



## Original Article

### Factors Leading to Cervical Pain among Display Screen Equipment Operators; An Observational Study

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#### Abstract

**Background:** Computer operators are more to develop pain in the cervical region. With a wide range of possible risk factors, that vary from person to person, this area requires continuous investigation. So that workplace can be modified to promote work safety. **Objective:** To estimate the association of different risk factors of neck pain among display screen equipment users in office settings. **Methods:** Using display screen equipment self-assessment questionnaire and musculoskeletal discomfort form, the data was gathered from offices in different cities of Pakistan. Office workers under 60 years who used a display screen for more than an hour each day were eligible to participate in the study. While those having any history of spinal deformities, cervical surgery, trauma or malignancy was excluded. For statistical computation and analysis, the data from 122 participants were recorded in SPSS version 21. The prevalence of neck pain and frequency distribution of variables were computed. The chi-square test was used to determine the correlation between the variables, and the p-value less than or equal to 0.05 were considered significant. **Results:** Neck pain was seen in 41.8% out of the 122 study participants. It was observed to affect the daily activities of 29.4% of the population, while 62.7% had experienced discomfort in the previous week. Neck pain was found to be substantially correlated with work fulfillment, stress and male gender. While among ergonomic factors it was linked to breaks from work, the height of the screen used, and computer hardware adjustability. **Conclusion:** Many office workers using display screen equipment report cervical pain. It is associated with both workplace and individual-level factors and such problems can be avoided by enhancing workplace ergonomics.

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## Introduction

With the rapid advancement in technology, workplaces have become acquainted with display screen equipment (DSE) or video display terminal (VDT) such as monitors and laptops to promote work efficiency. For this reason, the number of individuals that use display screen equipment has multiplied.<sup>(1)</sup> These DSE users undertake multiple tasks manually and are frequently exposed to recurrent physical activities, and spend most of their time sitting in persistently uncomfortable working postures.<sup>(2)</sup> This results in an increased occurrence of discomfort among them as compared to non-computer users.<sup>(3)</sup> While the most frequently affected regions in such situations include the head/neck, upper and lower back, wrists/hands and shoulders.<sup>(2)</sup> It is typically established that the reasons leading to discomfort among DSE users can be linked to either individual or workplace factors. For instance, age, gender, physical activity, number of working hours or posture.

However, these risk factors, individually or in combination, tend to differ from person to person.<sup>(4)</sup> Although proper ergonomics training in offices can prevent such musculoskeletal pain and discomfort.<sup>(5)</sup> However, due to lack of awareness about ergonomics, such as proper placement of laptops or computer hardware creates an unsafe work environment. This in turn jeopardizes the well-being and quality of life of office workers, which further reduces their work efficiency and output. Generally, several office setups in Pakistan have unfortunate workplace ergonomics.<sup>(6)</sup> However, their link to pain and discomfort remains uninvestigated. To prioritize the importance of including workplace ergonomics within companies' policies, there is a need to first identify the most significant factors to work upon. For this reason, this study was intended to identify the prevalence of cervical pain

among display screen equipment workers and to determine the association of different risk factors of neck pain among display screen equipment users in office settings.

## Methods

Two questionnaires from diverse workplace configurations in Pakistan were filled out as part of this cross-sectional study. The first survey was derived from a display screen equipment self-assessment questionnaire. It covered questions on personal characteristics like age, sex, and personal habits. The psychological variables included stress and job fulfillment level whereas work-related factors comprised duration of work, office environment, break from work, computer hardware positioning and level, chair settings and working posture. To determine potential discomfort areas, a second Nordic questionnaire, the musculoskeletal discomfort form was used.<sup>(7)</sup>

Office workers under 60 years who used a display screen for more than an hour each day were eligible to participate in the study. While those having any history of spinal deformities, cervical surgery, trauma or malignancy was excluded. For statistical computation and analysis, the data from 122 participants were recorded in SPSS version 21. The prevalence of neck pain and frequency distribution of variables were computed. The chi-square test was used to determine the correlation between the variables, and the p-value less than or equal to 0.05 were considered significant.

## Results

The prevalence of cervical discomfort in this study was reported to be 41.8% with a mean age of participants being 34.75 years (SD 9.33). (Table I). About 29.4% of those who reported neck pain said it had kept them from working at or away from home, and 62.7% said it had flared up in the previous seven

days. About 72.5% of men and 27.5% of women who used display screen equipment, reported pain in their neck region with a p-value  $\leq 0.001$  (Figure I). Neck discomfort was associated with mental stress ( $p < 0.02$ ) and job fulfillment level ( $p < 0.023$ ) among psychosocial risk factors. Almost 29 (56.9%) participants had experienced neck pain and were under little stress, whereas 17 (33.3%) participants were under moderately heavy stress. Only one participant (2.0%) was unsatisfied with his job, whereas 39 (76.5%) were contented (Figure I). Regarding ergonomics variables (Table II), taking breaks from using DSE, the height of the display screen and adjustability of the screen, and keyboard all showed significant associations (p-values of 0.009, 0.027, 0.017, and 0.039 respectively).

