Impact of a Guideline Application on the Prevention of Occupational Overuse Syndrome for Computer Users

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Abstract: Following ergonomic principles helps in reduce work stress and eliminate many potential injuries and disorders. Hence, the aim of the present study is to assess the impact of guideline application on the prevention of Occupational Overuse Syndrome (OOS) for computer users .Quasi experimental study design was adopted to carry out this study. The study was carried out in commercial computer offices in Alexandria; using a convenient sampling method 300 of computer users who are using computer continuously for 6 hours and more per day were selected. Three tools were developed by the researcher for data collection. The findings of the present study reveled hat, 33.7% of the sample had correct knowledge about safe computing practices before guideline this was significantly improved to 85.4% after guideline distribution . Only 8.7% of computer users were practicing exercises before guideline significantly increased to 73.7% after guideline distribution. And8% of computer users' practices was scored as good practices before guideline distribution. Their practices were significantly improved to 36.1% after guideline distribution. The study concluded that the applying of the ergonomic principles guideline led to significant improvement in the computer users practices regarding safe computing as, the guideline had a positive effect on their knowledge, practices, workstation adjustment, and healthstatus .The study recommended that the health awareness 'of the community should be raised through ' mass media campaigns regarding the risk factors, signs and symptoms, and ergonomic principles for prevention of occupational overuse syndrome among computer users.

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1. Introduction

Today, almost every one interacts with computers on a daily basis for several reasons such as creating ideas, producing documents, retrieving information and corresponding with friends. Along with the expanding use of this technology adverse health changes for computer users was reported. [(1)] Work with computers may require individuals to assume static or awkward positions for typing; if workstations are not properly adjusted they are at high risk of occupational overuse syndrome. [(2)]

Occupational overuse syndrome (OOS) is the name given to a range of conditions usually caused or aggravated by poor work processes and unsuitable working conditions. The OOS is also known as 'repetitive strain injury' (RSI), repetitive motion injury (RMI), carpal tunnel syndrome. [(3)]

The characteristic symptoms of OOS often include swelling, numbness, restricted movement and weakness in or around muscles and tendons of the back, neck, shoulders, elbows, wrists, hands, or fingers. As such, for people experiencing symptoms of OOS, it may become difficult for them to hold objects or tools in their hands. These situations may thus affect the quality of life of the persons.[(4)] The OOS can be occurred because of maintaining constrained postures for prolonged periods of time that contributes to restricted blood flow to the muscles. Computer users adopt postures whereby the neck, shoulders and upper limbs remain in static positions for extended hours. The more time spent on this type of activity, the higher the risk of developing such injuries. 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, 6)] Other health complaints among computer users are computer-related vision problems. The American Optometric Association (AOA) reports that over 10 million patients a year schedule eye exams due to computer-related vision problems. The most commonly reported symptoms of discomfort and fatigue were the glare and reflection from the monitor screen, visual discomfort including eyestrain, burning or itching eyes, photosensitive epilepsy, blurred vision and double vision. [(7)]

Regular computer use is associated with an increase in skin irritation most probably due to high level of dust particles that are attracted to the skin by a build up of stasis electricity caused by the screen. Moreover, job stress manifested in computer users in the form of irritability and depression. [8]In 2006 nearly half a million people in the UK suffered from some form of Repetitive Strain Injury (RSI). The problem is increasing principally through the intensive use of computers and other technology that involves large amounts of keyboarding. Posture related health problems are also growing due to the sedentary nature of many jobs. [9] The study done At 2008 showed that 68% of UK workers suffered from some sort of RSI, with the most common problem areas being the back, shoulders, wrists, and hands.[10]Musculoskeletal disorders of the upper and lower limbs (RSIs) are a major problem in the workplace and a significant cause of lost production, with an estimated cost to industry in the UK of up to £3bn/year. According to a recent European survey, 45% of workers reported working in painful or tiring positions, while 17% of workers complain of muscular pain in the arms and legs. [11]

In the United States (2003) disorders such as carpal tunnel syndrome, tension neck syndrome and lower back pain are the most prevalent and expensive work-related injuries. Approximately 1.8 million workers report work related musculoskeletal disorders and 600 000 workers miss work annually as a result of these disorders, costing employers an estimated $15 to $18 billion in direct workers' compensation. Further substantial losses occur through absenteeism and decreased productivity. [12]In Egypt only 11.5 percent of those who were working used computers on their job. According to the World Development Report (2009) a higher prevalence of computer use in Egypt was estimated about 20 percent.[13,14] An apparent lack of epidemiological research locally highlights the need for further investigation. The Health & Safety Executive, a British institution responsible for the regulation of occupational risks to health, estimated that self-reported Work Related Musculoskeletal Disorders (WRMSDs) resulted in 4.7 million lost working days in 2003/ 2004. [15]In the USA one third of workers' compensation costs in private industry is estimated to be caused by Work Related Musculoskeletal Disorders (WRMSDs) and the direct costs, with compensation, exceed US$ 20 billion in Washington state alone.[16]A study done at the Netherlands in 2005 estimates the total annual costs due to WRMSDsat about 2.1 billion Euros, consisting of medical costs, costs due to decreased productivity, absenteeism related to WRMSDsand disability pensions.[15,16] .Much attention is paid to the prevention and treatment of occupational overuse syndrome (OOS). Conservative interventions such as physiotherapy and ergonomic adjustments play a major role in the prevention and treatment. [17] A specialist in the field of occupational health has to take such discomforts seriously as they appear in workers who work with computers after a longer period, as diseases related to working with computers may occur. Adequate measures of prevention can be helpful in reducing the discomforts related to the occurrence of the manifesting form of a disease. [18] Ergonomics, also called human factors engineering is the study of the physical and cognitive demands of work to ensure a safe and productive work place. The function of specialists in ergonomics is to design or improve the work place, workstations, tools, equipment, and procedures of workers so as to limit fatigue, discomfort, and injuries while also achieving personal and organizational goals. [19] Ergonomics is the study of humans at work to understand the complex interrelationships among people, their work environment, job demands, and work methods. [20]. The application of ergonomic principles can play an important role in the provision of a safe, healthy work environment for computer users. When understood and applied, ergonomics can "increase efficiency and performance, reduce fatigue, reduce negative work stress, and keep skilled staff on the job. [21] The computer ergonomic recommendations for prevention of OOScovering the points of; posture, workstation, chair, monitor, input devices, document holder, lightning, computing work habits, exercises, stretches, and rest breaks. [22] Ideal ergonomics workstation design and layout is based on the relationship between the individual users' personal anthropometry and characteristics (such as age and the type of glasses worn) and work factors such as the design of the office work area and work organization. The amount of ventilation and lighting has also been shown to be a significant factor. [23]. As the use of computerized nursing information systems increases, ergonomics is of increasing interest to nurses in their dual rule as users of computers and as health care provider. [13] New roles for nurses in nursing informatics are consultants, advisors, and researchers. Most recently, nurses are developing information management methods and tools for use in transforming health and nursing data to information. Interventions can be put into place in both work flow process development and workstation engineering to limit the risk of injury to nurses from their work with computer. [14] Computer users need to be provided with an ergonomically conducive environment as well as to be educated and trained with respect to ergonomic principles. [4] Many studies concluded that there is need for implementation of programs that include the concepts of ergonomics, health education, training of computer users so as to be able to prevent and overcome the phenomenon of OOS, and that there was lot of scope and need for improvement in the workstation layout on ergonomic parameters for improving health and efficiency of computer users. With this aim a set of Ergonomic Guidelines for efficient computer Workstation Design were suggested. [4, 9, 15, 16] Therefore, the present study will attempt to develop a guideline for the prevention ofOOS among computer users.

