Prevalence of neck pain in computer operators
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Abstract

Introduction: Persisting neck pain is common in society, especially in office-workers. Although, neck pain is common source of disability, little is known about its prevalence and course. The bulk of literature available on this problem is in west with few studies done in an Indian setup. India is a middle-income developing country. The importance of this kind of studies becomes more obvious when it is considered that some reports indicate that the greatest increase in the prevalence of musculo-skeletal disorders in the next decade will be in middle-/low-income countries.

Aims & objectives: The Primary aim of this research was to study the prevalence of neck pain in computer operators.

Methodology:

Study design: Cross Sectional Study.
Sampling technique: Simple Random Sampling.
Study subject: They should be working on computer for at least 3 hours / day or 15 hours/week, in current job for at least past 6 months & should be willing to participate in the study.

Technique: Study was approved from the Institutional Ethics Committee. Informed consent was taken prior to data collection. Data were collected from 700 subjects via structured mailed questionnaire which included individual variables & work related variables.

Conclusions: Prevalence of neck pain was found to be 47%. The study shows that neck pain is affected by individual variables and work related variables.

Key words
Neck pain, computer operators, ergonomics.

Introduction

Technological advances, particularly, invention of computers, have revolutionized our way of working. Computer has become an integral part of our life. However, its use is not free from health hazards. Intensive computer work puts stress and strain on muscles, as well as joints because of continuous and repetitive nature of movements.

Neck pain is a common health problem in the general population and especially among computer workers. Most people experience some degree of neck pain in their lifetime.1,2 Although some authors consider neck pain to be a significant contemporary health problem that is estimated to affect many millions of workers around the world annually, it was also described in the 18th century, along with other work-related upper limb disorders by Bernardini Ramazzini - an Italian physician and the father of occupational medicine - when he said the diseases: “… arise from three causes; firstly, constant sitting, secondly the perpetual motion of the hand in the same manner, and thirdly the attention and the application of the mind.”3

Neck disorders are common in Western society; causing major medical and socio-economic problems.4,5 Approximately two out of three individuals will at some time during their lives experience at least one episode of pain in their neck or shoulders. The prognosis for those suffering from neck pain is relatively poor. Not more than about half of the subjects with neck pain are pain-free after 1-5 years.6-14

Need of the study

It is important to consider the public health and financial implications of neck pain. Chronic neck pain patients use the health care system twice as often as the rest of the population.15,16 Over a decade ago, the National Institute for Occupational Safety and Health17, estimated that the cost associated with Work related Musculoskeletal Disorders was $ 13 billion annually; more recently, this was projected to be between $ 45 and 54 billion.18 With children being exposed to computer-related activities at ever-earlier ages, the health of the future workforce deserves contemplation.

Most studies of neck pain are based on high-income and industrialized countries, and there is little information on the general and working populations of middle and low-income countries. India being the forerunner in the cyber world, there is an urgent need to understand the dynamics of these problems and prevent it from assuming epidemic proportions. To the best of investigator’s knowledge, there is no such study done in Ahmedabad population to know about the prevalence of neck pain.

Research question
What is the prevalence of neck pain in computer operators of Ahmedabad city?
Significance of the study
This study will help to know about the prevalence of neck pain in computer operators of Ahmedabad city.

