

## Research Article

# A cross sectional study on work related musculoskeletal disorders among software professionals

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**Received:** 25 September 2015

**Revised:** 03 October 2015

**Accepted:** 16 October 2015

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## ABSTRACT

**Background:** This study has been carried out to determine the prevalence and pattern of Musculo Skeletal Disorders (MSD) among software professionals and to evaluate the association between socio-demographic factors, computer work related factors and MSD.

**Methods:** The study design was cross sectional with software professionals working in information technology (IT) companies in Chennai, Tamilnadu as the study population. The sampling method used for the survey is the non-probabilistic purposive sampling. Data was collected using a questionnaire which includes personal data, job details and standardized Nordic questionnaire.

**Results:** Prevalence of work related MSD during last 12 months, during last 7 days and annual disability were 69%, 49.2% and 16.6% respectively. The common prevalence of work related MSD reported during last 12 months based on their body region were neck (29.56%), lower back (22.89%), shoulders (12.17%) and knees (9.56%). There was a statistically significant difference in terms of gender, regular exercise, more than 5 working days per week, more than eight hours of work per day and habit of taking lesser breaks during work hours at regular intervals. There were no statistically significant difference in terms of age, BMI and years of employment.

**Conclusions:** The study has concluded that MSD is widely reported among software professionals working in the IT field in India. Hence, an appropriate prevention strategy needs to be carried out in order to enable them work comfortably.

**Keywords:** Musculo skeletal disorders, Software professionals, Prevalence

## INTRODUCTION

Information technology (IT) has played a vital role in transforming India from a slow bureaucratic economy into a land of innovational entrepreneurs. The IT sector is generating about millions of employments in India. In the current modern world, India is one of the biggest IT capitals and almost all the major IT players in the world are present in the country. IT related job opportunities offer glittering salary and the vast scope of this profession attracts many people into this field.<sup>1</sup>

In many working populations, work related musculo skeletal disorders (MSD) is responsible for morbidity and is known as an important occupational problem with huge compensation and health costs, decreased productivity, and lower quality of life.<sup>2</sup> The MSD in the workplace is sprouting as a growing health problem and has a tremendous impact on the day-to-day activities of the IT professionals. The MSD represents the second largest cause of short term or temporary work disability after common cold.<sup>3</sup>

Many scientific researchers have identified physical, psychosocial, organizational, occupational and individual causes as “risk factors” for the development of MSD. These studies have measured the levels of different factors and have investigated their associations with the incidence (or prevalence) of MSD for the concerned populations.<sup>3</sup>

In developed countries, many studies have focused on this problem but only a few studies have been done in India. A study by Shrivastava & Bobhate reported that 63% of the study subjects have musculo skeletal problems.<sup>4</sup> Another study conducted at Loni, Maharashtra by Giri et al has found musculo skeletal problems in 73.3% of the study subjects.<sup>5</sup> Sivaraman et al have observed musculo skeletal discomfort in 75.5% of the study population.<sup>6</sup>

The objective of the present study is to determine the prevalence and pattern of MSD among software professionals and to evaluate the association between socio-demographic factors, computer work related factors and MSD.

## METHODS

The study design was cross sectional with software professionals working in IT companies in Chennai, Tamilnadu as the study population. The inclusion criterion was both male and female software professionals working with desktop/laptop for more than 4hours daily for the past one year. The exclusion criteria were those subjects not willing to participate in the study, subjects with previous history of musculo skeletal injury, incomplete questionnaires and pregnant women. The study period was from December 2014 to July 2015. The sample size was fixed as 500 based on previously conducted studies.

The sampling method used for the survey is the non-probabilistic purposive sampling. Using the available data, the study subjects were contacted through e-mail, telephone or in person and explained about the study. Among subjects who met the inclusion and exclusion criteria, informed oral consent was obtained. The participants were later instructed to fill up the questionnaire.

The survey instrument has two parts. Part 1 deals with personal data such as age, sex, marital status, height, weight, regular exercise and job details such as experience in years, working hours per day, working days per week, shift timings and habit of taking breaks during work hours. Part 2 deals with musculo skeletal disorders. The survey instrument used was the adopted Nordic questionnaire<sup>7</sup>. This standardized questionnaire includes information on musculo skeletal complaints affecting the body regions namely: neck, shoulders, elbows, wrists/hands, upper back, lower back, hip/thighs, knees and ankles/feet.

