Rehabilitation Intervention Program about Neck Pain and Functional Disability among Information Technology Employees at Assuit City- Egypt

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Abstracts: Background: Neck pain is one of the most common musculoskeletal complaints worldwide. Objective: to evaluate the effectiveness of rehabilitation intervention program about neck pain and functional disability among information technology employees. Design: A pretest, posttest design was used in this study with total coverage of all complainants from neck pain (n=73). Methods: The period of collecting data was from the mid of April 2021 to mid of December 2021. Four tools were used, tool I: A structured questionnaire that consisted of two parts: 1st part: socio-demographic data and working hours, 2nd part: assessment of knowledge of employees. Tool (II): Neck Pain Questionnaire, tool (III): observational checklist and tool (IV):The educational program has been developed. Results: 68.5% of employees had moderate neck pain & functional disability in pre-test while only 69.9% of them mild pain in follow up test. 87.7% of them had poor knowledge in the pre-test and improved in the post and follow-up tests to 98.6 % and 61.6% respectively. A statistically significant negative correlation existed between total knowledge scores with neck pain and functional scores in pre and follow up test. Moreover, 86.3% of studied employees had poor practice scores about isometric, stretching exercises and correct posture in the pre-test, which improved to 94.5%, 39.7% of them having good practice scores in the post-test and in the follow-up test, respectively. A statistically significant positive correlation at pre, post, and follow-up tests (r = 0.520, 0.527, and 0.339, respectively). Conclusion: The study concluded that the rehabilitation intervention program had a positive effect on knowledge, practices and level of neck pain and functional disability of employees at post and follow-up tests.

Keywords: Cervical Exercises, Employees, Knowledge, Practices, Neck Pain, Rehabilitation Intervention Program.

1. INTRODUCTION

Neck pain (NP) is one of the most frequent musculoskeletal problems worldwide with a lifetime prevalence of 14-70% in the general population, annual prevalence ranging from 42 to 67% in young adults and the fourth leading cause of disability. It is more common in the middle age and females are more prone to it. From the occupational groups, office employees especially those who use computers frequently, are at risk for developing neck pain (1,2, 3, 4).

When performing computer-based tasks at work, poor working postures, repeated motions, and an unhealthy lifestyle are increasing the severity, frequency and intensity of pain in neck that may result in stiffness and tension on the neck. Long shifts with continuous work can increase the likelihood of injury and repetitive strain injuries that develop over time may lead to disability (5). Moreover, muscle tension or strain is a frequent cause of non-specific neck pain. The common daily activities that aggravate neck pain include sleeping in an awkward position, reading or watching television while hunched over or turning and twisting the neck violently (6, 7).

The signs of neck pain are various and can change dramatically. The symptoms of neck problems involve headache, pain doesn't improve within a few days, stiffness, numbness or tingling or weakness in arms to fingers, dizziness, radiating pain into both arms or legs and muscular spasms and sleep disturbance. Neck pain causes severe functional impairments and mobility issues (8,9).

The effect of neck pain on individual, companies, and society as a whole are enormous. Costs due to neck pain placed a burden on employers, society, and the individual through care-seeking behavior, decreased productivity, and workers' compensation claims (10).

The World Health Organization (WHO) launched the rehabilitation 2030 initiative in 2017 to raise awareness of the severe unmet need for rehabilitation globally, to emphasize the significance of strengthening rehabilitation in

health systems, and to assist countries in responding to both the current and anticipated increases in rehabilitation needs brought on by demographic and health trends, including those of people with musculoskeletal conditions like neck and back pain. Rehabilitation intervention program at workplace are becoming more crucial to reduce the burden of neck pain. This is due to the increasing responsibility of companies toward employee health, and because having a healthy workforce could result in cost-savings and increased productivity (11).

Isometric exercise is a static exercise in which a muscle contracts and creates force without significantly changing its length or exhibiting obvious joint motion.It is suitable for building neck muscle strength, while stretching exercise is a type of physical activity in which the neck muscle is purposefully flexed or stretched. It is suitable for more flexibility, encourages blood flow and muscle relaxation to reduce neck pain. Therefore, it is crucial to make the neck more flexible and to build up the muscles to prevent the recurrence of the neck pain through using cervical exercises (8, 12). A straight spine, which preserves the natural curve of the spine in the human body, is a key component of correct posture It reduces the strain on the body and prevents damage or gradual deformation in all positions and consider a prerequisite of a healthy life (13).

