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RESEARCH ARTICLE
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AN OBSERVATIONAL STUDY FOR ASSESSING FORWARD HEAD POSTURE IN PROFESSIONAL CAR DRIVERS AND CIVILIAN CAR DRIVERS.

Shahswar[1*], Sumit Kumar[2], Dr.Yash Pratap[3]

[1*,2,3]Department of Physiotherapy, Galgotias University

***Corresponding Author:** Shahswar
*Department of Physiotherapy, Galgotias University

Abstract

Background: A forward head posture is when the head is positioned structurally away from the body's centerline, with the upper and lower cervical vertebrae extended and the lower cervical vertebrae bent. This position increases the weight of the head being supported by the neck. The head's bending moment places pressure on the neck's joints, muscles, and myofascial trigger points, which can lead to cervical migraines, neck pain, and tension-type headaches. The neck's range of motion is also decreased.

Materials and Methods: for following study, 100 sample were taken after completing inclusion and exclusion criteria. Using a random sample procedure, the patients were split into two groups. Group 1 (50 professional car drivers), Group 2(50 civilian car drivers).

For assessing forward head posture, the cranio-vertebral angle was measured using the photogrammetric method and angle was measured by software M-B Ruler.

Results: The t-test results demonstrate a statistically significant difference in Cranio Vertebral Angle between professional car drivers and civilian car drivers. On average, civilian car drivers had a higher CVA (49.70 ± 4.434) compared to professional car drivers (39.50 ± 5.811). The negative mean difference (-10.199) indicates that the CVA was lower in professional car drivers than in civilian car drivers.

Conclusion: Based on the statistical analysis, there is a significant difference in Cranio Vertebral Angle between professional car drivers and civilian car drivers. The findings suggest that the nature of driving profession might have an impact on CVA, with civilian car drivers having a higher CVA compared to professional car drivers.

Further research and exploration are warranted to understand the underlying reasons for this difference and its potential implications for neck health and posture.

Keywords: Forward head posture (FHP)

INTRODUCTION

Forward head posture (FHP) is a typical persistent postural malalignment that can start as early as childhood and is frequently seen in those who spend a lot of time sitting still when reading or using a computer or driving motor vehicle for long time. In the FHP, the prevertebral muscles (cervical flexors) extend and the suboccipital muscles (cervical extensors) shorten.

The FHP is regarded as an internal element that contributes to dysfunction along with neck and shoulder pain. A FHP causes a posture where the upper cervical and upper head are stretched, and the

lower flexion of cervical vertebrae. By relocating the gravitational centre (the head) in front of the load-bearing axis, this lengthens the external moment (the arm). A shift in the biomechanical movement results from the persistent exposure to this load on the muscles and noncontractile components of the craniovertebral extension, and this increased stress may result in pain or damage to the musculoskeletal system.(1)

The rounded shoulder is a protrusion of the shoulder joint's acromion in relation to the body's centre of gravity.

body. FHP is associated with issues with the neck bone that result in round shoulder and neck pain from an imbalance between the curvature of the spine and muscles linked to the neck bone. A significant component called the "Neck" connects our body to our head. The term "neck disability" refers to neck pain.

People who use electronic devices for long periods of time while hunching over suffer from neck ache. Researchers discovered that neck issues are highly prevalent, and it is clear that a cell phone has become a necessity. The neck's anatomical relationship to the cervical spine is highly intricate. The muscles, bones, nerves, and spine are made easier by it.

Shoulder pain, thoracic kyphosis, radiating hand pain, back pain, and headaches can all be brought on by neck pain. The pull of gravity and the forward neck can be countered by the upper back muscle by having poor posture.(2)

Even though driving is a crucial necessity for the majority of us, it causes neck pain both metaphorically and literally, and professional drivers tend to have neck pain more frequently. People who drive for lengthy stretches of time are more likely to experience neck and shoulder pain, especially if they are not in proper driving position. Professional drivers adopt a position while driving that makes their necks hurt.(3)

Patients with neck disorders usually exhibit a forward head posture. Most patients with forward head posture spend the most of their days in prolonged sitting, including bus drivers, industrial- related jobs, and computer-based work. Prior research has demonstrated that forward head posture changes the scapular position, shortens the posterior neck extensor, and tightens the anterior neck and shoulder muscles. The prevalence of forward head posture among adults in the 20–50 age range is 66%.

