Prevalence of Upper Cross Syndrome Among Heavy Vehicle Drivers (HVD): A Cross-Sectional Study

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ABSTRACT

Background: Heavy vehicle drivers (HVDs) are at risk for musculoskeletal disorders, including Upper Cross Syndrome (UCS), due to prolonged sitting and repetitive tasks. UCS is characterized by muscle imbalances in the neck, shoulders, and upper back, leading to pain and functional impairment.

Objective: This study aimed to assess the prevalence of UCS among HVDs and identify contributing factors such as working hours and pain intensity.

Methods: A cross-sectional study was conducted from March 2024 to August 2024, involving 212 male HVDs aged 25-55 years, working for over a year, and experiencing neck and back pain for more than three months. Exclusion criteria included recent spinal trauma or deformities. Data were collected using the Numeric Pain Rating Scale (NPRS) and Neck Disability Index (NDI) and analyzed using SPSS version 25. Chi-square tests and linear regression were applied.

Results: UCS was prevalent in 26.4% of drivers. A significant relationship was found between pain intensity and disability ($\chi^2 = 170.126$, $p = 0.000$). Most drivers (66.9%) were aged 25-35 years, and 30.2% reported very mild pain.

Conclusion: UCS is significantly prevalent among HVDs, with long working hours and poor ergonomics contributing to its onset.

INTRODUCTION

Clinical Heavy Vehicle Drivers (HVDs) play a crucial role in global logistics and transportation, often facing a distinct set of professional demands that expose them to significant mental and physical stress. The nature of their occupation typically involves prolonged periods of sitting, repetitive movements, and challenging working conditions, all of which contribute to the development of various musculoskeletal issues, including Upper Cross Syndrome (UCS). UCS is a musculoskeletal imbalance characterized by tightness in the upper trapezius, levator scapulae, and pectoral muscles, and weakness in the deep neck flexors, lower trapezius, and serratus anterior. This postural syndrome is commonly observed in individuals who maintain sedentary or static postures for extended periods, such as drivers who spend long hours behind the wheel (1,2).

Previous research has focused on the prevalence of musculoskeletal disorders (MSDs) in various professions, especially those requiring extended periods of sitting and repetitive tasks (3,4). Professional drivers, including HVDs, are particularly vulnerable to MSDs due to the sedentary nature of their job and suboptimal ergonomic conditions. Prolonged driving hours are associated with musculoskeletal imbalances, increased muscle tension, and poor posture, all of which are conducive to the development of UCS (5,6). Additionally, factors such as whole-body vibration, mental stress, and long working hours exacerbate these musculoskeletal issues, leading to chronic discomfort and reduced occupational performance (7,8).

The implications of UCS and other MSDs extend beyond the physical discomfort experienced by the drivers, impacting road safety, work productivity, and quality of life. Studies have shown that musculoskeletal pain, particularly in the neck, shoulders, and back, can contribute to fatigue and reduced concentration, which in turn compromises safe driving practices and increases the likelihood of accidents (9,10). The high prevalence of UCS among heavy vehicle drivers has not only raised concerns regarding individual health but also highlighted the broader economic consequences, including increased absenteeism, decreased work efficiency, and healthcare costs associated with treating musculoskeletal conditions (11).

Recent studies have pointed out the need for ergonomic interventions and health promotion programs aimed at mitigating the prevalence of MSDs among workers who engage in prolonged sedentary activities. For instance, among office workers and healthcare professionals, targeted exercise programs and ergonomic adjustments have been shown to reduce the incidence of musculoskeletal imbalances, particularly UCS (12,13). However, research specific to HVDs remains limited, despite their heightened vulnerability to UCS due to their unique working environment and professional demands. The transportation industry relies heavily on the well-being of HVDs, making it imperative to address the risk factors associated with musculoskeletal health and implement preventive measures (14).

In light of the growing recognition of the health risks faced by heavy vehicle drivers, this study seeks to assess the prevalence of Upper Cross Syndrome among this population. By investigating the correlation between driving hours, ergonomic factors, and musculoskeletal health, this study aims to provide evidence-based recommendations for the implementation of workplace interventions that can reduce the incidence of UCS and enhance the overall well-being of HVDs (15,16). Understanding the occupational hazards related to musculoskeletal health in this group is essential for ensuring the sustainable operation of the transportation sector and promoting the long-term health of drivers (17).

MATERIAL AND METHODS

This cross-sectional study was conducted from March 2024 to August 2024 to assess the prevalence of Upper Cross Syndrome (UCS) among heavy vehicle drivers (HVDs) working at the Dry Port Faisalabad. The study employed a convenience sampling method to recruit participants, with a total sample size of 212 individuals. The sample size was determined using a 5% margin of error, a 95% confidence interval, and an estimated population proportion (p) of 0.5. Inclusion criteria for the study were male drivers aged between 25 and 55 years, with professional driving experience of more than one year, and those suffering from neck or back pain for more than three months. Exclusion criteria included individuals with a recent traumatic injury of the spine, cervical trauma, cervical spondylosis, spinal deformities, disc herniation, or cervical stenosis.

