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Prevalence of Cervicogenic Headache and Its Association with Prolonged Neck Flexion and Workload in Digital Artists

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ABSTRACT

Cervicogenic headache (CGH) is a secondary headache caused by cervical spine disruption. Prolonged neck flexion and psychological strain in digital artists may elevate CGH risk due to their screen-based, high-demand work. **Objectives:** To assess the prevalence of CGH among digital artists and examine its correlation with prolonged neck flexion and workload. **Methods:** A cross-sectional study was conducted with 200 digital artists aged 20–40 years. CGH was diagnosed clinically, and posture, workload, and screen time were assessed via observation and a structured questionnaire. Functional disability was measured using the Neck Disability Index (NDI). **Results:** 36% of participants had CGH. A significant correlation was found between CGH and prolonged neck flexion ($p < 0.05$). Participants spending over 6 hours daily in flexed postures had higher symptom incidence. Workload positively correlated with symptom severity, indicating multifactorial etiology. **Conclusions:** Digital artists are highly susceptible to CGH, primarily due to sustained neck flexion and occupational stress. Ergonomic interventions, posture training, and regular screen breaks are recommended to mitigate symptom onset and progression.

INTRODUCTION

Cervicogenic headache (CGH) is a secondary headache issue whose cause lies in the disruption of the cervical spine and other bony, disc, and/or soft tissue structures [1]. Unlike primary headaches, CGH is also accompanied by the presence of referred pain that does not occur in the head, but rather in the neck itself, but manifests as pain in the head similar to tension-type or migraine headaches [2]. The prevalence of CGH is reported to be extremely heterogeneous all over the world, (0.4–4.1%) in the general population, and lower (up to 15–20) in those who have chronic neck pain or occupations with sedentary work [3, 4]. The prevalence in Asian populations is found to be high; in India, a study of the prevalence of CGH in the general population reported a prevalence rate of 2.5%, a study of

office workers in South Korea and Japan revealed prevalence rates of 16.9% and 13.4%, respectively [5–7]. A Turkish survey found that CGH occurred in about 1.0% of the entire population of headache sufferers, indicating the importance of CGH in clinical practice [8]. The main etiological agents are the cervical facet joint arthritis, degeneration of the disc, trauma, poor posture (Forward head position mainly and ergonomic stress in the workplace), and muscular trigger points [9, 10]. Moreover, there are psychosocial factors, including job strain, high workload, and low physical activity [11]. Digital artist workload increases the risk of CGH in a complex process of biomechanical and psychosocial interactions. In the workplace, extended neck flexion during intricate screen



work leads to chronic muscle contracture, muscle fatigue, and muscle myofascial trigger points which result in head pain [12, 13]. Occupational stress because of deadlines and job demand has psychosocial effects of elevating generalized muscle tension and reducing pain thresholds, and decreasing breaks during recovery [14]. Critically, epidemiological evidence indicates that surpassing 6 hours of daily screen time or 40 hours of work per week significantly raises the risk for neck pain and headaches [15, 16]. Digital artists frequently exceed these thresholds due to the screen-based nature and overtime common in their field, placing them at substantial risk [17, 18].

This study aimed to assess the extent of cervicogenic headache in digital artists, as well as analyze the possible correlation with prolonged neck flexion and work stress. Through the risk factors of this profession, the findings will be suggestive of ergonomic interventions and occupational health policies related to this group not much studied but with huge professional bodies.

METHODS

This was a cross-sectional study that included 200 participants, both male and female, aged 20 to 40 years. The study was conducted at University Institute of Physical Therapy, University of Lahore, Lahore, Pakistan from May 2025 to September 2025. Participants were recruited from design companies, animation studios, and freelance networks in Lahore. All were practicing digital artists with at least one year of professional experience and a minimum of 4 hours of daily screen time. Exclusion criteria included a history of significant cervical trauma or surgery, diagnosed neurological disorders, other primary headache disorders as the primary complaint, or any systemic condition that could confound neck-related pain assessment. Data were collected after obtaining written informed consent from all participants, in accordance with the ethical principles outlined in the Declaration of Helsinki. Workload was assessed using the NASA Task Load Index (NASA-TLX), while average daily screen time and neck flexion duration were recorded using the Screen Time and Posture Questionnaire (STPQ). Cervicogenic headache (CGH) diagnosis proceeded according to the clinical screening criteria of the International Classification of Headache Disorders (ICHD-3) with the focus on pain on one side of the body instigated by neck movement or prolonged posture. The a priori calculation of the sample size through an equation of estimating a population proportion was performed taking the prevalence of CGH as 30 percent, a 5 percent error margin, and 95 percent confidence level. The data were gathered through the use of a self-going questionnaire that was of a structured nature and underwent a validity review after which 20 respondents were piloted to determine its efficacy. Demographic data