Knowledge about neck pain and its management have a great importance, not only for the relief of symptoms, but especially for the prevention of recurrent episodes of pain, personal suffering and loss of productivity at work. Knowledge is an important part that promotes behavior changes and employees must have adequate and correct information on neck pain, exercises and correct posture found in current study (14).

Health care providers especially the occupational health nurse is engaged in health education programs related work hazards and advice the workers how to protect against occupational hazards through teaching. Occupational health nurse is rehabilitation-oriented, instructing employees how to independently perform their daily tasks, providing only minimal necessary help and reminding the workers to sit up straight, keep their heads in a neutral position, and how to perform isometric and stretching exercises (15,16,17).

1.1. Significance of the Study

Computer professionals frequently experience neck strain from spending too much time in a static position looking at their device (18). The pain and disability associated with neck pain have a large impact on individuals in all aspect of their life (19).

In Egypt, the study was conducted at Minia University; 182 employees at Minia University using computers in their office work including Information Technology (IT) section. The prevalence of musculoskeletal complaints was arranged in the following order lower back pain (78%), neck complaints (68.1%) and upper musculoskeletal complaints (61.5%) (20).

In previous research which carried out at Information Technology Company in Assuit Governorate on 118 employees, it founded that the prevalence of neck pain & functional disability was 68.6 % among the studied employees and 85.6% of participants had poor knowledge regarding neck pain, exercises, and good posture (21). Fathollahnejad et al., (22) found that a combined treatment consisted of manual therapy and stabilizing exercises resulted in pain reduction and posture improvements, with a reduction in cervical and shoulder angles. While there aren't enough systematic programs for knowledge, exercise and posture correction is available to the public. So, the aim of this study is to evaluate the effectiveness of rehabilitation intervention program about neck pain and functional disability among information technology employees.

1.2. Research Hypothesis

H1. IT employees may have poor knowledge and practices about neck pain and its management before implementing rehabilitation intervention program.

H2. Improving the knowledge and practices will be more effective on improving neck pain level and functional disability.

H3. Rehabilitation intervention program about neck pain and its management will positively affect knowledge, practices scores, level of pain and functional disability among IT employees.

2. RESEARCH METHOD

2.1. Design

A pretest, posttest design was used in this study.

2.2. Setting

The study was carried out at IT Company in Assiut Governorate.

2.3. Sample

The sample size was calculated using G power software version 3.1.3, using paired t-test for comparing the difference of knowledge between two dependent groups under the study (before and after rehabilitation intervention program) with the following parameters, effect size 0.5 (assumed effect size), alpha error 0.05, power (1- beta error prob) 0.95, one tailed. The minimum required sample size was 45 employees. The sample size increased to 73 as total coverage of all IT employees.

According to eligibility criteria, participants aged 21– 40 years, suffering from non- specific neck pain less than 6 months, having mild and moderate level of neck pain and functional disability and no treatment for neck pain taken before. All the participants meet the eligibility criteria.

2.4. Instruments Of Study

Tool I. a self-administered questionnaire was used which included two parts:

Part I: The socio-demographic characteristics according to El-Gilany scale (23) and working hours.

Part II: It involved an assessment employees' knowledge about neck pain and application of isometric, stretching exercises and correct posture. The total mark for the knowledge item was (41); each correct answer given (1) and incorrect or non- response given (0). For each item, a percent score was added and assigned (Poor = 50%, fair = 50–70%, and good = > 70%) (24).

Tool II: The severity of neck pain and functional disability were assessed using the Northwick Park Neck Pain Questionnaire (NPQ). It includes nine items, 1- pain intensity, 2-neck pain during sleep, 3- numbness in arms at night, 4- duration of symptoms, 5- carrying, 6- reading and watching TV, 7- working/housework, etc, 8- social activities, and 9- driving (if applicable). Each parameter is divided in five answer possibilities with points from 0 till 4. Zero is significant for no pain and four is significant for worst pain. The minimum score is 0. The maximum score is 36 if all nine questions were answered and 32 if only the first eight questions were answered. The percentage ranges from 0% to 100%. The higher the percentage of the total score NPQ, the greater the disability and pain (25).

