Original Article

Role of Ergonomics in Occupational Health Problems of Information Technology Professional of Ahmedabad City

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Abstract

Background: Computer ergonomics is crucial for optimizing the interaction between individuals and their computer workstations to enhance overall well-being and productivity. By designing workspaces that consider the capabilities and limitations of the human body, computer ergonomics aims to prevent musculoskeletal disorders, reduce eye strain, and mitigate stress-related issues associated with prolonged computer use.

Material & Method: It was cross sectional study carried out in computer users of Ahmedabad city. Cross sectional study was carried out over a period of one year time among 800 participants to Study the knowledge and practice pertaining to computer ergonomics and obstacle for not following it.

Results: Only 359 (44.87%) participants were aware of the computer ergonomics. Main source of information was internet (47.91%). 35.65% of the participants were aware of computer ergonomics before any health problem occurred to them, while 64.34% participants became aware to computer ergonomics after occurrence of musculoskeletal or visual problem.

Conclusions: Appropriate furniture, appropriate monitor distance, change in brightness according to need and appropriate body posture had vital role in prevention of computer related health problem. In conclusion, the data highlights the need for widespread initiatives to enhance awareness of computer ergonomics, leveraging internet resources and incorporating structured training programs.

Key word: Awareness, Computer related health problems, Ergonomics, Practice, Work station

Introduction

In an era defined by unprecedented technological advancements, the pervasive use of computers in various domains has transformed the way we work, communicate, and interact. India being the part of forerunner in the cyber world the occupational

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health problems related to computer use are slowly awakening to this group of modern occupational diseases, which are slowly taking its roots among the information technology (IT) professionals. These problems if ignored can prove debilitating and can cause crippling injuries forcing one to change one's profession.[1,2] Physical environment plays an important bearing on health. Occupational environment too plays a major role on the health of the exposed. The work environment constitutes an important part of man's total environment, so health to a large extent is affected by work conditions.[3] The health hazards get more severe when the duration of the exposure increases. Computer users adopt postures whereby the neck, shoulders and upper limbs remain in static positions for extended hours.[4,5] The more time spent on this type of activity, the higher the risk of developing visual, musculoskeletal, psychological problems and in some cases it leads to poor digestion, headache, repetitive stress injury. This fixed position also causes lower back pain due to the increased pressure on the vertebra while sitting. The sitting position, the type of chair, and use of footrest also affect the lower back.[5] Studies have also shown that computer users are at greater risk of developing eye problems and visual fatigue.[6] Working at a computer for prolonged periods can be harmful to your overall health when you don't monitor your working environment. An unhealthy workstation set up can cause variety of computer related health problems.

As defined by the International Ergonomics Association, computer ergonomics involves the systematic study of the design and arrangement of computer systems, ensuring they adapt to the capabilities and limitations of the human body. The ultimate goal is to minimize the risk of musculoskeletal disorders, enhance user comfort, and boost overall efficiency in the workplace. Given the growing concern for employee well-being and the increasing hours spent in front of computers, businesses and individuals alike are recognizing the significance of implementing ergonomic principles. Properly designed workspaces not only contribute to physical health but also have a profound impact on mental well-being and job satisfaction.

As we witness a rapid digital transformation across various sectors in India, understanding and implementing ergonomic principles in our computing environments becomes pivotal for both personal well-being and professional efficiency. Awareness about ergonomics is very limited among computer users and this leads to many health problems. So present study was carried out to Study the knowledge and practice pertaining to computer ergonomics and obstacle for not following it. This study tries to analyze the effects of workplace environment and workstation design on visual and musculoskeletal health disorders.

Material and Method

This cross-sectional observational study was conducted at government and private offices of Ahmedabad city.

Study Period: The study was carried out over one year time duration.

Sample Size: In the pilot study the prevalence of eye related problems among computer users was found to be 67%. Considering this prevalence sample size was calculated with allowable error of 5%. Calculated sample size was 788 but for the convenience of study, the sample size was decided to be 800. The study subjects were drawn from software development workers, call center workers and data entry workers to have an adequate representation from all sectors of Information Technology industry. We had received ethical approval from the Institutional Ethics Committee on 1st August 2020, as indicated by Reference Number IEC/1322/20-21.

INCLUSION CRITERIA

Duration of computer use is more than 1 year.

Uses computer for more than 3 hours/day or 21 hours/week.

EXCLUSION CRITERIA

Any disease of eye or musculoskeletal system like rheumatoid arthritis or osteoarthritis.

Any acute injury related to eye or musculoskeletal system.

