Risk Factors Responsible for Musculoskeletal Pain among Computer Operators

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Abstract

Introduction: Computers have become an epitome of modern life, being used in every aspect of life. Work related musculoskeletal pain among employees working on computer and peripheral devices in information technology sections has been a major concern in recent years. It is multidimensional which is associated with, and influenced by, a complex array of individual, physical and work – related factors. Apart from lowering the quality of workers' life it is also responsible for negative impact on mental health.

Aims: The aim of this study was to determine the prevalence of musculoskeletal pain among computer operators, variation over Demographic data and to identify the risk factors responsible for their occurrence. This study was also to find the prevalence of stress facing in daily life due to the musculoskeletal symptoms among computer operators.

Methodology: It was a cross-sectional study conducted among Sample size of 715 Computer Operators working in various sectors. They were selected from Bhubaneswar and Cuttack and other city of Odisha and also recruited from outside of Odisha like Delhi, Mumbai, Varanasi, Lucknow etc. to get maximum participation from Computer Operators. Face-to-face interviews as well as Online/mail Survey were employed. Self-administered Questionnaire was used to obtain information regarding Demographic data, working environment, working time and hours of work on computer, short break, physical activity and respondent were asked to mark the body region where they experience pain, duration of pain and Psychological stress.

Results: Result of the study showed that the Prevalence of musculoskeletal pain among computer operators was (76%). The body region most affected was the lower back pain which was highest (59.86 %) followed by Neck pain (47.13%), Upper back (46.43%) Shoulder (46.43%), Wrist (38.04)% Hip/Buttock (37.90%), Knee (37.62%) and lower leg (34.82%). The risk factors for musculoskeletal were female sex, prolong use of computer, prolong working hours, BMI >24.9, longer work experience, shift duty and sedentary life. Self-reported risk factors were work related risk factors like working in same position for long periods, work station issues, repetitive work, and pressure to meet the targets. Besides this, it has also been found that musculoskeletal pain was risk factor for mental stress.

Conclusion: The study found that significant proportion of computer operators were found to have musculoskeletal pain. This study has also brought into focus the factors contributing to the occurrence of musculoskeletal pain. Thus, there is need of educating regarding risk factors for developing musculoskeletal pain and its impact on physical and mental health, training programme on prevention and coping strategies should be considered as an integral part of prevention and management of computer professionals who are at high risk for developing musculoskeletal pain.

Keywords: Computer Operators; Musculoskeletal Pain; Risk factors

Introduction

Musculoskeletal disorders denote health problems of the locomotors apparatus, i.e. muscles, tendons, the skeleton, cartilage, the vascular system, ligaments, nerves and spinal discs [1]. The World Health Organization defines work related musculoskeletal disorders as 'an appropriate nomenclature for a constellation of disorders that have been shown to have strong association with one or more work place exposures' [2]. Work related musculoskeletal disorders (WRMSDs) are sometimes called repetitive strain injuries (RSIs), cumulative trauma disorders and overuse injuries. It is a contemporary problem and accounts for 51% of reported occupational illness in United States [3]. It is an important public health problem in both developed and developing countries with substantial impact on the quality of life as well as substantial economic burden in costs, lost wages, and productivity [4] and also contribute about 37% of disease burden globally, which might be attributed to occupational risk factors resulting in substantial disability.

Computers have entered our daily, personal, commercial and military lives [5]. Musculoskeletal symptoms or disorders among employees working on computer and peripheral devices in information technology sections have been a major concern in recent years [6]. Worldwide 15 - 25% of all computer users are estimated to have WMSDs [7]. About 76% of computer professionals in India reported musculoskeletal pain and discomfort in various epidemiological studies [8-11]. Studies done in western countries and in India show a

high prevalence of MSD in computer professionals and computer users. Of which, studies done in Serbia and Nigeria report the prevalence rate of musculoskeletal complaints to be 55.8% and 21% respectively [12]. On the other hand, studies done in India in Delhi, Mumbai, Loni Maharashtra, and four metropolitan cities report the prevalence rate to be 76.5%, 63%, 73.3% and 59% respectively.

Furthermore, subjects have reported a high incidence of musculoskeletal symptoms, particularly in neck, lower back, shoulder, upper back, wrist and hand of which the most affected was the neck and the least affected was the shoulder [4,5,7]. Apart from musculoskeletal symptoms, visual affection and psychological affection are seen in computer professionals who work more than 6 hrs per day or 15 hrs per week [13].

Many studies have been done on computer professionals regarding the prevalence of musculoskeletal disorders affecting the neck, shoulders, arm, wrist and lower back. There are studies giving a number of risk factors like prolong sitting in a single posture, duration of computer use without breaks, gender, type of work etc. [7,14,17,18]. Most of the previous studies WMSDs among computer operators were limited on work station issues ,working duration and demographic variation but very limited studies are done on Physical activity during leisure time (active/sedentary) [18,19] as important variable for MSDs in computer operators also various studies suggest that work-related psychosocial aspects have been identified as causal factors contributing to the development of WMSDs but no specific study was done on WMSDs which can be a contributing factor to give rise a stress in daily life among computer operators.

The purpose of my study was to find out the prevalence of musculoskeletal pain among computer operators participating in regular healthy physical exercise and those who live with sedentary life style and quantified association between physical exercise and musculo-skeletal pain and other risk factors that contribute to development of musculoskeletal pain among computer operators. There was also need of the study to determine the prevalence of stress in daily life due to musculoskeletal pain among computer operators. By doing this survey we can give them the knowledge about the problems and guide them towards primary and secondary prevention of work related musculoskeletal disorders (WMSDs).

Aim of Study

1. To Document the prevalence of Musculoskeletal Pain in all over body region among computer operators and variation over demographic factors.

2. To understand the predictors of risk for Musculoskeletal Pain in all over body region and specific risk factors for Neck Pain and Lower Back Pain will be studied separately among computer operators.

3. To find out prevalence of Musculoskeletal Pain between individuals who participate in regular healthy physical exercise and those who participate in less physical exercise regime among computer operators.