The total score NPQ, pain can be divided into four categories: no neck pain (0–24%), mild (25–49%), moderate (50–74%), and severe (75–100%) (26).

Tools (III) observational checklist to assess employees' practices about isometric, stretching exercises and corect posture. The researchers developed this tool after reviewing the relevant literature (27, 26). It consists of (14) items. The scoring system was calculated according to the total score of 14. One (1) degree was given for each achieved item, and zero (0) was given for not achieved. It was classified as poor practice if the score was < 60%, fair if it was 60% to < 75%, and good practice if it was 75% (28).

Tool (IV): The educational program has been developed by the researcher and included the theoretical part and procedure based on the relevant literature (29).

2.5. Validity

The tools were transferred to the Arabic language. Four experts in community and one in medical surgical nursing reviewed the instrument to ensure their application, validity, and clarity. The researcher made the modification occurred in questionnaire.

2.6. Reliability

For knowledge and NPQ; Crombach's α has a value of 0.827 and 0.857, respectively and the observational checklist for assessing IT employees practices about isometric, stretching exercises and correct posture was (0.90)

2.7. Assessment Of The Questionnaire

It was carried out on 8 employees (10%), before collecting data to investigate the accuracy and applicability. No modification occurred in the questionnaire, so the assessment sample included to the study.

3. Data collection

The present study's data was collected from the middle of April 2021 until the middle of December 2021, two days weekly. Data was collected through three phases:

3.1. Pre-test phase

This phase was conducted before implementing the program to assess knowledge and practices regarding neck pain, exercises, correct posture and determine level of neck pain and functional disability among employees through a self-administered knowledge questionnaire sheet was used to collect their knowledge, which IT employees filled out after clarifying the instruction and an observational checklist was used to assess the employees' practices in the pre-test by the researchers. They observed the practices of the employees when they were applying isometric, stretching and correct posture via demonstration. The researchers met the participants, explained the aims of the study and gave instructions to them. The researcher began collecting data from the middle of April 2021 to the end of May 2021(6 weeks) two days per week in the evening time from 3 pm to 6 pm. The length of each interview took from 20-25 minutes to fill out the questionnaire.

3.2. Intervention Phase

This phase included the arrangement and implementation of the program and started after the pretest phase for 4 weeks; two days per week. The program content was created based on the relevant literature and available resources to enhance employees' knowledge and practices about neck pain, exercises and correct posture**.** An approval letter was obtained from the manager to release employees from work at time of implementation of the program. The study sample was divided into sixteen groups arranged from the average number was 4-5 employees in each group, two groups each day. Each group had two sessions. Every session took 80 minutes and 10 minutes for the rest period. The employees performed the exercise 3 times a week for 16 weeks (4 weeks for implementing program and 12 weeks after implementing but without observation) and the researcher followed their commitment.

The researchers used teaching methods such as discussions, presentations, and demonstrations. Power point presentations, poster, and a handout booklet (printed and pdf copy) were used. It was conducted in the meeting room in the IT company.

3.2.1. Objectives of rehabilitation intervention program

1- Assess employees' knowledge, practices about neck pain, isometric, stretching exercises and correct posture.

2- Determine level of neck pain and functional disability among IT employees.

3- Impalement rehabilitation intervention program about neck pain, isometric, stretching exercises and correct posture.

4- Apply isometric, stretching exercises and correct posture.

5- Evaluate the effectiveness of rehabilitation intervention program about isometric, stretching exercises and correct posture on knowledge, practices, level of pain and functional disability.

3.2.2. The session of the program

The 1st session included two-part, part I: orientation about importance, purpose, session of the program, and expectations, Part II: anatomy of neck, causes of neck pain, symptoms, shape &site of pain, prevention, importance of correct posture, steps of correct posture, tips for working on a computer. This session was conducted via group discussion.

The 2nd session contained two-part, part I (theoretical part for exercises), definition of isometric and stretching exercises, purpose, advantage, time to perform isometric, stretching exercises, preparation (pre, post) of performing exercise, indication and contradiction of performing exercise, steps of isometric, stretching exercises. Part II: applying isometric and stretching exercises and correct posture. This session was conducted via group discussion and demonstration.

3.2.3. Steps of applying isometric exercise

Instruct employees to do each step and hold for 5 seconds, repeat 5 times:

- Isometric flexion

- Isometric Extension

- Right lateral isometric flexion exercise

- Left lateral isometric flexion exercise

3.2.4. Steps of applying stretching exercise

Instruct employees to do and hold each step of stretching exercises for ten seconds before repeating the exercise five times.

