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Original Article

Association Between Visual Impairment and Neck Pain in Computer Users; A Cross-Sectional Study

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ABSTRACT

The most common cause of disability in the world is visual impairment. It is a condition that impairs vision and may not be improved by corrective lenses. The key factor for visual impairment is near vision. Nearly 10–21% of people report having neck pain at work, which contributes to forward head position and neck pain. **Objective:** This study examined the relationship between visual impairment and neck pain-related complaints brought on by awkward or bad posture among computer users between the ages of 21 and 30. **Methods:** 141 computer users between the ages of 21 and 30 were chosen for a cross-sectional study based on inclusion and exclusion criteria. The Neck Disability questionnaire and the Visual Functioning Questionnaire - Near Activities Subscale (VFQ-NAS) were used, respectively, to evaluate neck discomfort and visual impairment. **Results:** When performed one at a time with each group, and when the whole set of data was considered to correlate each other, there is a correlation between visual and neck-related complaints that provided significant value (P0.05) of the Chi-square. **Conclusions:** It is concluded that there is a strong relationship between visual impairment (nearsightedness) and neck pain.

INTRODUCTION

The steadily increasing use of computers, smartphones, and tablets for work and play has resulted in health issues, the majority of which are related to the eyes, including pain, strain, fatigue, tiredness, burning, red, and/or irritated eyes, blurred vision, and double vision, as well as neck and shoulder pain. The population who is visually handicapped has endured great suffering as a result. A disorder known as visual impairment reduces visual performance and may not be improved by surgery, medicine, or refractive devices [1]. The leading preventable cause of disability worldwide is visual impairment. Myopia, an uncorrected refractive defect, is the main factor in vision impairment. Uncorrected refractive defect (myopia) causes people to focus on objects by altering their physical appearance, such as squinting their eyes [2]. Squinting causes them to have a pinhole effect, which may result in a more accurate visual impression [3]. The orbicularis oculi muscle, which surrounds the eye, contracts when someone squints. Continuous continuing contraction of the annular muscle over a prolonged length of time affects the tear film, the surface of the cornea, and the eyelids, and is associated with symptoms in the neck and scapular region [4-5]. The additional ocular muscles contain some sensory receptors called "muscle spindles and my tendinous cylinders."

