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Association of Screen Time and Headache and Its Impact on ADLs in Freelancers

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ABSTRACT

Freelancers are especially vulnerable to Cervicogenic headaches and migraines as a result of prolonged screen time because of inadequate cervical neck curvature and over-illumination. Persistent migraine and Cervicogenic headaches can have a significant impact on a person's activities of daily life. **Objectives:** To evaluate the relationship between screen time and headaches and their effects on activities of daily living. **Methods:** The data of 200 freelancers were collected within 3 months of age 18-45, and descriptive statistics and correlation analysis were done to explore the associations between screen time, headaches, and activities of daily living. Usually, throughout seven days, participants log their screen utilization in real-time or at regular intervals. **Results:** The mean age of participants was 25, with 77% of freelancers having Cervicogenic headaches and 23% Migraine, among which 25.5% had mild pain, 49.5% had moderate pain, and 25% had severe headaches. The HALDI score of 60.77% showed that freelancers had severe impairments in activities of daily living caused by migraine or Cervicogenic headaches. A p-value of 0.00 showed that screen time was significantly associated with headaches, and a p-value of 0.017 revealed a significant impact of headaches on freelancers' activities in daily life. **Conclusions:** It was concluded that screen time is significantly associated with headaches, and freelancers suffering from migraine or Cervicogenic headaches can have a severe impact on activities in daily life.

INTRODUCTION

Over the past three years, the worldwide market for electronic labor has expanded by almost 50% as millions of independent freelancers increasingly use online platforms to find work [1]. Music, typing, computer programming, website design, graphic design, photography, translation, editing, and other tasks are among the most popular marketing-related tasks performed by freelancers who perform eight hours a day of work [2]. According to a study, headaches were experienced by 65.72% of people who spent more than three hours in front of a screen [3]. According to studies, computer users are increasingly experiencing Cervicogenic headaches and neck pain, primarily as a result of poor sitting position [4]. In young adults, screen time was also linked to migraine [5]. According to the Global Burden of Disease Study 2017, migraine is an acute illness that impacts over 1 billion people globally [6]. A study found that, with no discernible difference in screen time, 25.2% of participants had migraine without aura, 23.0% had migraine with aura, 28.1% had tension-type headaches, 15.8% experienced a combination of headaches, and 7.9% had an unclassified headache [7]. Additionally, it was revealed that the

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prevalence of headaches linked to screen usage increased during COVID-19 [8, 9]. In general, those with migraine symptoms were able to carry out work and other social tasks, although they indicated that their headache episodes impacted their everyday life [10]. Furthermore, a considerable percentage of headaches in patients with cervical pathology may be related to migraine or primary headache disorders instead of Cervicogenic headache, and the prevalence of Cervicogenic headache in the general population was reported to be 0.17%. Cervicogenic headaches also often co-occur with migraine or medication overuse [11]. Cervicogenic headaches can have a major negative influence on a person's quality of life and productivity in their everyday life and at work [12]. The Biopsychosocial Model provides a useful framework to examine how physical (e.g., screen-induced neck strain), psychological (stress and fatigue), and social factors (work demands) converge to affect headache incidence and activities of daily living (ADLs) in freelancers [13]. Previous studies have shown that the increase in screen use has raised concerns about health impacts, notably headaches, which can affect the ADLs.

This study aims to examine the correlation between daily screen time with headache intensity, and the impact of headache severity on ADLs in freelancers. It highlighted the potential hazards of excessive screen time in the booming freelancing industry, as chronic headaches can significantly impact quality of life, productivity, and concentration. The study aims to provide recommendations for workplace improvement and reducing headache risk.

METHODS

A cross-sectional survey study was conducted after getting ethical approval from the institutional research board of the Medical Teaching Institution, Bacha Khan Medical College, Mardan, No. 515/BKMC. The study duration was June 2024 to December 2024. The patients' informed consent was taken before the data collection. A sample size of 200 freelancers was calculated based on power analysis for detecting a moderate correlation ($r \approx 0.3$) with 80% power and alpha level (commonly 0.05). Data were collected using non-probability convenience sampling during the period of three months after taking informed consent from the patients with Cervicogenic headaches and migraines, aged 18-45 years. Usually, throughout seven days, participants log their screen utilization in real-time or at regular intervals. The patients with Migraines were diagnosed using standard International Classification of Headache Disorders, 3rd edition (ICHD-3) Criteria [14], and the Cervicogenic headaches (pain starting from the neck and spreading to the oculo-frontal and temporal areas) were diagnosed using clinical tests [15], including a decrease in cranio-cervical flexion with decreasing craniovertebral angle [16]. The people with systemic diseases, past spinal problems, psychiatric disorders, or spinal procedures were removed from the study. Data collected includes demographics, screen time, pain type, and intensity using NPRS, aggravating or relieving factors, and ADLs using the HALDI score [17]. The HALDI and NPRS scales were pre-tested on 20 freelancers to interpret reliability using Cronbach's alpha values of 0.839 and 0.811, respectively. Data were analyzed using IBM SPSS V23.