Next to back pain, neck discomfort is one of the most prevalent musculoskeletal conditions. At least once in their lives, many people seek treatment at medical facilities.

According to a study of various observational studies conducted worldwide, the prevalence of neck discomfort in adults (aged 17 to 70) ranged from 16.7 to 75.1% over the course of a year, with a mean of 37.2 percent.

Scapular retraction is essential to maintaining a healthy trunk posture. Simple scapula retraction exercises can help you build stronger muscles and strengthen your posture. Your shoulder blades are compressed together and pulled back into an upright position by these retractors. The middle trapezius and the rhomboids are the two main scapular retractors, yet the activities of these two muscles differ slightly. The middle trapezius fibres rotate the scapula and serve as a pure scapular function to depress the glenoid fossa.

If cervical muscular imbalance brought on by postural misalignment persists, an undue strain is placed on the joint and muscle, making the condition more severe. Chronic forward head position was induced by the issue.

Patients with FHP frequently experience functional mobility restrictions or generalised pain in the head and neck area.(4)

In addition to weariness, limited range of motion, and muscular imbalance, the forward head posture causes severe neck pain dysfunction of the temporomandibular joint, clenching of the teeth, pinched nerves, myofascial pain syndrome, headache, migraine, numbness, tingling in the arms and hands, and muscular spasm, all of which interfere with daily activities. The primary cause of poor head and neck posture at work is a lack of awareness of one's own posture.(5)

According to a general weakening of the accessory respiratory muscles, several investigations found a significant impact of FHP on respiratory performance. With a decrease in forced vital capacity (FVC), forced expiratory volume in one second (FEV1), and the activity of the accessory muscles of

respiration (AMR), it has been discovered that the involvement of FHP in respiratory function is more prominent in patients who already have chronic respiratory illnesses. According to a theory, the observed changes in respiratory performance may be caused by morphological changes in the shape of the thorax and by the final ribs' restricted movement during inspiration.(6)

Drivers are more likely to experience musculoskeletal problems due to their constant poor posture, extended periods of sitting, vibration, and mechanical shocks.

Physical and psychological risk factors are both impacted by work-related musculoskeletal disorders. Increased physical loading on the musculoskeletal system, vibration, extended sitting, and a mismatch between the driver and the seat are the frequent physical factors.

When a person is standing or sitting for an extended period of time while driving, their habitual posture can have an affect on their spinal vertebrae.

The seat design, the thermal environment, the exposure to whole-body vibration, and the length of time spent in the same seated position are some of the elements that have been linked to the discomfort.

Because there is an engine under the driver's seat, vibrations are felt more by drivers of cars. According to Gryphon et al., vibration can be uncomfortable when combined with long periods of sitting, especially while driving. When driving, vibration from the seat surface and backrest interacts with vibration from the steering wheel and pedals to create the impression of vibration, which can be uncomfortable with an increased vibration dose.

The risky variables linked to gastrointestinal, musculoskeletal, cardiovascular, respiratory, hearing, and other conditions that may have an impact on driving safety.

Vibration exposure and extended sitting time put professional drivers at increased risk of developing health problems.

Mansfield et al. shown that discomfort is increased by both vibration and the length of time spent sitting. The presence of vibration speeds up the onset of discomfort.(7)

The craniovertebral angle is defined as the point where a line linking the midline of the tragus of the ear to the skin overlaying the C7 spinous process intersects a horizontal line going through the C7 spinous process.(8)

One of the common techniques for determining head posture is to measure the craniovertebral angle (CVA).

