Prevalence and Pattern of Musculoskeletal Problem among Software Engineers in a Private Firm, Chennai- A Cross Sectional Study

Jasmine M [1], Ravivarman G [2], Vinoth Gnana Chellaiyan[3], Buvnesh Kumar[3]

[1]Postgraduate, Department of Community Medicine, Chettinad Hospital and Research Institute (Chettinad Academy of Research and Education), Kelambakkam, Tamil Nadu, [2] Professor, Department of Community Medicine, Chettinad Hospital and Research Institute (Chettinad Academy of Research and Education), Kelambakkam, Tamil Nadu, [3]Assistant Profeesor, Department of Community Medicine, Chettinad Hospital and Research Institute (Chettinad Academy of Research and Education), Kelambakkam, Tamil Nadu

Abstract

Introduction: Information Technology Industries has been a boon to many jobseekers. With its advantage, it has also brought many disadvantages in view of the health of the Software Engineers.

Objectives: The objectives of the present study were to estimate the prevalence and pattern of musculoskeletal problems among the Software Engineers

Material and Methods: This study was a cross sectional study conducted among Software Engineers working in a private firm Chennai. The sample size was calculated to be 403. The study was conducted with the nordic questionnaire. The data was collected and analysed through Statistical Package for Social Sciences. Multivariate analysis, Chi square was calculated and P value of less than 0.05 was considered significant.

Results: The results showed that the median age of participants was 26 years. The overall prevalence of musculoskeletal problem in any area of focus was 85.6% in the past 1 year and 49.9% in the past 1 week. The majority was affected with problems in the Neck followed by the Lower back and Shoulders.

Keywords: *Musculoskeletal problem, Software Engineers, Inofrmation Technology*

Introduction

Musculoskeletal problem remains one of the main causes of Sickness Absenteeism. There are many work-related and non-work-related determinants of musculoskeletal problem among the occupational group. WHO defines work related musculoskeletal disorders (WRMSDs) as "The musculoskeletal disorders which are caused or intensified by work" is called as the Work-related musculoskeletal disorders.[1] The main risk factors for the development of these disorders are high intensity stress, postural demands, long-term muscular strain etc.[1]

These issues are reported more in those who uses computers every day during their work. Software Engineers experience strong postural demands, repetitive stress, static muscular load etc, which contributes to the development of Musculoskeletal disorders among them.

Among many causes which attributes to the development of work-related musculoskeletal disorders, workstyle plays a very crucial part. The hazardous workstyle with respect to the computer work is also called as "Maladaptive coping behaviours." [2] The

Corresponding Author:
Dr. Vinoth Gnana Chellaiyan
Assistant Profeesor, Department of Community Medicine, Chettinad Hospital and Research Institute, Chettinad Academy of Research and Education, Kelambakkam, Tamil Nadu, Phone: 9944894554
Email; drchellaiyan@gmail.com

interaction between the risk factors like psychosocial and ergonomic, play a vital role in the development of disorders in the locomotor system and limiting their ability. [3,4] Along with these, the time constraint work and increased work demand give an added disadvantage to the development of WRMSDs

The objective of this study was to estimate the prevalence and pattern of musculoskeletal problems among the Software Engineers working in a private firm, Chennai.

Methodology

Study design and setting:

This study was a cross sectional study conducted in a private Information Technology firm in Chennai, Tamil Nadu, India

Study Population:

The study was conducted among the Software Engineers working in a private firm, Chennai.

Inclusion criteria:

i) Software engineers who had an experience of more than 2 years in the same company

ii) Software Engineers with the age less than 40 years, both genders

Exclusion criteria:

i) Software engineers who had past history of spine surgery or spinal disease such as disc prolapse, discitis etc.

ii) History of arthritis such as rheumatoid arthritis, osteoarthritis, psoriatic arthritis etc

iii) Orthopedically physically challenged and Pregnant women.