(including occupational exposure to neck flexion and perceived workload), were collected by formal questionnaires. The Neck Disability Index (NDI) was used to determine functional impairment caused by neck symptoms. The SPSS version 25.0 was used to analyze the data, both descriptive statistics and inferential tests were used i.e. Chi-square and Pearson correlation with the level of significance of $p < 0.05$. Among the 200 respondents, 52% were male and 48% female, and most of them (62% were aged 21-30 years). CGH prevalence was 36% with an increased prevalence among individuals who were in a position with their neck flexed more than 6 hours a day. It was established that there was a significant association between CGH and long-term neck flexion ($p < 0.05$), and CGH and increased workload. CGH participants were also significantly higher in NDI scores, which also represented moderate to severe functional disability.

RESULTS

Most of the participants were young adults between the ages of 20 and 30 years, comprising almost two-thirds of the sample, with fewer people being represented by the other age groups. The gender balance was quite equal with the proportion of males (52%) slightly higher than that of the females (48%). The sample, in general, is representative of a rather young and close to equal gender-balanced population (Table 1).

Table 1: Demographic Characteristics (n=200)

Variables	Categories	Frequency (%)
Age Group	20-25	60 (30%)
	26-30	64 (32%)
	31-35	46 (23%)
	36-40	30 (15%)
Gender	Male	104 (52%)
	Female	96 (48%)

Findings indicate that cervicogenic headache commonly affects 36% of digital artists, meaning that CGH is a significant burden in such population. This indicates that more than one-third of the participants are being impacted, which indicates that CGH can be an important work-related health problem (Table 2).

Table 2: Prevalence of Cervicogenic Headache

Headache Present	Frequency (%)
Yes	72 (36%)
No	128 (64%)

The risk of CGH is significantly higher when neck flexion is chronic with 74.6% of those with CGH spending over 6 hours and above in a flexed position. This indicates that there is a close relationship between persistent flexion of the neck and the emergence of cervicogenic symptoms (Table 3).

Table 3: Duration of Neck Flexion(Daily)

Duration (hrs/day)	CGH Frequency (%)
<4 Hours	28 (7.1%)
4-6 Hours	62 (18.3%)
>6 Hours	110 (74.6%)

The participants who scored the most in CGH symptoms (66.1) were those who had a heavy workload, which implies that work intensity is a contributing factor to headache. The effect of increasing workload also seems to worsen musculoskeletal strain, which increases CGH risk (Table 4).

Table 4: Workload Category

Workload Level	CGH Frequency (%)
Low	42 (9.7%)
Moderate	88 (24.2%)
High	70 (66.1%)

Majority of the CGH participants stated mild to moderate disability with only a few stating severe or full disability. This indicates that although the scope of functional impairment is typical, severe disability is quite on the lower side among the digital artists (Table 5).

Table 5: NDI Score Distribution

Disability Level	CGH Frequency (%)
None (0-4)	18 (9%)
Mild (5-14)	76 (38%)
Moderate (15-24)	64 (32%)
Severe (25-34)	36 (18%)
Complete (>34)	6 (3%)

The Neck Disability Index (NDI) scores of digital artists. Most participants had mild (38%) and moderate (32%) functional impairments (Figure 1).

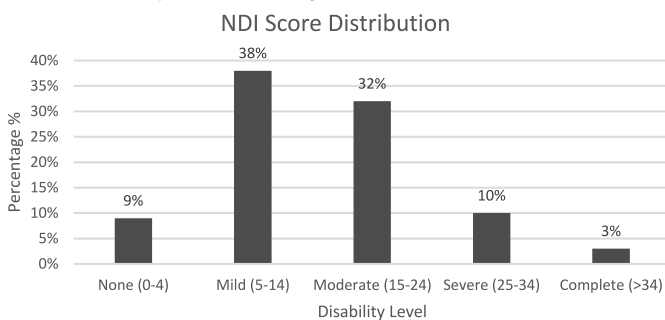


Figure 1: Neck Disability Index (NDI) Score Distribution

DISCUSSION

The current study offers special evidence on the occupational health burden of cervicogenic headache (CGH) among digital artists. The main findings were high prevalence of CGH at 36%; (2) significant dose-related relationship between CGH and extended neck flexion with prevalence skyrocketing to 74.6 per cent in those who flex more than 6 hours per day; (3) significant relationship