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Proprioceptive inputs from tendons and joints combine with visual information to contribute to the fused, integrated, perceptual map of the environment, and these receptors are implicated in practically all sensorimotor-driven motions [6]. Specific neck and scapular muscles may be used asymmetrically as a result of incorrect head-to-trunk alignment. These components are all involved in postural imbalance. The body's position in which we have the ideal body mass distribution is called posture. Postural balance may give the body the support it needs to move normally in either a stationary or moving position. The visual, vestibular, and somatosensory systems collaborate to maintain postural balance [7]. Poor postural control is caused by any misalignment between these systems. Low vision may result from any visual impairment, which raised the pressure on the vestibular and somatosensory systems. When a person tries to focus on something in order to see properly but is unsuccessful owing to visual system malfunction, it may even become symptomatic. By squinting, hunching forward, or even by tilting the head unevenly to grip the head forward for straight-ahead vision, the body finds an effective technique to focus its aim. The forward head posture (FHP) may result from daily adaption to this position (long hours per day) [8]. Some head and neck muscles become tight or extended in the forward head posture, whereas other muscles get tight or shortened. (Deep cervical flexors longus capitus and longus colli), (Erector spinae lower cervical and higher thoracic), and other muscles get long and weaker (Shoulder blade retractors middle trapezius and rhomboid muscles). Muscles like the Levator scapulae, Sub occipital, and Chest muscles that are short and tensed may go into spasm or strain, putting undue tension on the neck. Some head and neck muscles become tight or extended in the forward head posture, whereas other muscles get tight or shortened. (Deep cervical flexors longus capitus and longus coli), (Erector spinae lower cervical and higher thoracic), and other muscles get long and weaker (Shoulder blade retractors middle trapezius and rhomboid muscles). Muscles like the Levator scapulae, Suboccipital, and Chest muscles that are short and tensed may go into spasm or strain, putting undue tension on the neck [9]. The aforementioned factors are related to one another, and neck pain appears to be more prevalent. It is unknown what causes neck/scapular area and visual discomfort to coexist. Symptoms of these two categories are typically covered separately in applied and clinical research. Eye-neck and scapular area symptoms are caused by several internal and external sources. These elements may operate alone or occasionally in combination to cause symptoms. People with visual impairment may be impacted by both internal visual deficiencies and the requirement for vision-improving equipment. According to a national survey conducted in Sweden, neck pain affects people with near-vision issues twice as frequently as it does people with normal vision [12]. Nearly 10-21% of people report having neck pain while at work. Additionally, women are more likely to experience it than men [13]. In terms of disability, neck pain ranks fourth globally and twenty-first overall in terms of pain burden. Neck discomfort is common in various nations, with 52% of people reporting it in India, 57% in New Zealand, 48% in the USA, and 83.8% in China [14]. By treating the visual impairment with the use of the proper refractive aids, various exercises, and by keeping the forward head posture, neck pain associated with visual impairment is managed. The following eye exercises help lessen eye strain: 1) The 20-20-20 rule states that you should take a 20-second break every 20 minutes to focus on something that is around 20 feet away. 2) Shifting the emphasis Figure of eight; scan the space; 5) Eyes blinking. Fix the forward head posture using various strategies, such as Kendall strength training to lessen the forward head position and subsequently neck discomfort and McKenzie's neck stretching techniques for the correction of neck posture [15]. There are a few exercises described that can help to reduce the forward head position. stretch your neck, chin, and anterior chest. reach from the ear to the shoulder, stretching from ear to shoulder while applying pressure movement of the head, head movement with excessive pressure, a head turn supported by the elbows, supine head rotation, whilst seated, rotating the head Isometric neck rotation, looking up and down while seated, isometric neck extension, isometric neck flexion, isometric neck lateral flexion, isometric neck flexion, standing with the back extended, Neck elongation [16]. Additionally, when in 4-point kneeling, extend your neck. Neck flexion, 4-point kneeling neck flexion and extension, elbows supporting neck extension and flexion Neck flexion while kneeling in four points, neck flexion while sitting, Neck lateral flexion, Neck lateral flexor stretch, Neck retraction in sitting, Neck flexor/extensor stretch, in a 4-point squat, rotate your neck. Neck stretches, include neck stretches over the edge of the bed, neck rotator stretches, Stretching the pectorals in the doorframe strengthening your shoulders while you're standing, sitting, or lying down. Crossing your arms as you stand up from your chair, stretching the spine when seated with the arms crossed, Standing and scanning the sky and ground, In the doorframe, stretch [17]. Visual impairment a detriment of posture and neck pain is the most common problem of now a day. Numerous clinical and applied investigations address neck, posture, and their related disorders individually. According to my research and knowledge, there aren't many studies that take into

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account "Age Related Muscular Degeneration" and the combined effects of neck pain and vision loss. In order to overcome both restrictions, I chose the demographic of office employees who spend more than six hours each day at their desks (office workers > 6 hours) for this study.

METHODS

Participants were selected from private companies (Riaz Ahmad & Co., RSM International & Co., UHY & Co). Study was conducted on both males and females. It took six months to complete this study after the approval of synopsis. This was a cross sectional study design conducted on computer users. All participants were employed as computer employees between the ages of 21 and 30 who put in more than six hours a day of work without the use of glasses or contact lenses. Participants without systemic illnesses or physical deformities were also included. People with head and neck injuries, cancer, collagen vascular diseases, psychiatric problems (depression), eye diseases such ARMD and diabetic retinopathy, as well as those who had had refractive correction surgery, were excluded from my investigations. The National Eye Institute founded the National Institute of Eye Health, and Oswestry Low Back Pain Index were used to collect the data. To examine the relationship between neck pain among computer users and vision impairment, Pearson's correlation was used. The IBM Statistical Package for Social Sciences version 26.0 were used to analyze the data. Statistics, descriptive Age, gender, and working hours each had mean values, medians, modes, standard deviation values, frequencies, and percentages determined. A p-value of 0.05 or higher was deemed significant.