The Aims of this study are to:

- Assess the health complaints and workstation adjustment among computer users.
- Develop and apply a guideline for computer users to prevent the occupational overuse syndrome.

RESEARCH HYPOTHESES

- Unsuitable workstation adjustment among computer users will result in various health complaints.
- The developed guideline will prevent the occupational overuse syndrome among computer users.

2. Materials and Methods

Materials

Research design:

The Quasi experimental study design was adopted to carry out this study.

Setting:

The settings comprised the selected commercial computer offices of typing documents in Alexandria Governorate.

Subjects

Convenient sample of 300 computer users working in the above mentioned settings was selected.

Inclusion criteria :

Computer users, who are using computer continuously for 6 hours and more per day, were only selected.

Tools for data collection:

Three tools were developed and used by the researcher in order to collect the necessary information from the computer users.

Tool (I) Structured Interview Schedule- :

It included two parts:-

Part I

a) Socio- demographic characteristics as age, gender, level of education

b) Medical history.

c) Data of using computer such as: (Duration of computer use (years), Daily use (hours), Taking breaks and how often, practicing exercises, how often, who advice, its type and importance).

Part II " Assessment of health complaints among computer users' employees

A structured interview schedule based on the Physical Health Questionnaire used by Morrison et al. (1992)[182] was used to assess the studied sample physical health. Computer users indicated how often they had suffered from a range of 24 physical health problems in the previous month by circling the appropriate number on a three-point scale ranging from ‘never’, ‘occasionally’ to ‘frequently’. It included e.g. Musculoskeletal problems , pain in the foot or toes, pain down in the legs etc………..).

Tool (II) Computer Users Practices Observation checklist

Was used to assess the practice of computer user included:

Sitting at arm length from monitor ,resting feet on floor or on a stable foot rest ,moving frequently for circulation ,using a document holder center monitor and keyboard in front of him ,sitting at upright position (back straight).thighs are parallel to the floors and knees at about the same level as the hips. Wrists are flat and straight in relation to the forearms to use keyboard/mouse, arms and elbows relaxed close to body

Tool (III) Computer Workstation Observation checklist

Was used to assess the computer workstation design for the computer users in terms of dimensions and placement of chair, desk, computer screen, input device, document holder, Foot rest, Monitor, Layout other equipment along with light intensity.

Methods

1- Administrative process:

Before the conduction of the study, permission was obtained through official letters from faculty of nursing to secure approval of responsible authorities and for explanation of the purpose of the study.

2- Data collection methodology:

Tools of data collection were designed based on recent relevant literature.

3. Validity:

Tool (I), (II) and (III) were subjected to a jury composed of five experts in the field of community health from the faculty of Nursing and faculty of Medicine in Alexandria University. The jury examined tool one and two for content validity. They reported that the tools are valid but there were some ambiguous questions that need clarity, therefore, some modifications were done to simplify of the tools.

Pilot study was carried out in order to ensure the clarity of the tools and its comprehension by the target population,

4- Test of reliability was conducted on 25 computer users using Cronbach's Alpha.

Correlation Cronbach's Alpha was: At scale of health complaints = 0.770, in scale of perception toward the cause of those complains 0.935, in the scale of consulting health professional = 0.770, Computer Users Practices Observation checklist = 0.781, and on Computer Workstation Observation checklist = 0.788.

5- Data collection: -

By using a convenient sampling method 300 computer users who fulfilling the criteria of inclusion were included.

Tool (I) was used to assess personal characteristics of computer users' employees and their health complaints. Assessment of computers users practices and workstation adjustment was done by using Tool (II) and (III) (Pre-test)

According to analysis of collected data and review of the literature the researcher developed a guideline for computer users to prevent the occupational overuse syndrome. The selected computer users received a self learning guideline using CD.

Reassessment of the practice, workstation adjustment and health complaints among the computer users was done after 3months from receiving the guideline by using tool (I) , (II) and (III) . (Post-test).

Each interview took approximately 30 minutes. The data was collected during the period from (April 2010-March 2011)

6-Statistical analysis

Data was analyzed using PC with Statistical Package for Social Sciences (SPSS) version 16.0

The following statistical measures were used: Descriptive measures included: count, percentage, arithmetic mean, standard deviation. Statistical tests included: chi square test (X^2).A scoring system for assessing the computer users' health complaints .Percent of health complaints score was calculated as follows:-Eye complaints score Total points of eye complaints score was 18 points - Severe 100- 75% = 18- 13 points - Moderate 74%- 50% = 12- 9 points -Mild <50% = 8 - zero points

Upper musculoskeletal complaints score Total pints of Upper musculoskeletal complaints score was 42 points -Severe 100- 75% = 42- 31 points -Moderate 74%- 50% = 30- 21 points -Mild <50% = 20-zero points

Lower musculoskeletal complaints score Total points of Lower musculoskeletal complaints score was 12 points -Severe 100- 75% = 12- 9 points -Moderate 74%- 50% = 8- 6 points - Mild <50% = 5-zero points

-A scoring system for assessing the computer users' observational practices: Percent of observational practices score was calculated as follows:- Total points of eye complaints score was 10 points -Good 100- 70% = 10- 7 points - Fair 70%- 50% = 6- 5 points - Poor <50% = 4 - zero points

A scoring system for assessing the computer users' workstation modification Percent of observational workstation modification score was calculated as follows:-

Total points of eye complaints score was 21 points -Good 100- 70% = 21- 15 points -Fair 70%- 50% = 14- 11 points -Poor <50% = 10 - zero points

3. Results

General characteristics of computer users assigned in the study.