The data entry and analysis was performed with SPSS version 17. The final data was summarized into percentage and analyzed by cross tabulation for different variables. Chi-square ( $\chi^2$ ) test was applied for statistical significance and associations were assessed through Odds ratio with 95% confidence interval.

## RESULTS

The total number of software professionals studied were 500. The overall mean age was  $27.62 \pm 3.28$  years ranging from 22 to 54 years and their body mass index was  $24.38 \pm 3.61$  kg/m<sup>2</sup>. Subjects have been working in IT companies for an average of  $9.40 \pm 2.13$  hours per day and their average experience were  $12.73 \pm 5.61$  years ranging from 01 to 22 years. The summary of descriptive statistics for demographic variables collected from study participants are presented in Table 1.

The study population had 57.6% (288/500) of males and 42.4% (212/500) of females. Among the study subjects, 48% (240/500) of participants were married. About 28.1% (141/500) of the software professionals were involved in physical activities such as exercise, sports and yoga routinely. In the study population, 94% (470/500) worked in day shift only, 51.4 % (257/500) of the software professional's work more than 5 days per week and 34.4% (172/500) of software professionals have the habit of taking breaks during work hours at regular intervals. Figure 1 shows the basic information about the study participants.

**Table 1: Descriptive statistics for demographic variables collected from study participants.**

Variable	Minimum	Maximum	Median	Mean $\pm$ SD
Age (in years)	22	54	28	27.62 $\pm$ 3.28
BMI (Kg/m <sup>2</sup> )	17.80	34.50	23.78	24.38 $\pm$ 3.61
Experience (in years)	1	22	10.5	12.73 $\pm$ 5.61
Working hours per day	6	14	10	9.40 $\pm$ 2.13

SD = Standard Deviation

According to the results of Nordic MSD questionnaire, prevalence of work related MSD during last 12 months, during last 7 days and annual disability were 69%, 49.2% and 16.6% respectively as shown in Table 2. The common prevalence of work related MSD reported during last 12 months based on their body locations were neck (29.56%), lower back (22.89%), shoulders (12.17%) and knees (9.56%). The prevalence of work related MSD

reported during last 7 days based on their body locations commonly were neck (30.08%), followed by lower back (23.58%), shoulders (13.41%) and knees (9.35%). During last year software professionals reported that they had taken off due to pain in lower back (36.15%), neck (28.92%), and knees (8.43%). Details of work related MSD prevalence based on their body locations were reported in Table 2.

**Table 2: Prevalence of work related MSD with respect to the body locations among study participants.**

Human body location	Prevalence of work related MSD during last 12 months		Prevalence of work related MSD during last 7 days		Annual Disability	
	n	%	n	%	n	%
Neck	102	29.56	74	30.08	24	28.92
Shoulders	42	12.17	33	13.41	06	07.23
Elbows	16	04.64	08	03.25	04	04.82
Wrists/Hands	24	06.95	12	04.88	06	07.23
Upper back	18	05.21	17	06.91	03	03.61
Lower back	79	22.89	58	23.58	30	36.15
Hips/Thighs	16	4.64	9	03.66	01	01.20
Knees	33	9.56	23	09.35	07	08.43
Ankles/Feet	15	4.35	12	04.88	02	02.41
Total (n=500)	345	69.00	246	49.2	83	16.6

Table 3 demonstrates the association between those 'with MSD' and 'without MSD' during the last 12 months based on age, gender, BMI, exercise, experience in years, work hours per day, number of working days per week and the habit of taking regular breaks during work hours. In general, participants in the MSD group were younger, working more than eight hours per day for more than five days per week without the habit of taking regular breaks. There was a statistically significant difference in terms of gender, regular exercise, more than 5 working days per week, more than eight hours of work per day and habit of taking lesser breaks during work hours at regular intervals. There were no statistically significant difference in terms of age, BMI and years of employment.

