Research Article

Upper limb musculoskeletal disorders associated with computer usage in health-care professionals

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Abstract

Background: Musculoskeletal disorders following heavy computer usage are common and well known and usually affect the upper limb. Health-care professionals are also prone to these disorders; however, the effect on health-care professionals has rarely been reported.

Objective: To assess the prevalence of computer-related upper limb musculoskeletal problems among health-care students, as it can significantly affect the patient health care and the health-care system as a whole.

Materials and Methods: Four hundred fifty health-care students attached to a tertiary-care hospital were evaluated for computer-associated upper limb musculoskeletal problems using modified Maastricht Upper Extremity Questionnaire (MUEQ) and Revised Short Musculoskeletal Function Assessment (SMFA) Questionnaire.

Result: Prevalence of upper limb disorders was 45% in the study population. About 35.69% of the total problems were related to neck, 17.44% to shoulder, 19.62% to arm and forearm, 16.08% to wrists, and 11.17% to hands. Overall, Bothersome Index was higher at follow-up when compared with the beginning of study.

Conclusion: Upper limb musculoskeletal disorders following heavy computer usage have a large prevalence among health-care professionals, and adequate steps for awareness and treatment of these disorders should be taken to provide better patient care and improve the health-care system.

KEY WORDS: Musculoskeletal disorders, CANS, health-care professionals, computer-related diseases

Introduction

Work-related upper limb disorders are well known. In 2000, at the Georgetown conference on, "Bio-behavioral mechanisms of work-related upper extremity disorders," a summary of mechanisms responsible was given. It was revised at a later date. The term work-related musculoskeletal disorder (WMSD) comprises various conditions of the muscles, bones, ligaments, cartilage, and joints, which arise owing to nontraumatic causes.[1,2]

Millions of computers are installed each year, and their number is ever increasing.[3] With the increase in sale of computers, there has been a proportionate increase of usage and an associated increase in the number of musculoskeletal problems, especially, involving the upper limb.[4–6] Usage of just 3 h/day can lead to occupational overuse syndrome (OOS), computer vision syndrome (CVS), low back pain, tension headaches, and psychosocial stress.[7]

Multiple studies on college students involving engineering students, office workers, and workers in information technology have been done.[4,8–11] Complaints of arm, neck, and shoulder (CANS) were recognized about 3 decades back as a major cause of work-related inefficiency. The term CANS indicates "musculoskeletal complaints of arm, neck and/or shoulder not caused by acute trauma or by any systemic disease."[12]

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Computer-related upper limb problems were reported in 28% of the population in the Netherlands.[13] European data showed that 25% of the workers reported work-related neck or shoulder pain and 15% reported work-related arm pain.[14]

Health profession is not immune to these problems, and the incidence is increasing with each passing day as the use of technology in health care grows considerably. However, there have hardly been any reports of computer-associated musculoskeletal disorders in health professionals. We did this study to evaluate the prevalence of upper limb disorders associated with computer usage in a hospital setting, as we believe this can have a significant effect on the health-care delivery to the patient, and, therefore, it is of utmost importance to recognize and intervene at an appropriate time.

Materials and Methods

This prospective study was conducted at a tertiary-care hospital over a period of 1½ years from 2010 to 2012 after approval by the institutional review committee (Ethics Board). Four hundred fifty participants were enrolled for the study. The minimum follow-up period was 3 months.

Subjects enrolled in the study were students of nursing, medicine, physiotherapy, and dental colleges and were directly involved with health-care delivery to the patients. Enrolment was done on the basis of computer use for a minimum of 7 h/week on an average for 1 year. Those with usage less than 7 h/week or a total of less than 1 year usage were not included. All the participants with a preexisting musculoskeletal problems were excluded, based on the history and examination findings.