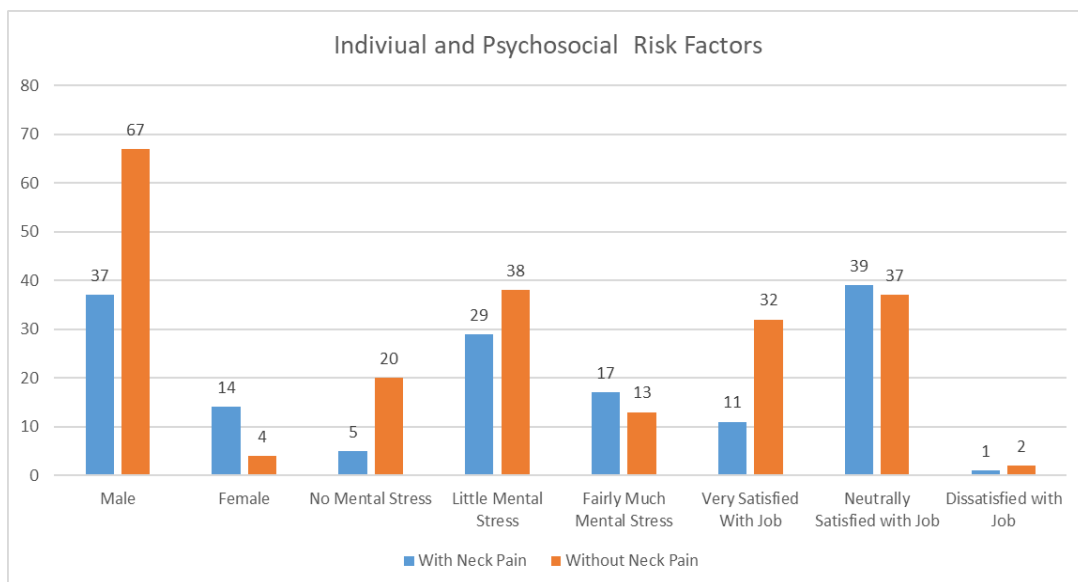
While by further categorizing neck pain associated with the frequency of work breaks;

cervical discomfort was highest among those who rarely took breaks (49.0%), followed by ones that took a break every 2 hours (33.3%) and lowest among those who took breaks every hour from their work (17.6%). Among the 37 participants that had display screens placed below the level of their eye, 21 (41.2%) had neck pain. In contrast, among the 85 participants with a display screen at the level of their eye, 55 (77.5%) had no discomfort in their necks. For those having adjustable screens, individuals without neck pain (67) outnumbered those with it (41) by a margin of 94.4% to 80.4%.

**Table I: Cervical pain occurrence in DSE users**

Cervical Pain	Percent
Yes	41.8%
No	58.2%
<b>Total</b>	<b>100.0%</b>

**Figure I: Association of individual and psychosocial risk factors with neck pain**



**Table II: Distribution of frequency and cross-tabulation of work-related risk factors with neck pain**

Work-Related Factors		Distributions of Frequency		Neck pain among DSE users: Cross-tabulations				Significant value (p<0.05)
				Cervical Pain		No pain		
		#	Percent	#	Percent	#	Percent	
Workplace lights	Adequate	104	85.2%	44	86.3%	60	84.5%	<b>0.786</b>
	Inadequate	18	14.8%	7	13.7%	11	15.5%	
Workplace Temperature	Cold	13	10.7%	6	11.8%	7	9.9%	<b>0.462</b>
	Neutral	108	88.5%	44	86.3%	64	90.1%	
	Warm	1	0.8%	1	2.0%	0	0.0%	
DSE Usage Time	>1 hour/day	1	0.8%	0	0.0%	1	1.4%	<b>0.148</b>
	>2 hours/day	8	6.6%	1	2.0%	7	9.9%	
	> 50% of working hours	113	92.6%	50	98.0%	63	88.7%	
Breaks from DSE usage	Rarely	41	33.6%	25	49.0%	16	22.5%	<b>0.009</b>
	After every hour	31	25.4%	9	17.6%	22	31.0%	
	After every 2 hours	50	41.0%	17	33.3%	33	46.5%	
Screen Location	Front	112	91.8%	49	96.1%	63	88.7%	<b>0.145</b>
	At side (Left Or Right)	10	8.2%	2	3.9%	8	11.3%	
Screen Height	At the level of eye	85	69.7%	30	58.8%	55	77.5%	<b>0.027</b>
	Below the level of eye	37	30.3%	21	41.2%	16	22.5%	
Adjustable Screens	Adjustable	108	88.5%	41	80.4%	67	94.4%	<b>0.017</b>
	Non-adjustable	14	11.5%	10	19.6%	4	5.6%	
Keyboard usage	Lean to use the keyboard	70	57.4%	30	58.8%	40	56.3%	<b>0.784</b>
	Do not lean to use the keyboard	52	42.6%	21	41.2%	31	43.7%	
Keyboard Type	Adjustable	105	86.1%	40	78.4%	65	91.5%	<b>0.039</b>
	Non-adjustable	17	13.9%	11	21.6%	6	8.5%	
Mouse usage	Enough space	112	91.8%	44	86.3%	68	95.8%	<b>0.059</b>
	Not Enough space	10	8.2%	7	13.7%	3	4.2%	
Average Sitting Time	Around 3hrs	8	6.6%	2	3.9%	6	8.5%	<b>0.603</b>
	Around 6hrs	45	36.9%	19	37.3%	26	36.6%	
	Around 8hrs	69	56.6%	30	58.8%	39	54.9%	
Chair Comfort	Comforting	103	88.4%	40	78.4%	63	88.7%	<b>0.122</b>
	Distressing	19	15.6%	11	21.6%	8	11.3%	
Type of chair	Adjustable for height	110	90.2%	49	96.1%	61	85.9%	<b>0.063</b>
	Not adjustable	12	9.8%	2	3.9%	10	14.1%	