## DISCUSSION

Work related MSD prevalence varies among different occupational groups and across national borders. Individuality of terms, modifications in assessment tools, organizational variation in work settings and cultural variation in perception and reporting of pain and disorders are attributed for variation in prevalence of work related MSD in different studies.

The prevalence of work related MSD among software professionals were found to be 69% during last 12 months which implies that almost 3 out of every 4 professionals suffer from this condition and 49.2% during last 7 days and annual disability was 16.6%.

Very few studies on work related MSD have been done in the general population. These studies report prevalence of work related MSD ranging from 20 to 93.3% in the studied population. The studies which were similar to the present study were the one done by Sharma et al in Delhi<sup>8</sup> that reported 77.5% of body ache, while the study by Giri et al showed 73.3% musculoskeletal problems in Loni, Maharashtra.<sup>5</sup> The study by Prasad et al done at Nagpur reported 67% of musculoskeletal problem and the study by Shrivastava & Bobhate reported 63% of MSD among software professionals in India which are similar to our studies.<sup>4,9</sup> A study done by Shbair & Abdulla in Jordan among professional computer users showed 93.3% prevalence which is higher than this study.<sup>10</sup>

In the present study, 69.45% in the age group less than 35 years and 68.25% in the age group more than of 35 years reported MSD during the last 12 months. In this study, it was found that there was no association between age group (OR = 1.06) among software professionals and MSD, which supports the study finding of Bhandari et al<sup>11</sup> and opposed by Shrivastava & Bobhate.<sup>4</sup>

The prevalence of MSD had been reported in many previous studies with female predominance in the general population. The present study has found that the female software professionals have 1.94 times higher risk (OR = 1.94) for developing MSD than male software professionals. This may be due to the cultural factor that females, in addition to the software job, have to look after the family and kids at home. This study finding has been

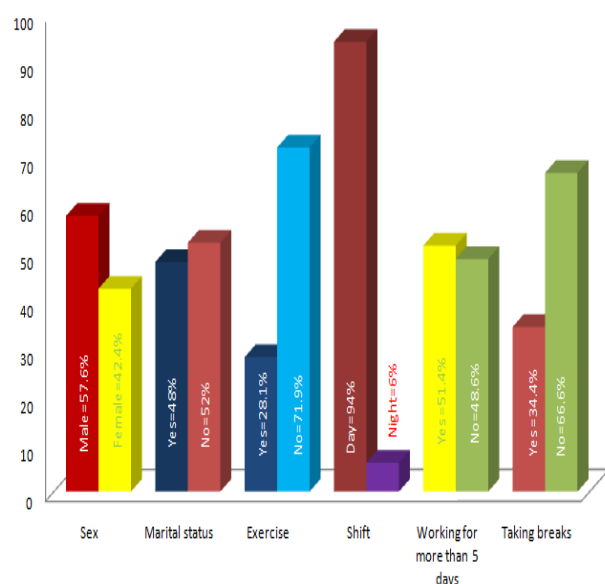
supported by Shrivastava & Bobhate, Sharma et al, Demure et al, Karlqvist et al, Ming et al and Shbair & Abdulla and has been opposed in the studies of Bhandari et al and Ortiz–Hernandez et al.<sup>4,8,10-15</sup>

Software professionals with high BMI were found to be at risk of MSD and the contributing factor could be the increase in physiological and mechanical load on tissues due to overweight/obesity.<sup>16</sup> In this study, it was found that there was no association between overweight/obesity (OR = 1.00) among software professionals and MSD.

Some previous studies have suggested that regular exercise was crucial for preventing MSD. Physical exercise or activities such as walking, running, fitness, and stretch exercise can help to relieve pain associated with excess computer use.<sup>17</sup> In this study, software professionals who were involved in physical activity such as aerobics, walking and yoga were having 10 times more protection from MSD (OR = 9.78) than those not involved in such physical activities. Boocock et al have described exercise and ergonomics education as modifying interventions.<sup>18</sup>

