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Original Research Article

The prevalence of musculoskeletal disorders among computer related professionals of Dahod City, Gujarat: a cross sectional study

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ABSTRACT

Background: Use of any gadgets like Laptops/Desktops etc. on daily basis generates disorders in body. The term use to denote this disorder as 'Musculoskeletal Disorder' (MSD).
Methods: Observational cross-sectional study was conducted by a random sampling method. A total 350 study subjects taken from Dahod city, Gujarat of various professionals like offices, institutions etc., who were working minimum one year with laptops/desktops at least four hours in a day with age 18-60 years. With the help of Neck Disability Index (NDI), Cornell Hand Discomfort Questionnaire (CHDQ) proforma data were collected. Descriptive statistics, Spearman's correlation, Chi-square test and Binary logistic regression was used to find role of predictors with an increased risk of pain.
Results: The mean±SD age of participants was 31.03±10.031 while males were higher than females (69.1% vs 30.9%). 53% subjects reported pain in hand, neck and/or back due to prolonged use of laptops/desktops. There exists positive correlation between NDI with CHDQ ($r=0.57$, $p<0.001$), significant association between working time (hours) and pain intensity ($\chi^2=6.94$, $p<0.001$). Computer use, age, gender, education were statistically significant predictors ($p<0.05$), with an increased risk of pain.
Conclusions: The results of this study showed MSD at different areas of hand and neck, back site of the body. To prevent MSD's some exercises, ideal posture at time of working on computers are recommended, for eye safety, professionals should regular check their eyes. Proper diet plan is proposed. With the help of these suggestions, one can increase work efficiency without MSD.

Keywords: Laptop/computer users, Musculoskeletal disorder, Pain

INTRODUCTION

In current era of information technology, smartphones, I-pad, laptops, desktops are most powerful devises among throughout the age group of population for doing multipurpose work. Like information sharing, accounting, office work (administration), data scientist, photoshops, banking, and many more. Moreover, using the internet, watching videos, using social media, gaming and many other daily activities.[1] Neck and back pain are very common in the society, particularly in office workers. Computer users had symptoms of discomfort in posture, headaches, discomforts in the neck and shoulder due to pain.[2] Musculoskeletal disorder is mostly related to computer related work and posture of sitting.

An extensive review of the literature on the association between keyboard usage and prevalence of musculoskeletal disorder (MSD) showed that the prevalence of keyboard related musculoskeletal disorder among computer users is relatively high .[3] The poor posture of the head and neck has been correlated with chronic

musculoskeletal cervical spine and upper back.[4] The incidence of MSD of hand, wrist, forearm, arm and neck has been increasing all over the world due to prolonged, forceful, low amplitude, repetitive use of hand-held devices (HHD).[5] Few studies have been reported about this substantial increase in the number of adolescent smartphone users, having various behavioral effects and its association with musculoskeletal discomfort, in recent years, which is becoming a growing problem and having a large impact globally.[6]

METHODS

The observational cross-sectional survey study was conducted from January to February 2022 by using a self-administered and a validated questionnaire. The study protocol was approved by scientific research committee and after the ethical clearance (December, 2021) data were collected by required subjects.

The required sample size for this cross-sectional study was estimated by using formula for estimating proportion as follows: (Cochran's sample size estimation, 1967).

$$n = \frac{Z^2 pq}{d^2}$$

Where, Z= 1.96 for 95% Confidence Interval and 5% margin of error, d= 0.05 (precision), p=proportion[5]=29.2% =0.292, q=1-p=1-0.292=0.708. Thus, minimum sample size required for this study was estimated to be, n = 317.67, (Considering 10% dropout of study participants) i.e., 32. Hence, for current study we have taken 350 samples.

Subject recruitment criteria

The target population for this study was various professionals who were working with laptop, desktop, I pad and android mobile, etc. at least four hours in a day with minimum one year experience. Following that, accessible population was selected from various Government offices, banks, private institutions (school, colleges, hospitals, etc.). Participants in this study were age group 18-60 years. We excluded participants from this study, if they had any known condition which could lead to pain in the neck or upper limb, any traumatic injury to the cervical spine or any neurological or cardiovascular problem. The nature and purpose of the study was explained by the researcher and informed consent was taken from the participants.

A self-administered and structured questionnaire contains: (1) demographic information (name, age, gender, education, job position, hand dominance, experience, working hours / days, use of spectacles, etc.) (2) Neck Disability Index (NDI) and (3) Cornell Hand Discomfort Questionnaire (CHDQ) were used to collect data by the face-to-face interview method.

NDI

The NDI will be used to assess the dysfunction of the neck, involving a 10-item. 50-point questionnaire. The questionnaire contains four subjective symptoms. Four about activities of daily living and the remaining two about discretionary activities of daily living. Each item is scored on a 0-5 rating scale with 0 meaning no pain and 5 meaning the worst pain. A raw score of a total of 10 points will be interpreted. A maximum score will be 50. A high score indicates a more severe neck disability. The validity and reliability of the NDI has already been established and it is a widely used instrument in patients with neck pain.