Table (1) illustrates the socio-economic characteristics of computer users. The table shows that the total studied sample reached 300 computer users; regarding age group of the computer users, nearly half of the sample (49.3%) was in the age group ranged from 20 to less than 30 years, followed by 35.3% of them their age group was from 30 to less than 40 years. The rest of the sample was in the age group ≥ 40 years, while the mean age group was 31.5 ± 7.9.With respect to the computer users' sex, males represented about one quarter (24.3%) of computer users, and the rest three quarters (75.7%) of them were females. Concerning the educational level, it was observed that slightly less than one third (30%) of computer users graduated from secondary school, followed by (70%) of them had BSCs and post graduate education. The same table describes the income per month of computer users. More than half (54%) of the sample had enough income, followed by less than half (45%) of them had not enough income, and only (1%) had enough and save income. Regarding to medical and surgical history. More than three quarter (78%) of computer users did not have any–medical history. While (12%) of them mentioned that they have hypertension. Additionally, few of the sample (6%, 5.3%, and 3.3%) stated that they have gout, diabetes mellitus, and rheumatic arthritis respectively. This table also reveals that the majority (83.3%) of computer users did not complaint from pain all over of the body before being computer users and only (16.3%) of them complained from that pain. As regards to the site of pain, the table shows that equal percentage of computer users (8.6%) mentioned that they had pain at neck and upper back, while (2.6% and 1.3%) of them had pain at arms and legs respectively before being computer users. Moreover, the majority (97.3%) of computer users did not have any surgical operation in the musculoskeletal system. Concerning to duration of use per year and daily use per hours. This table represents that about one third (34.3%) of the sample were using computer one years to less than five. Additionally, the same table shows that few percent (7.3%) of the sample were using computer less than one year and 5.3% were using computer more than 15 years. The mean duration of use per year was 2.87 ± 1.04. With respect to the daily use of computer, the table shows that the majorities (82.7%) of computer users were working on computer from 6 to less than 10 hours daily. The mean use per hours was (1.64 ± 0.95).

Figure (1) shows the distribution of computer users according to their correct knowledge about safe computing practices before and after guideline distribution. It was observed that about one third (33.7%) of the sample had correct knowledge about safe computing practices before guideline compared to 85.4% after guideline distribution. There was a statistically significant difference between knowledge of the sample before and after guideline.(X^2= 18.22, $P \leq 0.05$).

Figure (II) illustrates the distribution of computer users' according to their practices observational score before and after guideline distribution. It is apparent from this figure that only 8% of computer users' practices were scored as good practices before guideline distribution. Their practices were improved to 36.1% after guideline distribution. Additionally, it was observed that about three quarters (75.3%) of computer users had poor practices score before guideline distribution; this decreased to 46% of them after guideline distribution. Significant difference was found between computer users before and after guideline distribution regarding to their practices observational score (X^2 =116.04, $P \leq 0.05$).

Table (I): Distribution of computer users according to their general characteristics.

ITEMS	Total n = 300 No	% 100
Age (years):		
20 -	148	49.3
30 -	106	35.3
≥ 40	46	15.4
Means ± SD 31.5 ± 7.9		
Sex:		
Male	73	24.3
Female	227	75.7
Level of education:		
Secondary	90	30.0
> Secondary	210	70.0
Income per month:		
Enough &save	3	1.0
Enough	162	54.0
Not enough	135	45.0
Medical history:*		
Diabetes Mellitus	16	5.3
Hypertension	36	12.0
Gout	18	6.0
Rheumatic arthritis	10	3.3
None	234	78.0
pain in the body before being computer user:		
yes	50	16.7
No	250	83.3
Site of pain:*		
Neck	26	8.6
Arms	8	2.6
Upper back	26	8.6
Legs	4	1.3
Surgical operation in MSKS**		
Yes	8	2.7
No	292	97.3
Duration of use (years):		7.3
< 1	22	34.3
1-	103	27.3
5-	82	25.7
10-	77	5.3
15 & more	16	
Means ± SD 2.87 ± 1.04		
Daily use (hours) :		
6 -	248	82.7
10 and more	52	17.3
Means ± SD 1.646 ± 0.95		

*More than one answer were allowed
** **MSKS:** musculoskeletal system

Figure (III):Distribution of computer users according to their workstation modification observational score before and after guideline distribution was illustrated at figure (III). It was observed from this figure that about one third (33%) of computer users had good workstation modification before guideline distribution. This percentage was improved to 50% after guideline distribution. Additionally, it was clear that only 0.7% of computer users had poor workstation modification after guideline distribution; this percentage was higher (4.7%) before guideline distribution. Significant difference was found between computer users in the both guideline phases regarding to their workstation modification observational score (X^2 =155.78, P≤ 0.05).

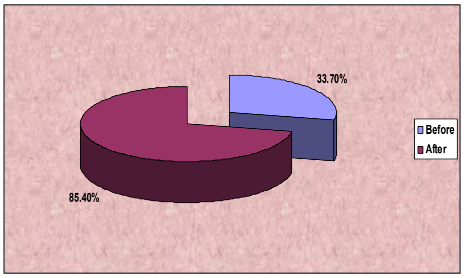

Figure (I): Distribution of computer users according to their correct knowledge about safe computing practices before and after guideline distribution.

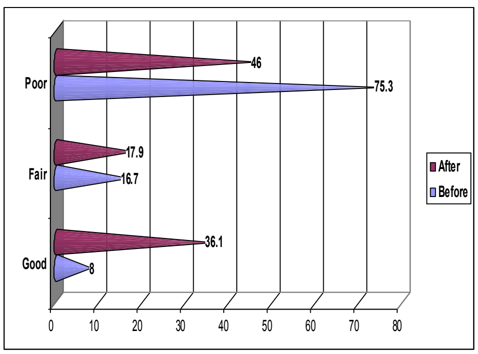

Figure (II): Distribution of computer users' according to their observational practices score before and after guideline distribution.

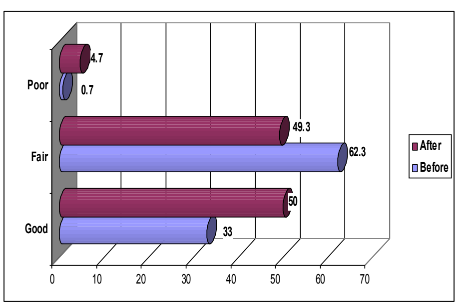

Figure (III): Distribution of computer users' according to their workstation modification observational score before and after guideline distribution.

