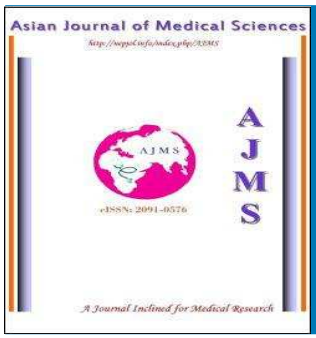

DURATION OF USE OF COMPUTER AS RISK FACTOR FOR DEVELOPING BACK PAIN AMONG INDIAN OFFICE GOING WOMEN.

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"Long duration spent working on computers result in back pain among the present population"

ABSTRACT

Introduction: The study was designed to investigate back pain among working women in one of the largest Research and Development Organization in India and identify occupational factors associated with lower back pain by means of a survey of female employees.

Methods: This study investigated the relative risk of whether different age groups, job types, body mass index (BMI), years or service, screen viewing distance, self perception of comfort level and duration of use of computer have a bearing on the occurrence of back pain and if such risk factors aggravate cases of back pain.

Results: In the unadjusted table, there was a statistically significant chance of developing back pain as the age increases (odds ratio) OR 1.56, 95% (confidence interval) CI (1.030 - 2.372), however, after adjusting for the other co-variates, this chance was not of significance. Job types, body mass index (BMI) >30 (OR >1 (0.802-1.877), years of service and screen distance OR >1 (0.96-1.745) all showed a positive association with back pain though the *p* values were not of statistically significance. In the adjusted table, for those who use the computer daily at the workplace for more than 6 hours, there was a statistically significant association for this group of developing back pain as compared to the first group i.e. those who work for 0-2 hours, as shown by OR 1.79, (1.123 - 2.864).

Conclusion: The present study indicated that back pain is present in as much as about 25.3% of the study population. For those who use the computer >6 hours daily, there was a statistically significant chance of developing back pain.

Keywords: Back pain; BMI; Age; Years of service; Computer use.

INTRODUCTION

In almost all scientific studies of work-related musculoskeletal disorders, women are found to be at higher risk than men, regardless of the kind of work or occupation involved. The same difference exists between women and men regarding VDU users [1, 2, 3, 4, 5]. No definite explanations were found in the reviewed studies, but differences in household work and childcare, work situation differences and constitutional differences were mentioned as possibilities. In a recent review, Tittiranonda and colleagues[4] suggested that differences in anthropometrics may cause women to work in more extreme postures or using higher relative muscle forces than men. Several studies have reported that the prevalence of low back pain increases in middle aged women [6, 7, 8]. As women age they tend to be overweight and an additional burden is placed on the lower back causing various types of disabilities including low back pain.

Sixty percent of office workers complain of physical discomfort [9,10] and sedentary office work is linked to complaints with regard to musculoskeletal system. Often work itself, particularly sitting while work, is considered to be the cause of such discomfort [11]. Low back pain is the most prevalent musculoskeletal condition in developing nations[12]. Reasons for discomfort can be unchanging sitting position[13] and/or a general lack of movement[1]. Increased exposure to computers and related workstation, types of jobs performed and the length of working hours/years were identified as potential risk factors for back pain.

MATERIALS AND METHODS

A total of 1066 women, aged 20-60 years were considered as sample taken from seventeen laboratories of DRDO, India working in different research laboratories spread all over the country volunteered for this study. The study was conducted during December 2008 to July 2010.

All women were office goers and employed in different laboratories in various categories. They were given prior information about the study and signed informed consent was obtained. The questionnaire collected information on individual, work related physical factors and musculoskeletal symptoms in the upper back and low back during the last 6 months.

Individual factors like age, height, body weight, height, weight, hand dominance, marital status, smoking and alcohol drinking habits were collected from them.

Work related physical factors include the average number of working hours in a day and years of service. Respondents were also asked whether the type of job they performed was of sitting or standing nature. The questionnaire also reported self rated perception of their working comfort level, screen distance from seat and duration of daily computer use.

Musculoskeletal symptoms viz. back pain was "self-reported" by the subjects. Questions were adapted from the standardized Nordic questionnaire [14]. In this study, workers were identified as cases if they reported musculoskeletal symptoms in the upper back and low back in the last six months. Of all the subjects studied, (270) 25.3% of them reported that they were having back pain.