4. To find out prevalence of stress facing in daily life due to the musculoskeletal symptoms among computer operators.

Methodology

It was a Cross Sectional Study conducted among Computer Operators working in various sectors like; Software company, Corporate sector, IT sector, Banking and Health care etc. They were selected from Bhubaneswar, Cuttack, other cities of Odisha and also selected from outside of Odisha like Delhi, Mumbai, Varanasi, Lucknow etc to get maximum participation from Computer Operators. 715 Subjects were included by Convenient Field sampling method after satisfying inclusion and exclusion criteria for the study.

Inclusion Criteria

1. Computer operators working on computer at least 4 - 6 hours/day.

2. Age group of 25 - 50 years.

3. They had to have been employed in the current position for at least six months.

4. Those who are willing to participate in the study.

Exclusion Criteria

1. Those who are suffering from medical condition like any systemic arthritis, Neurological problems, and recent musculoskeletal trauma and surgery.

2. Those who are not willing to the participate in the study.

Questionnaire description and administration

Self-administered Questionnaire was used as a study tool contains 24 questions. From question no 1 to 20 contained question regarding Demographic data, working environment, working time and hours of work on computer, short break, physical exercises and respondent were asked about current musculoskeletal complaints (pain, stiffness, tingling, trembling, and cramps) and tick on the body part which had discomfort or pain and for estimate the severity of pain visual analogus pain scale was used along with question no 21 to 24 regarding remedial approach taken for pain, history of chronic illness and they were also asked regarding stress felt due to musculoskeletal pain and how to cope with stress. One thousand copies (1000) of Questionnaire on 'Risk factors responsible for musculoskeletal pain among Computer Operators' were distributed among computer operators by face to face interview and also sent via mail to get maximum participation of subject. Seven hundred fifteen (715) were duly completed and thus were used for data description. Subjects were selected on the basis of Convenient Field sampling method Once subjects give their oral consent a brief explanation of the Objectives, procedure of filling the Questionnaire and benefit of the study were explained to the participants. Every participant was also requested to sign a consent form prior to the study. Subject willing to participate in the study was taken. In those subjects who were approached through mail/online given 2week to complete the questionnaire.

Data Analysis

The data collected were entered into Excel Spreadsheets and analyzed using Microsoft office Excel 2007. Frequency tables were used to describe the distribution of study variables in the population. Odds ratio and Chi square were used to measure the strength of associated risk factor and considering null hypothesis to be significant if P value is < 0.05, which is the level of significance.

Results

Demographic Characteristics

One thousand copies of Questionnaire on 'Risk factors responsible for musculoskeletal pain among Computer Operators' were distributed. Seven hundred fifteen (715) were duly completed and thus used for data description. Respondent rate was 71.5 percent. 65% participants were male and 35 % were female. Most of the respondents about 65 % were young between (25 - 30) yrs age group, only 26% (31 - 40) yrs age group and 9% (41 - 50) yrs old age group.

51% participant work (8 - 10 hrs) per day, 29% (> 10 hrs), only 4% participant spend (4 - 6 hrs), 16% (6 - 8 hrs) work per day. The frequency of computer use show that 44% participants use maximum time about (80-100%) of daily working hrs, 33 % (60-80%) and

only 17% use (40 - 60%) and 4% use (20 - 40 %) of total working hrs. In this study, majority of population 87% were in general working hrs and 13% work in a Shift duty.

Regarding work experience in Computer profession 46% population having < 5 years experience, 39% having 5 - 10 yrs, 6% having 10 - 15 yrs and 9 % having > 15 yrs of work experience. Of all, on the basis BMI distribution (kg/m2), 58% were Noted Under Normal Categories, 38% were Noted Over Weight And 4 % were noted in underweight categories. Most of the participants about 67% were not able to maintain regular physical activity or exercise daily, only 33 % were engage in daily regular healthy physical activity regime. The Prevalence of Musculoskeletal pain among computer operators were reported by about more than half (76%) of the participants reported musculoskeletal pain.

Regional Prevalence of Musculoskeletal Pain

Figure no 1 shows Regional prevalence of musculoskeletal pain among computer operators. Among all the lower back pain was highest (59.86%) followed by Neck pain (47.13%), Upper back (46.43%) Shoulder (46.43%), Wrist (38.04)%, Hip/Buttock (37.90%), Knee (37.62%) and lower leg (34.82%) whereas Upper arm (29.32%) followed by thigh (28.1%), Forearm (27.83%) and Elbow (26.01%) moderately reported.
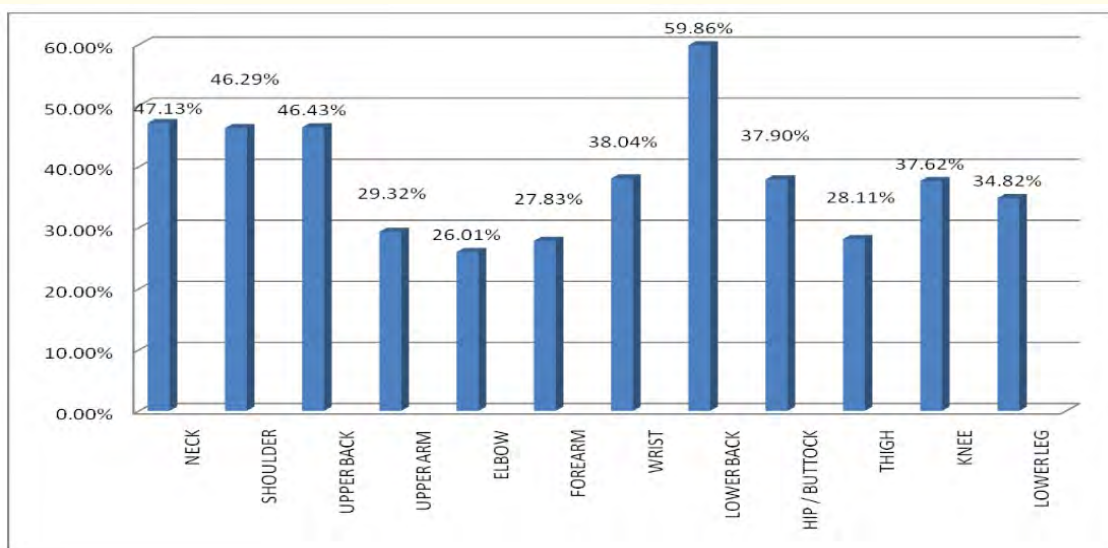
Self-reported issues that related to Working environment that affect Musculoskeletal System

