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Abstract. *Introduction:* Computer related musculoskeletal disorders affect millions of computer users yearly in developed nations as reported in the literature. With proliferation of computer systems in the developing nations, the associated musculoskeletal pain has yet to be investigated. This serves as impetus for this study.

Methods: A structured questionnaire was used to obtain information from computer users across six federal university campuses in Nigeria. The questionnaire contained two sections of 35 items each? The questions requested the respondents to provide information on age, sex, years of computer usage, hour spent on computer per week, associated musculoskeletal pain, pain severity and knowledge of preventive measures. 1041 questionnaires were analyzed using descriptive statistics.

Result: Low back pain and neck pain were found to be the highest pain complaint with 74% and 73% respectively. 67% of the respondents complained of wrist pain, followed by finger pain (65%). shoulder pain 63% and general body pain 61 %. The knee and foot pains were the least reported complaints with 26% and 25% respectively. In terms of pain severity, low back pain, finger pain, neck pain and shoulder pain are rated to be moderate, while all other joints were said to be of mild pain.

Discussion: The results of this study indicated that low back pain, neck pain and upper limbs are the common disorders complaints among the users. The cause of the pain may be attributed to bad ergonomics among the users.

Keywords: Computer, musculoskeletal, occupational injuries, pain

1. Introduction

The computer has been identified as a device that has a unique potential to improve the quality of health care system as well as the efficiency of the health workers both in the developed and developing countries [9]. Despite the fact that information and communications technologies are being used to improve health care systems, there may be health hazards associated with their use.

School children and adults commonly use computers and the Internet each day. Among computer users, the most common areas of complaint are the neck, shoulder and back [5]. Khaki and Rosemoff [10], in their studies on 'Ergonomics in Back pain' found that poor posture caused fatigue, strain and eventually pain. Poor posture may result in structural deformation of the body, muscular contractures, pain in the back and legs, decreased lung capacity, poor circulation, increased intravascular pressure and kinks in the bowel [18]. Stuart [18], states that muscles need stimulation to grow and need to experience movement to maintain coordination. Good circulation also provides nutrition to muscles and joints, but they will

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be deprived of that if people stay in the same position all day. Prolonged sitting leads to a slackening of the abdominal muscles and curvature of the spine which in return is bad for the organs of digestion and breathing [6]. Unnatural postures and bad seating can speed up the deterioration of the intervertebral discs. Back pain is the leading cause of absence from work. Expert predicts that one in six of employers will be affected by bad ergonomic design in one year alone [11]. Benz [2] reported that computer-related vision and musculoskeletal ailments affects millions of computer users every year.

Most occupational illnesses are now attributed to cumulative Trauma Disorder (CTD) or Repetitive Strain Injuries (RSI). Such conditions are Carpal Tunnel Syndrome, back pain, neck pain, tendonitis and eye fatigue or some other ergonomic causes [13]. RSI have become (he fastest growing workplace illness in the United States, up to an astonishing 770% over a decade ago (Business week, 1995).

Rob Hogan [8] reported that concentrating on the screen for long periods could reduce the blink rate and allow the tear film on the surface of the eye to dry which can result into dry and sore eyes. A study conducted by the Department of Human Factor Engineering, University of Occupational and Environmental Health, Japan, revealed that visual strain occurred after merely 60 minutes of video terminal task, which further resulted in lower productivity [3]. Headaches result from screen glare and poor image quality [7]. Half of America's work force (about 75 million people) that uses computers suffer daily from computer vision syndrome (Optometry Today, 2002).

Work-related upper limb disorder is a more general description of the problems suffered by people without implying a particular cause. The computer keyboard and mouse are the prime culprits [18]. Intensive use of a mouse or keyboard may give rise to aches and pains in the fingers, hands, wrists, arms or shoulders. Carpal Tunnel Syndrome is the leading cause of occupational illness in the United States with absenteeism and medical expenses costing the industry billions of dollars a year.

Since the price of computers has gone down considerably in Nigeria, the number of users has greatly increased as many organizations and individuals could afford them. Consequently, complaints of musculoskeletal pain are daily reported in the physical therapy department. The aim of this study therefore was to evaluate the pattern of musculoskeletal pain associated with the use of computers.

2. Method

This study was carried out to establish the pattern of musculoskeletal pain associated with the use of computers in Nigeria. The instrument used was a questionnaire, 1250 of which were distributed, Subjects were selected at offices, cyber cafes, classrooms and commercial centers in six federal universities in Nigeria.

A questionnaire was designed and self administered to collect information on related musculoskeletal problems associated with the use of computers. The questionnaire consisted of three sections of questions.

The first section requested background information – sex, age, years of computer experience and computer applications commonly used. Questions were asked to establish if subjects were familiar with the side effects that occur as a result of using computers. The second section was designed to quantify the pain perception due to the use of computer systems. Pain was assessed using a 4-point pain index:

0 – No pain.
1 – Mild pain.
2 – Moderate pain.
3 – Severe pain.

Subjects were asked to identify the painful parts of the body. Twelve areas of the body were itemized in this section. The third section was designed to assess the respondents' knowledge of ergonomics and

Table 1
Years of experience of computer users

S/N	Variable	Outcome scores
1	Number of males	46%
2	Number of females	43%
3	Mean age	29 years
4	Mean years of experience	6 years
5	Mean hour spent on computer per day	6 hours
6	Mean hours away from computer due to pain (in the last one month)	12 hours
7	Respondents that are aware of preventive measures	28%
8	Respondents that had formal ergonomics instructions at work place	3%

Table 2
Years of experience of computer users

Computer experience	% of Respondents	% of Pain complaint
0-1 year	31	21
2 years	25	43
3 years	15	57
4 years	11	81
5 years	10	93
Above 5 years	8	96

preventive measures, and also to see if ergonomic instructions are offered in the workplace. Of 1115 questionnaires returned, 1041 (583 males and 458 females) were suitable for analysis.