RESULTS

Table 1 shows that out of total sample 141, 87 (61.7%) were male & 54 (38.3%) were female. 60.28% were with age range of 21-25years and 39.72% with the age of 26-30years.In response to "How many working hours do you work" 89(63.1%) were doing work more than 6 hours a day and 52(36.9%) with less than 6 hours a day. Mean values of the Age, Gender & working hours were 1.3972, 1.3830 & 1.3688 respectively. Median & mode of all the variable was 1.00. Standard deviation of Age, Gender & working hours were 0.49105, 0.48785 & 0.48420 respectively. Total scoring of NDI 25.5% had no disability or neck pain, 42.6% had moderate neck pain & 31.9% had severe neck pain. Total scoring of NEI-VFQ-25 19.9% had no visual symptoms, 4.3% had mild symptom, 7.1% had moderate, 37.6 had severe symptoms & 31.2% had visual impairment. Mean value of NDI & VFQ-NAS was 1.81 & 2.5603 respectively. Median value of NDI & VFQ-NAS was 2.09 & 2.5603 respectively. Mode value of NDI & VFQ-NAS was 2.09 & 3.000 respectively. Std. Deviation of NDI & VFQ-NAS was 1.146 & 1.47051 respectively.

Quartile & Interquartile values of all variables					
Variables	**Ranges**	**Frequency(%)**	**Mean ±SD**	**Median**	**Mode**
Age	21-25	85(60.3%)	1.3972	1.0000	1.00
	26-30	56(39.7%)			
	Total	141(100%)			
Gender	Male	87(61.7%)	1.3832	1.0000	1.00
	Female	54(38.3%)			
	Total	141(100%)			
Working hours	More than 6 hours	89(63.1%)	1.3688	1.0000	1.00
	Less than 6 hours	52(36.9%)			
	Total	141(100%)			
NDI	0-3=no disability	36(25.5%)	1.81	2.00	2
	12-19=moderate	60(42.6%)			
	20-25=severe	45(31.9%)			
	Total	141(100.0%)			
VFQ-NAS	0-3=no problem	28(19.9%)	2.5603	3.0000	1.00
	4-11=mild	6(4.3%)			
	12-19=moderate	10(7.1%)			
	20-25=severe	53(37.6%)			
	26-40=complete	44(31.2%)			

Table 1: Quartile & Interquartile values of all variables

Table 2 shows that out of 141 participants 28 were having no problem related to visual impairment as well as no neck related disability found. 6 participants had mild visual problem & no neck related symptoms found. 2 participants had moderate visual related problem & moderate neck related disability found. Out of 53 severe visual impaired participants, 49 participants were with moderate & 4 participants were with severe neck related symptoms. Out of 44 participants with complete visual impaired symptoms had 3 participants with moderate & 41 participants with severe neck related symptom and the relation between NDI and VFQ-NAS is strong as it P value is significant i.e. P<0.05.

Visual functioning	Neck Disability Index-NDI			Total	P-Value
	0-3(No disability)	12-19 (Moderate)	20-25 (Severe)		
0-3 (No problem)	28	0	0	28	0.001
4-11 (Mild problem)	6	0	0	6	
12-19 (Moderate problem)	2	8	0	10	
20-25 (Severe problem)	0	49	4	53	
26-40 (Complete)	0	3	41	44	
Total	36	60	45	141	

Table 2: Association between visual functioning and neck disability

Table 3 shows that out of 141 participants, 89 were "work more than 6 hours" only 19 had no disability, 25 with moderate & 45 with severe neck related symptoms. 52 participants "work less than 6 hours" only 17 were with no disability, 35 with moderate & no participant with severe pain. SO The relation between NDI and working hours was strong as P value is significant i.e. P<0.0.

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Working hours	Neck Disability Index-NDI			Total	P-Value
	0-3(No disability)	12-19 (Moderate)	20-25 (Severe)		
More than 6 hours	19	25	45	89	0.001
Less than 6 hours	17	35	0	52	
Total	36	60	45	141	

Table 3: Cross tabulation of Neck Disability Index & working hours

Table 4 shows that out of 141 participants, 89 participants were "work more than 6 hours" only 16 had no visual related problem, 2 with mild & moderate, 25 with severe & 44 had complete Visual impairment. 52 participants "work less than 6 hours" only 12 had no visual related problem, 4 & 8 with mild & moderate respectively, 28 with severe & no participant had complete Visual impairment. The relation between VFQ-NAS and working hours is strong as it P value is significant i.e. P<0.05.