Figure no 2 shows Work Station issues (304), Repetitive work (215) and Pressure to meet target were reported as the highest self-reported risk factors related to working environment issues that affect Musculoskeletal System among all participants whereas 83 participant having no problem about working environment.
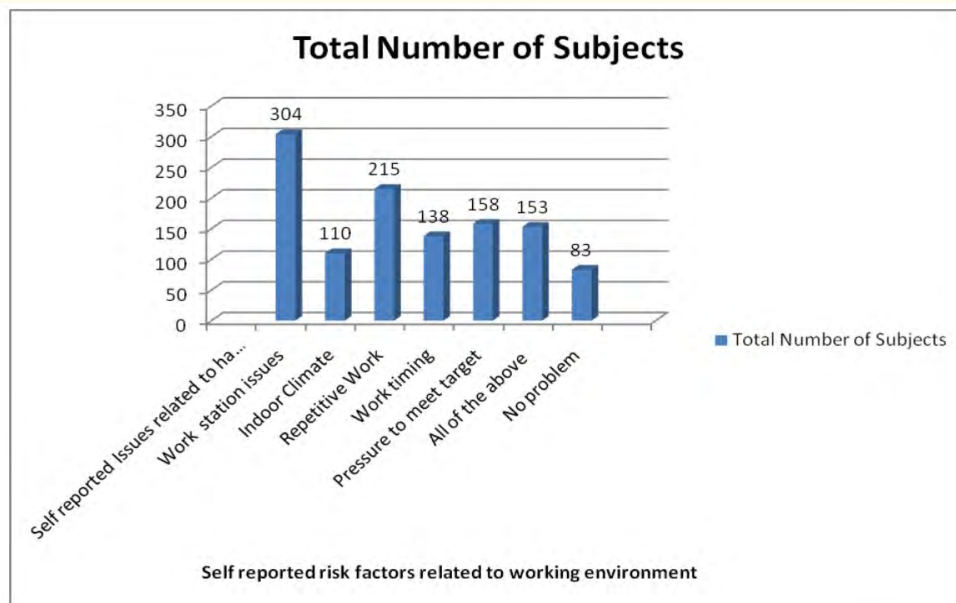
Variation in musculoskeletal pain over demographic factors

Table no 1 shows Variation in Musculoskeletal pain over demographic factors musculoskeletal pain was more prevalent among female (77.60%), above31 - 40 yrs 80.97 % and in 41 - 50 yrs old age participants having 86.15% , BMI > 24.9 (82.49%) and those were not doing physical exercise during leisure time having (84.61%) whereas prevalence of MSP increase with increase of duration of working hour on computer, frequency of working hours per day , shift duty and work experience because in this study participant who worked 60 - 80% of total working hrs on computer having 71% of musculoskeletal pain and those work 80 - 100% prevalence of musculoskeletal pain was 85.30% respectively, worked hours > 10 per day (80.95%), shift duty (79.56%) and > 15years (83.87%) respectively.

Variable	Category	Total Number of Subjects	Presence of Musculoskeletal Pain	No Pain
Gender	Male	465 (65%)	346 (74.40%)	119 (25.59%)
	Female	250 (35%)	194 (77.60%)	56 (22.40%)
Age	25 - 30	466 (65%)	335 (71.88%)	131 (28.11%)
	31 - 40	184 (26%)	149 (80.97%)	35 (19.02%)
	41 - 50	65 (9%)	56 (86.16%)	9 (16.07%)
Frequency of working hours per day	4 - 6	26 (4%)	19 (73.07%)	7 (26.92%)
	6 - 8	113 (16%)	76 (67.25%)	37 (32.74%)
	8 - 10	366 (51%)	275 (75.13%)	90 (24.59%)
	> 10	210 (29%)	170 (80.95%)	40 (20.0%)
Percentage of computer use per day	20 - 40%	41 (6%)	27 (65.85%)	14 (34.14%)
	40 - 60%	123 (17%)	77 (62.60%)	46 (37.39%)
	60 - 80%	238 (33%)	169 (71.00%)	69 (28.99%)
	80 - 100%	313 (44%)	267 (85.30%)	46 (44.69%)
Working Schedule	General working hours	622 (87%)	466 (74.94%)	156 (25.00%)
	shift duty	93 (15%)	74 (79.56%)	19 (20.43%)
BMI	< 18.5	26 (4%)	18 (69.23%)	8 (30.76%)
	18.5 - 24.9	352 (58%)	249 (70.73%)	103 (29.26%)
	> 24.9	337 (38%)	278 (82.49%)	59 (17.50%)
Physical Exercise during leisure time	Yes	234 (33%)	133 (56.83%)	101 (43.16%)
	No	481 (47%)	407 (84.61%)	74 (15.38%)
Work Experience	< 5 years	327 (46%)	243 (74.31%)	84 (25.68%)
	5 - 10 years	282 (39%)	209 (74.11%)	73 (25.88%)
	11 – 15 years	44 (6%)	36 (81.81%)	8 (18.18%)
	> 15years	62 (9%)	52 (83.87%)	10 (16.12%)

Predictors of risk for Musculoskeletal Pain among computer operators

Table no 2 Table shows the predictors of risk for Musculoskeletal Pain among computer operators Female had 1.19 times risk for developing musculoskeletal pain (OR = 1.19, 95% CI 0.82 - 1.71) as compared to male. It was also found that Subjects worked for more than 10 hours 1.56 time (OR = 1.56, 95% CI 0.16 - 2.76), shift duty 1.30 time (OR = 1.30, 5% CI 0.76 - 2.27), BMI > 24.9 1.98 times (OR = 1.98, 95% CI 0.86 - 5.04) times and > 15 years work experience 1.79 time (OR = 1.79, 95% CI 1.09 - 2.53) having risk for developing musculo-

skeletal pain. But these entire variable were not found significant as P value was not < 0.05 in any of the variables. Statistically significant differences found in the reporting of musculoskeletal pain across different age categories, percentage of computer use per day and physical exercise during leisure time those 41 - 50 years of age (OR = 2.43, 95% CI 1.69 - 5.06). Means 2,43 time risk for developing Musculoskeletal pain and Subjects 31 - 40 years of age (OR = 1.66, 95% CI 1.09 - 2.53) means 31 - 40 yrs age group having 1.66 time, 80-100 % use computer per day OR was (OR = 3.00, 95% CI 7.02 - 29.03), that means 3.00 time and Participants who were not able to maintain regular healthy physical activity regime (OR= 4.17, 95% CI 2.91-5.97) 4.17 times risk for having musculoskeletal pain and significant association found between these variable as P value was < 0.05.