Height of the subject was measured to the nearest mm, using SECA 767 electronic personal scale (Medical Scales and Measuring Systems, Germany). Weight was measured on minimal clothing on the same instrument. Body mass index (BMI) is a measure of fatness, also known as Quetlet's index and is calculated by dividing the subject's weight in kilograms by height in meters squared kg/m^2 [15.16]. In this study we have used the BMI classification according to classification of WHO for Ethnic Asian populations [17,18]

2.1 Statistical analyses

Statistical analyses were carried out using the Statistical Package for Social Science (version 11.5; SPSS Inc., Chicago, USA), in which the level of significance was set at 5%. The risk estimates with 95% CI for back pain relative for BMI, years of service, screen distance, self perceived comfort level and duration of computer use were computed using odds ratios and regression coefficients from logistic regression models. The back pain dummy was 1 for the subjects reporting back pain and 0 for those subjects not reporting back pain. The BMI variable was expressed in terms of the BMI category given for Asian population into five groups (underweight, normal, overweight, pre-obese and obese) and graded as 1, 2, 3, 4 and 5, respectively [17,18] . The age of the population was divided into four age groups (20-30 years**,** 31-40 years**,** 41-50 years, and 51-60 years) and the number of years of service was expressed in terms of group score, where the population was divided into three groups (<10 years, 10-25 years and >25 years). Job type was divided into three groups as 'sitting', **'**standing'**,** **'**both sitting and standing' and graded 1, 2 and 3 respectively. Screen distance ie. 'within range' (46-76 cm) [19] were graded as 1 and 'outside range' (< 46 cm and > 76 cm) were graded as 2. Number of hours spent daily working in the computer was grouped into four groups (0-2 hours, 2-4 hours, 4-6 hours and >6 hours) and graded as 1, 2, 3 and 4, respectively.

RESULT

The average age, height and weight of the subjects were 40.2 ±10.6 years, 154.8 ± 6.1 cm and 61.3 ± 11.2 kilograms respectively. The subjects had a mean BMI of 25.6 ± 4.5, and the average working experience was 15.5 ± 10.3 years. Average duration of daily use of computer was 3.9 ± 2.2 hours. Table 1 shows the frequency (%) distribution of various characteristics of the study population. For age, the

Table 1: Characteristics of study sample (n 1066)

Characteristics	Frequency (%)
Age	
20-30 years (*n* 263)	24.7
31-40 years (*n* 265)	24.9
41 – 50 years (*n* 326)	30.6
51-60 years (*n* 212)	19.8
Total (*n* 1066)	
Job type	
Sitting (*n* 801)	75.1
Standing (*n* 78)	7.4
Both (sitting and standing) (*n* 187)	17.5
Total (*n* 1066)	
BODY MASS INDEX (kg/m^2)	
18.50 - 22.99 (*n* 291)	27.3
<18.50 (*n* 34)	3.2
23.00 - 24.99 (*n* 190)	17.8
25.00 - 29.99 (n 389)	36.5
>30 (*n* 162)	15.2
Total (*n* 1066)	
Number of years working	
<10 (*n* 426)	40.0
10-25 (*n* 453)	42.5
>25 (*n* 187)	17.5
Total (*n* 1066)	
Screen distance (46-76 cm)	
Within range (*n* 826)	77.5
Outside range (*n* 240)	22.5
Total (*n* 1066)	
Self perceived comfort level	
Comfortable (*n* 728)	68.3
Not Comfortable (*n* 338)	31.7
Total (*n* 1066)	
Computer use (hours)	
0-2 (*n* 436)	40.9
2- 4 (*n* 275)	25.8
4-6 (*n* 230)	21.6
>6 (*n* 125)	11.7
Total (*n* 1066)	
Reporting back pain	
Yes (*n* 270)	25.3
No (*n* 796)	74.7
Total (*n* 1066)	

Population was divided into four groups viz. (20-30 years), (31-40 years), (41–50 years) and (51-60 years) with 24.7%, 24.9%, 30.6% and 19.9% with respectively. The types of job in respect to their workstation was classified into three broad 75.1% of the study population reported sitting job type, 7.3% standing job type and the remaining 17.5%

Table 2: Unadjusted and Adjusted univariate odds ratio (OR) and 95% CI for association of risk factors with back pain.