Operational definitions
Pain
Pain was defined as ‘an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage.
Neck Pain:
Neck pain was defined as pain in the head and neck region caused by degenerative disease, trauma, inflammatory or mechanical disorders. Neck pain arising from habitual postures has been referred as “Non-specific Neck Pain”.
Mental Stress:
The wording of the question was: “Stress means the situation when a person feels tense, restless, nervous, or anxious, or is unable to sleep at night because his mind is troubled all the time. Do you feel that kind of stress these days?” (Two categories: none / little and some / fairly much).
Video Display Unit Work:
The use of keyboard or other input or control device, including short thinking periods and checking the results on the screen. In the analysis a dichotomy < 50% and > 50% was used.
Time used for VDU Work:
Time used for Video Display Unit work (self rated proportion of time used for Video Display Unit work as percentage of total work time). The exact wording of the question was “Estimate how many percent of your total working time, you have used for VDU work”.
Physical Work Environment:
It includes - lighting conditions, temperature, quality of the air, size of the working room, and acoustic conditions in the work environment. The subjects rated each component by a scale from 1 to 5, where 1 was very poor and 5 very good. Since all the items were positively associated with the outcome, for each subject the median of the five components was calculated to represent the status of the physical work environment. In the analysis a dichotomous variable was used, values higher than 3 denoting good and values from 1 to 3 poor environments.
Ergonomics of the Work Station:
It includes - work chair, work desk, screen, keyboard, mouse and document holder. The workers rated each component by a scale from 1 to 5, where 1 was very poor and 5 very good. For each subject the median of the six components was calculated to represent the value of the workstation ergonomics. In the analysis a dichotomous variable was used, in which values 4 to 5 denoted good ergonomics and values from 1 to 3 poor ergonomics, because of a positively skewed distribution.
Screen Distance:
It means the distance between the eyes and the middle point of the screen (cm), measured by the employees themselves in their own offices. Based on the recommendations of the International Standard Organization Standard (Ergonomic requirements for office work with visual display terminals), two categories were used, where the distance between 50 and 70 cm was good and other measures were poor.
Height of VDU Screen:
It is the distance between the upper edge of the screen and the horizontal level of the eyes, measured by the employees themselves in their own offices. Based on the International Standard Organization recommendations, two categories were used, where more than or equal to 10 cm was good and less than 10 cm poor.
Distance of the VDU Mouse:
It is the distance between the middle point of the mouse and the edge of the desk, measured by the employees themselves in their own working rooms. Based on the recommendations, two categories were used, where more than or equal to15 cm was good and less than 15 cm poor.
Breaks during work:
It means whether there were breaks when working at the Video Display Unit. The scale ranged from “much too little” to “fully enough”. In the analysis a dichotomous variable was used, where less than “fully enough” was studied as potentially involving an increased risk of neck pain.

Limitations and delimitations
The study is limited to Ahmedabad City only.
The study is limited to the Computer Operators of Ahmedabad City who are using conventional computers with desktops. The study is limited to 700 subjects for questionnaire based variables.

Aims and objectives
The study was specifically aimed at identifying the prevalence of self reported non-specific neck pain in computer operators.

Material and methods
This is a cross-sectional study, conducted in Ahmedabad, Gujarat. The study was conducted at institutes and establishments where computers are used extensively. These included banks, computer training centres, pharmacological companies, BPO (Business Process Outsourcing) and institutes running degree courses in computer application. Subjects were included in the study if-
He/She is working on computer for at least 3 hours/day or 15 hours/week.

He/She is working in current job for at least past 6 months.

He/She is willing to participate in the study.

Rest other subjects were excluded from the study. Study was approved from the Institutional Ethics Committee. Subjects were provided with the information regarding the study and their purpose. They was assured of the confidentiality of their details. Thereafter, a written consent was obtained.

Pilot study

- A pilot study was conducted to determine the sample size and to test the validity and reliability of the questionnaire.
- The questionnaire was used by Korhonen T. et al\textsuperscript{19} and published in 2003, but in the present study, it was modified as per the requirements.
- The content validity of the questionnaire was tested and certified by three subject experts from the fields of Orthopedics, Pharmacology and Statistics.
- For the pilot study, an organization (Bank) was randomly selected.
- 20 subjects who fulfilled the inclusion criteria were randomly selected.
- The study questionnaire was distributed to them.
- The mean time for filling out the questionnaire was 20 minutes.
- The proportion of respondents having neck pain was estimated.
- The prevalence rate of neck pain was found to be 40%.
- By using the formula $n = \frac{4pq}{L^2}$.
  Where:
  - $n$ = Sample size
  - $p$ = Prevalence rate of neck pain
  - $q = 1 - p$
  - $L$ = Allowable error (which is taken as 10% for the study).

Therefore, $n = \frac{4 \times 0.4 \times 0.6}{0.04 \times 0.04} = 600$.

Thus, the minimum sample size required was 600.

Procedure

After seeking permission from the Head of Institutes a list of 1000 employees who fulfilled the inclusion and exclusion criteria were enlisted.

- Assuming a non-response rate of 20-30%, 900 subjects were selected randomly with the help of table of random numbers.
- 200 subjects either did not respond or did not return completely filled questionnaire. So, they were not included in the sample.
- 700 completely filled questionnaires were received.
- Thus, the response rate was found to be 77.77%.
- Independent variables- various individual variables & work related variables.
- Dependent variable - self reported neck pain during the preceding 12 months.
- Neck pain was defined as pain in the head and neck region shaded in a drawing of the head, neck and shoulder area. (Fig.)
Neck Disability Index (NDI) Score:

NDI Questionnaire is designed to provide information as to how neck pain affects a person’s ability to manage in everyday life. The questionnaire has 10 components and each component has a scoring from 0 to 5. Thus total score achievable is 50. Greater score indicates greater disability.