Table (II) portrays the distribution of computer users' who applied the guideline according to their health complaints scoring before and after guideline distribution. This table reveals that none of the computer users who applied the guideline experiencing severe eye complaints, while before guideline 17.5% of them were experiencing severe eye complaints. However no significant difference was found between computer users before and after guideline regarding eye complaints score (X^2 2.23 P=0.327). Concerning, upper musculoskeletal complaints score; it was observed that among those who applied the guideline at the both phases before and after guideline distribution no one was suffering severe upper musculoskeletal complaints. Furthermore, almost (97.5%) of them were experiencing mild upper musculoskeletal complaints after guideline compared to three quarters (75%) before guideline distribution. Significant difference was found between computer users at the both phases; before and after guideline regarding upper musculoskeletal complaints score (X^2=6.15, P≤0.05). Regarding, lower musculoskeletal complaints score; it was observed that only 2.5% of computer users who applied the guideline were suffering severe lower musculoskeletal complaints, compared to 12.5% of them before guideline. Additionally, almost (92.5%) of them were experiencing mild lower musculoskeletal complaints after guideline distribution, compared to nearly two thirds (65%) of them before guideline phase. Significant difference was found between computer users at the both phases; before and after guideline regarding lower musculoskeletal complaints score (X^2=23.92, P≤0.05).

The distribution of computer users' who partially applied the guideline according to their health complaints scoring before and after guideline distribution was illustrated in table (III). This table shows that before guideline more than one tenth (13.3%) of the sample who partially applied the guideline experiencing severe eye complaints. This slightly increased to 16.4% of them experiencing severe eye complaints after guideline distribution. Moreover, it was observed that only 3.9% of computer users who partially applied the guideline were suffering severe upper musculoskeletal complaints before guideline, compared to 5.5% of them experiencing severe upper musculoskeletal complaints after guideline distribution. Furthermore, about two thirds (67.2%) of them were experiencing mild upper musculoskeletal complaints before guideline phase. It decreased to 60.2% after guideline distribution. Regarding to lower musculoskeletal complaints score, it was clear that about one tenth (10.2%) of computer users who partially applied the guideline were suffering severe lower musculoskeletal complaints before guideline; compared to 11.7% of them experiencing severe lower musculoskeletal complaints after guideline distribution. Additionally, more than half (56.3%) of them were experiencing mild lower musculoskeletal complaints before guideline. It slightly increased to 62.5% after guideline distribution. Significant difference was found between computer users who partially applied the guideline at the both phases; before and after guideline regarding all health complaints score (X^2 = 74.15, 171.3, and 139.21 respectively). P≤ 0.05.

Table (II): Distribution of computer users' who applied the guideline according to their health complaints scoring before and after guideline distribution.

ITEMS	Before guideline		After guideline		Test X^2
	Total n = 80 No	% 100	Total n = 80 No	% 100	
Eye complaints					
Severe	14	17.5	0	0.0	2.23
Moderate	26	32.5	8	10.0	P= 0.327
Mild	40	50.0	72	90.0	
Upper musculoskeletal complaints					
Severe	0	0.0	0	0.0	6.15
Moderate	20	25.0	2	2.5	P = 0.013*
Mild	60	75.0	78	97.5	
Lower musculoskeletal complaints					
Severe	10	12.5	2	2.5	23.92
Moderate	18	22.5	4	5.0	P= 0.000*
Mild	52	65.0	74	92.5	

* Significant at p≤0.05

Table (III): Distribution of computer users' who partially applied the guideline according to their health complaints scoring before and after guideline distribution.

ITEMS	Before guideline		After guideline		Test X^2
	Total n = 128 No	% 100	Total n = 128 No	% 100	
Eye complaints					
Severe	17	13.3	21	16.4	74.15
Moderate	60	46.9	55	43.0	P= 0.000*
Mild	51	39.8	52	40.6	
Upper musculoskeletal complaints					
Severe	5	3.9	7	5.5	171.3
Moderate	37	28.9	44	34.4	P= 0.000*
Mild	86	67.2	77	60.2	
Lower musculoskeletal complaints					
Severe	13	10.2	15	11.7	139.21
Moderate	43	33.6	33	25.8	P= 0.000*
Mild	72	56.3	80	62.5	

* Significant at p≤0.05

Table (IV) shows distribution of computer users' who did not apply the guideline according to their health complaints scoring before and after guideline distribution. Before guideline phase only 15.2% of computer users who didn't apply the guideline experiencing severe eye complaints. This increased to 42.4% of them after guideline distribution. Additionally, it was observed that only 6.1% of computer users who didn't apply the guideline were suffering severe upper musculoskeletal complaints before guideline. This increased to 15.2% of them after guideline distribution. Concerning, the lower musculoskeletal complaints score, it was clear that 9.1% of computer users who didn't apply the guideline were suffering severe lower musculoskeletal complaints before guideline; compared to 15.2% of them after guideline distribution. Significant difference was found between computer users who did not apply the guideline at the both phases; before and after guideline regarding all health complaints score (X^2=36.7, 49.9, and 60.25, respectively). P≤ 0.5.

Table (IV): Distribution of computer users' who did not apply the guideline according to their health complaints scoring before and after guideline distribution.

ITEMS	Before guideline		After guideline		Test X^2
	Total n = 66 No	% 100	Total n = 66 No	% 100	
Eye complaints					
Severe	10	15.2	28	42.4	36.7
Moderate	28	42.4	28	42.4	P= 0.000*
Mild	28	42.4	10	15.2	
Upper musculoskeletal complaints					
Severe	4	6.1	10	15.2	49.9
Moderate	10	15.2	26	39.4	P= 0.000*
Mild	52	78.8	30	45.5	
Lower musculoskeletal complaints					
Severe	6	9.1	10	15.2	60.25
Moderate	16	24.2	26	39.4	P= 0.000*
Mild	44	66.7	30	45.5	

* Significant at p≤0.05

Table (V): Relation between computer users' age and score of health complaints before and after guideline distribution.

Health Complaints	Before guideline (n=300)						After guideline (n=274)						Test X^2
	Age groups						Age groups						
	20-		30-		≥40		20-		30-		≥40		
	No	%	No	%	No	%	No	%	No	%	No	%	
Eye complaints													
Sever	19	44.2	18	41.9	6	14.0	21	42.9	18	36.7	10	20.4	3.95, P= 0.557
Moderate	58	47.5	40	32.8	24	19.7	39	42.9	32	35.2	20	22.0	11.5, P= 0.043*
Mild	71	52.6	48	35.6	16	11.9	76	56.7	46	34.3	12	9.0	13.0, P= 0.023*
Upper musculoskeletal													8.87, P= 0.114
Sever	9	81.8	0	0.0	2	18.2	9	52.9	4	23.5	4	23.5	4.87, P=0.432
te	34	45.3	27	36.0	14	18.7	32	44.4	24	33.3	16	22.2	7.71, P=0.173
Mild	105	49.1	79	36.9	30	14.0	95	51.4	68	36.8	22	11.9	
Lower musculoskeletal													
Sever	10	32.3	11	35.5	10	32.3	5	18.5	16	59.3	6	22.2	20.2, P=0.001*
Moderate	35	43.2	30	37.0	16	19.8	25	39.7	24	38.1	14	22.2	7.82, P=0.166
Mild	103	54.8	65	34.6	20	10.6	106	57.6	56	30.4	22	12.0	26.1, P=0.000*
Total	148	49.3	106	35.3	46	15.3	136	49.6	96	35.0	42	15.3	

