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A Study of Computer Related Musculoskeletal and Visual Health Problems among Computer Users and its Association with Desktop Ergonomics in the Gujarat State, A Cross Sectional Study

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Abstract--- Background: *Technological advances, particularly integration computer in day to day work leads to Musculoskeletal and Visual problems. There must be link between the use of computers and health related issues arise among users.*

Objectives: *To determine the magnitude of Musculoskeletal and Visual problems, effect of increase in time of computer usage on various health issues and prevalence of inappropriate ergonomics practices related to computer usage.*

Results: *Around 85% users were right handed, 70% were having education of graduate or above. Among all users, 67% were using desktop and laptop both simultaneously. Around 60% participants were using computers for more than 8 years. Among all musculoskeletal problems, almost half of the participants have redness of eye, itching/burning and irritation of eye. Majority of the participants had pain/stiffness in neck and lower back, musculoskeletal related issues.*

Conclusions: *The neck, lower back and upper back areas were found to be the most affected areas due to computer usage. Redness, irritation and itching were common eye related problems.*

Keywords--- *Musculoskeletal Discomfort, Visual Problems, Ergonomics, Computer Usage.*

I. INTRODUCTION

As technology use increases among the all age groups, Musculoskeletal system and Visual Health are most common problems throughout the world.[1]Computers have become an epitome of modern life, as being used in

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every aspect of life from calculating bills, video and mail communications, various money transfer tasks etc. With the integration of internet along with computer, any information can be accessed with a click of mouse.

Constant computer usage usually creates Musculoskeletal related disorders, mainly affects Upper Extremities.[2] Vision is also affected for those who daily uses computers/laptops for more than 4 hours. In today's era, most of the work needs assistance of computer, it requires long hours to sit against the computer screen.[2,3] This creates both Eye related and Musculoskeletal system related problems amongst the users over a period.[4] Katz et al[5]stated that if proper ergonomics not followed during work related to computers, musculoskeletal discomforts arises. Eye problems arise due to constant computer usage falls under category "Computer Vision Syndrome". During working at computer, eyes needs to do focus and refocus with upward and downward movement. Constantly changing image on the computer screen requires a lot effort from eye muscles. To establish the linkage between computer usage and its related health problems, the present study focused on the dynamics of these problems.

Objectives

1. To understand the magnitude of Musculoskeletal and Visual problems among Computer users.
2. To know the effect of increase in time of computer usage on Musculoskeletal and Visual problems among Computer users.
3. To estimate the prevalence of inappropriate computer related ergonomics.

II. MATERIALS AND METHODS

Study design/; Cross sectional study

Sample size: Sample size was calculated on the basis of reported 32.10% prevalence of Musculoskeletal discomfort in neck region among computer users in a study done at Pamukkale University, Denzil, Turkey[6] and fixing 15% as the relative precision using formula 4 PQ/ L^2. By applying this method, sample size was calculated to be 376 participants.

Study area: Study participants were taken from the entire state of Gujarat purposively, who will fit in inclusion criteria of the study.

Sampling method: Snow ball sampling technique was used to identify location of computer users and all the computer users will be interviewed present in particular location consecutively till the data from calculated sample size collected.

Study tool: Pre-designed questionnaire was used to document computer related problems of study participants. Details of socio-demographic profile, use of computer in hours and facing visual, musculoskeletal problems were recorded.

Inclusion criteria:

1. Study participants above the age of 18 years.

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2. Participants who will give written informed consent.
3. Participants who use computers at least 5 hours per day.
4. Participants who use computers since more than 6 months.

Exclusion criteria:

1. Participants who are unable to provide information (either not willing, mentally unstable).
2. Participants with medical condition like; rheumatoid arthritis, diabetes and thyroid, most of them leads to dry eye itself.

III. METHODOLOGY

Survey started after getting approval of Institutional Ethical Committee, Sumandeep Vidyapeeth University. Being a questionnaire based data collection tool, all possible way of data collection was tried to collect data from the participants, either in the form of personal interview or telephonic interview.

Duration of the Study

The study was conducted from a period of April 2018 to September 2018.

Statistical Analysis

The result was analysed using Microsoft Office 2019. To evaluate socio-demographic variables and ergonomic related appropriate positions, descriptive statistical methods were used. Most of the descriptive statistics was stated as count, percentages and frequencies.

IV. RESULTS

Table 1: Basic Details of Computer Users (n=376)

Variables	*Sub-variables*	*N*	*%*
Gender	Male	300	79.79
	Female	76	20.21
Handedness	Right	320	85.11
	Left	56	14.89
Education	Primary	9	2.39
	High school	62	16.49
	Graduate	214	46.91
	Postgraduate	91	24.20
Marital status	Married	182	48.40
	Unmarried	194	51.60

Table 1: The present study included 376 computer users. Mean age of the study subjects was 28.23 years. The Male: Female ratio was 3.9:1 among the respondents. Majority of the participants (85.11%) were Right handed, while 14.89% were left handed. Most of the respondents were graduate, and half of the total participants were married.

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Table 2: Descriptive Analysis of Computer Related Variables (n=376)

Variable	*Sub-variable*	*N*	*%*
Type of Computer used	Desktop	73	19.41
	Laptop	53	14.10
	Both	250	66.49
Hours of Computer use per day	5 to7	169	44.95
	7 to 9	111	29.52
	>9	96	25.53
Total Computer use (in years)	1 to 4	54	14.36
	4 to 8	90	23.94
	8 to 12	67	17.82
	>12 years	165	43.88

Table 2: Regarding type of computer used, around 66.49% of participants were using both Desktop and Laptop. Maximum percentages of participants spent, 5 to 7 hours per day in front of computer and were using computer for more than 12 years.