Variable	Category	Total Number of Subjects	Presence of Musculoskeletal Pain	No Pain	Odds Ratio(OR)	95% CI	Chi Square ($\chi2$)	P Value
Gender	Male	465	346	119	Reference			
	Female	250	194	56	1.19	0.82 - 1.71	0.896	0.343
Age	25 - 30	466	335	131	Reference			
	31 - 40	184	149	35	1.66	1.09 - 2.53	5.732	0.016
	41 - 50	65	56	9	2.43	1.69 - 5.06	5.979	0.014
Frequency of working hours per day	4 - 6	26	19	7	Reference			
	6 - 8	113	76	37	0.75	0.29 - 1.95	0.331	0.565
	8 - 10	366	275	90	1.12	0.45 - 2.76	0.067	0.795
	> 10	210	170	40	1.56	0.16 - 2.76	0.900	0.342
Percentage of computer use per day	20 - 40%	41	27	14	Reference			
	40 - 60%	123	77	46	0.86	0.14 - 1.82	0.140	0.708
	60 - 80%	238	169	69	1.26	0.62 - 2.56	0.445	0.504
	80 - 100%	313	267	46	3.00	7.02 - 29.03	9.742	0.001
Working Schedule	General working hours	622	466	156	Reference			
	shift duty	93	74	19	1.30	0.76 - 2.27	0.946	0.330
BMI	< 18.5	26	18	8	Reference			
	18.5 - 24.9	352	249	103	1.07	0.45 - 2.54	0.027	0.869
	> 24.9	337	278	59	1.98	0.86 - 5.04	2.821	0.093
Physical Exercise during leisure time	Yes	234	133	101	Reference			
	No	481	407	74	4.17	2.91 - 5.97	65.71	<0.00001
Work Experience	< 5 years	327	243	84	Reference			
	5 – 10 years	282	209	73	0.98	0.68 - 1.42	0.003	0.956
	11 – 15 years	44	36	8	1.55	0.69 - 3.69	1.172	0.278
	> 15 years	62	52	10	1.79	1.09 - 2.53	2.599	0.106

Predictors of risk for Lower back pain symptoms among computer operators

Table no 3 Risk factors for lower back pain among computer operators were Participants who Spent 8 - 10 hrs work per day OR was (OR = 4.022, 95% CI 1.81 - 9.15). that means 4.022 times than those Spent > 10 hrs work per day OR was (OR = 11.32, 95% CI 5.01 - 25.75), on looking percentage of computer use per day we found that those participant spent 60 - 80% use computer per day OR was (OR = 2.23, 95% CI 2.01 - 11.97), that means 2.23 time and spent 80-100 % OR was (OR = 3.43, 95% CI 5.01 - 25.57) 3.43 time. BMI > 24.9 i.e. Obesity odd ratio (OR = 9.85, 95% CI 3.86 - 25.14), that means 9.85 times and those not doing physical

exercise odds ratio 2.09 times (OR = 2.09, 95% CI 1.43 - 3.05) risk for developing for musculoskeletal pain and significant association found between these variable as P value was < 0.05. On other side it found that female1.31 time (OR = 1.31, 95% CI 0.82 - 1.71), above 30 yrs age i.e. 31 - 40 having (OR = 1.18, 95% CI 0.81 - 1.72) 1.18 times , shift duty 1.14 times (OR = 1.14, , 95% CI 0.82 - 1.71) and work experience 11 - 15years 1.14 times (OR = 1.14, 95% CI 0.71 - 1.84) risk for developing musculoskeletal pain but these variables were not found significant risk factors for developing musculoskeletal pain as P value was not < 0.05.

Variable	Category	Total Number of Subjects	Presence of Lower Back Pain on VAS >5 Yes	No Pain on VAS ≤ 5	Odds Ratio (OR)	95% CI	Chi Square ($\chi2$)	*P* Value
Gender	Male	465	124	341	Reference			
	Female	250	81	169	1.32	0.82 - 1.71	2.615	0.105
Age	25 - 30	466	128	338	Reference			
	31 - 40	184	57	127	1.18	0.81 - 1.72	0.798	0.371
	41 - 50	65	20	45	1.07	0.66 - 2.06	0.309	0.578
Frequency of working hours per day	4 - 6	26	7	19	Reference			
	6 - 8	113	20	93	0.75	1.19 - 7.30	5.856	0.015
	8 - 10	366	83	283	4.022	1.81 - 9.15	13.073	0.003
	> 10	210	95	115	11.32	5.01 - 25.75	46.487	<0.00001
Percentage of computer use per day	20 - 40%	41	6	35	Reference			
	40 - 60%	123	17	106	0.93	0.31 - 2.55	0.017	0.896
	60 - 80%	238	66	172	2.23	2.01 - 11.97	3.133	0.076
	80 - 100%	313	116	197	3.43	5.01 - 25.57	14.570	0.0001
Working Schedule	General working hours	622	176	446	Reference			
	shift duty	93	29	64	1.14	0.71 - 1.84	0.330	0.565
BMI	< 18.5	26	6	20	Reference			
	18.5 - 24.9	352	85	267	1.06	0.41 - 2.72	0.015	0.902
	> 24.9	337	114	223	9.85	3.86 - 25.14	32.459	<0.00001
Physical Exercise during leisure time	Yes	234	27	207	Reference			
	No	481	80	401	2.09	1.43 - 3.05	15.159	0.0005
Work Experience	< 5 years	327	102	225	Reference			
	5 – 10 years	282	69	213	0.71	0.49 - 1.02	3.391	0.065
	11 - 15 years	44	15	29	1.14	0.54 - 1.75	0.151	0.697
	> 15 years	62	19	43	0.97	0.58 - 2.22	0.007	0.933

Predictors of risk for Neck Pain among Computer Operators

Table no 4 shows that female 1.21 times (OR = 1.21, 95% CI 0.82 - 1.77), 31 - 40 years age group 1.27 times (OR = 1.27, 95% CI 0.88 - 2.08), participants those who were not doing physical exercise 1.51 times (OR = 1.51, 95% CI 1.01 - 2.27). and work experience 11 – 15 years 1.14 times (OR = 1.14, 95% CI 0.58 - 2.22). Having risk for developing musculoskeletal pain but there was not significant association found between these variables as P value was not < 0.05.