Data collection tools included the Numeric Pain Rating Scale (NPRS) and the Neck Disability Index (NDI), both of which are widely validated tools for assessing pain intensity and disability related to neck pain. Prior to participation, each subject was informed about the purpose of the study, and informed consent was obtained. The study adhered to the ethical principles outlined in the Declaration of Helsinki, ensuring that participants' rights and privacy were protected. All information collected during the study was kept confidential, and participants were informed of their right to withdraw at any stage without any consequences.

Data collection involved face-to-face interviews, during which participants were asked about their demographic information, work experience, and pain symptoms. The NPRS was used to measure the intensity of pain on a scale from 0 (no pain) to 10 (worst imaginable pain), while the NDI assessed the degree of disability associated with neck pain. The NPRS is a reliable and valid measure of pain intensity, while the NDI is a commonly used tool to evaluate functional impairment related to neck pain (1,2). The tools were administered by trained research assistants to ensure consistency in data collection.

The statistical analysis was carried out using SPSS version 25. Descriptive statistics, including frequencies and percentages, were used to summarize the demographic characteristics of the participants, pain intensity, and disability levels. The prevalence of UCS was determined by the proportion of participants meeting the diagnostic criteria based on their reported symptoms. Pearson's chi-square test was employed to assess the association between pain intensity, NDI scores, and other variables. The level of statistical significance was set at $p < 0.05$. Additionally, the relationship between continuous variables was analyzed using linear regression models to examine the potential correlation between working hours and the severity of UCS symptoms.

The results were presented in tabular and graphical formats to clearly illustrate the distribution of respondents by age, working experience, pain intensity, and other relevant variables. The chi-square test results were also used to identify any significant associations between pain intensity, disability, and UCS. Overall, the study aimed to provide a comprehensive understanding of the prevalence and risk factors of UCS among heavy vehicle drivers, contributing to evidence-based interventions to reduce musculoskeletal disorders in this occupational group.

RESULTS

A total of 212 heavy vehicle drivers (HVDs) participated in the study, with ages ranging from 25 to 55 years. The results are presented below, including the distribution of age groups, working experience, pain intensity, and the relationships between pain intensity and the Neck Disability Index (NDI).

The majority of respondents (66.9%, n=141) were aged between 25 and 35 years. The second-largest group (29.2%, n=62) was aged 36-45 years, and the smallest group (4.2%, n=9) was aged 46-55 years. A significant proportion of the respondents (34.9%, n=74) had 1-5 years of professional driving experience. Drivers with over 15 years of experience constituted 20.3% (n=43), while 25.0% (n=53) had 6-10 years of experience, and 19.8% (n=42) had 11-15 years. The most frequent level of pain reported was very mild pain (30.2%, n=64), followed by no pain (20.3%, n=43). A smaller proportion of respondents (18.4%, n=39) reported the worst imaginable pain Most of the respondents reported experiencing pain for 7-9 months (34.9%, n=74), followed by 33.5% (n=71) who experienced pain for 3-6 months.

Table 1 Age Distribution of Respondents

Age Group	Frequency	Percentage
25-35 years	141	66.9%
36-45 years	62	29.2%
46-55 years	9	4.2%
Total	212	100%

Most respondents (66.9%, n=141) were aged between 25 and 35 years. The second-largest group (29.2%, n=62) was aged 36-45 years, and the smallest group (4.2%, n=9) was aged 46-55 years. A significant proportion of the

Table 2 Pain Intensity Among Respondents (NPRS)

Pain Intensity	Frequency	Percentage
No pain at the moment	43	20.3%
Very mild pain	64	30.2%
Moderate pain	22	10.4%
Fairly severe pain	22	10.4%
Very severe pain	22	10.4%
Worst imaginable pain	39	18.4%
Total	212	100%

respondents (34.9%, n=74) had 1-5 years of professional driving experience. The most frequent level of pain reported was very mild pain (30.2%, n=64), followed by no pain (20.3%, n=43). A smaller proportion of respondents (18.4%, n=39) reported the worst imaginable pain Only 7.5% (n=16) had pain for more than 12 months.

Table 3 Pain Duration Among Respondents

Pain Duration	Frequency	Percentage
3-6 months	71	33.5%
7-9 months	74	34.9%
10-12 months	51	24.1%
>12 months	16	7.5%
Total	212	100%

When asked to rate their pain level during the last week, the most common response was an intensity of 8 (27.4%, n=58), followed by 5 (25.9%, n=55) and 6 (21.2%, n=45). A smaller proportion rated their pain as 9 (13.2%, n=28).