CHDQ

The CHDQ is a six-item questionnaire with a hand map diagram of six shaded area of the hand that contains questions regarding the prevalence of musculoskeletal pain, discomfort and interference with work. The total discomfort score will be calculated as *frequency*×*discomfort*×*interference*. The maximum score in an area of one hand is 45 and the total score of the six areas is 270. The questionnaire will be filled in by the participants for only dominant hand. The validity of the CHDQ has been tested by Erdinc et al and found good results.

Statistical analysis

Primary data were compiled in Microsoft excel. Statistical package for social sciences (SPSS, V-16.0) was used for data analysis. Continuous variables were expressed as mean ± standard deviation. Categorical variables were expressed in proportions and percentages.

The prevalence rates of musculoskeletal disorders among computer related professionals were expressed as percentages, the association between musculoskeletal pain intensity and working time of computer related professionals was tested using chi-square test for independency. Correlation between NDI score with CHDQ was measured using Spearman's rank correlation coefficient. Logistic regression was used to find out the correlation of presence of MSD with independent variables such as computer use, work experience, gender, education etc. Statistical significance level was set as $p<0.05$.

RESULTS

A total 350 participants were included in this study from study area of Dahod city. Among 350 participants, 242 (69.14%) were male and 108 (30.86%) were female with the mean (±standard deviation) age of the respondents was 31.03±10.03 years.

It also shows that among the respondents, 50.29%, 30.57%, 8.29%, and 8.75% of respondents belongs to the level of education had graduate, post graduate and higher secondary respectively (Table 1).

Table 1: Distribution of respondents by socio demographic and computer related characteristics (n=350).

Characteristics		Number (%)
Age group (in years)	18-25	122 (34.86)
	26-35	142 (40.57)
	36-45	53 (15.14)
	46-55	20 (5.71)
	≥56	13 (3.71)
	Mean±SD	31.03±10.031
Gender	Male	242 (69.14)
	Female	108 (30.86)
Educational qualification	Higher secondary	29 (8.29)
	Graduate	176 (50.29)
	Post graduate	107 (30.57)
	Ph. D.	16 (4.57)
	Diploma	22 (6.29)
Experience	1	37 (10.57)
(years)	2	127 (36.29)
	3	109 (31.14)
	4	46 (13.14)
	≥ 5	31 (8.86)
Type of computer	Desktop	312 (89.14)
(multiple)	Laptop	179 (51.14)
	I pad	20 (5.71)
	Android mobile	348 (99.43)
Total		350 (100)

SD: Standard deviation.

Figure 1 gives, whether participants have any kind of mild to severe pain in hand, neck and back due to the prolonged use of computer or any such device(s). It shows that, almost half (53%) respondents were reporting 'pain' either any region of above stated area.

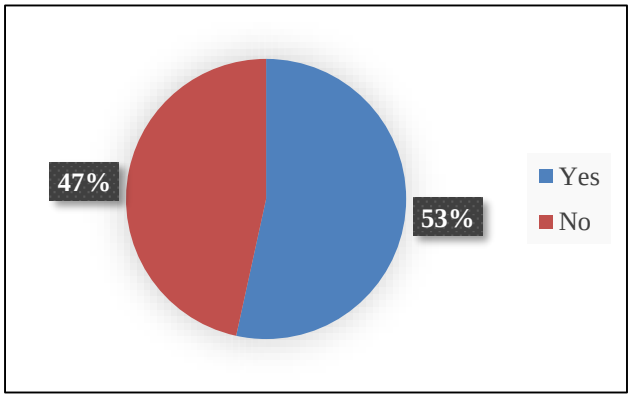

Figure 1: Pattern of musculoskeletal disorders (neck/back/hand).

The Spearman's correlation coefficient between NDI score with CHDQ is found to be positive and significant (r = 0.57, p<0.001) (Table 2).

It is concluded form this that, maximum respondents have more or less pain in both neck and different area of hand.

Table 2: Correlation between NDI score with CHDQ (n=350).

Spearman's rho		CHDQ
NDI	Correlation Coefficient	0.570**
	p-value	0.000

**Correlation is significant at the 0.01 level (2-tailed).

Table 3: Descriptive Statistics of outcome measures (n=350).

Score	Mean±SD	Median
NDI[a]	14.65±16.56	8.89
CHDQ[b]	16.47±29.60	4.5

[a]:Neck Disability index; [b]:Cornell hand discomfort questionnaire.

Significant association were found between computer use and pain intensity (p<0.05). Most of the participants working on computer as 5 and more 8 hours have more pain as compare to working up to 4 hours (Table 4). Based on the Nagelkerke R^2 that the values of the dependent variables risk of pain differed by 17.8% displayed in Table 5. The first part of this table shows how many cases were correctly anticipated; a total of 113 and 81 cases were observed to be in the "yes" and "no" (of being "at risk) categories, respectively, and were correctly predicted to be in the "yes" and "no" categories respectively.