Data Collection: List of offices was procured from internet. Offices from this list were randomly selected and prior permission of the proprietor of selected offices was taken. All the selected offices

were visited with prior appointment convenient to proprietor and study participants. Verbal consent from each employee, who were using computer as per inclusion criteria was taken and he/she was given predesigned, pretested questionnaire to fill up the questions regarding their, Demographic profile, Job profile; Work duration, Work distribution, Work environment. Knowledge and practice of ergonomics.

Each part of questionnaire was explained to participants in detail. Filled up questionnaire was collected and checked for completeness of information. Data entry and data analysis was done in Epi-Info software version 7.1.Chi-Square tests were used to test the significance.

Result

Present study was carried out to find out various health related problems among computer users of selected government and private offices of Ahmedabad. Among 800 study participants 71.12% were males and 28.88% were females. Mean age of study participants was 25.60 ± 5.14 years with 51.25% of participants being in the age group 20-25 years. More than half (51.50%) of study participants had formal training in computer use (BE-24.5%, B.C.A-17.50% & M.C.A-9.50%). Out of all participants 54.75% participants were married and 59% belonged to nuclear family. (Table1)

It was observed that 508 (63.50%) participants were permanent employee while 118 (14.75%) participants were part time employee in their present job. Almost equal numbers of participants were involved in various type of computer work; software development (33.50%), call center work (33.00%) & data entry (33.50%). Mean duration of computer related job was 3.60 ± 2.34 years. 300 (37.5%) participants use computers for 7 to 9 hours/day. Mean duration of total computer use per day was 8.60 ± 2.09 hours. Duration of one spell varies from less than two hours to more than four hours with mean duration of 2.97 ± 1.21 hours. (Table 2)

Only 359 (44.87%) participants were aware of the computer ergonomics. Main source of information was internet (47.91%). 35.65% of the participants were aware of computer ergonomics before any health problem occurred to them, while 64.34% participants became aware to computer ergonomics after occurrence of musculoskeletal or visual problem. (Table 3)

In the present study, distance of 45–65 cm from the screen was considered as appropriate and distances less or greater than the above range were termed inadequate. Of the 549 who did not have the monitor at correct distance. Person who use appropriate viewing distance i.e 45–65 cm, 194 (80.4%) had visual problems compare to 539 (96.4%) who use inappropriate viewing distance. This observation was found to be statistically significant ($P < 0.05$). Appropriate furniture, appropriate monitor distance, change in brightness according to need and appropriate body posture had vital role in prevention of computer related health problem. (Table 4)

Table 1: Demographic profile of Participants

Demographic Particular	
Sex	
Male	569 (71.12)
Female	231 (28.88)
Age	
≤20	67 (8.38)
20 - 25	410 (51.25)
25 - 30	186 (23.25)
30 - 35	103 (12.88)
35 - 40	20 (2.50)
>40	14 (1.75)
Education	
Higher secondary	61 (7.63)
B.E	196 (24.50)
B.C.A	140 (17.50)
Other Graduates	196 (24.50)
M.C.A	76 (9.50)
Other post-graduates	131 (16.37)
Marital status	
Married	438 (54.75)
Unmarried	360 (45.00)
Divorcee	2 (0.25)
Type of family	
Nuclear	472 (59.00)
Joint/Extended	328 (41.00)

Table 2: Job profile of participants

Variable(n=800)	Number (%)
Type of Recruitment	
Permanent	508(63.50)
Contractual	174(21.75)
Part time	118(14.75)
Type of Work	
Software Development	268(33.50)
Call center	264(33.00)
Data entry	268(33.50)
Duration of computer related job (in completed years)	
1-5	652(81.50)
6-10	140(17.50)
11-15	7(0.88)
15-20	1(0.13)
Total Computer work duration per day (in hours)	
3-5	83(10.37)
5-7	153(19.13)
7-9	300(37.50)
>9	264(33.00)
Average duration of one spell (in hours)	
<2hours	88(11.00)
2-3	222(27.75)
3-4	232(29.00)
>4	258(32.25)

Table 3: Knowledge of computer ergonomics among participant

Variable	Number(%)
Knowledge of computer ergonomics	
Yes	359 (44.87)
No	441(55.13)
Source of Computer ergonomics information*	
Internet	172 (47.91)
Training	98 (27.29)
Book	43 (11.97)
Doctor	15 (4.17)
Friend	31 (9.63)
Time of awareness*	
After visual problem	115 (32.03)
After musculoskeletal problem	116 (32.31)
Before any health problem	128 (35.65)
Reasons for partially/not following ergonomics@	
Lack of facilities in office	83
Difficulty in changing work environment	60
Habituated to wrong posture	52
No time for change	43
Not having any problem	25