3. Results

The mean age of the respondents was 29 ± 2.5 years as shown in Table 1. The respondents had a mean of 6 years experience with computers and an average of 6 hours usage per day. A mean of 12 hours of work were lost in the previous month due to computer related pain. Few users, 28%, were aware of preventive measures and only 3% had formal ergonomics instructions in the work place (Table 1)

3.1. Years of computer usage

Table 2 shows the years of experience of computer users. The respondents had an average of four years of using computers. Twenty four percent of the respondents had less than one year of computer use; 32% had 1–2 years' experience; 17% had 2–4 years' experience and 18% of the respondents had been using computers for more than five years. The data above show that usage of computers became popular in the previous 2 years and pain complaints were, more common among the respondents with over four years experience with computer systems in Nigeria.

3.2. Average time of usage of computer per day

Thirty-five percent of the respondents spent 1–5 hours; 59% spent 6–10 hours and 6% spent 11 – 15 hours per day with computers. The data in Table 3 show that majority of the respondents spent 6–10 hours with the computer daily. Pain complaints are more pronounced with people spending 11– 15 hours daily with computer. Respondents who used computers for 6–10 hours and 11–15 hours daily complained of pain at a variety of anatomical sites.

Table 3
Number of hours spent on computer daily

Number of hours per day	% of Respondents	% of Pain complaint
1–5	35	33
6–10	59	62
11–15	6	79

Table 4
What respondents use computer for

Facilities	Percentage
Internet	90
E-mail	83
Word processing	76
Games	17
Programming	14

Table 5
Pain perception of respondents

Pain perception	% of Respondents	%
Low back pain	2.0	74
Neck pain	1.94	73
Wrist pain	1.93	67
Finger pain	1.55	65
Shoulder pain	1.51	63
General body pain	1.46	61
Headache pain	1.40	54
Elbow pain	1.40	51
Hip pain	1.34	40
Ankle pain	1.31	29
Knee pain	1.27	26
Foot pain	1.24	25

3.3. *Computer usage in Nigeria*

From the study, 90% of the respondents used computers for internet browsing, 83% for e-mail, 76% for word processing and 14% and 17% used it for programming and games respectively as shown in Table 4.

3.4. *Percentage of pain perception reported by the respondents*

As shown in Table 5, low back pain has the highest, with 74%, followed by neck pain 73%, wrist pain 67%, finger pain 65%, shoulder pain 63% and general body pain 61%. Headache and elbow pain are 54% and 51% respectively. Others, including hip pain, ankle pain, knee pain and foot pain, account for less than 50%. Low back pain has the highest severity value of 2.0 followed by finger pain and neck pain which are 1.94 and 1.93 respectively (Table 5).   .

4. Discussion

The purpose of this study was to examine the pattern of musculoskeletal pain associated with the use of computer systems. The results of this study indicated that low back pain and neck pain are the leading

complaints among the users. This is in line with the prediction of Waverley [20] that the increase in computer usage at homes and work places will lead to the increase in the number of people suffering from low back pain. Stuart [18] reported that common areas of pain among computer users are the neck and shoulder. While back pain is linked with poor sitting posture, faulty furniture [6], neck pain resulted from the incorrect placement of monitors. Garden [4] advised that a monitor, properly positioned at the correct height, could prevent back pain. Upper extremity disorders are usual complaints as recorded in this study. The majority of the respondents complained of shoulder, wrist and finger pains. Recently, several authors have identified this problem among computer users [14,15]. Palmer et al. [14] studied the relationship between upper limb symptoms and keyboards users. They concluded that the use of keyboards was associated with discomfort at the shoulder and wrist or hand. All frequent computer users usually report pain around the fingers after an entire day of mousing and typing [7]. These symptoms are the clinical features usually linked with the onset of carpal tunnel syndrome (CTS). Lacy [12] concluded from her four years study, that looking down on a low monitor pitches the head forward, placing strain on the neck muscles which in turn causes spasm. Spasm aggravates the nerve roots emerging from the lower cervical spine which form the median nerve. This eventually causes the symptoms associated with CTS which may worsen to a point where the nerves die and so preventive surgery is required.

Problems in productivity, absenteeism, turnover, increased costs, decrease accuracy and low morale are directly linked to aches and pain, vision problems and comfort levels in the computer-intensive environment [13]. Our study confirmed this assertion and the respondents indicated that they were off work for several hours due to pain. Though computer technology is advancing an ever faster pace, little is done to prevent the ailments associated with its use. Many experts advocate good working posture, ergonomic and stretching exercises to ease the pain when using computers. However, the majority of the respondents had no formal ergonomic instruction at the work place. This might not be unconnected with the high incidence of musculoskeletal pain. The results of this study should be interpreted with caution because of several limitations. Firstly, the questionnaire was based on self report, which can be subject to recall bias that may under or overestimate the pain perception recorded. Secondly, there may be other possible causes of musculoskeletal pains, such as smoking, which were not controlled for in this study.

5. Conclusion

The result showed that the most frequent complaints are of low back pain, neck pain and wrist pain. Foot and knee pain are the least reported when using computer systems. Pains are more severe in people with more than four years working experience on computers. In practice, the results of this study can help to prevent occupational injury associated with the use of computers by emphasizing good posture, workstation design and computer hardware.

In the concept of preventive rehabilitation, the role and scope of expertise of physiotherapists must be enlarged to provide advice and education towards proper ergonomics. Counselling and working with authorities of different offices will further assist in reducing occupational injuries that can lead to musculoskeletal pain among computer users. There is also a need to focus on research, health planning and health education for computer users.

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