Variable	n (%)	Unadjusted			Adjusted		
		OR	95% interval		OR	95% interval	
			Lower	Upper		Lower	Upper
Age:							
20-30 years	263 (24.7)	-	-	-	-	-	-
31-40 years	265 (24.9)	1.43	0.961	2.134	1.40	0.908	2.163
41-50 years	326 (30.6)	1.14	0.774	1.689	1.15	0.690	1.910
51-60 years	212 (19.9)	1.56**	1.030	2.372	1.52	0.792	2.918
Job type:							
Sitting job	801 (75.1)	-	-	-	-	-	-
Standing job	78 (7.3)	1.30	0.778	2.170	1.45	0.851	2.457
Both (sitting and standing)	187 (17.5)	1.20	0.837	1.713	1.34	0.921	1.942
BMI:							
<23.0	291 (27.3)	-	-	-	-	-	-
<18.5	34 (3.2)	0.73	0.307	1.753	0.78	0.324	1.875
23-24.99	190 (17.8)	0.85	0.556	1.306	0.82	0.531	1.260
25-29.99	389 (36.5)	0.90	0.635	1.278	0.83	0.574	1.206
>30	162 (15.2)	1.23	0.802	1.877	1.14	0.722	1.792
Years of service:							
less than 10 years	426 (40.0)	-	-	-	-	-	-
10-25 years	453 (42.5)	1. 21	0.888	1.645	1.13	0.760	1.689
above 25 years	187 (17.5)	1.38	0.933	2.032	1.25	0.692	2.247
Screen distance (46-76 cm)++:							
Within range	826 (77.5)	-	-	-	-	-	-
Outside range	240 (22.5)	1.30	0.962	1.745	1.29	0.954	1.751
Self perceived comfort level:							
Comfortable	728 (68.3)	-	-	-	-	-	-
Not Comfortable	338 (31.7)	0.94	0.712	1.230	0.96	0.726	1.268
Time in computer (daily):							
0-2 hrs							
2-4 hrs	436 (40.9)	-	-	-	-	-	-
4-6 hrs	275 (25.8)	0.99	0.695	1.398	1.08	0.758	1.552
>6 hrs	230 (21.6)	0.88	0.601	1.278	1.02	0.682	1.518
	125 (11.7)	1.46	0.951	2.255	1.79**	1.123	2.864

++ Center for Disease Control, USA ** $p<0.05$

was of both sitting and standing job type. Out of the total population studied about 69.5% fall under overweight category and about 15.2% are considered obese. About 17.5% of the employees were having more than 25 years service experience whereas 40% had less than 10 years work experience.

With regard to the duration of computer use at work, around 40.9% of them reported use of computer for about 2 hours daily. 25.8% of them reported using it moderately for 2-4 hours daily, while 21.6% of them used it for 4-6 hours and only about 11.7% used it for more than 6 hours daily.

From table 2, (Annexure) job type, BMI, years of service, time in computer, screen distance, and self perception of comfort level were the covariates in the unadjusted odds ratio and we see that for age, the (31-40 years) and (41-50 years) groups had a positive association with back pain although the odds were not statistically significant. However, for those above 51 years of age (51-60 years) they were 1.56 times more likely to have back pain as compared to the younger age group (ie, 20-30 years) (OR=1.030, CI 1.030-2.372) but not statistically significant when adjusted for other co-variates.

The women were divided into four (4) groups based on the number of hours they daily spent on the computer ie. 0-2 hrs, 2-4 hrs, 4-6 hrs, >6 hrs. For those who work >6 hours daily on the computer, after adjusting for age, job type, BMI and years of service, screen distance and self perceived comfort level, this group showed that they had 1.79 more chance of developing back pain as compared to the 0-2 hours group and the odds ratio was statistically significant (OR 1.79, CI 1.123-2.864).

DISCUSSION

The prevalence rate of back pain in the present population is about 25.3 percent which means that about twenty five percent of the female office workers under study reported having back pain in the upper and/or low back in the last six months from the date of investigation.