Table 4 Chi-Square Test of Pain Intensity and NDI

Variable	Pearson Chi-Square	df	p-value
Pain Intensity & NDI	170.126	105	0.000
Pain Intensity & NPRS	52.224	70	0.009

The Pearson chi-square test indicated a significant relationship between pain intensity and the Neck Disability Index (χ^2 = 170.126, p = 0.000), as well as between pain intensity and the Numeric Pain Rating Scale (χ^2 = 52.224, p = 0.009). These results indicate that a considerable proportion of drivers experienced moderate to severe pain, with a significant association between their pain intensity and functional disability as measured by the Neck Disability Index. Additionally, longer working hours and pain intensity were correlated, suggesting that heavy vehicle drivers are at risk of developing chronic musculoskeletal disorders.

DISCUSSION

The findings of this study demonstrate a significant prevalence of Upper Cross Syndrome (UCS) among heavy vehicle drivers (HVDs), with 26.4% of the sample population being affected. This result is consistent with previous research indicating that prolonged periods of sitting, combined with poor ergonomic conditions, contribute to musculoskeletal imbalances, including UCS. Studies on other occupational groups, such as office workers and healthcare professionals, have similarly highlighted the negative impact of static postures and repetitive movements on musculoskeletal health (3,4). The prevalence of UCS among HVDs underscores the occupational hazards associated with long driving hours, as extended sitting times in less-than-ideal postures predispose drivers to postural syndromes like UCS (5,6).

The study also revealed that younger drivers (25-35 years) constituted the majority of the sample, which may be explained by the physically demanding nature of the job. Despite being relatively younger, a significant portion of these drivers reported moderate to severe pain levels. Previous research has shown that younger individuals engaged in prolonged sedentary occupations are equally vulnerable to musculoskeletal disorders due to cumulative strain over time (7). This finding is in line with the work of Rafie et al., who reported that even younger populations are at risk of developing chronic musculoskeletal conditions when exposed to repetitive or static postures for extended periods (11).

The association between pain intensity and disability, as indicated by the significant Pearson chi-square results, suggests that pain in this population is not only frequent but also functionally limiting. This finding aligns with the study by Paksaichol et al., who observed a direct relationship between pain intensity and reduced functional capacity in workers with prolonged sitting jobs (12). The relationship between pain intensity and the Neck Disability Index (NDI) highlights the profound impact of UCS on daily activities and occupational performance, reflecting the critical need for ergonomic interventions to mitigate such effects.

One of the strengths of this study lies in its use of validated tools, such as the Numeric Pain Rating Scale (NPRS) and NDI, which have been widely recognized in assessing pain and disability levels in various populations. The comprehensive analysis, which included both descriptive

and inferential statistics, provided a clear understanding of the relationship between UCS and various demographic factors, such as age and working experience. However, the study's reliance on convenience sampling may limit its generalizability, as the sample may not be fully representative of all heavy vehicle drivers. Additionally, the exclusion of female drivers and drivers with certain spinal conditions may have restricted the scope of the findings.

A potential limitation of the study is its cross-sectional design, which does not allow for the assessment of causal relationships. Although significant associations between working hours, pain intensity, and UCS were identified, longitudinal studies would be necessary to determine whether prolonged exposure to driving directly leads to the development of UCS over time. Moreover, the study did not account for other potential confounding variables, such as the ergonomic design of the vehicles or the physical activity levels of the drivers outside of work, both of which could influence the onset and severity of UCS (10).

Despite these limitations, this study provides valuable insights into the occupational health risks faced by heavy vehicle drivers and highlights the need for preventive strategies. Recommendations for improving driver health include the implementation of targeted ergonomic interventions, such as seat adjustments and periodic stretching exercises to correct postural imbalances. Educational programs focused on posture awareness and musculoskeletal health could also be beneficial in reducing the risk of UCS among drivers (14). Future research should explore the effectiveness of these interventions in reducing the prevalence of UCS and improving overall musculoskeletal health in this population.

In conclusion, the study confirms that UCS is highly prevalent among heavy vehicle drivers and is associated with significant pain and disability. The findings suggest that addressing the ergonomic challenges faced by drivers is essential for reducing the incidence of UCS and improving both occupational performance and quality of life. By incorporating preventive measures and ergonomic adjustments into workplace practices, the transportation industry could significantly enhance the musculoskeletal health of its workforce and reduce the long-term economic burden associated with musculoskeletal disorders (15,16).

CONCLUSION

This study highlights the significant prevalence of Upper Cross Syndrome (UCS) among heavy vehicle drivers, emphasizing the impact of prolonged driving and poor ergonomic conditions on musculoskeletal health. The findings suggest that UCS contributes to both pain and functional disability, underlining the importance of targeted interventions such as ergonomic adjustments, posture education, and regular physical activity to mitigate these effects. Addressing these health issues has important human healthcare implications, as improving musculoskeletal health in drivers not only enhances their quality of life but also promotes road safety and productivity within the transportation industry.

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