Table 4: distribution of respondents according computer use and pain intensity

Computer use (hours)	No pain	Pain intensity				Total	chi-sq	P value
		Mild	Moderate	Fairly Severe	Very severe			
1 to 4	10	7	6	4	2	29	14.904	0.021
5 to 8	120	35	40	37	19	251		
9 and more	33	12	21	3	1	70		
Total	163	54	67	44	22	350		

Whereas 74 cases were observed to be in the "yes" category but predicted as "no," as many as 82 cases were observed to be in the "no" category only initially but were later predicted to be in the "yes" category. Under the column head "percent correct," the percentages of cases that are correctly predicted for high risk of pain was 55.4%.

Table 6 shows that computer use, age, gender and education were statistically significant predictor ($p < 0.05$), but experience was not ($p > 0.05$). For p value is less than 0.05. This indicates independent variables were associated with an increased risk of pain as compared to other independent variables.

Table 5: Observed and predicted risk of pain in hand, neck, back

	Predicted risk of pain		Percentage Correct	Nagel kerke R^2
Observed risk of pain	Yes	No		
Yes	113	74	60.4	0.178
No	82	81	49.7	
Overall Percent			55.4	

Table 6: Variables in the equation.

Variables	B	S.E.	Wald	df	Sig.	Exp(B)
Computer use (hours)	-0.769	0.23	11.202	1	0.001	0.463
Experience (years)	-0.133	0.087	2.352	1	0.125	0.875
Age (years)	1.789	0.747	5.737	1	0.017	5.984
Gender	0.556	0.245	5.149	1	0.023	1.744
Education	-0.298	0.13	5.238	1	0.022	0.742
Constant	3.329	1.011	10.851	1	0.001	27.918

DISCUSSION

Among age, gender and education distribution of participants in this study was higher (75.43%) in 18-35 years of age, as per gender it was 69% as male and for education it was seen 80.86% were graduate and post graduate respectively.[7] Our finding quite increased in case of age and not much more difference in gender and education distribution as compare to study conduct by Amin et al. where below 35 years of age respondents were 60.8%.

Our results in the present study showed that, the prevalence of MSD among computer related professionals was 53.4%, (Figure 1) i.e., at least respondents have pain either neck, back or hand (mild to severe). It seems that in this study there is increased prevalence found as compare the study done by Ahmed et al (prevalence=29.2%) and Rajgopal et al (prevalence=88% but sample size was small and only college students included).[8] This study can be considered representative of the population has similar MSD.

Our study found out there exists significant positive correlation between scores of NDI with CHDQ ($r = 0.57$, $p<0.001$). Shah et al also reported parallel results of this (Table 2).

The association between musculoskeletal pain and duration of computer related work were statistically significant ($p<0.001$) (Table 4), similar conclusions were given by Amin et al in a study done on the prevalence of computer related MSD among bankers of Dhaka city. This study gives duration of computer use in years and severity of pain. Now-a-days we observed everyone every time busy in computer related gadgets. So, we collect data on hour basis us of computer etc. Ultimately it clearly indicates that, there is significant association between computer use and pain intensity.

Our study found that, independent variables such as computer use, age, gender and education were statistically significant predictor ($p<0.05$) associated with an increased risk of pain as compared to other independent variables. In line with the previous study, conducted by Rajgopal et al, we did not find any association between independent

variables like physical activity level, hours of computer use per day, frequency of computer breaks and type of computer etc. and MSD.[8] However, there is little information on the dependent variable as MSD and independent variables such as discussed earlier.

Similar study done by Sharma et al on computer related health problems among information technology professionals in Delhi, found that MSD (77.5%) problem was higher as compare to visual (76%) and stress (35%).[9] A study conducted by Le et al, on neck pain and functioning in daily activities associated with smartphone usage. This study aimed to investigate neck posture, range of motion, muscle endurance and self-report of pain and disability in smartphone users with neck pain group and no neck pain group.[9] Differences were found between groups on pain and disability questionnaires. Subjects with neck pain had significantly higher disability scores than those of no neck pain group. In this study researcher found out neck posture of both groups played significant role.

Another study done by Mahmoud et al on the relationship between forward head posture and neck pain as systematic review and meta-analysis showed that age played an important role as a confounding factor in neck pain. (19.4%).[10]

Availability of supporting data

Data pertaining of the original article will be provided to editorial board of IJCMPH journal if needed by the editorial board.

Limitations

The results of the study only limited to Dahod tribal district of Gujarat.

CONCLUSION

A high proportion of computer users among various participants has been established in this study. There exists a significant positive correlation between scores of NDI with CHDQ. Also, this study found that excessive use of computer related gadgets leads to pain intensity. Among various independent variables computer use, age, gender and education were significant predictor associated with an increased risk of MSD.

Recommendations

Hence, further studies are required to elaborate the relation between lack of exercises or physical activity and type of diet, precaution for the eye safety etc. and job demands and loads as well as other organizational and social factors on occurrence of musculoskeletal disorder.

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