Risk Factors Responsible for Musculoskeletal Pain among Computer Operators

Variable	Category	Total Number of Subjects	Presence of Neck Pain on VAS >5 Yes	No Pain on VAS ≤ 5	Odds Ratio (OR)	95% CI	Chi Square (χ^2)	P Value
Gender	Male	465	86	369	Reference			
	Female	250	55	195	1.21	0.82 - 1.77	0.968	0.325
Age	25 - 30	466	91	375	Reference			
	31 - 40	184	45	139	1.27	0.88 - 2.08	1.937	0.163
	41 - 50	65	15	50	1.23	0.66 - 2.30	0.450	0.502
Frequency of working hours per day	4 - 6	26	8	18	Reference			
	6 - 8	113	19	87	0.15	0.13 - 0.97	4.296	0.382
	8 - 10	366	58	270	0.42	0.17 - 1.02	3.861	0.049
	>10	210	66	136	1.03	0.42 - 2.49	0.005	0.943
Percentage of computer use per day	20 - 40%	41	11	30	Reference			
	40 - 60%	123	15	108	0.37	0.15 - 0.91	4.936	0.026
	60 - 80%	238	36	202	0.48	0.22 - 1.05	3.426	0.064
	80 - 100%	313	89	224	1.09	0.52 - 2.25	0.046	0.830
Working Schedule	General working hours	622	133	489	Reference			
	shift duty	93	18	75	0.88	0.50 - 1.52	0.200	0.654
BMI	< 18.5	26	9	17	Reference			
	18.5 - 24.9	352	66	286	0.43	0.18 - 1.02	3.832	0.050
	> 24.9	337	76	261	0.55	0.23 - 1.28	1.959	0.161
Physical Exercise during leisure time	Yes	234	39	195	Reference			
	No	481	112	369	1.51	1.01 - 2.27	4.139	0.041
Work Experience	< 5 years	327	72	225	Reference			
	5 - 10 years	282	53	229	0.71	0.49 - 1.02	3.391	0.065
	11 - 15 years	44	12	32	1.14	0.58 - 2.22	0.151	0.697
	> 15 years	62	14	48	0.97	0.54 - 1.75	0.007	0.933

Prevalence of stress facing in daily life due to the Musculoskeletal Pain among computer operators Prevalence of Stress due to Musculoskeletal Pain

Table no 5 and Figure no 3 shows 540 Participants who were reported Musculoskeletal pain among 321 having Stress due to MSP (Musculoskeletal Pain) and 219 Not having Stress due to MSP.

	Total Number of Subjects	Percentage
Presence of Musculoskeletal pain	540	75.52%
Presence of Stress due to Musculoskeletal pain	321	59.44%
No Presence of stress due to Musculoskeletal pain	219	40.55%
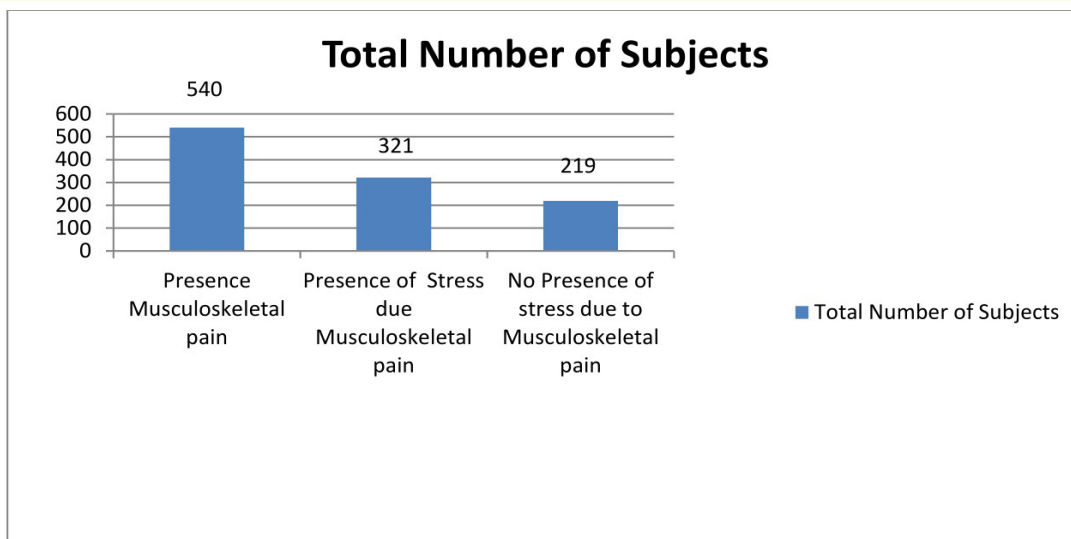
Prevalence of Stress due to Another factors