Scores (out of 50) 0-4 no disability, 5-14 mild disability, 15-24 moderate disability, 25-34 severe disability, > 35 complete disability. Test – Retest reliability for NDI is found to be good; r = 0.89. Interclass correlation (ICC) = 0.68, 95% CI = 0.54 – 0.90. Cronbach’s alpha is 0.80. Specificity and sensitivity are 59% and 52% respectively.

Data analysis
- The data was analyzed by using the Statistical Package for the Social Sciences (SPSS) Software (Version 17).
- Demographic distribution of study subjects was determined.
- Prevalence of neck pain in study subjects was also determined.
- Chi-square test was used to know the association of dependent variable – neck pain with other independent variables and to comment upon their significance at 95% confidence level.

Results

Description of Study Sample
- A total of 900 questionnaires were mailed out of which 200 subjects either did not respond or did not return completely filled questionnaire. So, they were not included in the sample. Thus, 700 completely filled questionnaires were received making a response rate of 77.77%.
- Out of the total participants in the study, 53% were males and 47% were females. The age of the participants ranged between 23-58 years and the mean age remained 38.37 ± 9.06 years.

Dependent Variable: Neck Pain
- Out of 700 questionnaires received, only 329 subjects reported neck pain making a prevalence rate of 47% and the remaining 371 subjects did not have neck pain.

<table>
<thead>
<tr>
<th>Gender</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>175</td>
<td>53.19%</td>
</tr>
<tr>
<td>Female</td>
<td>154</td>
<td>46.81%</td>
</tr>
<tr>
<td>Total</td>
<td>329</td>
<td>100%</td>
</tr>
</tbody>
</table>

Subject distribution according to Age

<table>
<thead>
<tr>
<th>Age in years</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 30</td>
<td>89</td>
<td>27.05%</td>
</tr>
<tr>
<td>30-50</td>
<td>174</td>
<td>52.88%</td>
</tr>
<tr>
<td>More than 50</td>
<td>66</td>
<td>20.07%</td>
</tr>
<tr>
<td>Total</td>
<td>329</td>
<td>100%</td>
</tr>
</tbody>
</table>

Independent variables
- Following individual, work related and clinical variables were studied for their association with neck pain.
- Individual variables
  Gender, age, smoking, physical exercise, mental stress, job satisfaction, pre-existing neuro-muscular or
traumatic conditions, family history of Similar problems, Neck Disability Index score.

- **Work related variables**
  - Duration at current job, Video Display Unit working hours, physical work environment, ergonomics of work station, distance and height of screen, distance of mouse and breaks during work.

**Association between independent variables and dependent variables – neck pain.**

- Chi-square test was used to know the association of dependent variable neck pain with other independent variables and to comment upon their significance at 95% confidence level.

A significant association was found between -

- Neck pain and gender (p=0.026), neck pain and age (p=0.001), neck pain and physical exercise (p=0.042), neck pain and mental stress (p=0.003), neck pain and job satisfaction (p=0.002), neck pain and pre-existing traumatic or neuro-muscular conditions (p=0.001), neck pain and Neck Disability Index Score (p=0.001), neck pain and duration at current job (p=0.002), neck pain and Video Display Unit working hours (p=0.037), neck pain and score of physical work environment (p = 0.003), neck pain and ergonomics of work station (p=0.030), neck pain and screen distance (p=0.005), neck pain and screen height (p=0.011) and neck pain and breaks during work (p=0.042).

- Therefore, the difference found between these variables is statistically significant and not due to chance.

- It was found that there is No statistical significant association between neck pain and smoking (p=0.684), neck pain and family history of neck pain (p=0.320), neck pain and mouse distance (p=0.546)

Therefore, whatever difference is found between them is purely by chance, and not statistically significant.

**Discussion**

- In epidemiological studies for neck pain prevalence, different definitions have been used. There is no “gold standard” measurement tool for estimating the prevalence of neck pain among populations. In neck pain studies there are different points and assessment measures for prevalence. So, to compare the results the different points in time and the population studied must be taken into account. Although self-reporting is usually considered a less reliable way to measure disease outcomes, neck pain is a mainly a self-reported condition.