Table 3: Eye Problems among Computer Users

Eye problem	*Total(n=376)*	*%*	*Male (n=300)*	*%*	*Female (n=76)*	*%*
Watering of eyes	41	10.90	35	11.67	6	7.89
Pain in eye	43	11.44	38	12.67	5	6.58
Irritation in eye	45	11.97	38	12.67	7	9.21
Blurring/ itching	39	10.37	29	9.67	10	13.16
Redness of eye	37	9.84	26	8.67	11	14.47
Blurring of vision	22	5.85	19	6.33	3	3.95
Headache	41	10.90	33	11.00	8	10.53

Table 3: The subjects were inquired about the various visual problems experienced by them, mainly because of constant computer usage.

As described in the table, most common visual problems were irritation of eyes (11.97%), pain in eyes (11.44%), watering in eye and headache (10.90%). Except for burning in eye and redness of eye, all other problems were more prevalent in male study participants.

Table 4: Musculoskeletal Problems among Computer Users

Musculoskeletal problem	*Total (n=376)*	*%*	*Male (n=300)*	*%*	*Female (n=76)*	*%*
Pain/stiffness in neck	104	27.66	93	31.0	11	14.47
Pain/stiffness in shoulder	36	9.57	32	10.7	4	5.26
Pain/stiffness in Lower back	74	19.68	67	22.3	7	9.21
Pain/stiffness in Wrist/hand/fingers	45	11.97	40	13.3	5	6.58

Table 4: this table depicts most common musculoskeletal problems, major problems are pain/stiffness in neck (27.66%), pain/stiffness in lower back (11.97%), and pain/stiffness in shoulder (9.57%). All the musculoskeletal problems were more prevalent among male participants.

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Table 5: Number of Participants Following Ergonomically Position Rule (n=303)

Ergonomic related position	*responses*	*(n=303)*	*%*
Monitor should be 16-29 inches away from your eyes and monitor's top line should be in line with your eyes	Yes	259	85.48
	No	44	14.52
Keep your head and body straight with shoulders relaxed	Yes	190	62.71
	No	113	37.29
Adjust your chair's backrest such that the curve of the chair matches with curve of your back	Yes	180	59.41
	No	123	40.59
Keep elbows close to your sides	Yes	183	60.40
	No	120	39.60
Exert only slight pressure at the end of cushion	Yes	186	61.39
	No	117	38.61
If you re-adjust height of your chairs, also re-adjust your monitor	Yes	205	67.66
	No	98	32.34
Keep your feet flat on the floor	Yes	261	86.14
	No	42	13.86
Drape your hand over the mouse and hold it lightly. Click as gently as possible. Keep your wrists straight and flat with your hands, wrists and forearm parallel to the floor	Yes	148	48.84
	No	155	51.16

Table 5: As we can see, among 376 participants, 303 responded the query related to ergonomic and position. The query was about the various ergonomic position attained by them while on work. As per the results shown in this table, we can say majority of them follow occasionally.

V. DISCUSSION

In the present study, we studied musculoskeletal and visual problems among computer users working in mainly Computer related fields. Prevalence of various visual and musculoskeletal problems related to constant computer usage, was found in the range of 5.90% to 27.66%. Similar study by Borhany et al [7], found musculoskeletal related problems among 47% of participants. The prevalence found less than a study that was done in Estonian university students who reported 77% prevalence[8]. Main reasons for this may be a less sample size compared to them, lack of awareness among the participants and inability to report the ergonomic related problems to appropriate authorities. Various ergonomics position specifically designed to prevent work place health problems were also assessed i.e. keep your body and head straight with shoulders relaxed, adjust chair's backrest, keep elbows close to your side etc. Amongst these ergonomics positions, in our study around half of the participants followed and similar findings were reported in a study done in Pakistan [7].

In the present study, visual complaints were more among those who did not take frequent breaks from the computer. This can be explained by the fact that accommodation is an active process and stationary position of the eyes can lead to fatigue of accommodation. Relief can be obtained from continual visual accommodative spasm and glare from monitor by varying the focal point of the user.[9]It has been recommended that the user looks at a distant object away from the screen at least once every ½ to 1 h.[10] All the participants were advised to follow rule of 20-20-20 i.e. keep your eyes 20 feet away for 20 seconds after constant 20 minutes computer work. This will help to reduce eye strain and other eye related issues.

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VI. CONCLUSION

Among computer users, musculoskeletal and visual problems arise as constant use leads to head, neck stiffness and burning, redness of eye. All the computer users, using it form more than 4 hours per days should be taught about positional ergonomics to prevent various health related issues.

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VIII. LIMITATIONS

The proforma was filled by the participants themselves as various company authorities didn't allow us to visit. Prior to study, ergonomic conditions were not assessed. Handling the participants by filling questionnaire themselves, we were unable to calculate association of time with computer related health problems.

Conflict of Interest: No conflict of interest raised for conducting the study among all participants.

Ethical Clearance

For conduting the study, mandatory Ethical Clearance was obtained from Sumandeep Vidyapeeth Institutional Ethical Committee before commencing the study. Written Informed Consent (ICF) was taken from all the participants.

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