Informed consent was taken from all the volunteers. Maastricht Upper Extremity Questionnaire (MUEQ) and Revised Short Musculoskeletal Function Assessment (SMFA) Questionnaire[15,16] were used for the assessment. For each participant, Bothersome Index (BI) was calculated as per the revised SMFA questionnaire.[16] Different types of questionnaire have been used by other studies [Table 1].[4,8–11,16–24]

Two hundred two subjects were identified for upper limb problems, and the data related to them were tabulated and analyzed using SPSS software, version 19. Mean, standard deviation, Student's *t*-test, Pearson's correlation, χ^2-test, and Mann–Whitney test were used for calculations. A $p < 0.05$ was taken as significant. For reporting of the results, the upper limb complaints were subdivided into neck, shoulder, arm, forearm, wrist, and hand.

Result

Upper limb involvement including neck was seen in 202 students of the total of 450, which constituted 45% of the total students. The total number of symptoms seen in neck and upper limb, which came under CANS, was 367 in 202 study subjects, as many presented multiple symptoms.

Table 1: Questionnaires and scores

Authors	Questionnaires/scores
Katz et al.[8]	Own questionnaire
Hupert et al.[9]	Brigham System Severity Scale (1995)
	Brigham Functional Status Scale(1993)
Juul-Kristensen et al.[21]	Own questionnaire
Schlossberg et al.[10]	Student Health Related Role Function (SHRRF) 2002
Suparna et al.[11]	Standardized Nordic Questionnaire
Bhanderi et al.[17]	Own questionnaire
Eltayeb et al.[16]	Maastricht Upper Extremity Questionnaire (MUEQ 1999)
Jenkins et al.[20]	Brigham and Women's upper extremity System Severity Scale (1993)
	Student Role Functioning Scale (2002)
	College Computing and Health Survey (2004)
Palm et al.[23]	Own questionnaire
Menendez et al.[22]	Brigham and Women's Upper Extremity System Severity Scale (1993)
	College Computing and Health Survey (2004)
Bostrom et al.[18]	Own questionnaire
Eltayeb et al.[16]	Arabic version of Maastricht Upper Extremity
	Questionnaire (MUEQ 1999)
Talwar et al.[24]	Own questionnaire
Jacobs et al.[19]	Pre/Post Boston University Notebook Computer and Health Survey
	PDA- based questionnaire survey
	The pre/postergonomic quiz
Our study	Modified Maastricht Upper Extremity Questionnaire (MUEQ)
	Revised Short Musculoskeletal Function Assessment (SMFA) Questionnaire

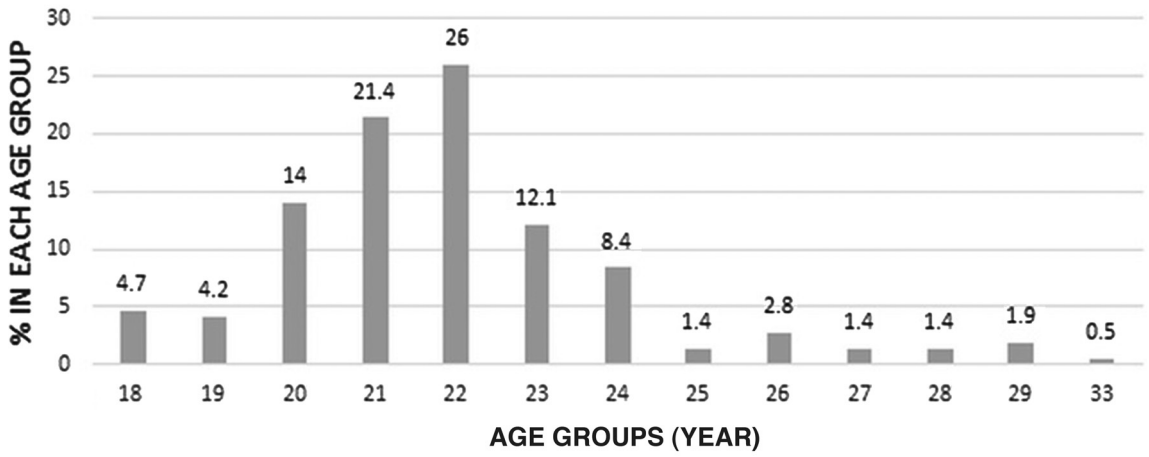

Figure 1: Percentage-wise distribution of students in various age groups.