Sample size determination:

The prevalence of musculoskeletal disorder among the software professionals was reported as 64.5%. [5] in a previous study and allowable error of 5%, the sample size was calculated to be 366.36 using the formula $4pq/l^2$. Accounting for the non-response rate of 10%, the final sample size arrived was 403.

Sampling method:

The sampling method used was simple random sampling done in 2 phases.

Phase 1: Selection of a private IT firm:

CMMI (Capability Maturity Model Integration) [6,7,8] is an appraisal given to the companies by the CMMI Institute, a subsidiary of Information Systems Audit and Control Association. In CMMI there are 5 levels, with 5 being the highest in order. The levels define the activities the firms undertake and defines the capability of the organisation. The level 1 firm is ad-hoc while the highest-level firms have specific guidelines (like legibility and ergonomics) of their own. These types of organisations deal with more complex projects. The work targets of the employees are time bound. The employees compromise the work style, ergonomic principles and longer duration of computer usage etc. Thus level 5 firm was chosen for the study.

There were totally sixteen CMMI level 5 firms in Chennai [9], Tamil Nadu and out of that one company was selected by simple random method using Lottery method

Phase 2: Selection of the participants:

There were totally 12800 Software Engineers working in the selected company and out of which, 4580 software engineers fulfilled the inclusion criteria among which 33 of them were excluded on the basis of exclusion criteria. The name listing of the remaining 4547 employers in the alphabetical order was done and random number was allotted to them. Then the sample of 403 was selected by computer allotted random number table.

Study instrument:

A standardised pre-tested semi structured questionnaire was used. It had 2 sections. Section 1 consists of demographic profile and section 2 was nordic questionnaire.

Section 1:

This section included the basic details of the participants like age, gender, years of experience and the duration of computer usage. This section also includes anthropometric measurements like weight and height.

Section 2:

Nordic Questionnaire [10]:

This section had questions about the area of the body with the musculoskeletal symptoms in the past one week and one year. The areas specified are neck, shoulders, upper back, elbows, wrists/ hands, lower back, hips/ thighs, knees and ankles/ feet.

Data collection procedure:

After obtaining written informed consent, the participants were interviewed using pre tested questionnaire. Confidentiality of the study participants was maintained in all phases of the study.

Statistical Analysis

Data was entered in Microsoft Excel Spread Sheet and analysed in Statistical Package for Social Sciences (SPSS- IBM) software version 21. Data was assessed for normality before applying tests of significance. Chi square test was applied. $P<0.05$ was considered significant. Association between the variables is analysed by calculating odds ratio.

Results

The median age of the study participants were 26 years. 51.4% were in the age group of 23-26 years. Among the 403 participants, 61.5% were males. 47.1% had work experience between 2 and 4 years in software firm. Almost all the study participants (96%) had more than 5 hours of computer usage in a day.

Table 1: Profile of study participants (N=403)

S no	Profile	Frequency	Percentage
1.	Age (years) < 30 >30	 355 48	 88.1 11.9
2.	Gender Male Female	 248 155	 61.5 38.5
4	Work experience (Years) <6 >6	 304 99	 75.4 24.6
5	Total duration of computer usage in a typical day (Hours) <7 >7	 83 320	 20.6 79.4
6	Total duration of continuous computer usage without break in a typical day (Hours) <1 >1	 77 326	 19.1 80.9

Maximum study participants (85.6%) had musculoskeletal problem in the past 1 year and 49.9% had it in the past 1 week. (Table 2)

Table 2: Distribution of study participants according to the prevalence of any musculoskeletal problems (N= 403)

S no	Variable	Frequency	Percentage
1	Musculoskeletal problems in the past 1 week Yes No	 201 202	 49.9 50.1
2	Musculoskeletal problems in the past 1 year Yes No	 345 58	 85.6 14.4
3	Inability in performing daily activities in the past 1 year Yes No	 148 255	 36.7 63.3
4	Medical consultation in the past 1 year Yes No	 84 319	 20.8 79.2

Maximum number of study participants had musculoskeletal problem in neck (56.1%), followed by lower back (53.8%) and wrist/hands (49.4%).