* Responses of persons who were aware about ergonomics were recorded

@ Multiple response were allowed

Table 4: Relation of health problems with some important ergonomic factors

Particular		Health problem		Chi square value (df=1)
		Yes	No	
Appropriate furniture at work station*	Yes	262	43	21.04
	No	471	24	
Appropriate distance of monitor*	Yes	194	47	55.64
	No	539	20	
Change of brightness according to need*	Yes	73	22	8.01
	No	660	45	
Reflection of light on screen	Yes	172	22	2.93
	No	561	45	
Appropriate body posture*	Yes	122	27	22.66
	No	611	40	

Highly significant association $p < 0.01$

Discussion:

In the present study 71.12% participants were males and 28.88% participants were females. Similar findings were reported by Suparna K *et al*..[7] (69.5% males & 30.5% females). Various studies done in India reported predominantly male computer workers unlike the studies in west where female workers outnumber male. This gender distribution aligns with the broader trend in the IT industry in India, where there is often a higher representation of males compared to females, especially in technical roles. In the present study age of the subjects varied from 18 to 45 years with mean age of 25.60 years. The age profile is similar to other Indian studies. Shah *et al.*[8] reported mean age of 25.4 years in computer professionals. Suparna K. *et al.*[7] reported mean age of 29.86 years in their study which was done among computer professionals at National Capital Region Delhi. Sharan *et al.*[9] had reported subjects with median age of 27 years. This age distribution is consistent with the younger workforce often found in the IT industry, where a significant proportion of employees are in their early to mid-20s. In the current study 51.50% of study participants had formal training in computers, having degree or diploma in computer applications. This result is comparable with study done by Sharma A. K. *et al.*[10], they observed that 59.5% of computer professionals had formal training in computer use. This reflects a diverse educational background among participants, with a mix of engineering, computer applications, and postgraduate degrees, which is typical of the varied qualifications in the IT industry.

In this study mean duration of computer use among study participants was 8.60 hours/day. This duration was 7.4 ±1.4 in study done in Delhi by Sharma A. K. *et al.*[10] In the current study magnitude of computer related health problems was 91.63%. This finding was in agreement with study done by Suparna K *et al.*[7] (93%).

In the present study only 44.87% of participants were aware about the term ergonomics, which was higher than the finding of Ranasinghe P. *et al.*[11] (30.90%). Findings from other country reflect higher percentage (61.20%) of ergonomics awareness among computer ussers.[12] A significant proportion of participants (35.84%) reported being aware of computer ergonomics even before experiencing any health problems. This proactive awareness indicates a certain level of personal responsibility and suggests that preemptive education campaigns may be effective in fostering a culture of preventive care. On the other hand, 32.03% and 32.31% of participants became aware of computer ergonomics only after the occurrence of musculoskeletal and visual problems, respectively. This underscores the reactive nature of awareness, indicating that for a substantial portion of the population, health issues act as triggers for seeking information on ergonomic practices. Targeted educational campaigns aimed at recognizing early signs of discomfort and promoting preventive measures could prove beneficial.

In the current study statistically, significant difference was found between change of brightness as per participants need and occucarance of health problem. Not changes brightness of monitor is associated with high computer related health problems. These observations were supported by findings of Hunting *et al.*[13]that reported increase in subjective and objective symptoms of eye troubles with high luminance and inadequate contrast between screen and surrounding space. Possible explanation for muscular problems was that if participants didn't change brightness on screen, subject may deviate from neutral posture to get clear vision of the screen. This deviation may cause muscular problems. Glare in participants space didn't show any statistically significant association with health problems. Collins *et al.*[14] found glare in users field was not significantly associated with ocular, visual or systemic symptoms. There was not much difference in visual discomfort with display quality. The probable reason for which could be that only single aspect of display quality was considered not taking into account the micro aspects like resolution, colour, contrast, luminance, and font size.[15-17]

Ergonomics encompasses a broad spectrum of factors related to oneself and the surrounding environment. While an individual may adhere to correct ergonomic principles in one aspect, they might be unaware of other elements that could contribute to potential issues. The WHO manual on Visual Display Terminals (VDT) also notes a similar observation.[18] Additionally, a study by Soo *et al.*[15] highlights instances where crucial components of

workstations were either non-adjustable or featured mechanisms that were overly cumbersome to operate. This issue becomes more pronounced when multiple workers utilize the same furniture, leading to discrepancies that are often addressed through postural adjustments, further exacerbating problems, including immobilization.

Conclusion

The study reveals that awareness about ergonomics remains relatively low, suggesting a need for proactive education. The study indicates a link between changing brightness on the monitor and the occurrence of health problems, emphasizing the importance of ergonomic practices in minimizing computer-related health issues. Addressing these aspects is crucial for fostering a culture of preventive care and ensuring a healthier work environment.

Ethical Approval from the Institutional Ethics Committee on 1st August 2020, as indicated by Reference Number IEC/1322/20-21.

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Conflicts of Interest: Nil

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