Table 2: Relationship between computer type and upper limb stiffness

Computer type	*N*	UL stiffness		%
		No	Yes	
Desktop	57	40	16	28
Laptop	143	132	11	7.7
Both	2	2	0	0
Total	202	175	27	

χ^2value 17.140; $p = 0.0001$.

Table 3: Relationship between Usage hours and hands involvement

Usage hours (h/week)	*N*	Hand		%
		No	Yes	
7–21	165	150	12	7.27
22–35	24	23	3	12.5
36–56	11	9	3	27.27
>56	2	0	2	100
Total	202	182	20	

χ^2value 10.024; $p = 0.018$.

Neck-related problems were related to 35.69% of the total problems, 17.44% to shoulder, 19.62% to arm and forearm, 16.08% to wrists, and 11.17% to hands.

Age group ranged from 18 to 33 years with a mean age of 22 years. Of the 202 subjects, 141 (70%) female subjects and 61 (70%) male subjects were symptomatic for CANS.

Figure 1 shows the percentage-wise distribution in various age groups.

Of the 202 students, 57 used desktops, 143 used laptops, and 2 used both laptops and desktop computers. Eighty-five students had been using computer for over 5 years, 60 students for the last 2 years, and 57 for the last 2–5 years [Table 2].

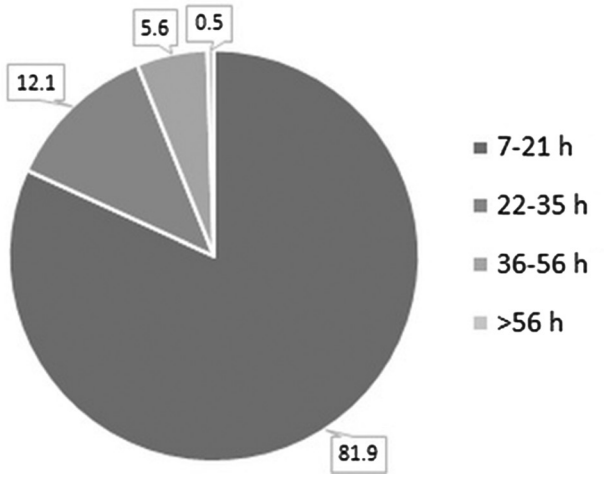

Figure 2: Percentage distribution of computer usage by hours per week.

Majority of the students (165/202) were using computers for an average of 1–3 h/day. Twenty-four students were using computers for 2–5 h/day, 11/202 used for 5–8 h/day. Only 2 students used for more than 8 h/day (>56/week). Relationship of usage hours to upper limb stiffness and involvement of hands is shown in Table 3.

Percentage distribution of computer usage by hours per week is shown in Figure 2.

Highest number of problems was related to neck with 131 of 202 students having neck-related problems owing to computer usage. Sixty-four subjects showed shoulder-related problems, while 138 did not have any shoulder complaints. Bilateral involvement of shoulders was seen in 37 (57.9%), right sided in 8 (13.2%), and left sided in 19 (28.9%).

Forty-seven of the 202 (23.3%) students showed symptoms involving the arm, when compared with 155 (76.7%) being asymptomatic. Nine subjects revealed bilateral involvement, 8 subjects left-sided, and 30 subjects right-sided symptoms. Twenty-five of the 202 (12.5%) showed symptoms involving the forearm when compared with 177 (76.7%) being asymptomatic. Five showed bilateral involvement and 3 showed left sided and 17 showed right sided symptoms.

Fifty-nine subjects and 24 subjects of the 202 subjects showed wrist- and hand-related problems, respectively. Finger stiffness was reported by 44 individuals, of which 41 said the stiffness disappeared after rest. Similarly, finger numbness was also complained by 15 students, 13 of which resolved after a short period of rest.