Studies on back pain in India among office working women are few though there are some studies on female workers in the bamboo and basket industry. In a morbidity study of 500 Indian women during pregnancy, it was reported that about 19.33% of pregnant middle income group women reported back pain [20]. While assessing the musculoskeletal problems of 155 women bamboo workers, the study revealed that low back pain was the major problem (99%), followed by upper arm (98%) and shoulder pain (93%). This may be due to the reason that these workers continuously work for more than two hours without any break or change of posture [21]. In a similar study of 60 female basket makers it was reported that 60 to 75 percent of the workers experience low back pain and the incidence of pain in shoulder and knee were reported by 55 to 65 percent of workers[22].

The present study was undertaken among female office-going employees (mean age 40.2 ± 10.6 years) in one of the largest Research and Development Organization in India. Study of the present nature specially among working women in India are few. Our hypothesis was that female employees in an office environmental setup are at increased risk of developing back pain due to sedentary type of office work with long working hours in the computer. Most of the respondents in the study mentioned that their lifestyles were quite sedentary at workplace and at home. The daily average seating time in the workplace was 3.9 ± 2.2 hours. Sitting for 4-6 hours daily means that physical activity is relatively reduced over time (with an average of 15.5 years of service), which may lead to increasing body weight. Reduced physical activity arising out of long seating hours may indirectly support the observation that states that being overweight or obese can affect the body posture and gait, which can lead to the development of back pain[23].

Currently, evidence is controversial in finding an association between sitting and occupational LBP [25]. Sitting by itself does not increase the risk of LBP.

However, sitting for more than half a workday, in combination with WBV and/or awkward postures, does increase the likelihood of having LBP and/or sciatica, and it is the combination of those risk factors, which leads to the greatest increase in LBP [24].

In India, it was reported that around 30-65% of adult urban Indians are either overweight or obese or have abdominal obesity[25]. In the present study, out of the total population studied, about 69.5% can be classified as falling under overweight category (BMI >23). Although there are certain limitations to BMI, across large population groups, there is an increased prevalence of certain diseases in people with a BMI over 25, and a much greater risk of disease and death in those with a BMI over 30 [26]. So the high percentage of overweight female employees observed in the present study is a cause for concern.

Back pain and computer use

Increased computer usage has also been linked to a high prevalence of musculoskeletal symptoms in the neck, upper extremity and back[27,28,29]. There are reports that sustained sitting posture during computer use in combination with poor workstation ergonomics was significantly attributable to the development of musculoskeletal symptoms[1,30,31]. Low backache was found to be common among people who were involved in bending the spine for long hours while at work [32]. A combination of above average height and unfavorable ergonomic conditions were established as factors that account for a higher chance of developing low back pain [33]. In the present study, longer is the number of hours spent in the computer, higher is the chance of developing back pain. For those employees who work >6 hours in the computer, the chance of having back pain is statistically significant.

The present study supports the observation of a study of 6003 samples of adolescents where computer-related activities were identified an independent risk factor for neck shoulder pain (NSP) and low back pain (LBP) and that daily use of computers exceeding 2–3 hours seems to be a threshold for neck shoulder pain (NSP) and exceeding 5 hours for low back pain (LBP) [34]. About 17.5 % of the employees were having more than 25 years service experience whereas 40% had less than 10 years work experience in the present study. For all those who work >6 hours daily on the computer, we also tried to see whether there was any significant difference of developing back pain among the three working groups who have <10 years, 10-25 years and >25 years of service respectively. However, there was no statistically significant difference.

Limitations of the present study

First, data on back pain were "self-reported" by the subjects, which did not involve a clinician, and self reported questionnaires can have erroneous recall of time/intensity can be reported. Moreover, this is a cross sectional study and in the absence of follow up, it is difficult to establish the causal relation between exposure and outcome. In conclusion, there are many factors or characteristics that could be related to back pain besides those reported in the present study.

CONCLUSION

The present study clearly indicated that:

(i) Back pain is present in as much as about 25.3% of the study population.

(ii) Age, job types, number of years of service, viewing distance of the screen and duration of hours spent working in the computer all showed a positive association with back pain though not statistically significant. For those who use the computer >6 hours daily, there was a statistically significant chance of developing back pain.

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