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Effects of wearing helmet on cervical spine deficient mobility and precipitate pain

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Abstract
Background: Cervical range of motion (ROM) is a critical predictive measure for assessing neck pain-related conditions. It encompasses the degree of movement in the neck across different planes: flexion, extension, lateral flexion, and rotation. Proprioception, the ability to sense body segment position and movement in space, relies on the integration of sensory signals from mechanoreceptors. Impairments in cervical mobility and proprioception are commonly reported in individuals with conditions such as whiplash-associated disorders and general neck pain. This study aims to evaluate the effects of wearing helmet on proprioception and cervical spine mobility.
Objectives: To determine the impact of wearing helmet on Cervical Mobility and pain precipitation.
Methodology: The women's are selected for this study having age group of 18-40 age group. They Visit Ratlam Medical Hospital Physiotherapy department. Tenderness, Spams, Cervical spondylitis females are excluded. Patient are instructed to sit on a chair and all the movement of neck are assessed by Goniometer. While on other hand checking their pain by giving command through VAS Score.
Result: Females in the non- helmet group had a significant reduction in CROM for right rotation 77.35±1.23, Left rotation 76.97±1.48, Flexion 42.4±3.68, Extension 40.17±3.67, Rt. Lateral Flexion 42.83±3.09, Lt. Lateral Flexion 43.43±2.86 compare to wearing Helmet.
Conclusion: Our study concluded that Helmet increase pain in the cervical area and effect the mobility of cervical spine.

Keywords: Cervical, helmet, spasm, mobility and proprioception

Introduction
Helmet wearing is the most operational and nominal way of preventing head injuries, moreover, in case of injury it also reduces the intensity and severity of the injury among scooty riders [1]. Wearing a helmet might potentially impact cervical Mobility due to the added weight and pressure on the head and neck. The cervical spine's soft tissue structures, including muscles, ligaments, tendons, and other connective tissues, contribute significantly to the stability and mobility of the neck. Injuries to these structures can occur due to various reasons such as trauma (e.g., whiplash injuries from car accidents), overuse, poor posture, or degenerative conditions [2]. Scooty riders and the manifestation of neck pain because of helmet use. Distress and uneasiness in the body throughout the ride can be due to the seat ergonomics that include, height of seat, hardness of seat, bad postural habits, and bike suspension for smooth ride and handle position adjustments. Wearing a helmet might potentially impact cervical proprioception due to the added weight and pressure on the head and neck [3]. When soft tissues are injured, it can disrupt the normal functioning of the sensory receptors, particularly the muscle spindles, that play a key role in providing proprioceptive information. Muscle spindles are sensory receptors embedded within skeletal muscles that play a crucial role in proprioception by detecting changes in muscle length and sending signals to the central nervous system [4]. The information provided by muscle spindles contributes to the awareness of body position and movement. Although an economical source of transportation, however the scooty riders bear a remarkable risk of fall because, in most two-wheelers, the center of gravity is not consistent. The second major cause of calamities is the speediness of the vehicle. The chance of fatal collision becomes greater at higher speed [5]. Neck pain is a pain, stress, and fatigue of the muscles in or around the spine beneath head. There exist inadequate literature concerning the uneasiness among scooty and the manifestation of neck pain because

of helmet use. Distress and uneasiness in the body throughout the ride can be due to the seat ergonomics that include, height of seat, hardness of seat, bad postural habits, and bike suspension for smooth ride and handle position adjustments [6]. Soft tissues of the neck back and abdomen provide stability to the spine. Facet joints inhibit as well as control spinal movements. Multifidus muscles play an important role in keeping the spine erect and provide stability during movements of the spine [7]. Chronic low neck pain patients have issues in multifidus muscles because of improper posture and movement. Complications to multifidus and other extensor muscles remain constant even without pain due to poor biomechanics and are the most common cause of returning of neck pain after it disappears for some period [8]. This study aim to find out the impact of Wearing helmet versus non helmet females in order to seem mobility and pain precipitation.

Aim

The impact of Wearing Helmet on Cervical Spine deficient mobility and precipitate pain.

Objective

1. To investigate the impact of routine Helmet wearing on proprioception in the cervical spine.
2. To assess the cervical range of motion (ROM) in individuals who routinely wear helmet compared to those who never wear helmet.

Methodology

The women's of 18-40 age group having profile of student and working professionals, are selected. They Visit Ratlam Medical Hospital Physiotherapy department. The women complaining of pain during movement and while helmet are include for this study. The women are of Tenderness, Spams, Cervical spondylitis females are excluded. Instruction are given to the Female patient are instructed to sit on a chair while placing the pair of forearm on Chairs side hands. Move the head up and down (Flexion and extension), side to side bending (Lateral Flexion) and rotate left and right slowly (Lateral Rotation) to the end range, while the physiotherapist evaluate the range of motion of cervical joint before starting the movement and at end range, simultaneously with the help of Goniometer after instructed by Therapist to remove Helmet. While, the Photographs has been taken with their concern of patient ROM in all Directions initially and after removing Helmet.

Pain is measured by the Visual analogue scale by Physiotherapist.