In our study, the period of inactivity among symptomatic students was from 0 to 28 days with the mean period of inactivity being 1.43 days. Around 64% students did not have any period of inactivity. Studies in 13.3% students and leisure activities in 14.2% were hindered owing to severity of symptoms. In 7.6% students, the symptoms' severity forced them to consult a doctor.

Sick leave for symptoms was taken by 6.7% students and 25.8% students had to take some treatment for their symptoms, and the most (22.5%) preferred treatment was physiotherapy. Physiotherapy treatment was significantly (p = 0.0001) more sought by physiotherapy students, which may be attributed to self-treatment, easy accessibility, and higher belief in the therapy.

Majority of the students showed pain, fatigue, finger stiffness, numbness, leg cramps, and hand swelling following prolonged computer usage, which disappeared after a short rest, signifying that the problems associated were transient and not persistent.

The BI in the study ranged from 0 to 77.5. The mean initial BI and final BI were found to be 10.87 and 11.17, respectively. Among symptomatic subjects, the mean initial BI and final BI were found to be 14.39 and 14.70, respectively. The mean BI among symptomatic patients was greater than asymptomatic students. The difference was found to be statistically significant (p = 0.005).

Discussion

The overall prevalence of CANS in the study is similar to many other studies. Thirty-six percent of overall involvement of neck and upper limb was seen in the study by Hupert et al.[9] Other studies have also showed almost similar rates with a combined average of about 35%–40%.[4,10,20,22] Some studies have, however, reported lower rates of up to 30%.[16,24]

Maximum prevalence of neck-related complaints in our study is similar to other studies, which have also reported a maximum ratio of complaints in the neck among all the CANS group disorders.[4,20,22] Others have reported lower rates of neck symptoms in their study. Around 49% was reported by Talwar et al.[24] and 56% by Hupert et al.[9] Eltayab et al.[16] in their study have reported considerably lower rates of 33%.

Shoulder problems seen in our study were similar to that reported by Eltayab et al.[16] Only half of this was observed in the study by Talwar et al.[24] Some authors have reported higher incidence of these problems in their study, with 56% reported by Jenkins et al.[20] and 67% by Menendez et al.[22]

Prevalence of arm- and forearm-related complaints are similar to some other studies that were reviewed.[4,9,10,16,20,22,24] However, hand- and wrist-related problems were comparatively very low when compared with other studies. Most studies have significantly higher rates of hand and wrist involvement. Hupert et al.[9] reported 64% in wrist and 40% hand complaints. Finger stiffness and numbness have also been reported by some authors. Hupert et al.[9] showed 29%, Jenkins et al.[20] showed 28%, and Menendez et al.[22] showed 33% finger-related complaints in their studies.

A summary comparing all the studies in relation to the affected regions of the body is given in Table 4.

We duly acknowledge the limitations of our study. The main limitation of our study is a small population included in the study, However, the main strength of the study lies in the fact that a specific subset of health-care professionals is the main focus of the study, and to the best of our knowledge, this is the first study to address and study this issue in health-care professionals.

Table 4: Comparison of studies by different regions involved

Author	Neck (%)	Shoulder (%)	Arm (%)	Elbow (%)	Forearm (%)	Hand (%)	Wrist (%)	Fingers (%)
Hupert et al.[9]	56	39	11	15	37	40	64	29
Schlossberg et al.[10]	35		21	53				
Eltayab et al.[16]	33	31	32	16	21	30	21	-
Jenkins et al.[20]	72	56	11	11	16	36	51	28
Menendez et al.[22]	70	67	17	13	27	50	53	33
Eltayab et al.[4]	64	41	32	19	21	30	29	-
Talwar et al.[24]	48.6	15.7	23.1					
Present study	65	31.7	23.3	-	12.5	20	29.2	-

Conclusion

There is a high prevalence of upper limb musculoskeletal problems among health-care workers and care needs to be taken to identify and treat these disorders at an appropriate time. Nonidentification and delay can cause a significant decrease in productivity and can influence the overall health-care community.

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