RESULTS

In the study, 154 patients had Cervicogenic headaches, with a mean and SD of age 25.64 ± 6.70, whereas 46 patients had migraines, with a mean and SD of age 25.13 ± 5.92. 93 (46%) were female, and 107 (53%) were male, among whom 154 (77%) had Cervicogenic headaches and 46 (23%) had Migraines, as shown in table 1.

Table 1: Types of Headaches and Gender Distribution

Variables		Type of headache		Total
		Cervicogenic Headache	Migraine	
Gender	Female	64	29	93 (46%)
	Male	90	17	107 (53%)
Total		154 (77%)	46 (23%)	200

The devices used for freelancing are given in figure 1.

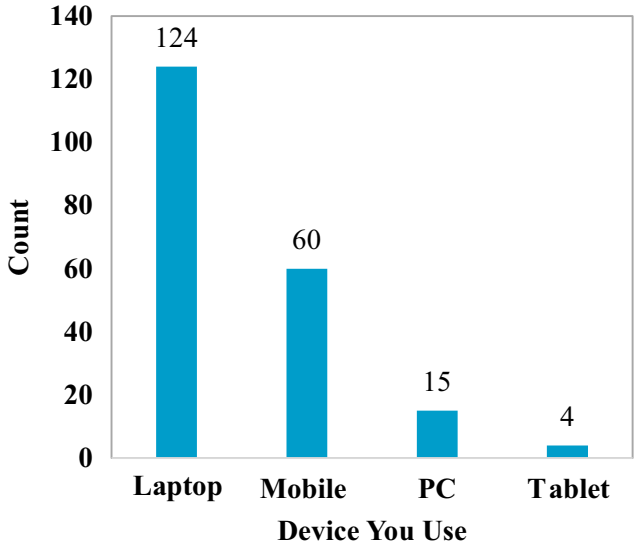

Figure 1: Devices Used for Freelancing

Screen time is depicted in Figure 2.

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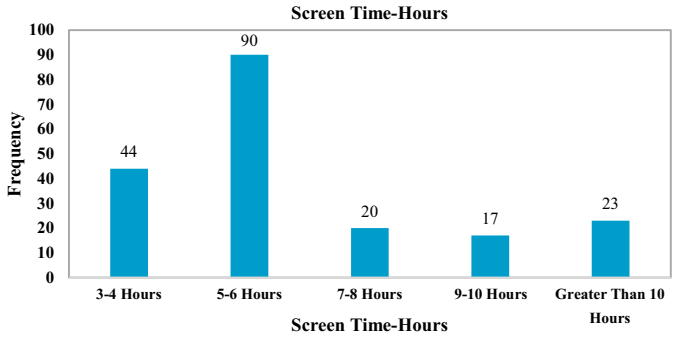

Figure 2: Screen Time (Hours)

The types of pain are illustrated in figure 3.

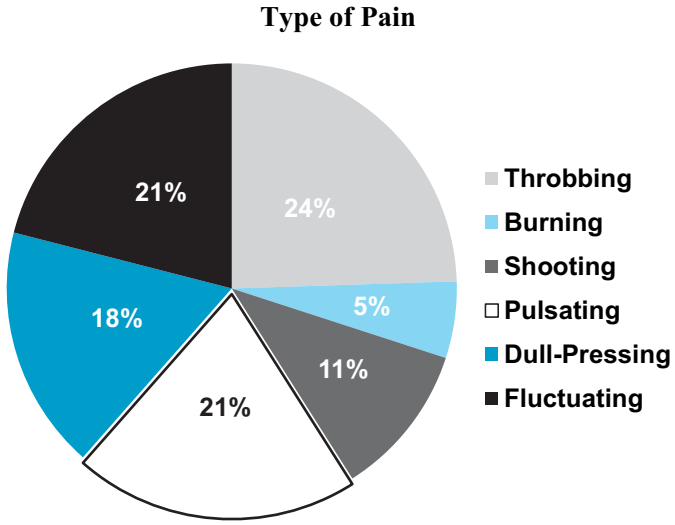

Figure 3: Types of Pains

Headache intensity for the participants were measured using the Numeric Pain Rating Scale (NPRS). The study showed that (121) 60.5% had their pain aggravated due to head movement, (79) 39.5% had their pain while staying long in a static posture, among which (131) 65.5% had pain relieved by rest and medicines, and (69) 34.5% had pain relieved only by taking medicines and shown in figure 4.