Statistical Analysis

To analyze the data Statistical Product and Service Solutions (SPSS) for Windows version 23.0 (IBM Corp., Armonk, New York). A sample size of 60 subjects was needed to obtain a medium effect s. Data was summarized using frequencies and Gender for categorical variables and means±standard deviation (SD) for quantitative variables. The normality of the quantitative variables was examined using Kolmogorov-Smirnov and Shapiro-Wilk tests. Mean age and body mass index (Kg/m^2) of females in the helmet group and those in the control group were compared using independent t-test. Mean outcome variables (cervical ROM right rotation, left rotation, flexion, extension, right lateral flexion.

lateral flexion) by time spent per day wearing the helmet (≤4 hours versus > 4 hours). There is no relationship between cervical ROM measures and age at onset of wearing the helmet, number of years worn, and hours per day spent wearing the helmet were examine using Pearson correlation test. The significance level was set at a p-value of less or equal than 0.05.

Result

A total of 60 females with mean age 28.1± 3.1 years participated in the study. The distribution of age, body mass index (BMI) in Kg/m^2, and range of motion (degrees) was approximately normal. There was no significant difference in mean BMI between the helmet and control groups (26.9±5.3 vs. 27.4± 5.0, p= 0.73) and hand dominance (right- handed (92.3%, n=24) in the helmet group vs. (84.6%, n=22) in the control group; p=0.33). In the helmet group, the mean age at onset of wearing the helmet was

12.6±1.6 years, the mean time spent per day wearing the helmet was 7.0±2.3 hours, and the mean number of years worn was 15.5±3.6 years.

There was a significant difference in mean± standard error (SE) in range of motion in all directions between the two groups Table 1 and Table 2.

Table 1: Mean (SE) and standard deviation of cervical ROM of non-Helmet Group 1 (N=35)

ROM	Gender	Frequency	Std. Deviation	Variance	Mean±Std.
Rt. Rotation	Female	35	1.23	1.51	77.35±1.23
Rt. Lateral Flexion	Female	35	3.09	9.56	42.83±3.09
Lt. Rotation	Female	35	1.48	2.21	76.97±1.48
Extension	Female	35	3.67	13.5	40.17±3.67
Flexion	Female	35	3.68	13.54	42.4±3.68
Lt. Lateral Flexion	Female	35	2.86	8.19	43.43±2.86

There was a significant difference in mean± standard error (SE) in range of motion in all directions (Table 1). Females in the non- helmet group had a significant reduction in CROM for right rotation 77.35±1.23,Left rotation 76.97±1.48, Flexion 42.4±3.68, Extension 40.17±3.67, Rt. Lateral Flexion 42.83±3.09, Lt. Lateral Flexion 43.43±2.86.

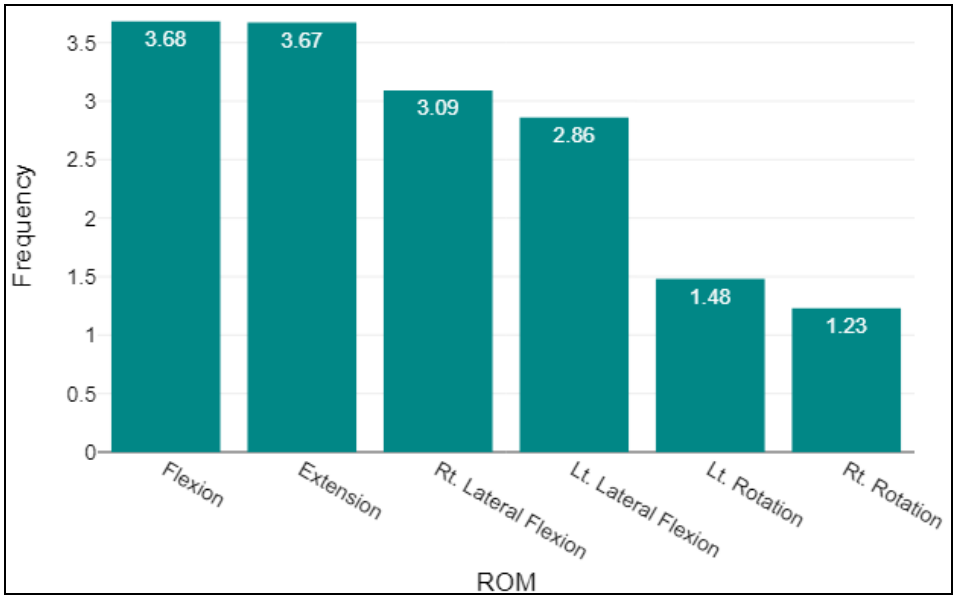
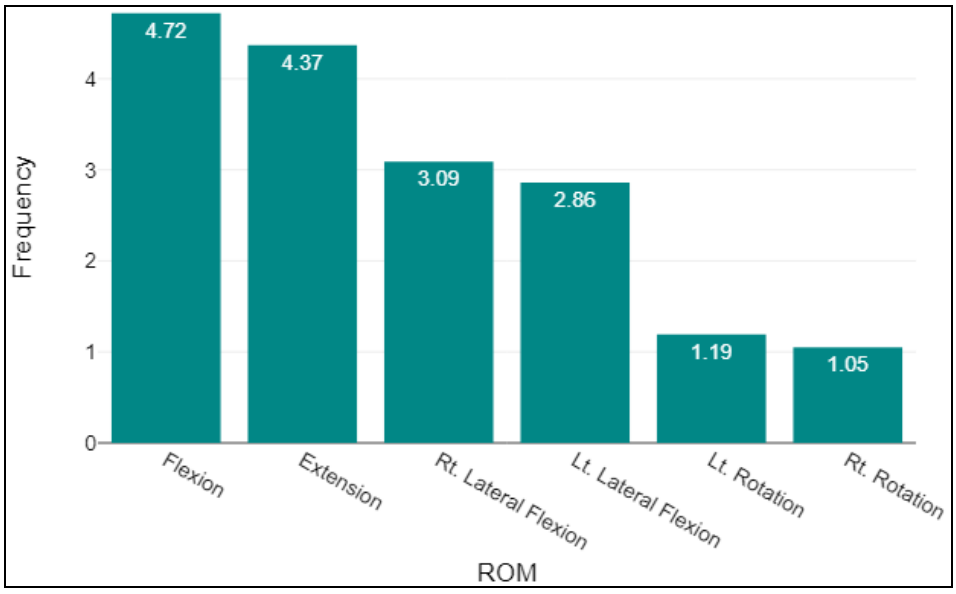