<table>
<thead>
<tr>
<th>Chi-Square-Test</th>
<th>Association of Neck Pain with all variables</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>P-Value</strong></td>
<td><strong>Comment</strong></td>
</tr>
<tr>
<td>Neck pain and gender</td>
<td>0.026</td>
</tr>
<tr>
<td>Neck pain and age</td>
<td>0.001</td>
</tr>
<tr>
<td>Neck pain and smoking</td>
<td>0.684</td>
</tr>
<tr>
<td>Neck pain and physical exercise</td>
<td>0.042</td>
</tr>
<tr>
<td>Neck pain and mental stress</td>
<td>0.003</td>
</tr>
<tr>
<td>Neck pain and job satisfaction</td>
<td>0.002</td>
</tr>
<tr>
<td>Neck pain and pre-existing neuromuscular conditions</td>
<td>0.001</td>
</tr>
<tr>
<td>Neck pain and family history of neck pain</td>
<td>0.320</td>
</tr>
<tr>
<td>Neck pain and Neck Disability Index Score</td>
<td>0.001</td>
</tr>
<tr>
<td>Neck pain and duration at current job</td>
<td>0.002</td>
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<tr>
<td>Neck pain and Video Display Unit working hours</td>
<td>0.037</td>
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<tr>
<td>Neck pain and physical work environment</td>
<td>0.003</td>
</tr>
<tr>
<td>Neck pain and ergonomics of work station</td>
<td>0.030</td>
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<tr>
<td>Neck pain and screen distance</td>
<td>0.005</td>
</tr>
<tr>
<td>Neck pain and screen height</td>
<td>0.011</td>
</tr>
<tr>
<td>Neck pain and mouse distance</td>
<td>0.546</td>
</tr>
<tr>
<td>Neck pain and breaks during work</td>
<td>0.042</td>
</tr>
</tbody>
</table>

- VDU specific measures such as height and distance of screen, mouse distance were based on the measurements done by the subjects themselves. This might
be a source of error if there were low agreement between self-assessed locations and direct measurements.

- Questionnaire was used in this study to get information about individual and work-related variables. Questionnaires are considered to be important tools in research, especially when large samples are required. The questionnaire used in the present study is a shortened version of the questionnaire used in the study by Korhonen T. et al.\(^{19}\) and published in 2003 which was found to be valid and reliable by the subject experts.

This is a cross-sectional study with a primary aim to find out the prevalence of neck pain in computer operators of Ahmedabad City. Cross-sectional studies investigating prevalence are useful starting points for understanding the burden of neck pain. But in order to advance this field of study, more high quality cohort studies and case control studies are needed to identify and investigate both risk and protective factors. In this study, prevalence for neck pain was found to be 47%. The prevalence of neck pain during the past 12 months in the present study is in agreement with other studies.\(^{19,21-24}\) Other studies on office workers have reported both higher\(^{25}\) and lower prevalence of neck pain.\(^{26}\) The differences between these studies could be due to differences in populations studied, the time periods used in the period prevalence calculations, or in the criteria used for defining pain or symptoms.

Some studies included only those people with neck pain who were presenting for health care; other surveyed general populations and generally yielded higher estimates of neck pain incidence or prevalence. The actual location of symptoms also varied. Some investigators only consider pain felt in a very clearly delimited part of the body.\(^{27,28}\) Others included “neck or shoulder” pain within their case definition. Generally, prevalence of neck pain was higher in more extensive area(s) of the body.\(^{29}\) There were also differences in the period under consideration for measures of prevalence (from point prevalence to life time) and also in the frequency, duration, and severity of symptoms captured by different case definitions.

The response rate could be considered high (77.77%), since the questionnaire was distributed only once. A possible selection bias from a healthy workers effect cannot be excluded. Moreover, since the analyses were limited to currently working subjects, workers might have been excluded who had left the job market because of musculoskeletal pain.

**Conclusions**

In this study among office employees working with Video Display Units, prevalence of self-reported non-specific neck pain was found to be 47%. It was also found that neck pain was associated with work related & individual variables.

**Future recommendations**

- A future study with large sample size from different areas of the country; both urban and rural can be done.
- Modifiable and non-modifiable risk factors can be analysed and strategies can be derived for modifiable factors to prevent occurrence of neck pain.
- The strength of association between dependent and independent variables can be studied.

**Bibliography**

4. Hansson EK, Hansson TH (2005) The costs for persons sicklisted more than one month because of low back or neck problems.