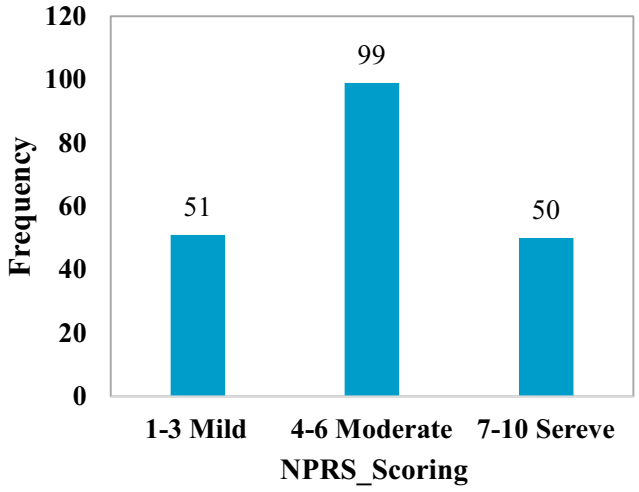

Figure 4: Headache Severity Using NPRS Scoring

For activities of daily living with headaches, the headache activities of daily living index (HALDI) was used, with a total score of 45, having nine questions (5 marks for each question). The score of 0-25% (0-11.25) mild, 26-50% (11.7-22.5) moderate, 51-75% (22.95-33.75) severe, 76-100% (34.2-45) complete impairments in activities of daily living. The HALDI score of 60.77% (27.35) falls into the "severe" group. The typical ratings for personal care, lifting, reading, sleeping, exercise, social activities, job, driving, and leisure range from 54.4% to 71.4%, as in table 2.

Table 2: Headache activities of daily living Index (HALDI)

Variables	n (%)	Mean ± SD	SD. Error Mean
Personal Care	200 (57.8%)	2.89 ± 1.129	0.080
Lifting Something	200 (54.4%)	2.72 ± 1.242	0.088
Reading from a Book or Device	200 (70.4%)	3.52 ± 1.252	0.089
Sleeping	200 (63.6%)	3.18 ± 1.275	0.090
Exercise	200 (55.2%)	2.76 ± 1.363	0.096
Social Activities	200 (60.2%)	3.01 ± 1.228	0.087
Work	200 (71.4%)	3.57 ± 1.217	0.086
Driving or travelling	200 (58.8%)	2.94 ± 1.210	0.086
Recreating Activities Like Sports, Fun, or Leisure	200 (55%)	2.75 ± 1.246	0.088
HALDI Total Score	200 (60.77%)	27.35 ± 6.642	0.470

The HALDI Score across the severity of Headache (NPRS) are represented in table 3.

Table 3: HALDI Score and Headache Severity (NPRS)

Descriptive	NPRSS Scoring	Statistic	SD. Error
HALDI Total Score (Mean ± SD)	1-3 (Mild)	25.55	1.080
		7.716	
	4-6 (Moderate)	27.66	0.603
		5.997	
	7-10 (Severe)	28.58	0.910
		6.434	

While results suggest that at the mean screen time of 5.42 hours, there was an average of 5 (NPRS) headache score, depicting that increased screen time causes an increase in headache in Freelancers and shown in figure 5.

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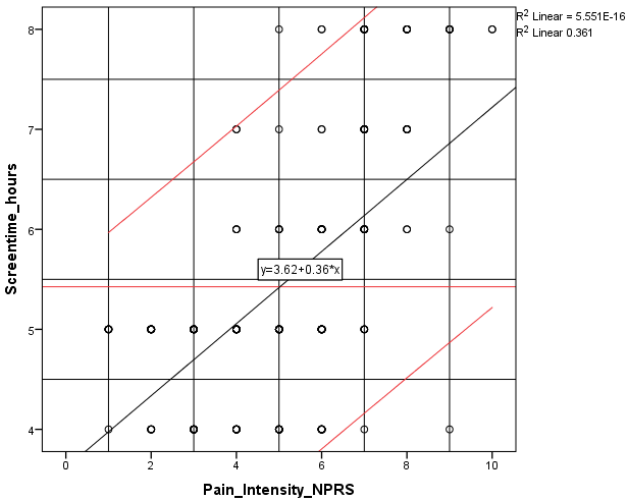

Figure 5: Correlation between Screen Time (Hours) and NPRS Score(95% CI)

The correlation analysis between the screen time and headache (NPRS) reveals a statistically significant positive relationship, with a Spearman's correlation coefficient of 0.562 (p=0.000). This indicates that as the screen time increases, individuals tend to report higher headaches, suggesting that greater screen time is associated with increasing headaches. The correlation analysis between the HALDI Total Score and Headache (NPRS) also reveals a statistically significant positive relationship, with a Spearman's correlation coefficient of 0.168 (p=0.017). This indicates that as pain intensity increases, individuals tend to report higher HALDI scores, suggesting that greater headache is associated with greater difficulties in daily activities, as shown in table 4.