- Gently bend their necks forward until they felt their chins hit the jugular notch.

- Gently bend neck back as far as they could.

- Gently bending their necks to the right and left, trying to touch the ear lobe to the shoulder.

- Gently turn their necks to the right and left, while gazing over their shoulders.

3.2.5. Steps of applying correct posture during working on computer

- Head: held straight & squarely over shoulders
- Eyes: top of the computer screen should be at or slightly below eye level
- Shoulders: relaxed, not raised or hunched
- Arms: keep forearms parallel to the floor.
- Wrists: naturally straight and flat
- Elbows: bent approximately 90 degrees and positioned close to the body
- Back: sufficiently supported to maintain its natural curve through Adjust the backrest of your chair to support you for the low and mid back or use the back support.
- Hips: bent approximately 90 degrees
- Knees: bent approximately 90 degrees. There should be two to three finger space between the edge of the seat and back of the knees
- Feet: placed flat on the floor or supported by a footrest
- Avoid sitting in the same position for long periods of time

3.3. Post and Follow up phases

The evaluation was performed through a post-test immediately after the program's intervention by re-demonstration of isometric and stretching exercises and how to sit in a good posture using an observational checklist (the observation was done by the researchers). Moreover, their knowledge was also assessed immediately by using the same pretest questionnaire. Follow-up test was performed after three months later from the end of the program to evaluate engineering employees' knowledge, practices, level of pain and functional disability using the same pre-test tool I, II & tool III.

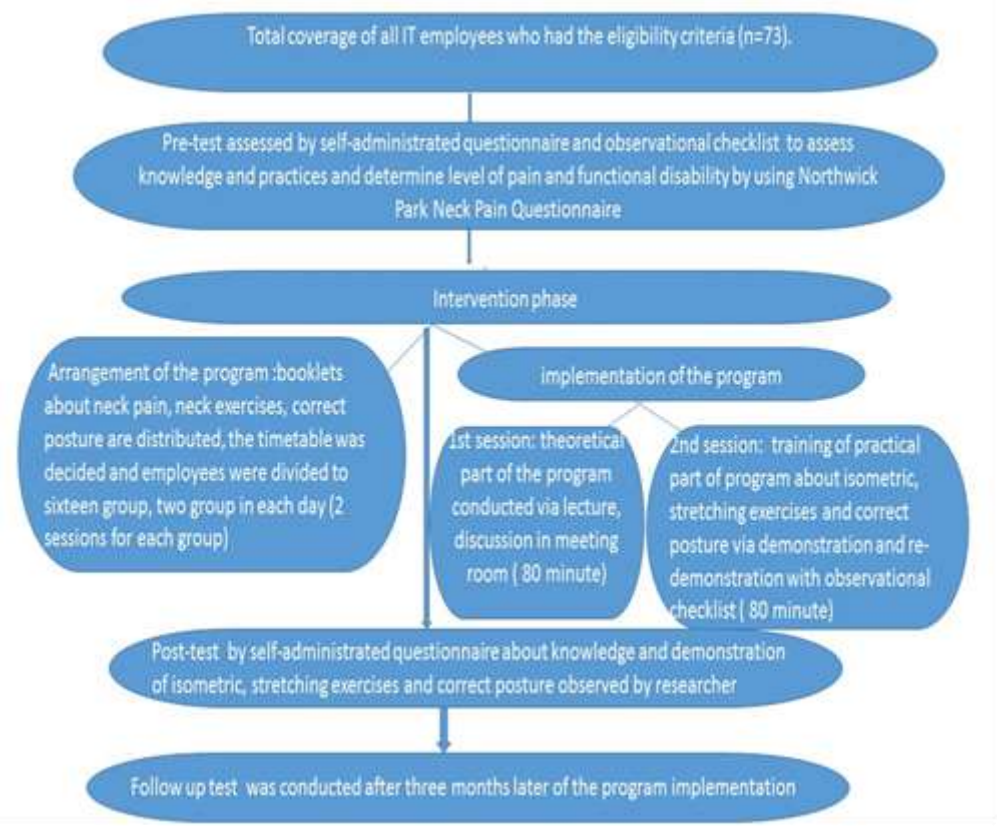

Figure (1): Flow chart of the research.

