[10] Persistent muscle tightness may contribute to Shoulder and neck stiffness , Restricted cervical mobility ,Chronic musculoskeletal discomfort

The analysis of levator scapulae muscle length test (LSMLT) on the left (LT) side revealed that 32% (41 cases) exhibited muscle shortening, while 67% (85 cases) had normal muscle length. The p-value for this data was 0.00038, which is statistically significant ($p < 0.05$), indicating a strong association between occupational factors and muscle shortening on the left side.

These findings suggest that repetitive postures, prolonged static positions, and asymmetric loading of the shoulder complex contribute to muscle shortening. The significant difference between muscle shortening and normal muscle conditions reinforces the occupational strain associated with prolonged hairstyling activities.

Just 15.1% (19 cases) of the levator scapulae muscle showed bilateral shortening, while 84.9% (107 cases) maintained bilateral normal muscle length. The results of the statistical analysis showed a p-value of 0.995, which is not significant ($p > 0.05$). This implies that bilateral muscle shortening is less common in hairdressers and does not differ significantly from normal muscle conditions.

D. Ranney (2007) One possible explanation is that hairstylists predominantly engage in asymmetric postures, favoring one side of the body more than the other, rather than evenly distributing the workload bilaterally. This aligns with previous research indicating that unilateral muscular imbalances are more common in occupations requiring repetitive upper limb use.[21] The Neck Disability Index (NDI) scores showed a mean of 18.05, indicating moderate disability among the participants. The statistical analysis revealed a significant difference from the expected mean of 15, confirming a higher-than-average disability level.

The correlation analysis demonstrated a negative relationship between LSMLT angles and NDI scores, suggesting that greater muscle flexibility may reduce neck disability**.** Rabia Liaqat (2024): Found a 38.5% prevalence of LSS among beauticians, significantly associated with neck pain and disability.[22] The findings suggest that prolonged working hours, repetitive movements, and asymmetric postures contribute to muscular imbalances and neck disability in hairdressers

Conclusion

This study concludes that long work hours, repetitive motions, and asymmetrical postures are the main causes of the high prevalence of levator scapulae muscle shortening among hairdressers.
Additionally, more than half of the hairdressers in this study showed signs of right-sided muscle shortening; however, this finding should be interpreted cautiously due to its lack of statistical significance. To promote musculoskeletal health in this line of work, preventive measures and ergonomic awareness should still be given priority due to the possible long-term effects of muscle tightness.

Acknowledgement

I would like to thanks the staff of Late Shree Fakirbhai Pansare Education Foundation for all their constant help in our study. I would also like thank participants for their keen participation in our study.

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