*** Significant at p≤0.05**

Table (V) shows the relation between computer users' age and score of health complaints before and after guideline distribution. It was observed from this table that the percentage of computer users who complained from severe eye complaints decreased by older age group, whereas, 44.2% of the sample suffering from severe eye complaints among the age group of 20 to less than 30 years declined to 14% among the age group of ≥40 years. Additionally, the same was observed after distribution of guideline, as the percentage of computer users who complained from severe eye complaints was 42.9%, declined to 20.4% by the older age group (≥40year). Their was statistically significance difference between computer users eye complaints(moderate and mild) score in relation to age group before and after guideline distribution (X^2= 11.5, and 13.0, respectively). P ≤ 0.05. Regarding the upper musculoskeletal complaints, it was observed that the percentage of computer users who complained from severe upper musculoskeletal complaints declined by older age group, as it was 81.8%, among the computer users of the age group 20 to less than 30 years and decreased to 18.2% among the age group ≥40year before guideline. Furthermore, the same was observed after distribution of guideline, as the percentage of computer users who complained from severe upper musculoskeletal complaints decreased older age group to be 52.9%, and 23.5, respectively. No significance difference was found between computer users upper musculoskeletal complaints score in relation to age group before and after guideline distribution (x^2= 8.87, 4.87 and 7.71, respectively). As regard to lower musculoskeletal complaints, this table reveals that no differences were observed between age groups as related to severe complaints (32.3%, 35.5%, and 32.2%) respectively before guideline. While, after distribution of guideline, it was observed that the percentage of the sample who complained from severe lower musculoskeletal complaints decreased by age group, to be 59.3%, among the age group of 30 to less than 40 years. Statistically significance difference was observed between computer users complained of severe and mild lower musculoskeletal complaints and age group before and after guideline distribution (x^2= 20.2, and 26.1, respectively). $P \leq 0.05$.

Table (VI) portrays the relation between computer users' sex and score of health complaints before and after guideline distribution. It can be observed from this table that, the percentage of the sample who complained from severe, mild, and moderate eye complaints increased among females (86%, 73.8%, and 74.1% respectively), compared to (14 %, 26.2%, 25.9% respectively) among male before guideline. After distribution of guideline the higher percent of the sample who complained from severe, mild, and moderate eye complaints was belonging to females (83.7%, 60.4%, and 84.3%, respectively), compared to (16.3%, 39.6%, 15.7% respectively) among male. Their was statistically significance difference between computer users eye complaints score in relation to sex before and after guideline distribution (x^2= 21.8, and 10.6, respectively). $P \leq 0.05$..Additionally, this table shows that, the percentage of computer users who complained from severe, mild, and moderate upper musculoskeletal complaints was higher among females than males (63.6%, 81.3%, and 74.3%, respectively) before guideline. After distribution of guideline those complaints remains higher among female than male to be (88.2%, 72.2%, and 76.8% respectively). No significance difference was found between computer users upper musculoskeletal complaints score in relation to sex before and after guideline distribution (x^2= 4.47, 2.74 and 1.79, respectively). Concerning, the lower musculoskeletal complaints score; it was observed that the higher percent (100%, and 92.2%) of females before, and after distribution of guideline were suffered from severe lower musculoskeletal complaints respectively. Their was statistically significance difference between computer users lower musculoskeletal complaints (severe and moderate) score in relation to sex before and after guideline distribution (x^2= 15.7, and 12.3, respectively). $P \leq 0.05$.

Table (VII) presents the relation between computer users' level of education and observational score of their practices before and after guideline distribution. On studying the total score of practices among computer users with educational level, it was observed that there is improvement of good practices score with increasing the level of education after distribution of guideline. Whereas, among those who had secondary education 13.3 % of them scored good practices, their scores increased to 37.5 % after guideline. Also, among those who had more than secondary education (BSCs & post graduate) only 5.7 % of them had good before guideline practices ,increased to 35.6% after guideline distribution. Statistically significance difference was found between computer users' level of education and observational score of their practices before and after guideline distribution (x^2=69.6, 17.7 and 53.8, respectively). $P \leq 0.05$. Furthermore, it was noticed from this table that there is improvement of good workstation modification score with increasing the level of education before and after distribution of guideline. Whereas, among those who had secondary education 22.2 % scored good practices, this increased to 42.5 % after guideline. Moreover, among those who had more than secondary education (BSCs & post graduate) 37.6 % of them had good workstation modification before guideline. This percentage increased to 53.1% after guideline distribution. Statistically significance difference was found between computer users' level of education and observational score of their workstation modification before and after guideline distribution (x^2=25.9, 25.5, and 18.7, respectively). $P \leq 0.05$.

Table (VIII) presents the relation between computer users' practicing exercises and health complaints score before and after the distribution of guideline. It was obvious from this table that 30.8 % of computer users who practicing exercises suffered from severe eye complaints before guideline. This percentage decreased to 11.4 % after guideline distribution. Statistically significant difference was observed between practicing exercises and eye complaints score before and after guideline distribution (x^2= 31.2, 7.6 and 29.3, respectively). $P \leq 0.05$.This table also reveals that 7.6 % of computer users who practicing exercises had severe upper musculoskeletal complaints score before guideline compared to 3.5 % after guideline distribution. Moreover, 46.2% of them suffered from moderate upper musculoskeletal complaints before guideline their percentage decreased to 22.8 % after guideline distribution .Statistically significant difference was observed between practicing exercises and upper musculoskeletal complaints score before and after guideline distribution (x^2= 15.4, 11.8 and 23.6, respectively). $P \leq 0.05$.Moreover, 30.8 % of computer users who practicing exercises were suffered from moderate lower musculoskeletal complaints before guideline; this percentage decreased to 18.3 % after distribution of guideline .Statistically significant difference was found between practicing exercises and lower musculoskeletal complaints score before and after guideline distribution (x^2= 10.4, 11.8 and 13.9, respectively). P≤ 0.05.

Table (VI): Relation between computer users' sex and score of health complaints before and after guideline distribution.