Figure no 4 Shows 175 (24.47%)were reported no presence of Musculoskeletal pain. Among 52 (29.71%) were reported stress due to other factors and 123 (70.28%) reported no presence of stress.
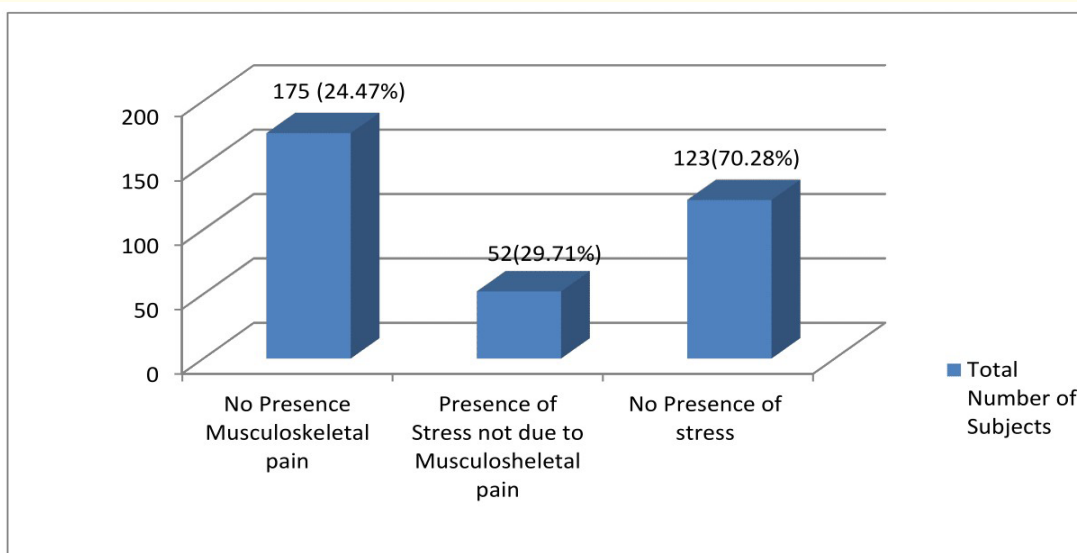
Analysis

Table no 6 shows that on calculating Odds ratio and Relative ratio risk of participants who were having Musculoskeletal pain indicate that OR = 3.46, 95% CI 2.4023 to 5.0039 and RR = 2.00 times having risk for developing stress due to pain. there was highly association found between musculoskeletal pain and stress as (Chi square χ^2 = 46.81, df = 1, P = < 0.00001)

Presence of Musculoskeletal Pain	Presences of Stress		Total Number of person
	Yes	No	
Yes	a 321	b 219	(a+b) 540
No	c 52	d 123	(c+d) 175

Odds Ratio = 3.46

Relative Risk = 2.00

Confidence interval 95% for Odds ratio = 2.4023 to 5.0039

Prevalence of Musculoskeletal Pain between Professionals who participate in regular healthy physical exercise and Professionals who participate in less physical exercise regime during leisure time among computer operators

A. Whether Sedentary life style is a risk for Musculoskeletal Pain Physical Exercise during leisure time.

   Table no 7 Indicated that the OR for Physical exercise indicate that the participants who were not able to maintain regular healthy physical exercise (OR = 4.17, 95% CI 2.9194 to 5.9755) indicate that 4.17 times risk for developing Musculoskeletal Pain compared with participant who were able to maintain regular healthy physical exercise during leisure time.

B. Level for Physical Exercise for pain free

   Figure no 5 shows Prevalence of Musculoskeletal pain in terms of Physical Exercise Level during leisure time. It shows that more prevalence of musculoskeletal pain among subjects those were doing mild form of physical exercise during leisure time.

C. Level for physical activity for pain free

   Table no 8 shows that means there is significant association found between level of physical activity and musculoskeletal pain as (Chi square χ^2 = 86.19, *df* =2, at significance level 0.05 = 5.991 and at 0.01 = 9.21).

Category	Musculoskeletal Pain	No Pain	Total Number of Subjects
No	a 407	b 74	(a+b) 481
Yes	c 133	d 101	(c+d) 234

Odds Ratio = 4.17
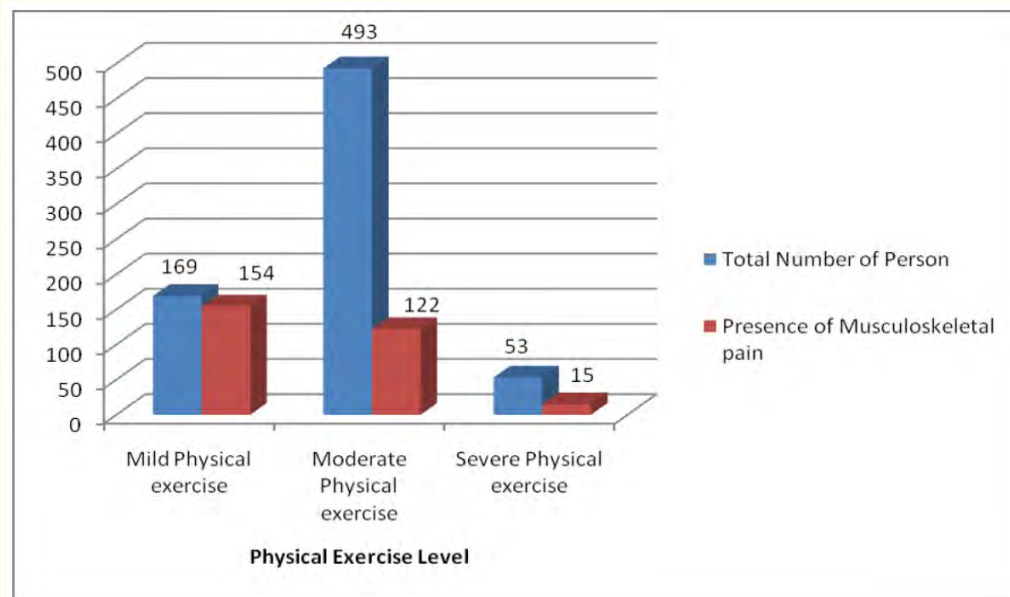
Physical Activity Level	Presences of Musculoskeletal pain		Total Number of Person
	Yes	No	
Mild	154	15	169
Moderate	371	122	493
Severe	15	38	53

Discussion

Prevalence of musculoskeletal disorders varies across occupational groups and over national boundaries. Subjectivity of terms, variations in assessment tools, organizational differences in work settings, and cultural differences in perception, and reporting of pain and disorders are adduced or the variation in rates of WMSDs in different studies.

In our study the prevalence of Musculoskeletal pain among computer operators were 76 % this observation was similar with the result obtained by D. Bhandar [20] found prevalence of Musculoskeletal pain 75.2% and Armstrong., *et al.* 25 - 76% [21] among Video display unit in his study.