3.3.1. Ethical considerations:

The nursing faculty at (x) University's ethics committee has given its approval to the study plan (Ethical Approval code: 27xxx25). The research participant was at minimum risk while the study was being conducted. The employees had the freedom to leave research at any time. The information was kept private and anonymous. Common ethical guidelines for clinical research were followed during the research.

4. RESULTS

Table 1 mentioned that the age group > 25 years represents 61.6% in this study, 54.2% of the studied employees were female and 34.2% of participants had <1-year experience. It was found that 61.6% of the studied employees worked on computers for 8 hours per day, 41.1% of participants have overtime outside the place of work 2 hours per day**.**

Figure 1 illustrated that 87.7% of the studied employees had poor knowledge in the pre-test and improved in the post and follow-up tests to 98.6 % and 61.6% had good knowledge, respectively.

Figure 2 showed that 86.3% of the studied employees had poor total practice scores in the pre-test and improved in the post-test and follow-up tests to 94.5% and 39.7%, who had good practices respectively.

Table 2. There was a statistically significant difference in all items of NPQ between pre and follow-up tests among studied employees (p2=0.000) except carrying at (p2 =0.008).

Figure 3 showed that 68.5% of the studied employees had moderate neck pain & functional disability before the application of the training program, and in the follow-up test, none of them had moderate pain**.**

Table 3 There was negative correlation between total scores of knowledge with neck pain &functional disability scores in pre-test & follow up-test (r = - 0.385 and -0.119 respectively).

Table 4 demonstrates a statistically significant positive correlation between total knowledge and practices score at pre, post, and follow-up tests (r = 0.520, 0.527, and 0.339, respectively) (p-value = 0.001, 0.001 and 0.003 respectively).

Table 5 There was negative correlation between total scores of practices with neck pain &functional disability scores in pre-test & follow up-test (r = - 0.366 and -0.560, - 0.266 respectively).

Table 1. Socio-demographic data and working hours among the studied employees (N=73).

Socio-demographic data and working hours	**n(%)**
Age: (years)	
≤ 25	28(38.4)
> 25	45(61.6)
Gender:	
Males	34 (46.6)
Females	39 (53.4**)**
Marital status	
Single	51(69.9)
Married	22(30.1)
Years of working experience	
< 1 year	25 (34.2)
One year	15 (20.2)
Two year	9 (12.3)
Three year	12 (16.4)
Four year	4 (5.5**)**
> 4 years	8 (11.1)
Educational status	
Graduate	60 (82.2)
Post-graduate	13 (17.8)
Socioeconomic status	
Very low	15(20.5)
Low	20 (27.4)
Average	25 (34.3)
High	13 (17.8)
Daily computer usage time:	
6 hours	10(13.7)
8 hours	45(61.6)
10 hours	18 (24.7)
Daily overtime hours:	
None	18 (24.7)
2 hours	30(41.1)
4hours	20(27.4)
6 hours	5 (6.8)

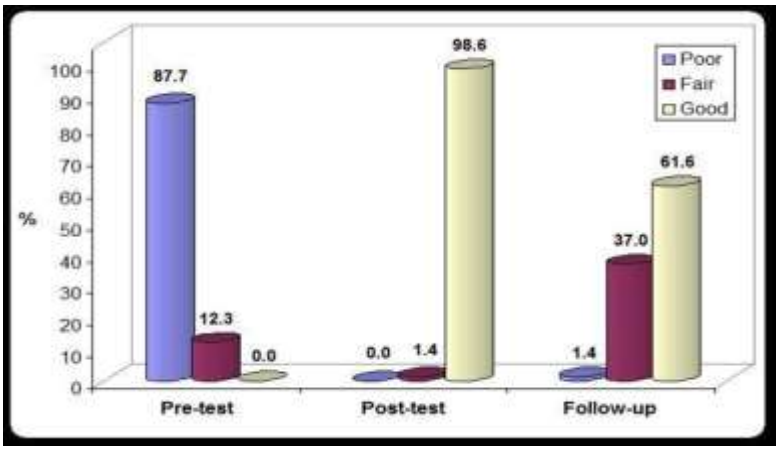

Figure 1. The total score of the studied employees' knowledge (N=73).