Table 3: Pattern of Musculoskeletal problem among the software engineers in the past 1 year (N= 403).

Area	Musculoskeletal problem N (%)	Musculoskeletal problem causing disability N (%)	Musculoskeletal problem that needed medical consultation N (%)
Neck	226(56.1)	57 (14.1)	32(7.9)
Lower Back	217(53.8)	88 (21.8)	39(9.7)
Wrist/Hand	199(49.4)	41 (10.2)	11(2.7)
Shoulder	170(42.2)	48 (11.9)	18(4.5)
Ankle/Feet	163(40.4)	46 (11.4)	26 (6.5)
Hip/Thigh	162(40.2)	49 (12.1)	14 (3.5)
Upper Back	136(33.7)	47 (11.7)	18 (4.5)
Knee	89(22.1)	33 (8.2)	15 (3.7)
Elbow	64(15.9)	13 (3.2)	1 (0.2)

*multiple options applicable

Among those who work for more than 7 hours in computer per day, 87.5 % developed musculoskeletal problem (p value=0.034). Similarly among those who work continuously for more than 1 hour in computer without a break, 86.5% developed musculoskeletal problem. (Table 4)

Table 4: Distribution of Musculoskeletal problem according to the profile of the participants (N= 403).

S no	Variable	Musculoskeletal problem		Odds ratio (CI)	P value
		Yes (%)	No (%)		
1	Age (years) < 30 >30	 303 42	 52 6	0.832 (0.337-2.057)	0.691
2	Gender Male Female	 205 140	 43 15	0.511 (0.273-0.955)	0.033
3	Computer Usage in a day (Hours) <7 >7	 65 280	 18 40	0.516 (0.278-0.957)	0.034
4	Continuous Computer Usage without Break in a typical day (Hours) <1 >1	 63 282	 14 44	0.702 (0.363-1.359)	0.292

Discussion

In the present study the median age of the participants was 26 years. This coincides with the study done by Bhanderi D et al [11], in which the mean age of the participant was 25.04 years. In the present study, the majority of the study participants were in the age group of 23-26 years. Similarly, in a study done by Das R [12], the mean age of the participant was 29 years and, in a study, conducted by Shrivastava SR et al [13], the majority of the study population was in the age group of 20-39 years.

In the present study, the majority of the study population were males (61.5%). This coincides with the study done by Bhanderi D et al [11], in which the male participant was 65.4%.

The present study showed that the majority of the participants (79.4%) had duration of computer usage for more than 7 hours per day. A study done by Talwar R et al [14] showed that 66% spent more than 6 hours per day in computer. The present study also observed that among those who used computer for 5 to 7 hours, 79.1% developed musculoskeletal symptoms Similarly, a study done by Shrivastava SR et al [13] showed that among those who used computer for 6 to 8 hours, 66.6% developed the symptoms.

The present study stated that 85.6% of the sample had musculoskeletal problem in the last 1 year. In a study done by Sharma AK et al [15] detailed that the

prevalence of musculoskeletal problem is around 77.5% and in the same way Talwar R et al [14] conducted a study, which showed that the musculoskeletal prevalence was 76.5%. The slightly lower prevalence in this study could be attributed to non-homogeneous workstation environment, level of knowledge and practice between the studies etc.

Limitation:

Similar studies focussing on software engineers working in different levels with different work pattern could yield better understanding of the disease burden.

Conclusion

The musculoskeletal problems can decrease the efficiency of the Software Engineers and thereby decrease the productivity. Frequent workshops highlighting the preventive strategies should be conducted by the organisations. The Engineers should be trained about the coping strategies such as periodic health check-up, healthy life styles and adequate breaks between the computer usage.

Conflict of Interest: Nil

Source of Funding: Self

Ethical Clearance: Institutional human ethics committee, Chettinad Hospital and Research Institute

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