**Table 3: Predictors of MSD during last 12 months among study participants.**

Predictors	Category	Total (n=500)	With MSD (n=345)	Without MSD (n=155)	OR	95% CI	p value
Age(in years)	<35	311	216	95	1.00	-	-
	>35	189	129	60	1.06	0.72	1.56
Gender	Male	288	182	106	1.00	-	-
	Female	212	163	49	1.94	1.30	2.89
BMI (Kg/m <sup>2</sup> )	Normal	326	225	101	1.00	-	-
	Obese	174	120	54	1.00	0.67	1.49
Exercise	Yes	141	47	94	1.00	-	-
	No	359	298	61	9.78	6.29	15.26
Experience (in years)	<10	234	161	73	1.00	-	-
	>10	226	184	82	0.98	0.67	1.44
Working hours per day	<8	115	61	54	1.00	-	-
	>8	385	284	101	2.50	1.62	3.83
Working days per week	<5	243	127	116	1.00	-	-
	>5	257	218	39	5.11	3.34	7.80
Taking breaks	Yes	172	96	76	1.00	-	-
	No	328	249	79	2.50	1.68	3.70



**Figure 1: Basic information about the study participants.**

Software professionals with long years of exposure to computers have been found as a risk factor for MSD<sup>19</sup>. The study by Korhonen et al showed an association between MSD and experience but the present study did not find any association between experience and MSD.<sup>20</sup>

Many studies reported dose response relationship between MSD prevalence and duration of computer use.<sup>11-14</sup> In the current study, it was found that software professionals who were working for more than 8 hours/day have 2.5 times higher risk (OR = 2.50) of developing MSD than those working for less than 8 hours/day. This finding is in accordance with the findings of Demure et al, Karlqvist et al and Ming et al, Ali & Sathiyasekaran, Hameed but Ortiz –Hernandez et al did not observe such association in their work.<sup>12-15, 19,21</sup> Apart from this, the present study has also found that software professionals who work for more than 5 days/week have 5 times higher risk (OR= 5.11) of developing MSD than those working for 5 days or lesser per week.

Some studies have reported that there is an association between the habit of taking break with MSD prevalence.<sup>12,13,18</sup> In the current study, 34.4% of the study population took 5 to 10 minutes break after every 60 to 90 minutes. Taking short breaks has shown to decrease the effect of MSD while not looming productivity.<sup>22,23</sup> The study subjects not with the habit of taking frequent breaks were 2.5 times at higher risk (OR= 2.50) of developing MSD. This observation correlated with the observations of Demure et al and Korhonen et al But the studies by Shbair & Abdulla, Bhanderi et al, Ortiz–Hernandez et al did not observe any association between the habit of taking breaks and MSD.<sup>10-12, 15</sup>

### Limitations

The cross sectional study design with purposive sampling limits the generalizability. Causation cannot be infested with this design. More research, especially longitudinal studies is needed to find the strength of association between MSD and demographic factors. Even with this limitation, the current study appears to be unique in that it has used standardized measures to evaluate the prevalence of MSD and its association with demographic factors among software professionals.

### CONCLUSION

The demographic factors analyzed in the study suggest that strategies incorporating life style modifications and working style alterations as the best option to reduce the risk of MSD that is more common among software professionals. The MSD prevalence is high among female subjects, subjects working on computers for more hours per day and more number of days per week. The prevalence of MSD also high among those not taking regular breaks in between working hours and is found to be low in software professionals doing regular physical activities.

The ergonomics of the working environment of software professionals have a direct impact on their health and wellbeing as found by the study. Therefore, appropriate prevention and intervention strategies must be emphasized to ensure a healthier working atmosphere in order to improve their productivity from the organization's point of view. The present study is thus a wakeup call for software professionals as well as the IT industry. It is recommended that awareness education and training programs on prevention and coping strategies for MSD must be made mandatory for software professionals.

*Funding: No funding sources*

*Conflict of interest: None declared*

*Ethical approval: The study was approved by the Institutional Ethics Committee*

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**Cite this article as:** Saleem M, Priya S, Govindarajan R, Balaji E, Diwaha Anguraj J, ShylendraBabu PG, Dhivyapriya S. A cross sectional study on work related musculoskeletal disorders among software professionals. *Int J Community Med Public Health* 2015;2:367-72.