Table 2: Mean (SE) and standard deviation of cervical ROM of Control group helmet group 2 (N=35)

ROM	Gender	Frequency	Std. Deviation	Variance	Mean±Std.
Rt. Rotation	Female	35	1.05	1.1	77.11±1.05
Rt. Lateral Flexion	Female	35	3.09	9.56	42.83±3.09
Lt. Rotation	Female	35	1.19	1.41	76.66±1.19
Extension	Female	35	4.37	19.06	37.37±4.37
Flexion	Female	35	4.72	22.3	41.77±4.72
Lt. Lateral Flexion	Female	35	2.86	8.19	43.43±2.86

Table 2 showing Significant difference in Rt rotation 77.11±1.05, Rt lateral flexion 42.83±3.09, Lt. Rotation76.66±1.19, Lt. Lateral Flexion 43.43±2.86, Flexion41.77±4.72, Extension 37.37±4.37

By the comparison of Tabl1 and Table 2 it shows, after wearing scarf there is decrease in rotation in every directions.



Implementing Repeated measures ANOVA to compare the deviation of both group with age then the results come, That there is significant difference between ROM of both groups and Age. So it shows may be no significant difference showing in cervical spine mobility not wearing Helmet

	Type III Sum of Squares	F	Mean Squares	F	p	η^2
Treatment	4154.15	2	2077.08	3280.15	<.001	1
Error	6.33	10	0.63			

Discussion

This study evaluated the neck pain in occupational scooty riders. The occupational factors are posture, long riding position and years of scooty riding. This study shows that the pain is strongly associated with posture of scooty riding and long hours of scooty riding. A total of 30 female participants who were scooty riding for more than 6 hours reported pain in the neck. In this study, the differences in active cervical ROM between females who routinely wore the helmet and females who never wore the helmet were investigated [9]. The findings indicated that the helmet group reported a significant limitation in cervical ROM in all four directions except right and left lateral flexion. Additionally, females in the helmet group who wore the helmet for four hours or more a day had significantly less left rotation compared to those who wore it for less than 2 hours a day. Podolsky *et al*. [10]. State that Helmet use may have a notable impact on cervical range of motion, The duration of helmet use over an extended period appears to be a significant factor influencing cervical ROM. It's important to consider these findings in the context of the study's methodology and population characteristics. Dunleavy and Goldberg [11] reported that erect posture is more likely to increase the amount of cervical ROM as compared to habitual posture. Since, in the current study, neither EMG nor postural analysis was assessed, this explanation needs to be explored in future studies. Neck proprioception plays an important role in postural control. Increased JPE has been reported in subjects with WAD. Joint position error has also been reported in subjects with neck pain. Deficits in cervical proprioception as indicated by higher JPE might be a predisposing factor for development of cervical pain and dysfunction. In our study, subjects who wore headscarves showed to have higher JPE compared to those who did not wear them when moving their head in all directions (Table 2). Although this increase in JPE had a borderline significance, this difference may contribute to maintenance of joint stability and thus may increase the risk of injury. Similar to this study, Sterling *et al*. (2003) [12] reported a significant difference in JPE between subjects with traumatic neck pain compared with healthy control in right rotation only. They concluded that the side of pain might contribute to this discrepancy because the majority of the subjects had bilateral involvement. Although, hand dominance was not considered in their study, they speculated that it might explain their finding. Moreover, Treleaven *et al*. (2003) [13] demonstrated a significantly higher joint position error in subjects with WAD compared with healthy control in rotation and extension.

Conclusion

This study concluded that among scooty bike riders, frequency of neck pain due to helmet use is high. While weight of the helmet was causing pain of higher intensity.. Future research is needed to confirm these findings and should include larger sample size, age-matched control.

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