Health Complaints	Before guideline (n=300)				After guideline (n=274)				Test X^2
	Sex				Sex				
	Male		Female		Male		Female		
	No	%	No	%	No	%	No	%	
Eye complaints									
Sever	6	14.0	37	86.0	8	16.3	41	83.7	5.99, P = 0.112
Moderate	32	26.2	90	73.8	36	39.6	55	60.4	21.8, P = 0.000
Mild	35	25.9	100	74.1	21	15.7	113	84.3	10.6, P = 0.014
Upper musculoskeletal									
Sever	4	36.4	7	63.6	2	11.8	15	88.2	4.47, P =0.215
Moderate	14	18.7	61	81.3	20	27.8	52	72.2	2.74, P = 0.433
Mild	55	25.7	159	74.3	43	23.2	142	76.8	1.79, P =0.617
Lower musculoskeletal									
Sever	0	0.0	31	100.0	2	7.4	25	92.6	15.7, P = 0.001
Moderate	29	35.8	52	64.2	20	31.7	43	68.3	12.3, P = 0.006
Mild	44	23.4	144	76.6	43	23.4	141	76.6	1.54, P =0.672
Total	73	24.3	227	75.7	65	23.7	209	76.3	

* Significant at p≤0.05

Table (VII): Relation between computer users' level of education and observational score of practices and workstation modification before and after the distribution of guideline.

ITEMS	Before guideline (n=300)				After guideline (n=274)				Test X^2 Before After
	Level of education				Level of education				
	Secondary		> Secondary		Secondary		> Secondary		
	No	%	No	%	No	%	No	%	
Computer users practices									
Good	12	13.3	12	5.7	30	37.5	69	35.6	69.6, P= 0.000*
Fair	6	6.7	44	20.9	6	7.5	43	22.2	17.7 , P=0.001*
Poor	72	80	154	73.3	44	55	82	42.2	53.8 P= 0.000*
Workstation modification									
Good	20	22.2	79	37.6	34	42.5	103	53.1	25.9, P= 0.000*
Fair	70	77.8	117	55.7	46	57.5	89	45.9	25.5, P= 0.000*
Poor	0	0.0	14	6.7	0	0.0	2	1.0	18.7 P= 0.000*
Total	90	100.0	210	100.0	80	100.0	194	100.0	

* Significant at P ≤ 0.05

Table (IX) illustrates the relation between computer users' taking break and their health complaints score before and after guideline distribution. This table reveals that 44.8% of computer users who taking break had mild eye complaint before guideline, compared to 54.9 % of them after guideline. However, 40.5% computer users had who taking break had moderate eye complaint compared to 30.5 % after guideline distribution. Statistically significant difference was observed between computer users' taking rest break and eye complaints score before and after guideline distribution (x2= 11.7, and 19.3). P≤ 0.05.Additionally, this table reveals that only 2.5% of computer users who taking break suffered from severe upper musculoskeletal complaints before guideline. After the guideline distribution this percentage increased to 4.9%. However, no percentage change was observed between computer's users who had moderate complaints before and after guideline. Statistically significant difference was found between computer users' taking period of rest and upper musculoskeletal complaints score before and after guideline distribution (x2= 8.09, and 10.3, respectively). P≤ 0.05.Lastly, only 8% of computer users who take break suffered from severe lower musculoskeletal complaints before guideline; compared to 13.1% among those who did not take. After guideline distribution only 8.4% of computer users who take break suffered from severe lower musculoskeletal complaints compared to 16.7% among those who did not take. Statistically significant difference was found between computer users' taking period of rest and lower musculoskeletal complaints score (moderate and mild) before and after guideline distribution (x2= 7.81, and 13.3, respectively). P≤ 0.05.

Table (VIII): Relation between computer users' practicing exercises and health complaints score before and after guideline distribution.

Health Complaints	Before guideline (n=300)				After guideline (n=274)				Test X^2
	Practicing exercises				Practicing exercises				
	Yes		No		Yes		No		
	No	%	No	%	No	%	No	%	
Eye complaints									
Severe	8	30.8	35	12.8	23	11.4	26	36.1	31.2, P= 0.000*
Moderate	8	30.8	114	41.6	61	30.2	30	41.7	7.60,P= 0.055*
Mild	10	38.4	125	45.6	118	58.4	16	22.2	29.3,P= 0.000*
Upper musculoskeletal									
Severe	2	7.6	9	3.3	7	3.5	10	13.9	15.4, P= 0.001*
Moderate	12	46.2	63	23.0	46	22.8	26	36.1	11.8,P= 0. 008*
Mild	12	46.2	202	73.7	149	73.7	36	50	23.6,P= 0.000*
Lower musculoskeletal									
Severe	2	7.7	29	10.6	17	8.4	10	13.9	2.01, P= 0.571
Moderate	8	30.8	73	26.6	37	18.3	26	36.1	10.4,P= 0.016*
Mild	16	61.5	172	62.8	148	73.3	36	50	13.9,P= 0.003*
Total	26	8.7	274	91.3	202	73.7	72	26.3	

* Significant at P≤ 0.05

Table (X) portrays the distribution of the computer users' according to their opinion in relation to the guideline. This table depicts that the majority of computer users (93.4%, 91.2%, and 88.3%) stated that the guideline was informative, the CD was easy to use, and it was easy to understand, respectively. Nearly equal percent (63.9%, and 59.1%) of computer users reported that the guideline was useful in preventing their discomfort resulting from computer use, and it was easy to apply, respectively. Additionally, the table shows that less than one half (47.4%) of computer users stated that the guideline was useful in their daily use of computer. On the other hand nearly one third (33.9%) of them reported that the guideline resulting in increasing their work productivity.

Table (XI) presents the distribution of the computer users' according to their causes of partially and or not applying the guideline. It is obvious from this table that 49.2% and 47.6% of the sample relate the causes of partially applying the guideline to "No time, and lack of facilities", respectively. Furthermore nearly one quarter (26.6%, and 23.4%) of them relating to work pressure, and being habituated on wrong posture, respectively. On the other hand, only 8.6% of computer users relate the causes of partially applying the guideline to being impressed to make exercises in front of others .This table also reveals that less than half (48.5%) of computer users relate the causes of not applying the guideline to "No time. Additionally, nearly one third (33.3% and 30.3%) of the sample relate their causes to being habituated on wrong posture, lack of facilities, respectively. Furthermore, nearly equal percent (18.2% and 18.2%) of the sample relate their causes of not applying the guideline to difficulty in changing work environment, and work pressure, respectively. On the other hand, only 12.1% of computer users relate the causes of not applying the guideline to forgetting where they kept CD.

4. Discussion

A rapid increase in the use of advanced technology in the late nineties of the last century has raised concern for the health and well-being of the computer users. It is known that computer may predispose the users to health problems. Long duration of computer usage has leads to occupational risk of developing "health syndrome" which including Occupational Overuse Syndrome (OOS), Computer Vision Syndrome (CVS), and psychosocial stress.[24]

Occupational overuse syndrome (OOS) is an important occupational health problem and causes considerable human pain and suffering to individuals and their families. Moreover, it has important economic significance in terms of lost productivity, compensation and places a large burden on health care resources, such as health professionals' time, medical interventions and tests. [25]

Ergonomics, as a discipline involves arranging the work environment to fit the person into it. Following ergonomic principles helps reduce work stress and eliminate many potential injuries and disorders associated factors, as bad posture, and repeated tasks. Improving tasks, work spaces, posture, workstation, computing work habits, lighting and equipment help us to fit the employee's physical, psychosocial capabilities and limitations. [26-28]

Table (IX): Relation between computer users' taking rest break and score of health complaints before and after guideline distribution.