Working hours	Working hours		Total	P-Value
	More than 6 hours	less than 6 hours		
0-3 (No problem)	16	12	28	0.001
4-11 (Mild problem)	2	4	6	
12-19 (Moderate problem)	2	8	10	
20-25 (Severe problem)	25	28	53	
26-40 (Complete)	44	0	44	
Total	89	52	141	

Table 4: Cross tabulation between visual functioning and working hours

DISCUSSION

This study was purposely formulated to highlight the association of visual system & neck related issues like neck muscles strains, weakness, tightness, spinal curvature disturbance, trigger points etc. Neck pain complaints highly associated with many other factors other than visual impairment. As current study showed significant outcomes by the consideration of external factors of visual impairment. Focusing problem found frequently in visual impaired individuals without using refractive aids. In a previously conducted experimental study by "Camilla Zetterberg" in 2017 on "Neck/shoulder discomfort due to visually demanding experimental near work is influenced by previous neck pain, task duration, astigmatism, internal eye discomfort and accommodation" have taken 33 participant of chronic neck pain & 33 with control group & did 4 different trail tests by using 4 different types of lens to evaluate the internal & external factors of visual symptoms. Results shows that symptoms of internal eye discomfort aggravated neck/shoulder discomfort, but there was no significant effect of external eye discomfort [18]. As compared to this my study was a cross sectional and I specified the participants of computer users with sample size of 141 by specifying the age limit of 21-30 years to assess that individuals with nearsightedness associated with the neck pain by using VFQ-NAS and NDI to correlate visual related QOL with neck pain. The focus of my study was external parameter of visual acuity and found a highly significant (P<0.001) results. Another study "Possible Role of Myopia as a Risk Factor for Mechanical Neck Pain in Medical Students" A Pilot Study" by "Bahareh Kardah" in 2019 conducted to evaluate association of myopia and neck pain in medical students by using NDI & NPDS. NDI and NPDS were significantly higher in the case group (P<0.001). However, no significant differences were noticed between the groups regarding the severity (P=0.123) and the duration (P=0.417) of myopia. Also, the correlation of myopia severity with NDPS (ρ=0.159, P=0.216) and NDI (ρ=0.201, P=0.116) was non-significant within the case group [19]. As compared to this I selected a general population with specifying the computer usage more than 6 hours. I found the high prevalence of Neck pain in those having the visual impairment and working more than 6 hours. VFQ-NAS used for visual assessment and NDI for the neck pain. Pearson's correction showed positive correlation of VFQ and NDI. This study closely related to my study. Another clinical assessment was performed by Zetterlund & co-authors to account for the effect of low vision on age-related macular degeneration (ARMD) patients. For this assessment, a group of 24 ARMD patients, aged 65 to 85, with low vision and 24 patients with normal vision were selected. The VFQ- NAS and self-assessment questionnaire developed was used to assess these patients' complaints of neck & scapular area muscles. The results of this assessment supported the purpose of this assessment [20]. But in this study I used the assessment tool for VFQ-NAS, 5 questions same as they used in their study & NDI but the purpose of my study is to explore the relation of visual impairment of young adults rather than old age group with the neck pain due to poor posture and found a significant result of Pearson's chi-square correlation P<0.001.During this research study I found difficulty in the assessment of forward head posture because of lack of questionnaire related all the parameters of visual, forward & neck pain. Due to lack of resources and participant's co-operation I didn't move to the other assessment methods rather than questionnaire. A combination of 2 questionnaires VFQNAS & NDI used for the assessment of visual function & neck pain respectively. The significant values (p=0.983, p=0.0001) of the results showed strong association between Visual dysfunction and neck pain favor this study. Visual impaired participants who did computer work more than 6 hours a day ultimately suffer from neck related musculoskeletal issue as P<0.05 showed high significance.

CONCLUSIONS

It was concluded that visual impairment in office workers lead to neck pain. Findings also indicate that increasing level of nearsightedness can significantly increase neck

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pain, particularly when the working hours are > 6 and when the information provided by the somatosensory is disrupted due to disruptive functioning of visual system. As it is expected that poor quality input from the visual organs induce postural imbalance subsequently leading to neck pain. These findings highlight that those individuals who require refractive correction has a greater risk of neck pain.

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