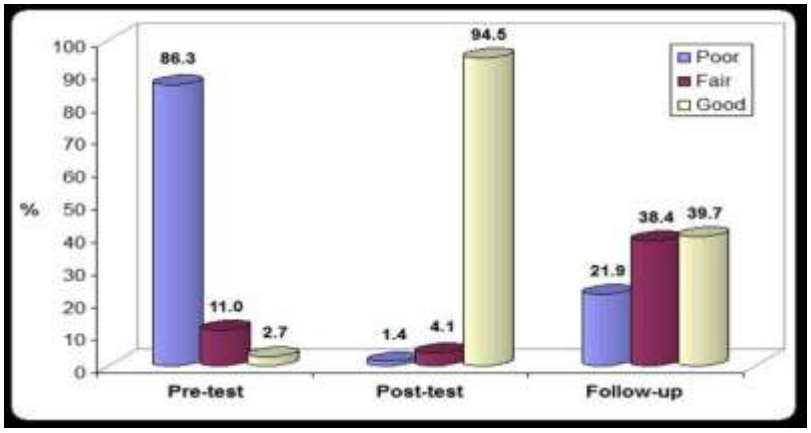

Figure 2. The total practices score about isometric, stretching exercises and correct posture(N=73).

Table 2. Neck pain & functional disability characteristics among the studied employees (N=73).

Neck pain and functional disability	Pre-test (n= 73)	Post-test (n= 73)	Follow-up (n= 73)	P^1	P^2
The intensity of pain:					
M ± SD	2.52 ± 1.00	2.51 ± 0.96	1.47 ± 0.90		
Median (Range)	3.00 (1.0-4.0)	2.00 (1.0-4.0)	1.00 (0.0-3.0)	.907	<.001 *
Neck pain when sleeping					
M ± SD	1.92 ± 1.19	1.82 ± 1.17	0.84 ± 0.76		
Median (Range)	2.00 (0.00-3.0)	2.00 (0.0-3.0)	1.00 (0.0-3.0)	.587	<.001 *
Arm numbness at night					
M ± SD	1.62 ± 0.81	1.60 ± 0.81	0.81 ± 0.66		
Median (Range)	2.00 (0.0-3.0)	2.00 (0.0-3.0)	1.00 (0.0-2.0)	.903	<.001 *
Duration of symptoms:					
M ± SD	1.66 ± 0.87	1.62 ± 0.92	0.84 ± 0.67		
Median (Range)	2.00 (0.0-3.0)	2.00 (0.0-3.0)	1.00 (0.0-2.0)	.805	<.001 *
Carrying:					
M ± SD	1.81 ± 1.17	1.85 ± 1.16	1.30 ± 0.74		
Median (Range)	2.00 (0.0-4.0)	2.00 (0.0-4.0)	1.00 (0.0-3.0)	.804	.008*
Reading and watching TV:					
M ± SD	1.89 ± 1.21	1.89 ± 1.20	1.14 ± 0.67		

Median (Range)	2.00 (0.0-4.0)	2.00 (0.0-4.0)	1.00 (0.0-3.0)	.987	<.001 *
Working/ housework, etc.:					
M ± SD	1.58 ± 0.97	1.53 ± 0.97	0.95 ± 0.57		
Median (Range)	2.00 (0.0-3.0)	1.00 (0.0-3.0)	1.00 (0.0-2.0)	.768	<.001 *
Social activities:					
M ± SD	1.49 ± 1.02	1.52 ± 1.00	0.92 ± 0.68		
Median (Range)	2.00 (0.0-3.0)	2.00 (0.0-3.0)	1.00 (0.0-3.0)	.871	<.001 *
Driving:					
M ± SD	1.75 ± 1.09	1.74 ± 1.08	0.92 ± 0.70		
Median (Range)	2.00 (0.0-3.0)	2.00 (0.0-3.0)	1.00 (0.0-2.0)	.924	<.001 *