Health Complaints	Before guideline (n=300)				After guideline (n=274)				Test X^2
	Taking break				Taking break				
	Yes		No		Yes		No		
	No	%	No	%	No	%	No	%	
Eye complaints									
Severe	24	14.7	19	13.9	33	14.6	16	33.3	11.7, P= 0.008*
Moderate	66	40.5	56	40.9	69	30.5	22	45.8	7.39,P= 0.061
Mild	73	44.8	62	45.3	124	54.9	10	20.8	19.3,P= 0.000*
Upper musculoskeletal									
Severe	4	2.5	7	5.1	11	4.9	6	12.5	8.09, P= 0.044*
Moderate	39	23.9	36	26.3	54	23.9	18	37.5	4.19,P= 0.242
Mild	120	73.6	94	68.6	161	71.2	24	50.0	10.3,P= 0.016*
Lower musculoskeletal									
Severe	13	8.0	18	13.1	19	8.4	8	16.7	5.19, P= 0.158
Moderate	45	27.6	36	26.3	45	19.9	18	37.5	7.81,P= 0.050*
Mild	105	64.4	83	60.6	162	71.7	22	45.8	13.3,P= 0.004*
Total	163	100.0	137	100.0	226	100.0	48	100.0	

* Significant at P≤ 0.05

Table (X): Distribution of the computer users' according to their opinion in relation to the guideline

Characteristics (n=274)	Yes		Partly		No		Not applicable	
	No	%	No	%	No	%	No	%
The guideline was informative	256	93.4	18	6.6	0	0.0	-	-
The guideline was easy to understand	242	88.3	32	11.7	0	0.0	-	-
The guideline CD was easy to use	250	91.2	24	8.8	0	0.0	-	-
The guideline was useful in your daily use of computer	130	47.4	76	27.7	2	.7	66	24.1
The guideline resulting in increasing your work productivity	93	33.9	101	36.9	14	5.1	66	24.1
The guideline was useful in preventing your discomfort resulting from computer use	175	63.9	33	12.0	0	0.0	66	24.1
The guideline was easy to apply	162	59.1	112	40.9	0	0.0		

Table (XI): Distribution of the computer users' according to their causes of partially and or not applying the guideline.

ITEMS	No	
	128	%
Causes of partially applying the guideline*	61	
lack of facilities	63	47.6
No time	34	49.2
Work pressure	30	26.6
Habituated on wrong posture	22	23.4
Difficulty in changing work environment	11	17.2
Impressed to make exercises in front of others	66	8.6
Causes of not applying the guideline*	20	
lack of facilities	32	30.3
No time	22	48.5
habituated on wrong posture	12	33.3
difficulty in changing work environment	8	18.2
I forgetted where I kept CD	12	12.1
Work pressure		

* More than one answer were allowed

Many studies concluded that there is need for implementation of programs that include the concepts of ergonomics, health education, and training of computer users so as to be able to prevent and overcome the phenomenon of Occupational Overuse Syndrome (OOS). With this aim a set of ergonomic guidelines for efficient computer workstation design were suggested. (26, 29-30) Therefore, this study was conducted to assess the impact of guideline application on the prevention of Occupational Overuse Syndrome (OOS) for computer users.

The study was carried out in commercial computer offices, the total size of sample was 300, about three quarters (75.7%) of them were females, and the rest quarter (24.3%) of them were males. The mean age of them was 31.5 ± 7.9.

Several previous reviews have indicated a possible causal relationship between computer work and various health complaints.(31-36)

On studying the effect of the ergonomic health education guideline on the studied sample health complaints, table (II) revealed significant improvement of the visual complaints among those who applied the guideline. This result agreed with that documented by other studies.(37,38) Additionally, the current study investigated the effect of guideline application on the score of upper and lower musculoskeletal complaints, the finding of current study proved significant improvement of the musculoskeletal complaints among the studied sample after guideline distribution ,which is supported by other researches.(39,40)

On studying the pattern of the effect of the ergonomic health education guideline on studied computer users' knowledge, this study revealed that the computer users' knowledge improved significantly after guideline distribution. (Figure I) These finding may be attributed to the effect of guideline on the computer users' knowledge and computer users had sufficiently understood the guideline. Table (X) Regarding the knowledge of computer users about safe computing practices, the present study revealed that, about one third (33.7%) of the sample had correct knowledge about safe computing practices before guideline distribution. (Figure I) These results were in the same line with other studies as **Cooper et al (2010)**, and **Paula et al (2010)** as they mentioned that the minority of computer operators had knowledge about safe computing work practices.[41,42]

The ergonomic health education guideline has a significant effect on improving the observational score of computer users' practices and their workstations modification and among those who had correct knowledge about safe computing practices after guideline distribution (Figure II& IIIand Table II) which is in accordance with the results of some studies by **Ekiof et al (2004)**, and **Amick et al (2003)** as they also proved that ergonomic training had a statistically significant effect on computer workers in modifying their workplace design. [43,44] This may be due to the significant knowledge gained from the ergonomics guideline, participants were able to effectively transfer the training to appropriately change and adjust their workstation to adopt healthy computing behaviors and enhance their performance.

On the other hand the current study finding revealed that there is no improvement of observational score of computer users' practices and their workstations modification among those who did not apply the guideline. (Table IV). It may be due to that knowledge alone doesn't change behavior; behavioral change requires an ongoing program of intervention, education and reinforcement.[45] There is evidence that occupational over use syndrome (OOS) can be reduced through an ergonomics approach and through education, so employers should also continue to provide employees who use computers with appropriate ergonomics training.[46]

On the other hand the current study findings proved a significant increase of the severity of eye complaints among those who partially applied or did not apply the guideline. Table (III, IV). This may be due to that the studied sample did not receive any support from work to facilitate application of the guideline. Further explanation may be related to "lack of time, being habituated on wrong posture, lack of facilities and work pressure of the studied sample. [Table (XI)]

Physical workstation design, task demands, method of keyboard operation, position of computer monitors, and type and use of input devices are associated with work related musculoskeletal disorders (WRMDs). [47] On the other hand, the current study findings proved a significant increase of the severity of musculoskeletal complaints among those who did not apply the guideline table (IV). This finding was in line with another study done by Robertson et al (2010) as they found that the No-trained group experienced a significantly higher number of musculoskeletal symptoms compared to the Ergonomic trained group.[48]