In the present study prevalence of musculoskeletal pain according to regional area found that among all region whether lower back pain (59.86%) was predominant complaint region followed by neck pain (47.13%), Upper back (46.43%) shoulder pain (46.43%) Wrist (38.04%), hip (37.90%), knee(37.62%) and lower leg (34.82%) whereas upper arm (29.32%) thigh (28.1%) , Forearm (27.83%) and Elbow (26.01%) moderately reported which support the study result of Surajo Kamilu Sulaiman., *et al.* [19] and P Shaul Hameed., *et al.* [22].

On comparing the variation over demographic area in this study i was not found that the prevalence of Musculoskeletal pain was slightly higher in female 77% than male 74% which support the study finding of S Arun Vijay., *et al.* [11] and Dinesh Bhanderi., *et al* [20].

This study showed that prevalence of pain was more among above 31 - 40 yrs 80.97 % and in 41 - 50 yrs old age participants having 86.15 % MSP. Similar to study finding of Dinesh Bhanderi., *et al*. [20] participants with age group of 36 - 45 yrs old was having 79.2% and46-55 age group having 100% musculoskeletal discomfort and study results of Dr S A Shah [23]. Present study also showed that prevalence of MSP increase with increase of duration of working hour on computer and work experience because in this study participant who worked 60 - 80% of total working hrs on computer having 71% of musculoskeletal pain and those who work 80 - 100% prevalence of musculo-skeletal pain was 85.30% respectively that more than those who spent less duration on computer similar to the study results of Richa Talwar., *et al*. [8] and this study also found that prevalence was more in those having work experience 10 - 15 yrs and more than 15 yrs having MSP 75.13% and 80.95.% which support the finding of Saurabh R Shrivastva., *et al* [9].

On comparing other variable it was found that participants who took short break after prolong sitting duration i.e. 3 - 4 hrs, more than 4 hrs and those were don't take any break having more prevalence of Musculoskeletal pain i.e 88.88%, 94.38% and 81.81% respectively compare to those who take a short break frequently which support the study done by Lys Rocha., *et al* [24].

This study showed that the prevalence of MSP was more among overweighed participants and was consistence with study finding of Jasobata Sethi., *et al.* [25] present study showed professionals were not able to maintain regular healthy physical exercise have more prevalence of MSP 84.61% compared to those not able to maintain regular healthy physical regime which support the finding of Korhone., et al. [18] and Julia M Hush., *et al*. [26] Found that participants who were not physical active prevalence of neck pain was 56.7% as com-pared to those physically active 38.6%.

Risk factor for Musculoskeletal Pain

Self-Reported Risk Factors: The current study has revealed that Work Station issues (42.25%), Repetitive work (30%) and Pressure to meet target (22.09%) were Self-reported Risk factors related to Working environment that affect Musculoskeletal system and produce musculoskeletal pain similar to the finding of Stanley M Maduagwu., *et al*. [27] and Study results of Ljiljana Blagojević., *et al* [5].

Risk Factors for Musculoskeletal pain

In our study, it was found that female computer professionals have 1.19 times higher risk (OR = 1.19) than male computer operators and Shift duty worker (OR = 1.30), means Shift duty workers 1.30 times compared with general working hours worker having risk for de-veloping which support the study finding of ljilana., *et al* [5] showed and Study finding of B. Cagnie reveals *et al* [28]. In this study, Gender and shift duty were not found statistically significant for developing musculoskeletal pain as p value was not less than 0.05. Hypothesis regarding gender difference in the prevalence of musculoskeletal symptoms may result from women's exposure to physical household work, but this may be offset by men's exposure to other physically demanding activities outside the workplace, such as garden Another hypothesises that gender differences in anthropometrics may put women at a disadvantage as they work in more extreme postures or use relatively greater muscle force than men.

In the current study, statistically significant differences found in the reporting of musculoskeletal pain across different age categories with the highest likelihood of pain being among those 41 - 50 years of age (OR = 2.43). means 2,43 time risk for developing Musculoskel-etal pain and Subjects 31 - 40 years of age (OR = 1.66) means 31 - 40 yrs age group having 1.66 time risk for developing musculoskeletal pain compared both to 25-30 years of age group. Here it was concluded that subjects younger than 30 reported significantly less muscu-loskeletal pain than older subjects (older than 30 years of age) and also significant association found between age and Musculoskeletal pain as p value was < 0.05 which support the study result of Dr. SA Shah., *et al*. [23] and B Cagnie., *et al* [28].

On calculating the Odds ratio between Percentage of computer user per day and Musculoskeletal pain indicate that those subjects spent 80 - 100% use computer per day OR was (OR = 3.00). that means 3.00time risk for developing musculoskeletal pain than those

were use 20 - 40% computer per day and significant association was found between 80 - 100% use computer per day and prevalence of musculoskeletal pain as p value < 0.05 similar finding was seen in study of Richa Talwar., *et al.* [8] and O Ayanniyi., *et al* [29].

It was also found that for those subject having Over weight BMI > 24.9 was (OR = 1.98). that means 1.98 times having risk developing musculoskeletal pain found as compared to those having BMI < 18.5. but statistically was not significant for developing Musculoskeletal pain among computer operators which support the study finding of ljilana., *et al* [5].

In support of this finding Shiri., *et al*. [30] confirmed about the association between weight-related factors and the prevalence of Low Back Pain.

Physical exercise during leisure time

Prevalence Musculoskeletal pain in the Exercise and Sedentary life style

In present study on calculating Odds ratio, Participants who were not able to maintain regular healthy physical activity regime (OR = 4.17), 4.17 times risk for having musculoskeletal pain as compared to those participant able to maintain regular healthy physical activity daily. It indicates sedentary life style more risk for developing Musculoskeletal pain among computer operators and significant association was between physical exercise during leisure time and prevalence of musculoskeletal pain. Similar finding was found in study results of Surajo Kamilu Sulaiman., *et al* [19].

Level of physical exercise for pain free during leisure time and Musculoskeletal pain

Present study confirms the finding of level of physical activity during leisure time. It was found that prevalence of Musculoskeletal pain was more among those professionals who were doing light physical exercise during leisure time it was 91.12% as compared to moderate physical exercises 24.74% and High physical exercises was 28.30% respectively. on statistically analysis chi square value was 86.19 which show high association between physical exercise and Musculoskeletal pain. From above finding we conclude that participant who was not doing healthy physical exercise regime level having more risk for developing musculoskeletal pain which support the study finding of Korhnen., *et al*. [20] and Jacobsen and Aldana., *et al.* [35].