* Statistical significance difference at p<0.05, SD: standard deviation

Chi-square was used Paired samples t-test

P^1: between pretest and post-test P^2: between pretest and follow up

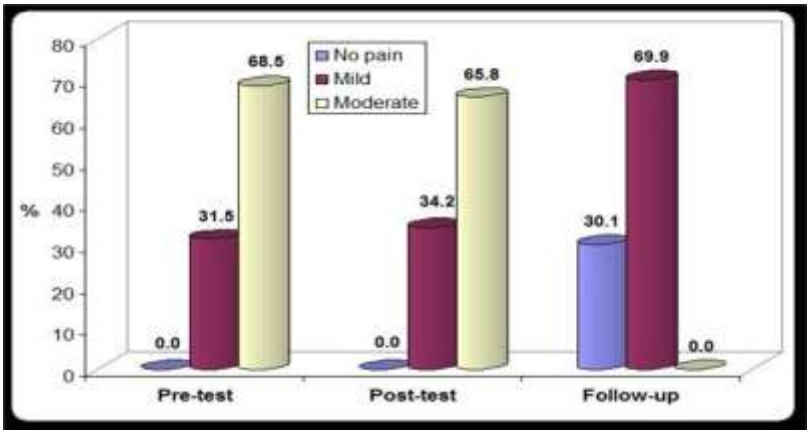

Figure 3. The level of neck pain and functional disability score among the studied employees(N=73).

Table (3). Correlation of total kowledge score among the studied employees with Neck Pain and Functional Disability Score (N=73).

Correlation		Neck pain and functional disability score		
		Pre-test	**Post-test**	**Follow-up**
Total knowledge score	**r-value**	-0.385	0.138	-0.119
	P-value	0.001*	0.245	0.316

* Statistical significance difference at p<0.05 Pearson correlation

Table (4). Correlation between total knowledge and practices score about neck pain, exercises and correct posture among the studied employees (N=73).

Correlation		Total Practices score		
		Pre-test	**Post-test**	**Follow-up**
Total knowledge score	**r-value**	0.520	0.527	0.339
	P-value	0.001*	0.001*	0.003*

* Statistical significance difference at p<0.05 Pearson correlation

Table (5): Correlations between practice and neck pain and functional disability score

Correlation		Neck pain and functional disability score		
		Pre-test	Post-test	Follow-up
Practices score	r-value	-0.366	-0.560	-0.266
	P-value	0.001*	0.000*	0.023*

* Statistical significance difference at p<0.05 Pearson correlation

5. DISCUSSION

Work-related musculoskeletal disorders especially Neck pain, are one of the largest occupational health problems in the working population in developing and developed countries, with the highest number of occupational complaints with different severity especially for computer users who may spend too much time slumped over their devices **(18,30).**

Concerning to the gender of the studied IT employees, the current study showed that more than half of them were female while more than two-fifths were male. These results conversely with Markopoulos et al.,**(18)** who mentioned that more than half of them were male, while more than two-fifths were female.

This finding noticed that more than one third of employees had working experience <1 years, this finding disagreed with Mohan et al., **(31**) who displayed that about more than one third of them had 1-3 years. This attributed that continuous work on computer results in excessive tension on muscles of body especially musculature of neck which causes pain in the neck region.

According to working hours on the computer per day, the present study showed that more than half of the studied employees worked 8 hours daily. The present study results in consistent with Khan & Faizan**, (32**) who mentioned that half of the computer users worked 8-9 hours. This may be attributed that when increasing the working hours on the computer per day, it will increase the risk for developing neck pain. so encourage the company's officials to take care of the rest periods for employees and encourage them to practice neck exercises to prevent pain.

The present study found that there was a statistically significant difference in neck pain intensity between pre and follow up test (<.001) and this results agreed with Louw et al.,**(33)** who revealed that there was a statistically significant difference in neck pain intensity (pre and follow up test) (p = 0.000).

As regards the functional disability, the present findings showed that about one-fifth of studied employees can carry heavy things, but it causes additional pain in the neck disagreed with Bhalala,**(34)** who reported that more than one-quarter of them can lift heavyweight, but it gives extra pain. The present study mentioned that there was a statistically significant difference in all items of NPQ between pre and follow-up tests among studied employees (p2= <.001) except carrying at (p2 = .008). This may have attributed to carrying heavyweight stretches neck and shoulder muscles which makes extra neck pain.

Related to level of neck pain & functional disability, the present study mentioned that more than two thirds of the studied employees in pre-test had moderate level of neck pain & functional disability and nearly one third of them had mild level. In follow up-test, more than two thirds of them had mild level and about one thirds of them had no pain & functional disability.