The terms cervical angle and forward head angle are also used to describe the cranial-vertebral angle.(9)

Two lateral pictures of the subject in a relaxed seated position without a back support are taken to determine the subject's craniovertebral angle. A body marker is used to mark the tragus of the ear and the spinous process of C7. C7 is the intersection of a horizontal line that forms a right angle with the vertical. Then, using a tool like a goniometer.(10) or software like Image J, the angle between the horizontal line and the line connecting the C7 spinous process with the tragus of the ear is measured.(11)

In a study, the craniovertebral angle was studied between sitting and standing positions by B. Shaghayegh Fard et al. The thoraco-lumbar spine posture and cervical spine posture, which depend on various sitting and standing positions, are clearly related. According to the study's findings, it is best to evaluate CVA while standing because slumped sitting causes a reduction in postural muscle activity compared to standing.(12)

The seventh cervical vertebra is referred to as the prominens vertebra. The occurrence of a long, conspicuous spinous process that is perceptible from the skin surface is this vertebra's most distinguishing feature, therefore the name. The ligamentum nuchae is linked to the lower end of the spinous process, which is thick, nearly horizontal in orientation, and not bifurcated.(13)

The benchmark for determining how the head and neck are positioned is the craniovertebral angle.

Those with neck pain have a substantially smaller angle.

The higher incidence of forward head posture and a higher level of disability among the participants with neck pain are related to the decline in craniovertebral angle values.(10)

A greater forward head posture is indicated by a smaller craniovertebral angle (CVA). Forward head position is defined as a CVA of less than 48–50.(12)
According to a study by Kim et al., measuring forward head posture in accordance with CVA can be utilised as an important index to identify the consequent functional impairment of the neck.(14)
Previous research have verified the validity and reliability of the CVA angle.(15)

METHODOLOGY

The study is an observational one utilizing simple random sampling, conducted in New Delhi and Noida. The sample includes 100 adult male car drivers divided into two groups: 50 professional drivers and 50 civilian drivers, all driving 4-5 hours daily. Excluded from the study were individuals with scoliosis, kyphosis, neck injuries, neurological problems of the neck and shoulder, and females. The primary equipment used was a Canon 1300D EDS camera with an 18-55mm lens on a tripod stand.

The cranio-vertebral angle, which measures forward head posture, was evaluated using M-B Ruler software. The hypothesis posited a change in cranio-vertebral angle and forward head posture, while the null hypothesis suggested no change. Participants gave written consent and provided demographic information. They were seated comfortably on an armless chair, with their buttocks against the back, hips and knees at 90 degrees, and feet flat on the ground, ensuring neck and shoulders were visible. Positioned 1.5 meters from the camera, each subject's lateral view photograph was taken from the right side. The cranio-vertebral angle was measured by drawing a horizontal line through the C7 vertebra and a line from the C7 spinous process to the ear tragus. All data was recorded and saved in MS Excel format.