Exposure to risk factors such as individual factors (age, gender,) physical factors (time spent at the computer without breaks, daily duration of computer use, working posture, and poor workstation ergonomics) were contributing significantly to the occurrence of occupational overuse syndrome).[49]

On studying the effect of various risk factors on the score of health complaints of the studied sample it was noticed that the current study proved statistically significant difference between computer users eye complaints score in relation to age group before and after guideline distribution, as it was observed that the percentage of computer users who suffered severe eye complaints decreased by older age before and after guideline. Table (V). These findings were supported by another research as **Rahman and Sanip (2011)** as they reported that younger age group had higher odds for computer vision syndrome (CVS) compared to older age group. [50] Additionally, the present study proved that the severity of upper and lower musculoskeletal complaints score reported by the studied sample declined by older age after guideline distribution. This finding was in accordance with that of **Janwantanakul et al (2008)**, and **Cote (2008)**.[51,52] It may be due to that younger age represents the period where most individuals are more active in life and probably have more computer work load than the older workers in the same stations. Another possible reason for higher occurrence of symptoms among younger computer users specifically could be because younger office workers use computers for longer periods than their senior counterparts, resulting in more reporting of health complaints.[53]

On studying the effect of gender on reported health complaints among the studied computer users, it was revealed that there was significant difference between computer users' eye complaints score in relation to sex before and after guideline distribution. As, it can be observed that, the percentage of the sample who suffered severe, mild, and moderate eye complaints were higher among females at both phases before and after guideline distribution. The present finding was in agreement with previously reported finding that computer vision syndrome were more prevalence among women **(Alexander, and Currie 2004**, and **Richardson and Sen 2007**). [24,54] Several studies have reported many male–female differences in the prevalence of some symptoms of work-related musculoskeletal disorders.[55-56] In addition, it was revealed in the current study finding that the percentage of the sample who had severe, mild, and moderate upper and lower musculoskeletal complaints score were higher among females at both phases before and after guideline distribution. Table (VI) The present results are parallel with previous findings by **Gustafsson et al (2010)**, **Dahlberg et al (2007)**, and **Messing et al (2009).**[57-60] A possible explanation for this gender related difference is that women are more often exposed to additional stress from unpaid work such as housekeeping and child care. Also this could be explained by the fact that office works nowadays that mostly require computer were dominated by women gender. [61]

Additionally, the present study proved statistically significant difference between computer users' total good score of practices and workstation modification and educational level as it was observed that higher the score was for those who graduate from faculty or post graduate (> secondary) from before to after guideline distribution. Table (VII) this may be due to that better understanding and accepting the health education guideline by the higher educated computer users. Furthermore, it may be more difficult for persons with a lower education to adhere to the guideline.

Task break during continuous computer work is important to reduce eye strain as changing eye focus from computer screen can relax the eye muscles. [238] Results of present study showed a significant decrease of the percentage of the computer users who suffered severe eye complaints among those who taking break after the distribution of guideline [Table (IX)]. It may be due to that the computer users utilized the time of break in doing different exercises as mentioned in the guideline. These findings were supported by other studies by **Zairina and Atiya, (2009), Subratty and Korumtolee, (2005)**. On the other hand this finding was contradicted with the result in study conducted by **Balci and Aghazadeh (2003)** who concluded that 10 minutes rest of every hour work schedule was associated with higher eye symptoms. [62-64]

The concept of 'microbreaks,' surfaced when people realized that optimal ergonomic structure was inadequate to combat work related musculoskeletal disorders (WRMSDs) [65] Awkward posture and prolonged sitting are all independent predictors for having musculoskeletal problems. [66]

Findings of present study showed a significant decrease of the percentage of the computer users who suffered severe upper and lower musculoskeletal complaints score among those who taking break before and after the distribution of guideline. These findings were in agreement with the result in study conducted by **Galinsky et al (2000), Menzel (2007)**, and **Thorn et al (2007)**. [67,68] Large systematic reviews concerning the effectiveness of exercises in decrease the risk of developing repetitive Strain Injury (RSI) where a clear benefit of exercises is established. Stretching exercises can help in reducing muscle tension and eyestrain. [65,60] Result of the present study proved that there is a significant decrease of the percentage of computer users who complained severe eye and upper musculoskeletal complaints among those who practice exercises from before to after guideline distribution. Table (VIII). This finding was in accordance with other researches.[69,-73]

Consistent with **Horneij et al 2001**, and **Viljanen et al 2003**, the current study revealed that there is slight increase of the percentage of computer users who complained severe lower musculoskeletal complaints among those who practice exercises from before to after guideline distribution. This may be due to long term adherence to exercise programs is often low, or high barriers to visit a health club.[74,75,76]

The optimistic effect of written guideline on knowledge and practices were expected from literatures and researches findings. [4]

Regarding the evaluation of the guideline according to computer users' opinion, the results of the current study depicts that the majority of computer users stated that the guideline was informative, the CD was easy to use, and it was easy to understand. More than half of computer users reported that the guideline was useful in preventing their discomfort resulting from computer use and it was easy to apply. Table (X) This result was in the line with **Trujillo, and Zeng** (2006).[77] When asking the studied sample about the causes of not applying or partially applying the guideline they relate that mainly to "No time, being habituated on wrong posture, lack of facilities and to work pressure". Table (XI). It may be due to that the self administered health education guideline can't maintain the computer users' compliance with the program.

Conclusion and Recommendations

Conclusion

It could be concluded that, before applying the guideline about one third only of the studied sample had a correct knowledge about safe practices of computer and they were complaining from different health complaints . After application of the ergonomic health education guideline, a positive improvement on knowledge, practices, workstation adjustment, and health status of computer users were apparent.

Recommendations

Based on the finding of the study the following recommendations are suggested:

1- A comprehensive computer ergonomic principles must be included in the curriculum of community health nursing and equipped the students nurse not only with adequate theoretical knowledge but also with the practical skills that help in prevention the occurrence of occupational over use syndrome.

2- Encourage student nurses to participate and to be oriented with the different preventive programs that helps in strengthening their skills and knowledge about the ergonomic principles for prevention of occupational overuse syndrome among computer users.

3- Enhance the role of IEC (information – education and communication) in increase awareness about occupational overuse syndrome through:

- Raise community's awareness through mass media (TV, radio, MSM, campaigns, internet, posters) regarding the risk factors, signs and symptoms, and ergonomic principles for prevention of occupational overuse syndrome among computer users.
- Development and dissemination of brochures, guidelines and leaflet for health professional and clients about occupational overuse syndrome

4. All computer users should mandatory taking in-service training program on safe computing techniques, body awareness and posture .

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