Distance between chair arms and desk	None	76	62.3%	28	54.9%	48	67.6%	0.153
	Present	46	37.7%	23	45.1%	23	32.4%	
Elbow forms 90 degree	Yes	62	50.8%	23	45.1%	39	54.9%	0.284
	No	60	49.2%	28	54.9%	32	45.1%	
Supported Back while using keyboard	Yes	53	43.4%	17	33.3%	36	50.7%	0.056
	No	69	56.6%	34	66.7%	35	49.3%	

Whereas for non-adjustable screens, participants with pain (10) outnumbered those without it (4) by a margin of 19.6% to 5.6%. Among those using adjustable keyboards, 78.4% reported neck pain, compared to 21.6% of those using non-adjustable keyboards. Sitting duration and tilting forward while using a keyboard had a positive correlation with cervical pain, but statistical evidence did not support an association with cervical discomfort. (Table II).

## Discussion

This study found that neck pain was prevalent in 41.8% of the population. A study was conducted by Johnson et al. in 2008, to find the association between cervical pain and the female gender, and it was found that it is more common among middle-aged women.<sup>(8)</sup> It could be the result of the smaller sample size of women and the unequal representation of both gender. Accordingly, Lund et al in 2011 reached a consensus about the link between a greater BMI and lack of physical activity and an increased risk of low back and neck discomfort.<sup>(9)</sup>

While Palmer et al. discovered a substantial association between smoking and localized discomfort that was visible also in former smokers.<sup>(10)</sup> But in this study, there was no statistically significant difference between these characteristics and neck pain. However, this current investigation validated a review by Arieëns et al., who established a significant

link between neck discomfort and workplace challenges, low income, high and low-skill options, and less job fulfillment.<sup>(11)</sup> Neck pain can be reduced to some extent by receiving suitable ergonomics training.

The importance of ingraining regular breaks from work during office hours is highly supported by the evidence.<sup>(12)</sup> Whereas viewing display screens through desktop monitors (at the level of the eye) instead of laptops (below the level of the eye) is desirable as it preserves an upright head posture.<sup>(13)</sup> Similarly, neck pain associated with computer use has also been related to the keyboard's fixed height and a forward-curving neck.<sup>(14)</sup> This study, on the other hand, was not viewed as being supportive of a longitudinal study by Eltayeb et al.<sup>(15)</sup>, where the number of working hours per day was also established as a potential factor for neck discomfort, as well as the recommendation that decreasing the keyboard height or maintaining support for the back while typing would lessen discomfort in the neck among computer users.<sup>(16,17)</sup>

## Conclusion

The prevalence of neck pain among DSE users is reported to be substantial, and it is observed to significantly correlate with stress, job fulfillment, male gender, pauses from DSE usage, and adjustability of screen and keyboard height and position. Workplace factors are modifiable and preventable. Considering them during the workplace design

phase or while upgrading workstations, can improve the health outcomes of office employees. It can also be achieved by introducing workplace ergonomics training where computer operators can adjust their workstations properly to prevent strain or discomfort in their neck muscles.

## Declarations

**Consent to participate:** Written consent had been taken from patients. All methods were performed following the relevant guidelines and regulations.

**Availability of data and materials:** Data will be available on request. The corresponding author will submit all dataset files.

**Competing interests:** None

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**Authors' contributions:** All authors read and approved the final manuscript.

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