In contrast with our study, another study conducted by Mullai, **(8)** reported that more than half of computer professionals had moderate level of neck pain, about two thirds of them had mild functional disability and two fifths of them had mild level of neck pain, more than one third of them had moderate functional disability in pre- test. in

post- test two thirds of them had mild level of neck pain, more than half of them had mild functional disability and one third of them had no pain, two fifth of them had no functional disability. This may have been attributed to the rehabilitation training program had a positive effect on level of neck pain and functional disability of employees at pre and follow-up tests.

In addition, the current study demonstrated that more than three-quarters of the studied employees had poor knowledge which may be due to the lack of advertising campaigns through mass media about neck pain, neck exercises, and the feasibility of obtaining intervention program, so feasibility leads to a lack of awareness about neck exercises & good posture. After implementing rehabilitation training programs, discovered that the vast majority of studied employees had good knowledge in immediate post-test, while decreased slightly to two-thirds in follow up test. This decrease in knowledge at follow up may be due to length of time (3 months) after implementing intervention program lead to forgetfulness.

This finding showed that 86.3% of the studied employees had poor total practices scores in the pre-test and improved in the post-test and follow-up tests to 94.5% and 39.7%, who had good practices respectively. This indicated that rehabilitation intervention program had good effect on improving practices of the studied employees in post and follow up tests. This decrease in good practices score at follow up- test may be due to length of time (3 months) after implementing intervention program without observation from researcher how to apply isometric, stretching exercises and correct posture and decrease application of exercises due to increasing number of working hours.

These results demonstrate a statistically significant positive correlation between total knowledge and practices score about neck pain, exercises and correct posture among the studied employees at pre, post, and follow-up tests ($r = 0.520$, 0.527, and 0.339, respectively) (p-value = 0.001, 0.001 and 0.003 respectively). This may be attributed to increase the employees' knowledge, this lead to increase their practices at work place about isometric, stretching exercises and correct posture.

The present study revealed that there was a significant statistical difference in the level of neck pain and functional disability between pre and follow-up tests after applying isometric& stretching exercises ($p2 =0.000$). This may be attributed to isometric, and stretching exercises being effective in increasing the strength and endurance of muscle & preserving the range of motion and elasticity and relieve neck stiffness **(8).**

These findings were supported by Lee et al., **(35)** who reported there were statistically significant differences in neck pain & functional disability between the groups after application-based neck exercise. Moreover, these results agreed with **Liyanage et al., (26)** who showed that isometric, stretching exercises were more beneficial than other interventions for neck pain in computer professionals ($p<0.001$).

This study's results founded that there was negative correlation between total score of knowledge about neck pain, exercises and correct posture with the level of neck pain &functional disability in pre and follow-up test (-0.385, -0.119, respectively). This refer to when increase awareness about neck pain, exercises and correct posture, it will enhance to decrease the level of pain and correct the functional disability.

This study had strengths points, unlike most studies that focused on evaluating the effect of neck exercises and did not care about the participants' knowledge, when improving the employees' knowledge and practices, this lead to improving their application at work place about isometric, stretching exercises and correct posture so it will lead to reduce neck pain. Moreover, the follow up continued up to 12 weeks without observation by researcher with emphasize to apply all instruction in their home.

The study had some limitation which included a small sample size so; the study results cannot be generalized. The current study recommended company authorities to ensure that workers get enough rest periods and to encourage them to do neck exercises to prevent pain. Checkup to for all employees in the IT companies periodically for early detection of muscle skeletal disorders. Further studies should be done on a large sample size. Encourage IT companies to put brochures on the desk in front each employee as a reminder of correct posture and doing neck

exercises.

4.1. Implications for practice

Rehabilitation intervention program about neck pain, prevention and correct posture through health education and practicing isometric, stretching exercises are two nursing interventions which have minimal side effects compared to other interventions that can decrease IT employees 'pain intensity and improve their quality of life because neck exercises make the neck more flexible which prevent the recurrence of the neck pain. So far, very limited studies have done rehabilitation intervention program about neck pain among IT employees in Egypt.

CONCLUSIONS

The study concluded that rehabilitation intervention program about neck pain had a positive effect on knowledge, practices and level of neck pain and functional disability of employees at follow-up tests. Combining between the isometric and stretching exercises, correct posture and improving the knowledge and practices were helpful to reduce the risk of musculoskeletal hazards at computer workstations.

CONFLICT OF INTEREST

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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