between CGH and greater subjective workload levels; and (4) much greater functional disability, that is, as assessed by the Neck Disability Index (NDI). It showed that 36% prevalence which is significantly more than suggested in general population [3, 4] but agrees with the findings of high-risk occupational groups. The prevalence among office workers in South Korea was reported to be 16.9% [7], and a study conducted among IT professionals reported a prevalence of up to 20% [19]. Greater value was observed due to the synergistic combination of risk factors in digital art prolonged stationary position, great visual-cognitive load, project-related pressure, which indicates that this subgroup is at a high risk of being higher than other computer-users. The close relation between CGH and the length of neck flexion aligns with the available biomechanical literature. A definite gradient of 7.1% (less than 4 hrs), 18.3% (4-6 hrs) and 74.6% (more than 6 hrs) was observed. This complements existing literature that has found out that sustained forward head posture produces more mechanical stress on cervical structures and results in pain [9, 14]. The fact that the number of hours per day is the important threshold of over 6 hours gives a more specific action inside the bigger warning signals that are present in previous ergonomics research [15]. The multifactorial model of CGH is reinforced by the fact that there is a strong correlation between high workload and CGH. This finding can be explained by the fact that there is an increasing amount of evidence on the role of psychosocial stress in musculoskeletal disorders. The research on both graphic designers and computer programmers also has shown that deadline pressure and high mental demand is also directly correlated with the report of having neck pains and headaches [20]. The observation that the category of High workloads had a CGH prevalence of 66.1% supports the argument that the psychological stress factor is synergistic with the physical strain and causes the symptoms. The high scores in NDI in the subjects that reported CGH support the fact that the condition has a considerable effect on everyday life. This is very much compatible with the clinical profile of CGH where the core features are pain and related disability. It is consistent with results of the NDI among other populations with cervical disorders, which confirm the functional implications of our results [10]. Although our main finding conforms to the general literature on neck pain at work, they are of particular size and content. The prevalence rate (36%), the intensity of the relationship with the neck flexion is on the upper end of the range documented in screen-based workers. This might be taken, at least in part, as a contradiction to research which discovered smaller effects, which might be reflecting the particular vulnerability of digital artists as a sub-group not well represented by more inclusive Office worker labels [8]. The

main innovative aspect of our study is that we quantify such risks in this group of professionals, which is not studied in-depth. The cross-sectional design does not allow the causal inference. Convenience sampling and self-reporting of the posture and the workload might be biased. Moreover, CGH diagnosis was made as per modified ICHD-3 at the absence of clinician confirmation that may result in misclassification. In order to evaluate possible mode biasing caused by mixed data collection methods, we contrasted important demographic and outcome variables (age, gender, CGH prevalence, NDI scores) between the participants who have completed the online form and those who completed the interview in person. Independent samples t-test (when the variables are continuous) and chi-square tests (when the variables are categorical) showed no significant statistical differences between the two groups ($p > 0.05$ in all test results), and were thus no indication that the mode of data collection did not significantly alter the main findings of the present research. Overall, the findings of this study suggest that CGH is an extremely common and clinically important issue among digital artists. The results are mostly consistent with the available literature on occupational musculoskeletal disorders but go beyond that by determining the extraordinary risk of the working patterns peculiar to this creative career. This highlights a high degree of necessity of specific ergonomic and organizational interventions in this area.

CONCLUSIONS

The study found a high prevalence of cervicogenic headache (36%) among digital artists, significantly associated with prolonged neck flexion (>6 hours/day) and high workload. These findings highlight the need for targeted ergonomic interventions, including posture training and workload management, to mitigate symptoms in this occupational group.

Authors Contribution

Conceptualization: NRM, IH

Methodology: ST

Formal analysis: TA

Writing and drafting: ST

Review and editing: NRM, IH, ST, TA, TB, NK

All authors approved the final manuscript and take responsibility for the integrity of the work.

Conflicts of Interest

All the authors declare no conflict of interest.

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