Risk factors for Neck Pain

In our study, we found that Female (OR = 1.21) that means female 1.21 times having risk for developing Neck pain compared with male. Subjects younger than 30 reported significantly less neck pain than older subjects (older than 30 years of age). 31 - 40 years of age (OR = 1.27 means 31 - 40 yrs age group having 1.27 time risk for developing Neck pain than 25 - 30 years of age group. 41 - 50 years of age OR was (OR = 1.23), 1.23 times risk for developing Neck pain as compared to 25-30 age group. Not being physically active increased the risk of neck pain (OR = 1.51, 95% CI 1.49 - 3.16). These all findings support the study result of B Cagnie., *et al* [28].

On statistical analysis, it was found that above 2 variable Gender and Age were not significant risk factor for producing Neck pain among computer operator as p value was not < 0.05 but their significant association was found between Physical activity and Neck pain as p value < 0.05.

Hypothesis regarding gender pattern and age seen in this study may be as Women are working with higher relative musculoskeletal load, for instance, applying higher forces to the mouse and using greater range of motion, than are men. Additionally, women are shown to report motor symptoms than men [32] and made an hypothesis regarding age and Musculoskeletal pain was that the increase with age can be understood by increasing degeneration of the cervical spine with age.

Researchers who investigated the relationship of activity and neck pain found that Being physically active decreases the likelihood of having neck pain. Korhonen., *et al.* [18] found in their cohort study that employees who exercised less frequently demonstrated a higher risk of neck pain. This may have some clinical implications: as concluded by Hildebrandt et al., stimulation of leisure time physical activity may constitute one of the means of reducing musculoskeletal morbidity in the working population, in particular in sedentary workers.

On calculating risk factor for Neck pain found that those subject Spend 80-100 % use computer per day OR was (OR = 1.09) that means 1.09 time risk for developing Neck pain than those were use 20 - 40% computer per day which was not very significant risk factor for Neck pain in present study.

Regarding work experience found that Odd ratio for work experience indicate that those subject having 10-15 yrs of work experience OR was (OR = 1.14). that means 1.14 times risk for developing Neck pain found as compared to those were having work experience < 5 years but calculating odd ratio for work experience indicate that those subject having > 15 years of work experience OR was (OR 0.97) that means no risk found for developing neck pain as compared to those were having work experience < 5 years.

All above two variables in our study found to be not significant among computer operators.

Similar finding was found in study done by Farideh Sadeghian., *et al.* [38] on Persistent of Neck/Shoulder pain among Computer Office workers.

In this study, BMI not fount risk factor for neck pain as Odds ratio of those subject having BMI 18.5 - 24.9 was (OR = 0.43) and those subject having BMI >24.9 was (OR = 0.55) that means not significant risk factor found for developing neck pain which dissimilar to the study done by Surendra Babu Darivemula., *et al.* [34].

Risk factors for Lower back pain

In present, it was study it was found that female was more prone to develop lower back pain compare to male on calculating Odds Female (OR = 1.31) that means female 1.31time having risk for developing low back pain compared with male similar to result finding of Hu HY., *et al* [35]. Participant who Spent 8-10 hrs work per day OR was (OR = 4.022). that means 4.022 times than those Spend >10 hrs work per day OR was (OR = 11.32). that means = 11.32 times risk for developing lower back pain and on looking percentage of computer use per day we found that those participant Spend 60 - 80% use computer per day OR was (OR = 2.23). that means 2.23 time and spend 80-100 % OR was (OR = 3.43) 3.43 time risk for developing lower back pain. which support study finding of study P Shahul Hameed., *et al* [22].

Hypothesis regarding working hours spent on computer leads back pain that working for prolonged period of time which require the workers to stay in a static posture for long periods. Back pain usually occurs due to sprains and strains in the back as an outcome of static or an awkward posture. It was significant risk factor for developing lower back pain as p value < 0.05.

In this study, it was found that participant having BMI > 24.9 i.e. Obesity odd ratio (OR = 9.85). that means 9.85 times having risk developing lower back pain and was highly significant association fond between BMI and lower back pain which support the study finding of P Shahul Hameed., *et al* [22].

Prevalence of stress facing in daily life due to the musculoskeletal

The finding confirm that Participants were reported MSDs having 3.46 times, (OR = 3.46,) risk of having stress compared with those who were suffering musculoskeletal pain and On calculating chi square theatrical statistic value was x2 = 46.81 higher than the critical

statistic value set at significance level 0.05 = 3.841 and at 0.01 = 6.635 hence there was highly association found between musculoskeletal pain and stress hence finding which support the study done by Maria D Antonopoulou., *et al* [36].

Conclusion

Our study showed high prevalence musculoskeletal pain among computer operators. Nearly three fourth of the professionals have musculoskeletal pain. Nearly (76%) of computer operators having musculoskeletal pain at one or more than one region, Lower back (59.86%) and Neck (47.13%) being the most commonly affected area. In the Present study, it was observed that Individual and work related risk factor play significant risk factors for developing musculoskeletal pain among computer operators. This study shows female, middle and old age group, Obesity (BMI > 24.9), and less physical exercise during leisure time were risk factors that contribute to increase in Musculoskeletal pain among computer users employees. Besides of individual risk factor work related risk factors like working in same position for long periods, work station issues, repetitive work, pressure to meet target, shift duty, longer work experience i.e. 10 - 15 yrs and > 15 yrs over same position, working hours > 10 hrs and 80 - 100 percentage of computer use per day were found to be most commonly reported job risk factors for the development of musculoskeletal pain.

Present study also provide impact of Musculoskeletal pain on mental health of professionals It was found musculoskeletal pain leads great risk for developing stress and ultimately leads negative impact on quality of life.

Limitations

A. Questionnaire on physical activity and on stress used in this study are self-reported and hence subjective biases might be there.

B. Gender difference could not be studied because of less female respondents.

Recommendations

1. Further research is required using more quantitative analytical tools may give an accurate estimate of physical exercise level expose to risk factors for musculoskeletal pain among computer operators

2. In our study, we are unable to use valid Questionnaire on Stress, further research is required diagnostic instrument to measure impact of musculoskeletal pain on stress.

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