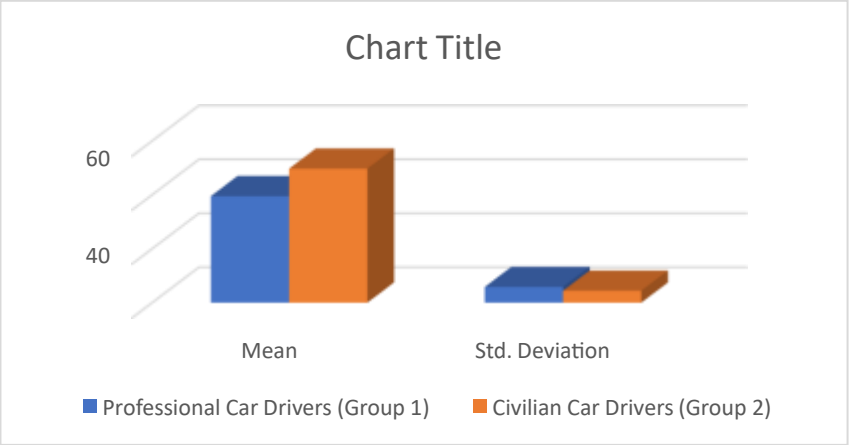
RESULTS

Descriptive Statistics: The mean CVA for professional car drivers (Group 1) was 39.50 ± 5.811, while for civilian car drivers (Group 2), it was 49.70 ± 4.434.
Independent Samples t-test: To compare the means of the two groups, an independent samples t-test was conducted. Levene's test for equality of variances revealed that the assumption of equal variances was not met ($F = 8.004$, $p = 0.006$). Therefore, the t-test was conducted without assuming equal variances.
The results of the t-test indicated a significant difference in Cranio Vertebral Angle between professional car drivers and civilian car drivers ($t = -9.866$, $df = 91.618$, $p < 0.001$). The mean difference between the two groups was -10.199 ± 1.034. The 95% confidence interval for the difference in means ranged from -12.252 to -8.146.
Interpretation: The t-test results demonstrate a statistically significant difference in Cranio Vertebral Angle between professional car drivers and civilian car drivers. On average, civilian car drivers had a higher CVA (49.70 ± 4.434) compared to professional car drivers (39.50 ± 5.811). The negative mean difference (-10.199) indicates that the CVA was lower in professional car drivers than in civilian car drivers.

List of tables:

Group	N	Mean	Std. Deviation
Professional Car Drivers (Group 1)	50	39.50	5.811
Civilian Car Drivers (Group 2)	50	49.70	4.434

TABLE 1---Mean ± Standard Deviation table for the data analysis of Cranio Vertebral Angle in Professional Car Drivers and Civilian Car Drivers.



GRAPH 1--- Mean ± Standard Deviation table for the data analysis of Cranio Vertebral Angle in Professional Car Drivers and Civilian Car Drivers.

DISCUSSION

The present study aimed to evaluate the cranio-vertebral angle (CVA) and its relationship to forward head posture (FHP) in professional and civilian car drivers. The results demonstrated a significant difference between the two groups, with professional car drivers exhibiting a notably lower CVA compared to civilian car drivers. This finding supports the hypothesis that prolonged driving, particularly in professional contexts, contributes to the development of FHP.

Implications of Lower CVA in Professional Drivers

The mean CVA for professional car drivers was found to be 39.50 ± 5.811, significantly lower than the 49.70 ± 4.434 observed in civilian car drivers. A lower CVA is indicative of a more pronounced forward head posture, which aligns with the understanding that extended periods of sitting and poor postural habits contribute to postural misalignments such as FHP. This condition, characterized by the extension of cervical flexors and the shortening of cervical extensors, increases stress on the musculoskeletal system, potentially leading to discomfort, pain, and dysfunction in the neck and shoulders.

Biomechanical and Physiological Consequences

The alteration in CVA reflects a biomechanical shift where the gravitational center of the head moves anteriorly to the load-bearing axis, thereby increasing the external moment arm. This shift imposes additional stress on the cervical and thoracic regions, leading to muscular imbalance and compensatory mechanisms that can exacerbate discomfort and contribute to chronic conditions such as myofascial pain syndrome, temporomandibular joint dysfunction, and headaches. The observed difference in CVA between professional and civilian drivers underscores the impact of occupational hazards on musculoskeletal health.

Prevalence and Impact on Musculoskeletal Health

The study's findings align with previous research indicating a high prevalence of neck pain and musculoskeletal issues among individuals engaged in prolonged sitting activities, including professional drivers. The significant decrease in CVA in professional drivers suggests a higher susceptibility to neck pain and related dysfunctions. This is consistent with literature reporting a prevalence of forward head posture in 66% of adults aged 20-50 and a mean annual prevalence of neck discomfort ranging from 16.7% to 75.1%.

Practical Applications and Recommendations

Given the significant difference in CVA between professional and civilian drivers, interventions aimed at mitigating FHP in professional drivers are crucial. Ergonomic adjustments to the driver's seat, regular breaks to alleviate prolonged static postures, and exercises focusing on scapular

retraction and cervical spine stabilization could be beneficial. Additionally, raising awareness about the importance of maintaining proper posture while driving is essential in preventing the onset of musculoskeletal disorders.

CONCLUSION:

Based on the statistical analysis, there is a significant difference in Cranio Vertebral Angle between professional car drivers and civilian car drivers. The findings suggest that the nature of driving profession might have an impact on CVA, with civilian car drivers having a higher CVA compared to professional car drivers. Further research and exploration are warranted to understand the underlying reasons for this difference and its potential implications for neck health and posture.

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