Table 4: Correlation of Intensity of Headache with Screen Time and HALDI Score

Correlations			Pain Intensity NPRS
Spearman's rho	Screen Time Hours	Correlation Coefficient	0.562*
		Sig. (2-tailed)	0.000
		N	200
	HALDI Total Score	Correlation Coefficient	0.168*
		Sig. (2-tailed)	0.017
		N	200

*Correlation is significant at the 0.05 level (2-tailed)

DISCUSSION

The study results revealed that 77% of the participants suffered from Cervicogenic headaches, while 23% were diagnosed with migraines. Among the participants experiencing migraines, 25.2% experienced migraine with aura, 23% experienced migraine without aura, and others reported mixed headache types. Javed et al., highlighted reduced craniovertebral angles and impaired cervical flexion as underlying causes of Cervicogenic headaches among computer users [4,]. The significant exacerbation of headache with neck movements observed in the current study further supports these biomechanical theories. Among the migraineurs, 45% had throbbing or pulsatile pain, while 17.5% had dull pressing pain. Migraine-type headaches are triggered by static postures in freelancers who work in ergonomically suboptimal conditions. A previous study found that individuals with excessive computer use experience migraines with aura more frequently [3]. In another study, the majority of the participants (56.3%) reported no headaches, while 29.4% reported migraines, and a small number of participants also reported non-migraine headaches [5]. Freelancers are often devoid of ergonomically optimal workplaces, creating ideal scenarios for manifesting biomechanical and psychological stressors. Applying the biopsychosocial model helps us understand headache etiology in this cohort [13]. The study found that freelancers with a mean age of 25 were particularly prone to developing headaches, with daily screen time ranging from 3 to 10 hours, and 65.72% of the participants who had more than 3 hours of screen time [3]. Headache intensity and excessive screen time are positively correlated, with those having more screen time experiencing more headache symptoms [18] and higher intensity of pain [19]. Although the prevalence of Cervicogenic headache was greater in our study, a study found that increased exposure to screen time is more likely to be associated with migraine as compared to low screen time. The association was more pronounced in migraine without aura [5]. Meanwhile, another study found a significant association between screen time and migraine with aura in the pediatric population. Tension-type headache was reported by 28.1% of participants, 25.2% reported migraine without aura, 23% reported migraine with aura, while 15.8% and 7.9% reported mixed and unclassified headache, respectively [7]. The higher incidence of migraine could be attributed to participants' work-related stress and anxiety. Depression alone could increase the risk of moderate to severe migraine by 56%, while anxiety alone could increase this risk by 39%. Notably, the coexistence of both depression and anxiety could aggravate the symptoms further, with a 79% rise in risk [20]. In the current study, headache was found to be aggravated with head movement, while rest and medications alleviated pain. Pain intensity was quantified as per the numeric pain rating scale; the majority of the participants (49.5%) reported moderate pain, while 25% reported severe pain, indicating that a vast majority of the participants suffer moderate to severe pain due to excessive screen time. The current study also found a highly significant positive association between screen time and headache severity (Spearman's r=0.562, p=0.000), which aligns with the findings from Montagni et al., and Roy et al., who reported increased migraine pain with increased

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screen time [5, 20]. The current study also highlights functional impairment due to screen time-related headaches, with average HALDI score placing most of the participants in the 'severe' impairment category. Ghaffar *et al.*, and Awaki *et al.*, reported that productivity loss and decreased quality of life were major consequences of chronic headaches [6, 21]. Headache-related functional disability has physical, psychological, and financial consequences, impacting the social, academic, professional, and personal lives of people [6]. Another study focusing on migraine-related disability found that 52.7% of participants had experienced disrupted sleep cycles, while 37.4% had severe mental impairment [21]. The study findings highlight the necessity for ergonomic education, behavioral adjustments, structured breaks, and the availability of a mental health support program. These measures are critical to preserving the well-being and productivity of the freelance workforce. The study limitations include a cross-sectional study design, which limits the causal inference, and reliance on self-reported data, which may introduce recall and reporting bias. Additionally, the non-probability sampling may limit the generalizability of the study findings. Further longitudinal and interventional studies could provide deeper insights into the causality and efficacy of ergonomic or behavioural interventions.

CONCLUSIONS

It was concluded that in addition to identifying a higher incidence of screen time-related headaches, the study revealed that Cervicogenic headaches are far more common than migraine among freelancers, and the higher screen time is significantly associated with headaches. The current study's findings also suggest that headaches have a negative impact on the activities of daily living of freelancers.

Authors Contribution

Conceptualization: SH
Methodology: SA, MT, AZ
Formal analysis: SA
Writing review and editing: SH, RSA, NQ

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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